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## FROM THE EDITORIAL COMMITTEE

We are giving you the next 30th 4 (2023) – part II issue of the Scientific Journal of the Faculty of Management at the Rzeszow University of Technology entitled “Humanities and Social Sciences”.

The aim of the Publisher is to raise the merits and the international position of the quarterly published by the Faculty of Management, that is why we are still developing the cooperation with foreign team of reviewers, as well as an international Scientific Council. The Editors have also attempted to apply for international databases; currently the quarterly HSS is indexed in **Index Copernicus Journal Master List, The Central European Journal of Social Sciences and Humanities (CEJSH) ERIH PLUS, DOAJ and EBSCO**.

The Journal has been also included in the list of projects qualified for funding under the **“Support for scientific magazines program”**.

The articles published in this publication are devoted to the broader issues of the humanities and social sciences. They are the result both of theoretical and empirical research. The subjects covered vary considerably and reflect the interdisciplinary nature of the Journal. We do hope that the papers published will meet your kind interest and will be an inspiration to further research and fruitful discussions.

On behalf of the Editorial Board of “Humanities and Social Sciences” we would like to thank the Authors for sending the outcomes of their research. We would like to express particular gratitude to the Reviewers for their valuable feedback that greatly contributed to increasing values of the scientific publications.

With compliments  
*Editorial Committee*



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Małgorzata BARAN<sup>1</sup>

## THE MANUFACTURING COMPANY MICROWORLD AS A STRATEGIC MANAGEMENT TOOL. THE EFFICIENCY IN ORDER FULFILLMENT

The main objective of the research was to assess the usefulness of manufacturing company simulators as tools supporting leadership in strategic management. A management simulator was built on the convention of the Systems Dynamics method. The research was carried out in three production companies located in the Podkarpackie Voivodeship in Poland. Through meetings with leaders and workers, a simulation model of the system of basic processes of a manufacturing company was built. The resulting model was the basis for developing the architecture of the manufacturing company simulator (microworld). While working with the simulator, the main focus was on efficiency in order fulfillment. The research shows that it is possible to identify the norms controlling the system that directly affect changes in the above aspect of strategic management.

**Keywords:** System Dynamics, microworlds, simulation, strategic management, manufacturing company, mental models, Vensim.

### 1. INTRODUCTION

In the scientific literature, management simulators are often called microworlds. This is due to the fact that they to some extent reflect the surrounding system and allow for making strategically important decisions regarding this system. They make it possible to test various directions of activities supporting the development of the system and to find solutions to problems exist in the system.

This publication focuses directly on management simulators built in the System Dynamics method. The method was developed in the late 1950s by J. Forrester in the Massachusetts Institute of Technology. It is used to construct simulation models of complex systems and to discover and study their behavioral dynamics. It is largely associated with economic systems of any dimensions.

Currently, management simulators are one of the most important management tools used by modern learning organizations and practising the discipline of systems thinking (Senge et al., 2008). Senge distinguished three basic features of working with management simulators: looking into the future, discovering hidden strategic opportunities and discovering untapped opportunities for reinforcement (Senge, 2006). Thus, managers

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running organizations can experiment with different strategies of action and learn about the effects of possible consequences of their decisions and actions even in the distant future. In addition, the lack of external pressures, cost constraints and operating risks supports experimentation.

## 2. LITERATURE REVIEW

Complex simulation models of economic systems were made based on the principles of Systems Dynamics before management simulators were created. The precursor of these models was Jay Forrester, who first presented a simulation model of a manufacturing company containing feedback interdependencies between streams of money, orders, materials, investments and personnel (Forrester, 1961). He used the DYNAMO software language. After him, the modeling of economic systems was also dealt by: Łukaszewicz (1975), Souček (1979), Sterman (2000), Śliwa (2001), Łatuszyńska (2015) and others.

Over time, more extensive computer software was developed to allow building and simulating economic systems, offering special tools for building models and simulators for managing them. These include: Microworld Creator (Diehl, 1992), Ithink® (Kreutzer, 2018), Stella (Isee Systems, 2023), PowerSim (Powersim Software, 2023) and Vensim (Ventana Systems, 2023).

The use of a simulator as a tool supporting the discovery of strategic opportunities was indicated by Senge who emphasized that one of the applications of microworlds is the possibility of their use by teams immersed in conflicting views on complex issues (Senge, 2006). Śliwa also wrote that thanks to simulators the management staff has the opportunity to make their understanding of the organization more authentic and is given the opportunity to work together to create a coherent theory of organizational action (Śliwa, 2001).

During reviewing management simulators for managers connected with strategic management and described in the literature, it is worth paying attention to the following: Customer Claims Laboratory (Senge, 1989), which helps in systemic understanding of cost and quality issues in the insurance industry; the People Express Airline Simulator (SD Games, 2023), supporting the company's strategic activities for low-cost airlines; B&B Enterprises simulator, thanks to which the leadership of a production company can test business decisions in such areas as: product prices, marketing, production capacity, competition (Senge, 2006).

The vast majority of business management simulators are built in such a way that it is possible to examine specific problems that occur in the system. By understanding the sources of these problems, managers can develop different variants of solutions and test the effects of their implementation on the available simulator. Not only an innocent "game" can be an effective tool for solving problems, but also a tool for determining the main, long-term goals of the company and adopting such courses of action and allocating resources that are necessary to achieve them. This reflects the essence of strategic management (Koźmiński, Piotrowski, 2005).

The main purpose of this article is to examine the possibility of using a production company management simulator in such aspects of strategic management as effectiveness in orders fulfilment.

## 3. MATERIALS AND METHODS

In order to build a production company management simulator, the research was carried out in three Polish companies operating in the Podkarpackie Voivodeship. The aim of the

research was to collect empirical material for the construction of a simulation model, which was the basis for the management simulator. Two enterprises from the small sector and one from the medium enterprise sector were selected.

The small business sector was represented by the Najlepszfoto.pl company. The company has been operating on the photographic market for several decades. The company's clients are professional photographers from Poland and Europe, photography enthusiasts and people for whom photography is a passion and hobby. The research focused on the photobook which is a combination of a traditional book with the concept of a photo album. Its production takes place only for a special order. The production cycle lasts 4 days. After this time, the finished photo book is sent to the customer.

Another company from the small business sector was the Gamma company. The company agreed to the research but wished to remain anonymous. The company has been operating since 1996. It produces, among others, professional silicone matrices and steel matrices for pad printing used for decorative marking of glass and plastics. The research focused on silicone stamps production. They are used mainly for marking plastic products. The production of stamps takes place only for the special orders and it is a unit production.

The third company that the research was carried out was Alfa which also requested anonymity. It is a medium-sized clothing company. The scope of its activity includes sewing elegant men's trousers for the Polish and foreign markets. Customers are primarily other clothing companies, clothing stores and wholesalers as well as individual customers. The research focused on the production of black trousers. The production of this type of trousers is mass.

### 3.1. Methodology of building the simulation model

In the initial stage of the research, meetings with the leaderships and workers of enterprises were organized. Talks were about what problems they most often encounter while managing the enterprise, how they deal with them and what they would expect from working with a management simulator. The research also focused on elements related to strategic management responsible for effectiveness in orders fulfillment, rational management of raw materials and workforce as well as the financial result of the company's activity.

After many discussions, the following parts of the simulation model were adopted: Orders, Production and Sales, Stocks of Raw Materials A, Stocks of Raw Materials B, Labor, Revenues and Costs – Figure 1.

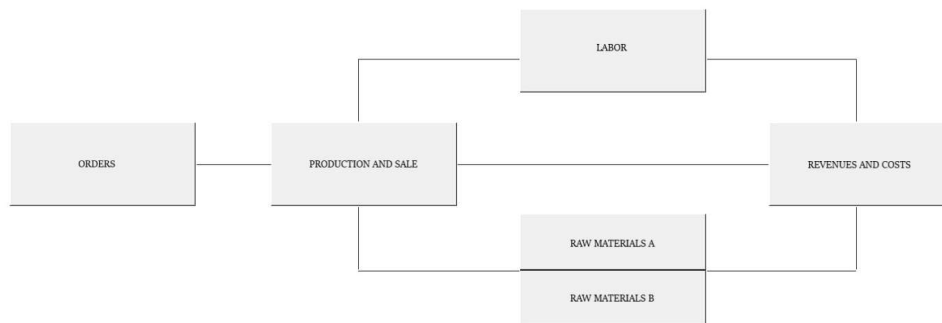


Figure 1. Parts of simulation models

Source: Own elaboration.

In the next step, variables for each part of the simulation model were defined and linked together to create dependency diagrams. Diagrams showed direct and indirect cause-and-effect relationships between the variables. Thanks to that, it was possible to discover the types of feedback loops that had a direct impact on the dynamics selected model variables.

Then, the dependency diagrams of each part were converted into simulation models. Individual variables were presented as mathematical variables and constants. Also, necessary coefficients have been added. Stocks, flows and auxiliary (information) variables as well as mathematical relationships between them were indicated. The models were built in the Vensim DSS program and the mathematical apparatus was presented using mathematical functions and expressions available in it. Both individual dependency diagrams and simulation models of individual parts have been presented in articles (Baran, 2013) oraz (Baran, Stecko, 2013, 2014, 2015, 2016).

The last step was to link the individual parts of the model into one main model which was validated. The following validation methods were adopted:

- assessment of the correctness of the choice of modeling boundaries, the correctness of the model structure and the consistency of the adopted parameter values (model constants) in comparison with available knowledge about the modeled system;
- test of the correctness and consistency of variable units adopted in the model;
- statistical analysis which the ability of the model to reproduce the actual behavior of the system was estimated;
- test of the model's work under imposed extreme conditions.

Individual tests confirmed the correctness of the simulation model's work.

### **3.2. Methodology of building the simulator of managing a production company**

During the next stage were determined: the number of views of the simulator, the functions by individual views, view content, the order views appear, interactions between views. Then, the main menu was developed and the arrangement of elements' individual views was planned.

The designed simulator was built similarly to the simulation model in the Vensim DSS program using: text mode, graphical interface and "screen definition" dialog boxes. Validation of the correctness of work of the management simulator was carried out using the integration test between the simulation model and the simulator interface, the boundary conditions test, modular integration tests and the acceptance test. The revealed discrepancies have been corrected.

## **4. RESULTS**

The following showed empirical materials from one of the surveyed companies, NajlepszeFoto.pl, which agreed to make them public. The research was divided into two stages. At the initial stage, the inflow of orders for photobooks based on historical data was assumed and the dynamics of the behavior of the variables responsible for effectiveness in orders fulfilment were checked. In subsequent studies, norms (constants of the model) controlling the variables responsible for that strategic goal were sought.

### **4.1. Orders based on historical data**

At the initial stage of the research, the inflow of orders for photobooks based on historical data was assumed (Figure 2).



At the beginning of the research period, the number of orders was assumed to be 150 pieces/week. In the fourth week, a sharp increase in orders to 450 units was assumed, which was maintained for the next 4 weeks. It resulted in the increased interest in photobooks during the Holy Communion period. From eight week, a gradual decrease in the volume of orders was assumed until the end of the research period. The longest delay in the production system was 12 weeks, so the research period was twice as long as the longest delay in the system – i.e. 24 weeks.

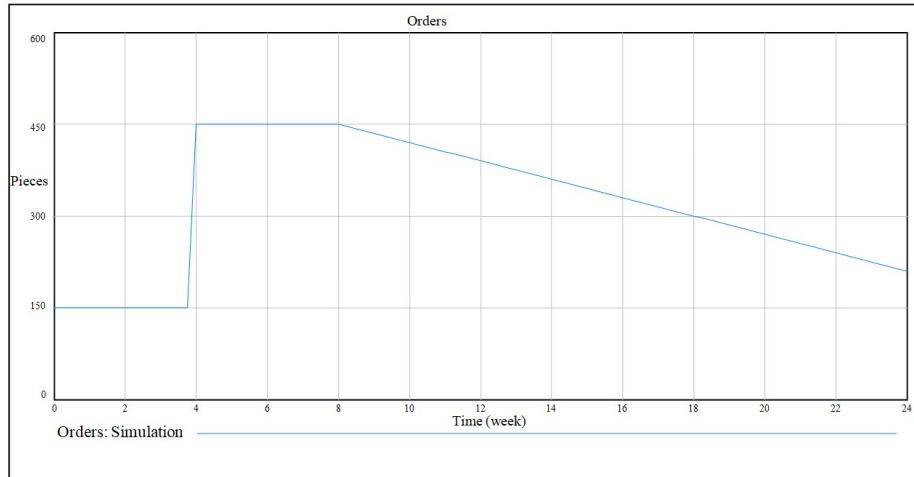


Figure 2. The run of orders

Source: Own elaboration.

The table below shows the values of the model constants used to simulate the model.

Table 1. Values of the model constants

No.	Constans of the Model	Value
1	Orders	$[(0,0)-(24,200)],$ $(0,150),(24,150)$ [Piece]
2	Value of the one-time increase in orders	2 [Piece]
3	Time of the one-time increase in orders	4 [Week]
4	The slope of the line of a linear increase or decrease in orders	-0.1 [1/ Week]
5	End time of a linear increase or decrease in orders	24 [Week]
6	Start time of the sine wave of orders	8 [Week]
7	Time of the one cycle in sine wave	1 [Week]
8	Turn on the production under orders	1
9	Manufacturing cycle time	0.68 [Week]
10	Time to adjust the volume of production in progress	0.17 [Week]
11	Time to correct for overdue production	0.085 [Week]
12	Planned delivery delay	0.68 [Week]
13	Time to adjust stock levels of raw materials A	0.17 [Week]
14	Time to prepare a raw materials A for usage	0.04 [Week]

Table 1 (cont.). Values of the model constants

No.	Constans of the Model	Value
15	Time maintaining inventory of raw materials A	2 [Week]
16	Minimum stock of level of raw materials A	400 [Set]
17	Raw materials A used per unit of production	1 [Set/ Piece]
18	Turn on Raw materials B inventory	1
19	Time to adjust stock levels of raw materials B	3 [Week]
20	Time to prepare a raw materials B for usage	0.02 [Week]
21	Time maintaining inventory of raw materials B	12 [Week]
22	Minimum stock of level of raw materials B	400 [Set]
23	Raw materials B used per unit of production	1 [Set/ Piece]
24	Time to adjust to the required number of workers	2 [Week]
25	Coefficient of required supply and storage workers	0.04
26	Coefficient of required sales workers	0.04
27	Average productivity	19 [Piece / Week / Person]
28	Coefficient of inexperienced workers productivity	0.7
29	Coefficient of inexperienced workers leaving work	0.06
30	Average of inexperienced workers notice period	1 [Week]
31	Gaining experience time	4 [Week]
32	Coefficient of experienced workers leaving work	0.02
33	Percentage of additional workers	20
34	Average notice period	4 [Week]
35	Average cost of a inexperienced worker	450 [PLN/ Week / Person]
36	Average cost of a experienced worker	650 [PLN/ Week / Person]
37	Average cost of a raw materials A	75 [PLN/ Set]
38	Average cost of a raw materials B	15 [PLN/ Set]
39	Utilities per unit of production	1 [PLN/ Piece]
40	Average price of the finished product	180 [PLN/ Piece]
41	Indirect costs	4000 [PLN/ Week]

Source: Own elaboration.

The values of constants were adopted in accordance with conducted empirical research. The simulation of the model was carried out, supplemented with the above values of constants. The simulation step was 0.0078125. The dynamics of changes in selected variables of the simulation model are presented in the graphs shown in Figure 3.

The results showed that in the first four weeks, the company NajlepszeFoto.pl delivered the ordered photobooks to customers in accordance with the incoming orders. From the fourth week, due to the surge in orders, there was a backlog of photobooks production and thus a backlog of deliveries. The largest backlog occurred in the second half of the fourth week – 72 pieces. In the fifth week, the backlog declined to 15 pieces, in the sixth week to 7 pieces, and from the seventh week to the end of the research period, it was about 2–3 pieces.

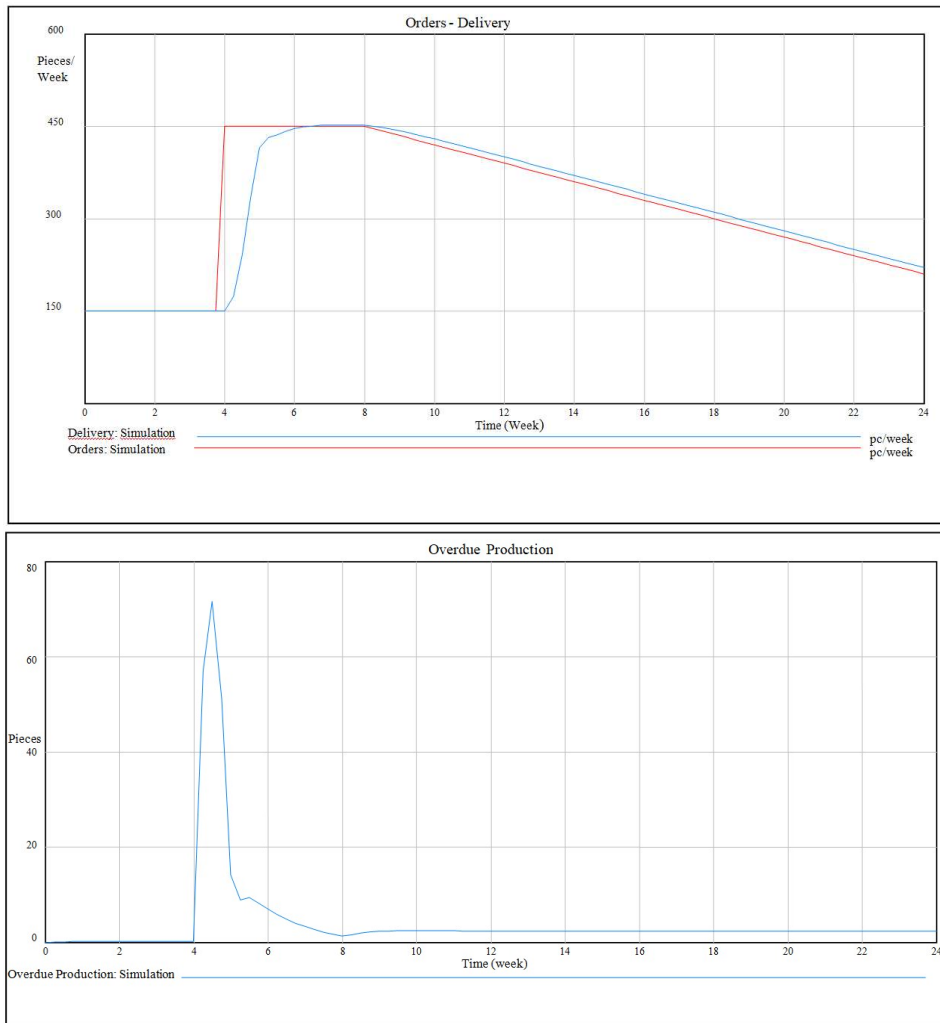


Figure 3. The run of Orders – Delivery and Overdue Production variables

Source: Own elaboration.

#### 4.2. Timely deliveries of ordered photobooks

Next, the focus was on the study of which variables (for the purposes of the publication they were called control variables) affected the size of the backlog in production (which might also affected the volume of deliveries of finished photobooks to customers). The analysis in the “Simulation Synthesis” window on the built simulator was used here. During the analysis, it was noted that four control variables had the greatest impact on the amount of the backlog: “Manufacturing cycle time”, “Planned delivery delay”, “Time to correct for overdue production” and “Time to adjust to the required number of workers”. The first two control variables were related to technology used in the company, so their values were not changed. Therefore, the other two control norms were used for the study.

Their values were changed to check what impact they had on the volume of overdue production as well as on the values of such variables as: “Delivery of finished products to customers” and cumulative “Gross profit”. The simulation results obtained during the changes the “Time to correct for overdue production” are summarized in Table 2. The gray column presents the results for the adopted value of that variable in the company.

Table 2. Different values of “Time to correct for overdue production” variable

	Week	Time to correct for overdue production [Week]				
		0.105	0.085	0.063	0.042	0.021
Overdue Production [Piece]	0	0,00	0,00	0,00	0,00	0,00
	1	0,23	0,21	0,19	0,14	0,06
	2	0,26	0,20	0,12	0,07	0,08
	3	0,24	0,21	0,17	0,12	0,04
	4	0,28	0,23	0,15	0,10	0,04
	5	26,55	14,20	3,25	0,00	0,00
	6	9,88	7,05	4,24	2,03	0,00
	7	4,79	3,28	1,93	0,98	0,12
	8	2,06	1,34	0,75	0,38	0,08
	9	2,89	2,29	1,69	1,15	0,58
	10	3,02	2,44	1,82	1,23	0,62
	11	2,97	2,40	1,78	1,19	0,59
	12	2,91	2,36	1,75	1,16	0,58
	13	2,88	2,33	1,73	1,15	0,57
	14	2,87	2,32	1,72	1,14	0,57
	15	2,86	2,31	1,72	1,14	0,57
	16	2,86	2,31	1,71	1,14	0,57
	17	2,86	2,31	1,71	1,14	0,57
	18	2,86	2,31	1,71	1,14	0,57
	19	2,86	2,31	1,71	1,14	0,57
	20	2,86	2,31	1,71	1,14	0,57
	21	2,86	2,31	1,71	1,14	0,57
	22	2,86	2,31	1,71	1,14	0,57
	23	2,86	2,31	1,71	1,14	0,57
24	2,86	2,31	1,71	1,14	0,57	
Delivery [Pc./Week]	0	150,00	150,00	150,00	150,00	150,00
	1	149,80	149,82	149,85	149,90	149,98
	2	149,96	150,00	150,03	150,02	149,95
	3	149,99	149,98	149,96	149,98	150,00
	4	149,97	149,99	150,01	150,00	150,03
	5	404,02	415,21	420,19	411,63	397,70
	6	447,63	446,12	443,74	440,77	438,08
	7	453,14	451,83	450,24	448,68	447,20
	8	452,65	451,79	450,88	450,12	449,40
	9	442,91	442,64	442,46	442,41	442,43
	10	429,61	429,53	429,51	429,53	429,55

Table 2 (cont). Different values of “Time to correct for overdue production” variable

	Week	Time to correct for overdue production [Week]				
		0.105	0.085	0.063	0.042	0.021
Delivery [Pc./Week]	11	415,11	415,08	415,07	415,08	415,07
	12	400,22	400,21	400,20	400,19	400,18
	13	385,23	385,22	385,21	385,21	385,20
	14	370,22	370,21	370,21	370,21	370,20
	15	355,21	355,21	355,20	355,20	355,20
	16	340,20	340,20	340,20	340,20	340,20
	17	325,20	325,20	325,20	325,20	325,20
	18	310,20	310,20	310,20	310,20	310,20
	19	295,20	295,20	295,20	295,20	295,20
	20	280,20	280,20	280,20	280,20	280,20
	21	265,20	265,20	265,20	265,20	265,20
	22	250,20	250,20	250,20	250,20	250,20
	23	235,20	235,20	235,20	235,20	235,20
24	220,20	220,20	220,20	220,20	220,20	
Gross Profit [PLN]	0	0,00	0,00	0,00	0,00	0,00
	1	3807,53	3807,35	3807,06	3806,61	3806,04
	2	7605,25	7606,42	7608,44	7611,65	7615,04
	3	11412,81	11415,45	11418,13	11419,41	11422,40
	4	15220,03	15222,05	15224,41	15228,09	15229,60
	5	18466,96	18459,55	18451,90	18230,98	17139,73
	6	32056,23	31588,63	30775,22	29442,41	26792,65
	7	46751,43	45863,04	44466,58	42409,79	38802,18
	8	61643,83	60436,75	58617,49	56047,66	51740,55
	9	76310,77	74884,06	72775,33	69848,64	65040,71
	10	90272,61	88694,49	86380,66	83190,66	78001,30
	11	103452,91	101760,66	99287,84	95888,57	90393,34
	12	115863,74	114082,38	111483,41	107916,75	102177,02
	13	127536,04	125684,46	122985,41	119285,63	113351,81
	14	138497,27	136590,33	133812,05	130007,02	123919,63
	15	148766,66	146816,11	143975,25	140087,08	133878,56
	16	158356,17	156371,25	153481,11	149527,08	143223,28
	17	167272,41	165260,48	162331,53	158325,94	151946,73
	18	175518,61	173485,34	170525,86	166479,70	160041,14
	19	183095,66	181045,67	178062,17	173984,13	167498,91
	20	190003,31	187940,20	184937,80	180834,75	174312,81
	21	196240,63	194167,16	191149,91	187027,28	180476,50
	22	201806,27	199724,66	196695,78	192557,73	185984,33
	23	206698,73	204610,80	201572,78	197422,67	190831,53
24	210916,63	208823,73	205778,61	201619,03	195013,95	

Source: Own elaboration

The next table (Table 3) presents the results of the simulation for the previously selected variables after changes the “Time to adjust to the required number of workers”.

Table 3. Different values of “Time to adjust to the required number of workers” variable

	Week	Time to adjust to the required number of workers [Week]			
		3	2	1	0.51
Overdue Production [Piece]	0	0,00	0,00	0,00	0,00
	1	0,26	0,21	0,12	0,05
	2	0,36	0,20	0,11	0,08
	3	0,26	0,21	0,13	0,09
	4	0,30	0,23	0,14	0,10
	5	72,92	14,20	0,00	0,00
	6	15,04	7,05	0,00	0,00
	7	5,97	3,28	0,00	0,00
	8	2,14	1,34	0,00	0,00
	9	2,49	2,29	1,41	0,00
	10	2,47	2,44	2,11	0,00
	11	2,40	2,40	2,29	0,00
	12	2,35	2,36	2,33	0,00
	13	2,33	2,33	2,32	0,00
	14	2,32	2,32	2,32	0,61
	15	2,31	2,31	2,31	1,60
	16	2,31	2,31	2,31	2,05
	17	2,31	2,31	2,31	2,22
	18	2,31	2,31	2,31	2,29
	19	2,31	2,31	2,31	2,31
	20	2,31	2,31	2,31	2,31
	21	2,31	2,31	2,31	2,31
	22	2,31	2,31	2,31	2,31
	23	2,31	2,31	2,31	2,31
24	2,31	2,31	2,31	2,31	
Delivery [Pc./Week]	0	150,00	150,00	150,00	150,00
	1	149,77	149,82	149,92	149,98
	2	149,91	150,00	149,98	149,97
	3	150,05	149,98	149,99	149,98
	4	149,97	149,99	149,98	149,99
	5	367,00	415,21	393,97	384,83
	6	460,77	446,12	437,23	435,15
	7	458,80	451,83	447,09	446,62
	8	454,65	451,79	449,34	449,23
	9	443,70	442,64	441,55	442,70
	10	429,89	429,53	428,91	429,63
	11	415,18	415,08	414,79	415,07
	12	400,23	400,21	400,09	400,17
	13	385,22	385,22	385,18	385,19
	14	370,21	370,21	370,20	369,53

Table 3 (cont.). Different values of “Time to adjust to the required number of workers” variable

	Week	Time to adjust to the required number of workers [Week]			
		3	2	1	0.51
Delivery [Pc./Week]	15	355,21	355,21	355,20	354,34
	16	340,20	340,20	340,20	339,69
	17	325,20	325,20	325,20	324,96
	18	310,20	310,20	310,20	310,10
	19	295,20	295,20	295,20	295,16
	20	280,20	280,20	280,20	280,19
	21	265,20	265,20	265,20	265,20
	22	250,20	250,20	250,20	250,20
	23	235,20	235,20	235,20	235,20
	24	220,20	220,20	220,20	220,20
Gross Profit [PLN]	0	0,00	0,00	0,00	0,00
	1	3807,86	3807,35	3806,62	3806,67
	2	7602,92	7606,42	7612,20	7613,76
	3	11408,63	11415,45	11418,64	11421,11
	4	15219,17	15222,05	15226,84	15228,80
	5	18199,82	18459,55	17956,77	15496,67
	6	32181,43	31588,63	29060,88	24590,12
	7	47319,74	45863,04	42360,32	36520,33
	8	62200,78	60436,75	56372,94	49495,39
	9	76707,08	74884,06	70531,48	62903,83
	10	90485,55	88694,49	84149,96	76015,48
	11	103495,50	101760,66	97091,01	88577,97
	12	115761,18	114082,38	109329,93	100549,93
	13	127314,64	125684,46	120874,37	111927,17
	14	138180,31	136590,33	131738,03	122693,00
	15	148373,45	146816,11	141931,80	132770,75
	16	157902,38	156371,25	151462,22	142218,84
	17	166770,55	165260,48	160332,23	151042,66
	18	174978,56	173485,34	168542,13	159227,56
	19	182525,45	181045,67	176090,70	166761,61
	20	189409,28	187940,20	182976,06	173637,41
	21	195627,70	194167,16	189195,88	179850,20
	22	201178,47	199724,66	194747,77	185396,55
	23	206059,23	204610,80	199629,52	190273,78
24	210267,95	208823,73	203839,06	194479,67	

Source: Own elaboration.

## 5. DISCUSSION

The results showed that the gradual reduction of the “Time to correct for overdue production” by one hour (from the initial value of 4 hours) would reduce the amount of backlog production in individual weeks and a single increase in this time would increase

the volume of outstanding production. The volume of deliveries of finished photobooks to customers would also change. To the fourth week, the supply would be 150 pcs/week. In the fifth week, during reducing the “Time to correct for overdue production” by one hour, the weekly delivery would increase by 5 items but further reduction would cause the volume of deliveries to decrease. Interestingly, in weeks 6, 7 and 8, during increasing the “Time to correct for overdue production” by one hour would result in a slight increase in the volume of deliveries. This is related to the “Current capacity” values, which would take on larger values due to the feedback from “Production backlog”, increasing “Production start required”, which affects the “Current capacity”. In the following weeks, changes to the “Time to correct for overdue production” would not affect the volume of deliveries of finished photobooks to customers.

During analyzing the sales revenues and total costs, it was observed that the accumulated gross profit would decrease after 6 months along with the decrease in the “Time to adjust for overdue production”. With a base value of 0.085 per week, it would amount to PLN 208823,73. After reducing the “Time to correct for overdue production” by one hour – it would fall to PLN 205778,61. After reducing by two hours - it would fall to PLN 201619,03; reduced by three hours, it would amount to PLN 195013,95. Interestingly, increasing the “Time to correct for overdue production” by one hour would result in an increase in cumulative gross profit to PLN 210916,63.

The gradual reduction of “Time to adjust to the required number of workers” from the base value (equal to 2 weeks) would result in a decrease in the volume of overdue production. Reducing the variable by 1 week would completely eliminate the backlog of production in weeks from the first to the eighth, while assuming that the “Time to adjust to the required number of workers” would be 3 days – it would be possible to eliminate the backlog of production in the first thirteen weeks. Increasing the variable by 1 week would result in an increase in the backlog of production in each of the studied weeks.

Reducing the “Time to adjust to the required number of workers” would not, however, affect the increase in the volume of deliveries of finished photo books to customers. There would be no difference in the volume of deliveries in the weeks when order volumes were stable. In the weeks when orders would increase, the gradual reduction of the “Time to adjust to the required number of workers” would also result in a gradual reduction in the volume of deliveries. Increasing the variable by 1 week from the base value, initially would not change the volume of deliveries, but in the “critical” weeks, in which there was an increase in orders, it would slightly increase the amount of finished photobooks that can be delivered to the customer (especially in weeks six, seven and eight). This would result, as in the case of “Time to adjust for overdue production”, from the feedback effect, which by increasing the “Time to adjust to the required number of workers” would increase the amount of “Overdue production”, which, subsequently affecting “Start production required” (Baran, Stecko, 2016).

As a result of changes in sales revenues and total costs, the cumulative gross profit after 6 months and after increasing the “Time to adjust to the required number of workers” by 1 week from the base value would increase by PLN 1444,22. Reducing the “Time to adjust to the required number of workers” would result in a loss of PLN 4984,67 in the case of a decrease of 1 week and a loss of PLN 14344,06 in the case of a decrease of 1.5 weeks.



## 6. CONCLUSIONS

The final results presented that the use of a management simulator built in the convention of the Systems Dynamics method can help in strategic management in terms of timely deliveries of ordered photobooks to customers as well as the financial result in the company. By changing the “Time to adjust for overdue production” from a base value of 0.085 weeks to a value of 0.105 weeks (i.e. 5 hours), the company would increase the volume of deliveries of finished photo books to customers in “critical” weeks and increase the final gross profit by PLN 2092,90 from the profit base. By increasing the “Time to adjust to the required number of workers” by 1 week from the base value (2 weeks), the company would also slightly improve the volume of finished goods deliveries and increase gross profit by PLN 1444,22.

Interesting observation resulting from the conducted research was a noticeable change in the mental models of the company leaderships. While working with the simulator, they learned the complexity of the system they manage and realized that there are feedback loops in the system that they had no idea about them before. This contributed to changing the mental models they used and to searching for new, creative solutions to existing problems in the company system.

Working with a management simulator allows to conduct research with a much wider range than shown in this article. In further research, it would be worth focusing on other control norms that control the company's system, which directly affect the key processes in the company. The simulation model could be developed with further variables that affect various aspects of management and thus improve the company's operations.

In the summary, tools currently offered by the Systems Dynamics method, together with systems thinking and the computer approach, can be used in the strategic management of a company. They allow the company to determine a course of action that will ensure its current and future position in the environment in accordance with the adopted general strategy and the company's mission.

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## **TAXONOMIC ANALYSIS OF UNEMPLOYMENT IN EU COUNTRIES IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT**

Unemployment is one of the most important problems affecting people in all countries. It affects the functioning of entire economies, industries, and enterprises; it also reduces the level and quality of people's lives. The dynamic changes that are taking place in the labor market are forcing entrepreneurs to adopt a flexible approach to labor market resources – that is, employees – and also to choose appropriate forms of human capital management. This may lead to a reduction in unemployment in the market. Consequently, tackling unemployment is one of the important challenges facing the European Union, especially on its way to achieving sustainable development goals. High levels of unemployment could significantly hamper the achievement of the Agenda 2030 employment targets (SDG8), leading to poverty, social and economic inequality, and social instability. Therefore, the subject of this study is unemployment in EU countries; the main objective is to examine unemployment levels across EU member states. The deliberations and analysis are carried out in the context of the Agenda 2030 Goal 8 (SDG 8) for sustainable development. Taking into account the different degrees of implementation of SDG8 by individual Member States, and thus the different results in this respect, the study finds differences and similarities among the surveyed Member States in terms of types and levels of unemployment. The research is based on Eurostat data for 2022, and uses multidimensional comparative analysis methods

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such as cluster analysis and linear ordering. A review of selected sources on international and European law focuses on employment policy standards, including the problem of unemployment; this serves as a background for the analyses. The considerations are embedded in the concept of sustainable development, which influences the functioning of entire economies, but also in the processes of enterprise management. Based on the literature and the results of the analyses, it is concluded that levels of unemployment vary greatly in the analyzed countries. The best conditions for availability and accessibility of work are found in the Czech Republic and Malta; the worst are in Spain and Greece, where unemployment is very high.

**Keywords:** Sustainable development, unemployment, SDG8, labor market management, human capital management, taxonomic method.

## 1. INTRODUCTION

The level of unemployment around the world varies according to region, country as well as the time span of the study. Unemployment is determined by a number of different factors that can be considered in different dimensions and at multiple levels of research. Unemployment data are regularly collected by international organisations such as the International Labour Organisation (ILO) and Eurostat (for the European Union). In the European Union, the average unemployment rate reaches relatively high levels, particularly for long-term unemployment and unemployment of young people (Eurostat); (young people are defined as those between 15 and 29 years old; Eurostat, Which information). This gives rise to the need for adequate institutional intervention in the form of the use of economic policy instruments, including employment policy, for example, unemployment benefits, integration allowances or courses aimed at retraining unemployed people (Leogrande, 2023). It is becoming necessary to take measures designed to ensure a balance between the three dimensions of human life and work: the economic, environmental and social dimension, with particular emphasis on the latter.

In the context of the issues addressed in this paper, the greatest importance should be attached to any action aimed at stable, sustainable and inclusive economic growth, full and productive employment and decent work for all people (Background paper, 2012). The persistence of high levels of unemployment in many parts of the world is not conducive to such stabilising initiatives and, on the contrary, exacerbates socio-economic inequalities, making actions aimed at balancing development more difficult and less effective. An analysis of statistical data characterising global labour force participation does not inspire optimism. In the report “World Employment and Social Outlook: Trends 2023” (Trends, 2023), the International Labour Organisation (ILO) predicts that global employment growth in 2023 will be only 1.0%. The report also points to two vulnerable groups that have been the most disadvantaged in the labour market for years, namely women and young people, emphasising that these groups will continue to face difficulties in finding a satisfactory job. According to the aforementioned report, the global female labour force participation rate in 2022 was 47.4%, compared to 72.3% for men: this means that for every inactive male worker, there were two inactive women. Young people between the ages of 15 and 24 were also at a disadvantage when it came to finding and keeping a quality job: their unemployment rate was three times that of the rest of the unemployed. Overall, global unemployment is projected to reach 208 million people in 2023, with an unemployment rate of 5.8% (International Labour Office, 2023). High levels of unemployment make it very difficult to achieve the Sustainable Development Goals. This is due to the following

reasons (Levasseur, Lesage, Margni, Deschênes, Samson, Werf, 2010): lack of access to income, social inequalities, social conflicts and tensions, slowed economic growth. In view of the above, in the context of the implementation of Sustainable Development Goals 8 (SDG8), it is extremely important to focus attention on the upward/downward trends of the unemployment rate in individual EU countries, as well as to identify differences in this regard between countries. The subject of the research undertaken for the study is unemployment in the European Union countries, defined according to selected criteria (gender, age, length of unemployment). The main objective is to examine the variation of unemployment levels in EU countries due to various aspects and criteria. The analyses were carried out in the context of the eighth goal of Agenda 2030 (SDG 8) for the idea of sustainable development. A review of the international literature on these issues was carried out. Information and up-to-date statistical data collected from publicly available databases such as Eurostat and the OECD were used, the research period being 2022. Taxonomic methods were used in the course of the research task.

## **2. THE SEARCH FOR EMPLOYMENT POLICY STANDARDS AND THE PROBLEM OF UNEMPLOYMENT IN THE LIGHT OF SELECTED SOURCES OF INTERNATIONAL AND EUROPEAN LAW**

The beginnings of the development of international employment policy standards can be traced back to the first half of the 20th century, when the ILO began its activity. Thus, already in 1919, the Preamble of the ILO clearly emphasized that the main assumptions of this organization included, among others: the development of uniform, universal international standards in the field of employment policy and combating unemployment. An update of the objectives stated was contained in the ILO Declaration on Social Justice for a Fair Globalization of 10 June 2008 (ILO Declaration, 2008). The document considered the promotion of employment by creating sustainable institutional and economic environment as a strategic objective within of social justice. Thus, both initially and several decades later, these goals were regarded as crucial, and their achievement was seen as the elimination of inhumane practices that invariably threaten universal prosperity, social justice and peace. According to the literal wording of the provisions, these rights are vested in everyone, and therefore their universal character should be considered. In the literature one emphasizes that the content of the indicated regulations shows that unemployment poses a threat to the implementation of one of the fundamental rights of the individual, i.e. the right to work. The concept of unemployment means the occurrence of a lack of paid work among people in a specific age range related to the working age, who are capable and ready to take up work, and who are looking for it. This means that unemployment remains in opposition to employment and is associated with shifting production resources to the sphere of professional inactivity (Frątczak, 1993). Similarly, the content of the International Covenant on Economic, Social and Cultural Rights of 16 December 1966 (International Covenant, 1966) confirms the indicated rights with their additional strengthening. Specifically, the document emphasizes the need for their full implementation, strengthening them by indicating specific organizational and legal instruments (Article 6(1)). The achievement of full and productive employment, which will allow all concerned to take up employment, will thus become an articulated and overriding objective of employment policy and one of the most important goals adopted by the ILO. Therefore, it is impossible to omit the basic principles regarding the subject matter, which were also the assumptions and objectives of the ILO. They were included in the

Philadelphia Declaration of May 10, 1944, where it was noted that work was not a commodity, and that existing poverty was a threat to common prosperity. In view of the above, the indicated document obliges the Member States, together with international organizations, to undertake permanent and agreed actions, based on equal cooperation both from the representatives of employees, employers and the governments of the Member States. This means that none of the international organizations undertake employment policy directly, and their activities are limited only to defining certain standards, as well as goals voluntarily undertaken by the Member States in the field of autonomously conducted strategies. In case of voluntary actions on the part of the Member States, the activities of the ILO will be limited to the creation of specific legal standards in the field of global employment policy. Then, the international employment policy will consist in the establishment of legal standards defined by the ILO by the Member States that have decided to ratify the Convention in this matter. In addition to the Convention, the Member States must take into account the guidelines contained in circulars (ILO recommendations), as well as supervision in the field of compliance with applicable standards of conduct in the field of broadly understood employment. The achievements of the ILO contributed to the development of certain common solutions that are applicable both in the global and national labor markets of the Member States, i.e. uniform standards for labor markets in the form of job placement, vocational training and vocational guidance. On the other hand, in terms of protection against unemployment, it was recognized that the existing system should be coordinated with the national employment policy, and thus support full, productive, but also freely chosen employment. So far, the declarations contained in the Treaty of Rome have referred only to vague statements encouraging to promote employment, increase and maintain the level of employment and counteract unemployment (Baran, 2019). Thus, the activity of the Community institutions consisted only in encouraging the Member States to cooperate in matters relating to employment. This means that these issues were not considered priority goals at the time, but only complementary (Wise, Gibb, 1993) ones. The European Economic Community (EEC) was to be helpful in this respect by facilitating the coordination of activities in the field of social policy (Article 118 of the EC Treaty, modified by Article 156 of the TFEU – Treaty on the Functioning of the European Union (TFEU)).

However, it is impossible to omit the activities of one of the first international organizations, i.e. the EEC, whose overriding goal was to build a common economy, but it was emphasized that the freedom of movement of employees in this case would become crucial both for prosperity and for the market economy (Baran, 2019). Nevertheless, in accordance with the then 48-66 Training and Enterprise Council, and now 45-62 TFEU, it was based on the assumption that both the supply and demand for labor would be self-clarified, thanks to the free movement of workers. In view of the above, until the 1980s, it was assumed that the activities related to employment policy remained within the competence of individual member states. Such a position was also reflected in the term used at that time to define the issues analyzed, so these issues were included in the category of socio-economic policy. The indicated tendency of non-interference of Community institutions in social matters was recognized as inappropriate already in 1973 during the summit in Paris (Świątkowski, 2016). At that time it was noticed the need not only to modify the resulting political union into an economic and monetary union, but also to actively participate social partners, trade union organizations and entrepreneurs in economic and social goals undertaken by community institutions. The result of these changes were the strategies of action announced in 1974 – the Social Action Program

(Council Resolution 1974) assuming the improvement of working and living conditions of employees, as well as allowing full, efficient employment (Świątkowski 1982). As a result of these changes, it was possible to see an improvement in the equal treatment of working women and men (Wandzel 2003), as well as the protection of employees' rights in the event of restructuring of the workplace, but the document did not contain proposals for changes in the employment policy. However, this was dictated by the previously adopted procedure, according to which actions in this area could be taken when they related to one of the objectives assumed in the treaties (Wandzel, 2003). This procedure was also aimed at ensuring the sovereignty of the Member States' authorities in the field of employment policy. Significant trends in the shaping of the European social model were initiated in Lisbon in 2000. One assumed to build competitive economy with better jobs, as well as to achieve full employment, which was a much better solution than the current concept of high employment (in accordance with Article 9 Treaty on the Functioning of the European Union (TFEU)). The goal was to be achieved thanks to the open method of coordinating employment programs, and the strengthened role of the European Council as a supranational coordination center for a modern employment strategy. In the following decades, the Lisbon employment strategy, which was initiated, was given new, improved versions adapted to modern realities. At that time, the essence of the changes was based not so much on instructions and direct supervision, but on coordination by supranational EU institutions of modern undertakings that had proven themselves in national labor markets. In addition to the existing entities, non-governmental organizations were also involved in cooperation in this area. The activities strictly aimed at job seekers, and not only at those already employed have also become an important modification. The rights to full participation and development have also been equalized for all employees, including those outside the employment relationship. At this point, it should also be noted that the year 2010 was associated with the introduction of the concept of flexicurity, consisting in creating an attractive workplace for everyone interested in entering the common market, allowing the development of talents (Świątkowski, Wujczyk, 2011). An important stage was also the implementation of two new goals included in the Working Together for Growth and Jobs program – a New Start for the Lisbon Strategy. The first of them concerned initiating links between economic and social growth and employment policy, while the second was aimed at increasing the effectiveness of work management. The new program was implemented in 2005, and based its operation on three-year cycles. The essence of its operation was included in companions to economic and employment policy, which included guidelines in the field of macro and microeconomics and employment (Commission 2005/193). The next step was the development by the Commission of the Community Lisbon Programme, which contained a summary set of reform programmes of the Member States. It was a comprehensive document whose implementation at the supranational level was to result in synergy between economic policy and employment policy.

For the analysis in question, it is important that out of the 24 guidelines, 8 concerned employment, i.e.: implementation of an employment policy aimed at achieving full employment, improving the quality and efficiency of work, strengthening social and territorial cohesion (no. 17); promoting a continuous training program (no. 18); modifying the nature of the labor market – by making it accessible to everyone, making work more attractive, paying financial benefits for job seekers (no. 19); balancing supply and demand in the labor market (no. 20); promoting flexibility and social protection, reducing the fragmentation of the labor market, respecting the powers of social partners (no. 21);

maintaining favorable employment costs, developing a wage increase mechanism (no. 22); enriching investment in human capital (no. 23), and updating the education and training system to real professional needs (no. 24). The indicated, revised strategy has been extended and condensed with goals and deadlines that should be achieved in 2010, i.e.

Unfortunately, not all of the intended objectives in the field of employment strategy were achieved, which is why they were replaced by the integrated EU 2020 strategy.

As the analysis shows, the proposed strategies were based mainly on the increasing use of active funds, modernization and flexibility. A further step in terms of the future of the EU, in accordance with the assumptions of the 2030 Agenda for Sustainable Development adopted by the UN General Assembly on September 25, 2015, was the pursuit of an economically sustainable Europe where people live well within the limits of our planet.

### 3. LITERATURE REVIEW

The conceptual category of 'sustainability' literally means 'the capacity to sustain some entity, outcome or process over time' (Jenkins, 2009) while taking care not to exhaust the resources on which this capacity depends (Klarin, 2018). In the above context, every action should be implemented in such a way that it does not lead to self-destruction, but allows for long-term repetition and renewal. The origins of the concept of sustainability can be traced back to the World Commission on Environment and Development's report 'Our Common Future', where the term was first defined (Report 1987). Sustainable development was considered to be 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (Report WCED 1987), which should not be at the expense of depleting non-renewable resources (Perlo, 2014). Sustainable development implies the accomplishment of socially desirable goals (Pearce, Barbier, Markandya, 1990), and its most important message is to improve the quality of life of people around the world (by taking and implementing diverse actions in different regions of the world integrated in three key areas: economic, social and environmental) (Poskrobko, 2009). The concept aligns the essence of the three factors of development: economic growth, social progress and respect for the environment (Agenda 2030). The key document on sustainable development is the Agenda 2030, adopted in 2015 through the acceptance by all UN member states of the resolution:

Transforming our world: the 2030 Agenda for Sustainable Development'. It sets out 17 Sustainable Development Goals (SDGs), which can be divided into five areas: people, planet, prosperity, peace and partnership. For each goal, specific tasks (a total of 169 tasks) to be achieved by 2030 are outlined (Transforming our world: the 2030). One of the extremely important areas included in the Agenda 2030, directly affecting everyone, is the labour market, to which Goal 8 (SDG8) refers: 'Promote inclusive and sustainable economic growth, full and productive employment and decent work for all (Transforming our world: the 2030).

In the context of SDG8, sustainable economic growth should be inclusive, drive progress, create decent jobs for all and improve people's living standards. Accordingly, SDG8 sets the goal of achieving full and productive employment by 2030 (Goal 8). This term should be understood as a state where all people accepting a fixed wage in the labour market can find employment (Grzybek, 2021). In economics, the term is understood differently in a planned economy and differently in a market economy. The latter refers to



a situation in which there is only voluntary unemployment (Kośmicki, Malinowska, 2015) (the unemployed in this case are those who do not accept the offered working conditions and wages, look for a better job, etc.). High levels of unemployment can significantly impede the achievement of SDG8 (Lopez, Ahumada, 2022), leading to poverty, social and economic inequality and social instability. Without a stable income, it is difficult for people to meet basic needs such as food, housing and healthcare. The unemployed are often dependent on social assistance and institutional support programmes (social programmes), which is not conducive to achieving sustainable development goals that require investment in education, health and infrastructure. Those who are unemployed often have limited access to resources and development opportunities. They may also find it difficult to access education, health care and other social services, which consequently becomes an important barrier to achieving sustainable development goals aimed at eradicating poverty. On a psychological level, lack of employment prospects can lead to frustration, depression and anxiety. This, in turn, can lead to social conflict, political instability and a reduction in the state's ability to focus on sustainable development goals. Jobless people do not contribute to economic growth (Tjahjanto, Tuhana, Mafruhah, Istiqomah, Ismoyowati, 2023), often representing irretrievably lost human potential.

#### 4. DATA AND RESEARCH METHODS

In the research on the differences in the level of unemployment in the EU countries, the methods of multidimensional comparative analysis, i.e. cluster analysis and linear ordering (Cattell 1944, Tryon 1939, Grabiński 1992, Gatnar, Walesiak 2004, Młodak, 2021) were used. The methods enabled the precise division of the examined units characterized by many features into clusters (groups, clusters) of objects similar to in terms of the indicators selected for the research. They are used in many scientific fields. In the study, thanks to the use of cluster analysis, it was possible to check to what extent EU countries were similar to each other in terms of the level of unemployment and to pay attention to what differentiated them. The Ward method was applied for the analysis (Ward, 1963). The method uses the analysis of variance approach in its procedures. It aims at minimizing the sum of squared deviations of any two clusters that can be formed at any stage of the research (Grabiński, 1992). It was chosen as it is one of the most frequently used method (along with the k-means method). The order of operations in the Ward method is similar to that in other agglomeration methods. There are significant differences in the parameters used in the formula. The procedure is as follows: it starts with determining the  $n \times n$  taxonomic distance matrix, which contains the distance of each pair of objects. The matrix is symmetrical about the main diagonal, which is all zeros. Then, pairs of objects (and then clusters) are searched for which the mutual distance is the smallest. The objects are denoted  $p$  and  $q$ , with  $p < q$ . Subsequently,  $p$  and  $q$  are merged into one new cluster, which occupies the position with the number  $p$ . At the same time, the object (cluster) with the number  $q$  is removed, and the numbers of clusters with a number higher than it are reduced by one. In this way, the dimension of the matrix is reduced by 1. Then, the distance of the new cluster from each other is determined according to the formula:

$$D_{pr} = a_1 \cdot d_{pr} + a_2 \cdot d_{qr} + b \cdot d_{pq} \quad (1)$$

where:  $D_{pr}$  – is the distance of the new cluster from the cluster with the number  $r$ ,  $d_{pr}$  – is the distance of the original cluster  $p$  from the cluster  $r$ ,  $d_{qr}$  – is the distance of the original

cluster  $q$  from the cluster  $r$ ,  $d_{pq}$  – is the mutual the distance of the primary clusters  $p$  and  $q$ ,  $a_1, a_2, b$  – these are the parameters that in the Ward method are calculated on the basis of the following formulas:

$$a_1 = \frac{n_p + n_r}{n_p + n_q + n_r}, \quad a_2 = \frac{n_q + n_r}{n_p + n_q + n_r}, \quad b = \frac{-n_r}{n_p + n_q + n_r} \quad (2)$$

where:  $n_p, n_q, n_r$  mean the number of single objects in particular groups.

To assess the quality of division a lot of indicators have been developed (Młodak, 2011; Młodak, 2020; Migdał-Najman, 2011). Two indices were used in the analysis: silhouette coefficient – SI – (Rousseeuw, 1987; Kaufman, Rousseeuw, 2005) and Davies–Bouldin index – DB (Davies, Bouldin, 1979).

The silhouette index is a function of  $a_1$  average distance of object  $\Gamma_i$  from all other objects in the same cluster and  $b_i$  the smallest the average dissimilarity between  $\Gamma_i$  and objects in any other clusters, which it does not belong to  $i = 1, 2, \dots, n$ :

$$SI = \frac{1}{n} \sum_{i=1}^n \frac{b_i - a_i}{\max\{a_i, b_i\}} \quad (3)$$

The Davies–Bouldin measure was created using the distance between centroids of clusters and sum of their diameters, i.e.

$$DB = \frac{1}{s} \sum_{k=1}^s \max_{l=1,2,\dots,s,l \neq k} \left( \frac{\text{diamc}(\Theta_k) + \text{diamc}(\Theta_l)}{\|c_k - c_l\|} \right) \quad (4)$$

where  $\text{diamc}(\Theta_r) = \sqrt{\frac{1}{n_r} \sum_{i:\Gamma_i \in \Theta_r} \|y_i - c_r\|^2}$

and  $n_r$  is the number of objects in  $\Theta_r, r = 1, 2, \dots, s$ .

For the obtained clusters, an analysis of group means was carried out. The analysis aims to show indicators (diagnostic features) dominant in a given group. For the matrix of numerical data, general arithmetic means (without division into groups) of the examined indicators, marked as  $\bar{W}_i$  were calculated. Then, the group arithmetic means of the studied indices in the obtained clusters were calculated, which were marked as  $\bar{w}_i$ . The quotient  $\bar{w}_i / \bar{W}_i$  is the indicator of the structure of each cluster. High values of the average structure indicator inform about the dominance of a given feature in the obtained cluster. If the average level of the phenomenon in the group is identical to the average level in the entire examined population of objects, then the average quotient takes the value of 1 (or 100%). The values above 1 (>100%) indicate an average level of the factor in the group significantly exceeding its general average, and the values below 1 (<100%) indicate a lower average level of this factor in the study group compared to the entire analyzed population (Chudy-Laskowska, Pisula, 2022). In order to check whether the levels of the examined features differ in the resulting clusters, the Kruskal-Wallis ANOVA test (Gopal,

2006) was applied. However, in order to determine the ranking of EU countries in terms of unemployment, the well – known and commonly used ranking methods of linear ordering of multi-feature objects were used – in particular the rank averaging method (López de Mántaras, Plaza, 2000). The ranking method should specify the nature of the variables selected for research (stimulants and destimulants). For each selected feature, ranking is performed by assigning a value of 1 to the best value (in the case of a stimulant to the highest and in the case of a destimulant to the lowest. In the next stage, the average rank for a given object is calculated and the average ranks are then ranked, treating the average as a destimulant. The lower value is the better because the analyzed object is in a higher position in the constructed ranking (Gatnar, Walesiak, 2004).

## 5. DIFFERENTIATION OF UNEMPLOYMENT IN THE EUROPEAN UNION COUNTRIES – RESEARCH RESULTS

For the needs of the analysis, a set of potential explanatory variables was created. There are many different variables describing the diversity of unemployment levels. For the purposes of the study, 9 potential explanatory variables that represent various aspects of unemployment were selected. The variables defining the level of unemployment in various divisions – by gender, age, and total unemployment in UE countries in 2022. Labor productivity and the level of employment were also taken into account. The availability of data was guided, but also the fact that the selected measures are reflected in the assumptions of the 2030 Agenda for sustainable development. The data were taken from the Eurostat Database.

Table 1. Indicators and designation of tabel from Eurostat Database

Indicators selected for research	Designations
Unemployment, 15 to 24 years [% of population in the labour force]	[UNE_RT_A_custom_6811408]
Unemployment, 25 to 54 years [% of population in the labour force]	[UNE_RT_A_custom_6811408]
Unemployment, 55 to 74 years [% of population in the labour force]	[UNE_RT_A_custom_6811408]
Long term unemployment, 15 to 74 [% of population in the labour force]	[UNE_LTU_A_custom_6794888]
Females unemployment 25 to 74 [% of population in the labour force]	[UNE_RT_A_custom_6811408]
Males unemployment 25 to 74 [% of population in the labour force]	[UNE_RT_A_custom_6811408]
Nominal labour productivity per person employed**	[NAMA_10_LP_ULC_custom_3853725]
Total unemployment rate, 15 to 74 [% of population in the labour force]	Total unemployment rate [TPS00203]
Total employment, 20 to 64 [% of total population]	[LFSI_EMP_A\$DEFAULTVIEW]

Source: own study.

Table 1 presents the basic descriptive statistics of individual variables proposed for the research. As a result of the analysis of the coefficient of variation, the employment rate ( $X_9$ ) was excluded from further analysis. The coefficient of variation in its case was very

low (less than 10%), which means that it did not differentiate the surveyed countries in terms of total employment, 20 to 64 [% of total population] and is at a similar level in each of them.

Table 2. Basic descriptive statistics of indicators selected for research in EU countries in 2022

	Indicators selected for research	$\bar{x}^*$	Me	Min	Max	$\sigma$	Vz	Sk	K
X <sub>1</sub>	Unemployment, 15 to 24 years [% of population in the labour force]	15.5	15.3	6	31.4	6.7	43.3	0.7	0.1
X <sub>2</sub>	Unemployment, 25 to 54 years [% of population in the labour force]	5.1	4.7	2	12	2.4	48.2	1.5	2.8
X <sub>3</sub>	Unemployment, 55 to 74 years [% of population in the labour force]	4.4	3.9	1.7	11.4	2.1	48.5	1.7	4.2
X <sub>4</sub>	Long term unemployment, 15 to 74 [%of population in the labour force]	2.0	1.5	0.5	7.7	1.6	81.3	2.0	4.7
X <sub>5</sub>	Females unemployment 25 to 74 [%of population in the labour force]	5.2	4	2.3	15.2	3.1	58.9	2.2	5.1
X <sub>6</sub>	Males unemployment 25 to 74 [%of population in the labour force]	4.7	4.8	1.6	9.9	1.9	40.2	0.8	1.0
X <sub>7</sub>	Nominal labour productivity per person employed**	99.2	87.3	54.6	223.2	33.5	33.8	2.2	6.6
X <sub>8</sub>	Total unemployment rate, 15 to 74 [%of population in the labour force]	5.7	5.6	2.2	12.9	2.6	45.2	1.4	2.5
X <sub>9</sub>	Total employment, 20 to 64 [% of total population]	76.4	77.5	64.8	82.9	5.0	6.5	-0.9	0.0

\* $\bar{x}$  – Mean, Min – minimum, Max – maximum,  $\sigma$  – standard deviation, Vz – coefficient of variation Sk – skewness, K – Kurtosis

\*\* Nominal labour productivity per person employed (NLPR\_EMP) is calculated by dividing GDP at current prices by total employment (employees and self-employed (EMP)). This ratio is expressed in euro per person. It indicates to some extent how much total economic activity in nominal prices in a given period can be attributed to each employed person. Source: [https://ec.europa.eu/eurostat/cache/metadata/en/nama\\_10\\_prod\\_esms.htm](https://ec.europa.eu/eurostat/cache/metadata/en/nama_10_prod_esms.htm)

Source: own study.

The first indicator used for the purposes of the analysis – X<sub>1</sub> describe the level of unemployment in the youngest group aged 15 to 24. The lowest unemployment in the younger group (aged 15 to 24) was in Germany and amounted to 6%, and the highest in Greece – as much as 31.4%. The next two variables – X<sub>2</sub> and X<sub>3</sub> – mean the level of unemployment in two age groups - from 25 to 54 and from 55 to 74 years old. A higher percentage of the unemployed occurred in the group aged 25 to 54 years old – on average 5.1%. The lowest level of unemployment in this age group was in the Czech Republic – 2%, and the highest in Greece – 12%. On the other hand, in case of variable X<sub>3</sub> defining unemployment in the age group of 55 to 74 years old, the average unemployment rate was 4.4%, the lowest in Malta – 1.7%, and the highest in Spain – 11.4%. The next indicator (X<sub>4</sub>), which was taken into account in the analysis of differences in the level of unemployment in the EU and in Poland, is the long-term unemployment rate, the average level of which for all EU countries was 2%. The lowest level of long-term unemployment was in Bulgaria and Finland (only 0.5%), and the highest in Estonia (7.7%). The next two variables used in the research are the unemployment rates in the group of women (X<sub>5</sub>) and men (X<sub>6</sub>). This rate was slightly higher in the group of women – 5.2%, while in the case of men it amounted to 4.7% on average. The lowest unemployment rate among women was in Malta (2.3%) and the highest in Greece – 15.2%. In the group of men, unemployment was lowest in the Czech Republic – 1.6%, and the highest in Spain – 9.9%. In addition,

nominal labour productivity per person ( $X_7$ ) was included in the study. It is a measure for the economic activity. It is defined as the value of all goods and services produced less the value of any goods or services used in their creation. GDP per person employed is intended to give an overall impression of the productivity of national economies expressed in relation to the European Union average. If the index of a country is higher than 100, this country level of GDP per person employed is higher than the EU average and vice versa. Basic figures are expressed in PPS, i.e. a common currency that eliminates the differences in price levels between countries allowing meaningful volume comparisons of GDP between countries. *Person employed* does not distinguish between full-time and part-time employment (Eurostat). The year 2020=100 was adopted as the reference year in the analysis. The average labor productivity per person in 2022 in the EU countries amounted to 99.2, which was a slight decrease compared to 2020. The lowest labor productivity was characterized by employees from Bulgaria – it amounted to only 54.6%, i.e. compared to 2020 there was a decrease of almost 45%. On the other hand, the highest productivity was characteristic of people working in Ireland – (as much as 223.2%), i.e. compared to 2020, it increased by almost 124%.



Figure 1. Boxplot. Average unemployment in individual age categories, by gender and in total, and long-term unemployment in the European Union in 2022

Source: own study.

The last indicator included in the research on the differences in the level of unemployment in the EU countries and in Poland was the total unemployment rate ( $X_8$ ), which in the EU countries was on average 5.7%. The lowest unemployment in the EU in

2022 was in the Czech Republic – 2%, and the highest in Spain – 12.9%, and in Greece – 12.5%. All indicators included in the research are characterized by right-sided asymmetry, which bodes well for unemployment and means that in most of the countries surveyed they reached lower than average values. The kurtosis of the distributions is positive, which in turn indicates a greater concentration of the values of individual indicators around the average level (Figure 1). For the 8 indicators selected for the study, describing the differentiation of the unemployment level, correlations were calculated, and showed that they were strongly related to each other. The correlation matrix of the studied variables is included in Table 2. It shows that the general level of unemployment is most closely related to the unemployment of people aged 25–54. The correlation coefficient is very high (87%) and positive, which means that with the increase in the level of unemployment in the group of people aged 25–54, the general level of unemployment increases. Another feature strongly correlated with the general level of unemployment is the percentage of unemployed women (95%). This relationship is also positive, which means that the more unemployed women, the higher the total unemployment rate. Based on the analysis of correlation coefficients, it can be concluded that the total unemployment rate is highly correlated with other features, but since the analysis concerns unemployment in EU countries, it is an extremely important indicator for describing the results, so it was not rejected and allowed for further analysis.

Table 3. Correlation matrix between the indicators selected for the study

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>	X <sub>7</sub>	X <sub>8</sub>
Unemployment, 15 to 24 years [% of population in the labour force]	1							
Unemployment, 25 to 54 years [% of population in the labour force]	0,87	1						
Unemployment, 55 to 74 years [% of population in the labour force]	0,77	0,91	1					
Long term unemployment, 15 to 74 [% of population in the labour force]	0,24	0,12	0,02	1				
Females unemployment 25 to 74 [% of population in the labour force]	0,86	0,98	0,90	0,06	1			
Males unemployment 25 to 74 [% of population in the labour force]	0,82	0,95	0,93	0,15	0,88	1		
Nominal labour productivity per person	-0,18	-0,20	-0,11	0,22	-0,18	-0,19	1	
Total unemployment rate, 15 to 74 [% of population in the labour force]	0,86	0,97	0,92	0,14	0,95	0,93	-0,11	1

Source: own study.

The only one indicator which was negatively correlated with most features of unemployment was labor productivity. The relationship between them is small and negative, which means that labor productivity decreases with increasing the variables of unemployment. Correlation relationships between the selected indicators are presented in Figures 2 and 3. Figure 2 shows positive relationships between the total unemployment rate and long-term unemployment and the percentage share of the unemployed aged 25 to 54. On the other hand, the scatterplot (Figure 3) illustrates the relationship between labor productivity and the share of the unemployed aged 15 to 24. Noteworthy are the outliers

that appear in Figures 2 and 3. Greece and Spain definitely lag behind in the bagplot due to high unemployment values in the group of people aged 25–54. Similarly in the case of the scatterplot (Figure 3), which also shows very high values of the unemployment rate in these countries, this time among people aged 15 to 24. This graph also shows that Ireland is also an outlier, but in a positive sense – with a low level of unemployed people aged 15 to 24, labor productivity is very high there.

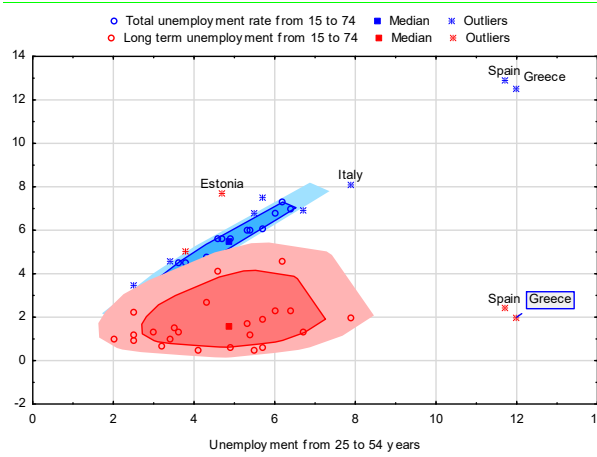


Figure 2. Bagplot. Unemployment in the group of people aged 25 to 54 and the total unemployment rate and long-term unemployment

Source: own study.

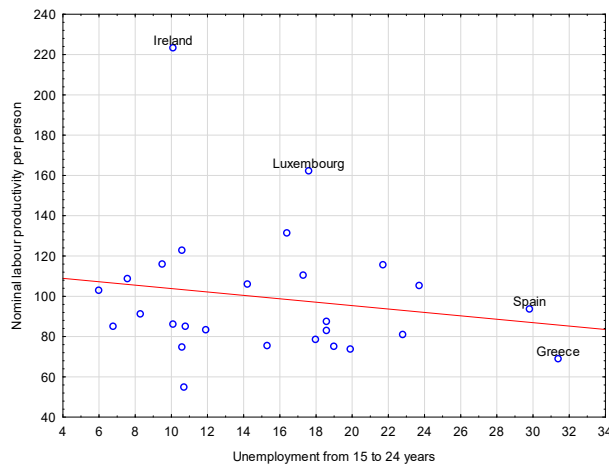


Figure 3. Scatterplot between labor productivity and the share of the unemployed aged 15 to 24

Source: own study.

Using the indicators adopted for the study, a clustering procedure was performed in order to isolate groups of countries similar to each other in terms of the level of unemployment. The results of the analysis are presented in a tree diagram (Figure 4). The Ward's method was selected for the study, assuming the Euclidean distance. A tree diagram can be divided into different heights (distances). By moving the dividing line to the left, more clusters are obtained, at a distance of 20 there are 2 of them, at a distance of 10 – 3, at a distance of 7 – 4 clusters are obtained and in the case of a cluster at the distance of 6 – 5 cluster are obtained.

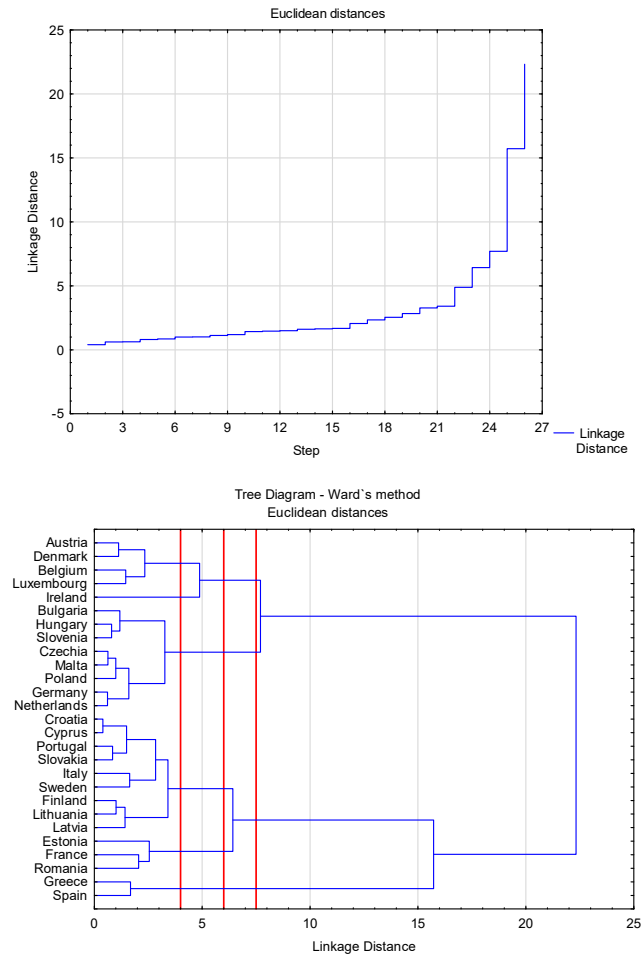


Figure 4. Clustering outcomes of EU countries in terms of unemployment in 2022

Source: own study.

First of all the correctness of obtained clusters should be verified. The optimum clusters should be internally homogenous and heterogenous in relations to the others (i.e. significantly differ one to other). To find out which of the divisions is the best and gives



good results, two indices were used in the analysis: silhouette coefficient – SI and Davies-Bouldin index –DB. The results were presented in table 3.

Table 4. Silhouette coefficient – SI and Davies-Bouldin index – DB

Number of clusters	Silhouette Score	Davies-Bouldin Index
4	0.366709	0.942432
5	0.367060	0.869809
6	0.349746	0.751170

Source: own study.

The Silhouette coefficient indicates that the best division is 5 groups and the Davies-Bouldin Index that the best division is into 6 clusters. Therefore the Kruskal Wallis's non-parametric ANOVA test was carried out, which showed for which of the divisions there are differences between groups in the set of all indicators adopted for research. The tests were carried out at the significance level  $\alpha=0.05$ . Only one of the divisions ensures differentiation of all indicators between groups. This is a division into 5 clusters. The results are presented in table 5.

Table 5. Results of the Kruskal Wallis ANOVA test – indicators adopted for the study and group affiliation for 4, 5 and 6 clusters

Specification	4 clusters p-value	5 clusters p-value	6 clusters p-value
Unemployment, 15 to 24 years [% of population in the labour force]	0.0002	0.0000	0.0016
Unemployment, 25 to 54 years [% of population in the labour force]	0.0001	0.0000	0.0005
Unemployment, 55 to 74 years [% of population in the labour force]	0.0002	0.0000	0.0011
Long term unemployment, 15 to 74 [% of population in the labour force]	<b>0.2011</b>	0.0002	0.0248
Females unemployment 25 to 74 [% of population in the labour force]	0.0001	0.0000	0.0005
Males unemployment 25 to 74 [% of population in the labour force]	0.0001	0.0000	0.0005
Nominal labour productivity per person	0.0074	0.0007	0.0330
Total unemployment rate, 15 to 74 [% of population in the labour force]	0.0909	0.0000	<b>0.2255</b>

Source: own study.

The analysis of differences shows that all features differ significantly in the created clusters, which means that the division was carried out correctly.

Table 6 presents clusters of countries similar to each other in terms of various unemployment rates in 2022.

In order to characterize the clusters formed as a result of the analysis, the quotient  $\bar{w}_i/\bar{W}_i$  as the indicator of the structure of each cluster was used. The method enables the separation of indicators that dominate in a given cluster, or are at a low level. If the value of the the quotient  $\bar{w}_i/\bar{W}_i$  equal to 1 informs that a given feature is at the level of the global average. The results of the analysis of group means are presented in figure 5. When

analyzing the clusters in general, it can be stated that the best in terms of unemployment are clusters b and a. Group c and d represent the average level, and cluster e is definitely the worst in terms of the analyzed unemployment indicators. The best group *b* includes 8 countries: Bulgaria, Hungary, Slovenia, the Czech Republic, Malta, Poland, Germany and the Netherlands. In these countries, all analyzed unemployment indicators are at the lowest levels. The only thing that can be assessed negatively is the low labor productivity per capita. In cluster "b" it is lower than the EU average.

Table 6. Division of EU countries into groups according to the level of unemployment in 2022

Group marking	Cluster composition
Group a	Belgium, Luxembourg, Denmark, Austria, Ireland
Group b	Bulgaria, Hungary, Slovenia, the Czech Republic, Malta, Poland, Germany, Holandia
Group c	Estonia, France, Romania
Group d	Croatia, Cyprus, Portugal, Slovakia, Italy, Sweden, Latvia, Lithuania, Finlandia
Group e	Greece, Spain

Source: own study.



Figure 5. Group averages of individual indicators

Source: own study.

Cluster *a* which was also rated very positively, includes: Belgium, Luxembourg, Denmark, Austria and Ireland. It ranks second in terms of the level of unemployment. All

the analyzed indicators are lower than the average values for the EU, but they are slightly higher than in group *b*. One exception is the long-term unemployment rate, which is above average. The labor productivity index was definitely above average and is the highest among all clusters, which is a very positive feature of this cluster. Group *c* consists of Estonia, France and Romania. Unemployment rates among young people are slightly above the global average, and the highest level is taken by the long-term unemployment rate (which is comparable to that in the worst cluster *e*). The unemployment rate among men and the general unemployment rate are also above the average level. Group *d* is the last cluster in terms of the analyzed unemployment characteristics. It consists of: Croatia, Cyprus, Portugal, Slovakia, Italy, Sweden, Latvia, Lithuania and Finland. All the indicators studied here exceed the average levels for the EU, only long-term unemployment there is quite low – below the global average. Definitely the worst in terms of unemployment is the last one, group *e* formed as a result of clustering, which includes Greece and Spain.

Table 7. Ranking of EU countries by unemployment rate in 2022

Countries	Group	Ranking
Czechia	b	1
Malta	b	2
Netherlands	b	3
Germany	b	4
Poland	b	5
Denmark	a	6
Hungary	b	7
Luxembourg	a	8
Ireland	a	9
Slovenia	b	10
Bulgaria	b	11
Austria	a	12,5
Belgium	a	12,5
Finland	d	14
Lithuania	d	15
Romania	c	16
Estonia	c	17
Sweden	d	18
Portugal	d	19
Cyprus	d	20
Slovakia	d	21
Latvia	d	22
France	c	23
Croatia	d	24
Italy	d	25
Spain	e	26
Greece	e	27

Source: own study.

All indicators here are definitely higher than the EU average. Unemployment among women reaches the highest level (out of all clusters), and labor productivity is also the lowest. In the created ranking, these two countries occupy the last positions. A ranking was created for EU countries taking into account the analyzed features regarding unemployment ( $X_1 - X_8$ ). The countries are ordered from 1 – which means the best situation in terms of unemployment and 27 – which means the worst situation in terms of unemployment. Table 7 and Figure 6 present the ranking and grouping of EU countries in terms of unemployment in 2022.

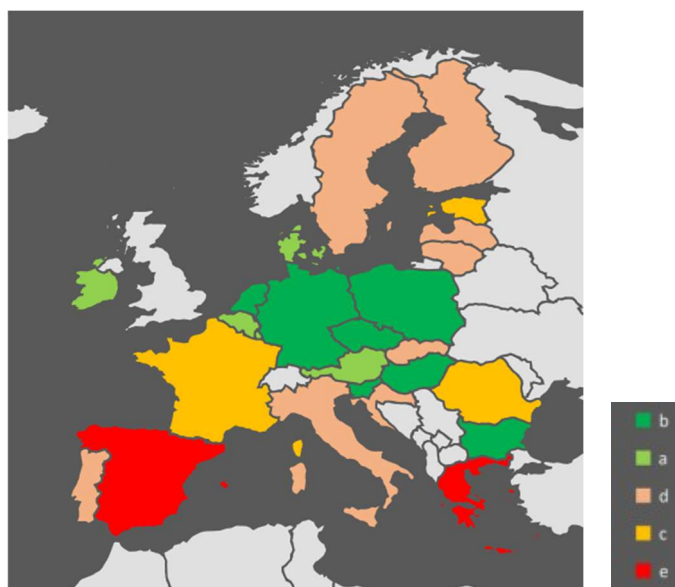


Figure 6. Ranking of EU countries by unemployment rate in 2022

Source: own study.

When comparing the results of the ranking and grouping, it can be seen that the countries from cluster "b" occupy the highest positions in the ranking. The Czech Republic came first, Malta came second, and the Netherlands came third (all three from cluster "b", which dominates the ranking). On the other hand, the last two positions were taken by Spain and Greece, which form the last cluster "e", in which the level of unemployment is very high and the situation on the labor market is the worst among the analyzed Member States.

## 6. CONCLUSIONS

Unemployment is a state that, under certain conditions, can apply to everyone. It is determined by various factors, sometimes independent of those concerned, these are cultural, geographical, random factors, but in some cases they may be intentional. It is well known that everyone tries to earn at a level that ensures a decent existence. That is why, the concept of unemployment appears so often in many studies and analyses. States strive to secure the basic living conditions for their inhabitants. For some, it works very well and

unemployment rates are low, while other countries, perhaps for geographical, cultural or simply historical reasons, do not have such a chance and unemployment reaches a very unfavorable level. Therefore, the undertaken research is aimed at showing the diversity of unemployment and its types in the countries of the community. The reduction of unemployment and the implementation of mechanisms encouraging professional activity significantly contribute to the acceleration of the economic development process in the long term. Therefore, EU institutions are working out common concepts of actions in the field of counteracting unemployment and employment policy. The adopted concept of actions initiated and only coordinated by EU institutions should be assessed as not threatening the sovereignty of individual members. Coordination, based on the open method with a clear division of tasks between the EU institutions and its members, remains in line with the principles of the functioning of the EU, i.e. the principle of subsidiarity. Ongoing and voluntary exchange of experiences between individual members undoubtedly brings us closer to developing a unified employment policy in the common labor market. The employment policy of the governments of individual countries, aimed, in accordance with SDG8 of the 2030 Agenda, at ensuring full and productive employment and decent work for all women and men by 2030, also includes the fight against unemployment (mainly long-term and structural), and consequently contributes to balancing (Csillag, Scharle, 2017). Together with social dialogue, it plays an important role in promoting a just transition towards sustainable development (International Labor Office 2012). Based on the taxonomic analysis of the unemployment level in EU countries, it can be concluded that:

- unemployment in the analyzed EU countries is very diverse, as evidenced by as many as 5 separate clusters;
- the countries with the most favorable situation in terms of the analyzed features characterizing unemployment are the Czech Republic, Malta, the Netherlands, Germany, Poland, Hungary, Slovenia and Bulgaria, they clearly differ from other EU countries;
- Denmark, Ireland, Luxemburg, Austria and Belgium are characterized by the highest labor productivity, although it is not the best group in terms of other analyzed indicators characterizing the level and diversity of unemployment; however, as its level is influenced, among others, by physical capital, human capital, innovation or organization of work - it is justified that it characterizes countries from group "a", not "b";
- the cluster rated as the worst included Greece and Spain, where all the analyzed indicators reached the highest level, significantly different from the EU average; the situation of these countries is very unfavorable.

The situation of the countries with the most favorable situation in terms of the analyzed features characterizing unemployment – the Czech Republic, Malta, the Netherlands, Germany, Poland, Hungary, Slovenia and Bulgaria – should be carefully analyzed and some employment policy solutions used there should be implemented to the countries where the unemployment situation is much worse (Spain and Greece). This requires further in-depth qualitative research as some determinants are probably cultural in nature, which are difficult to capture in quantitative analyses.

**Limitations:**

*The study covers only one year 2022, i.e., when countries are recovering from problems related to the COVID-19 pandemic. The research didn't refer to the connection between the situation in the*

labour market and the effects of the COVID-19 counteracting policy. Only 8 features were accepted for the study, if more indicators are introduced into the study, the results may change. There are many questions about the research conducted, therefore more extensive research should be conducted, covering a longer time range and a larger set of adopted indicators, which will be taken into account in subsequent analyses.

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## PARKING INFRASTRUCTURE MANAGEMENT AS AN ELEMENT OF THE SMART CITY CONCEPT

Moving around an urban area by vehicle and the act of parking are an almost integral part of everyday urban travel. Proper organization of parking spaces and the convenience of using them by drivers is key to follow the idea of sustainable urban development and manage the mobility of urban infrastructure users. Parking is influenced by many technical, organizational, economic and social factors. The aim of this work was to analyze and evaluate the functioning of the paid parking zone in Rzeszów, a voivodeship city located in the south-eastern Poland. In the presented case study, the authors, based on data collected from the Metropolis Intelligent Paid Parking System (PPS), determined the occupancy levels of parking subzones in the studied periods of time and analyzed the obtained results. The data and designated indicators available in the system can be the basis for taking appropriate steps to enable effective city management, which will result in, among others increasing the quality of life of residents.

**Keywords:** smart cities, smart parking systems, planning and management, parking management, parking occupancy.

### 1. INTRODUCTION

Sustainable development is understood as striving to permanently improve the quality of life of current and future generations by shaping appropriate interactions between three elements: social, environmental and economic. Depending on the aspect, the challenges to the concept of sustainable development are different:

- environmental dimension-e.g. global warming, degradation of ecosystems, depletion of non-renewable raw materials, high exploitation of renewable resources, threat to the health of living beings;

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- economic dimension-e.g. lack of employment stability, low level of satisfaction of needs, high prices, inflation, economic imbalance, state debt, inadequate distribution of income;
- social dimension-e.g. problems with democracy and the rule of law, poverty, demographic problems, conflicts, internal and external insecurity, burdens on health and quality of life.

The concept of sustainable development is also reflected in the assumptions of urban logistics (Huk, Górak, 2021). Creating a balance between social and economic, technological and environmental development is necessary for the city to develop effectively. Today's cities and agglomeration areas face many economic, social, economic and environmental challenges resulting from their dynamic development. The world's population is increasingly concentrated in cities-currently over 50% of the population lives in urban areas, and according to United Nations Organization (UN) forecasts this share will increase to 70% by 2050. Cities occupy only 3% of the Earth's surface, but are responsible for 60–80% of energy consumption and 75% of carbon dioxide emissions (<https://www.un.org/sustainabledevelopment/cities>). It is estimated that there are over 1.5 billion vehicles in operation worldwide, of which almost 1.2 billion are passenger cars. On the other hand, cities are obliged to guarantee residents not only general access to public services (including transport), but also effective urban distribution of goods, taking into account economic and environmental factors.

In the context of sustainable urban development, the most important role is played by the quality of life of residents, which is influenced by many factors. These include, among others: the state of the natural environment, the wealth of society, access to education and culture, health, safety, sense of belonging, interpersonal relations and participation in social life.

One of the concepts that improves the quality of life of residents is the Smart City concept. It currently has a significant impact on the spatial management of cities. A city managed in accordance with the guidelines of the Smart City concept effectively solves social, environmental and long-term problems. The implementation of this concept is based on knowledge, innovation and the use of information and communication technologies (Trindade, Hinnig, da Costa, Marques, Bastos, Yigitcanlar, 2017)

Cities are areas that concentrate economic and social potential for economic development. They provide jobs and locations to live, relax and enjoy culture. Cities also provide places to meet other life needs, such as shopping, culture, entertainment. An integral element of most of these aspects is transport, including inside the urban structure. This is one of the main factors in the mobility of urban space users. Transport has a significant impact on the degradation of the natural environment. Therefore, the idea of sustainable urban development focuses mainly on stopping the negative ecological effects caused by transport. It is worth mentioning that the negative impact of transport on the urban environment is significantly related to traffic congestion and its effects.

An important element that should be taken into account in implementing the idea of sustainable transport development in cities is social exclusion, which is identified in several categories:

- spatial exclusion-low quality of transport services caused by low population and building density in some areas;
- temporary exclusion-lack of access to public transport at times tailored to the needs of society;

- personal exclusion-inappropriate infrastructure and quality of transport services, e.g. for people with disabilities and elderly people;
- economic exclusion-low or no income.

The concept of sustainable development assumes that all three dimensions, i.e. social, economic and ecological, will develop at an even pace and level. Therefore, sustainable development of transport will focus on eliminating existing social exclusions, while reducing the negative impacts of transport on the environment, including: transport congestion in cities. These activities are also called sustainable urban mobility plans (Cruz, Paulino, 2020; Leo, Morillón, Silva, 2017). Their goal is:

- providing residents with access to public transport at the time and scope appropriate for them;
- improving the security situation;
- reduction of environmental pollution with exhaust gases and noise and reduction of energy consumption;
- improving efficiency and cost effectiveness for passenger and freight transport;
- making the urban environment more attractive with a focus on residents and the economy.

In order to apply the idea of sustainable development in the area of urban logistics, first of all, the assumptions of the sustainable transport development policy should be applied, with particular emphasis on the priorities in this area. These priorities include:

- introducing solutions to rationalize the use of individual vehicles;
- making public transport more attractive;
- the use of intelligent technologies in city infrastructure and means of transport;
- introduction of “good practices” in the use of existing city infrastructure.

Sustainable urban mobility plans are recognized as an appropriate strategic instrument for the development of an integrated approach to urban logistics targeting all modes and means of transport throughout the functional area of a city or urban agglomeration: public and private transport, taxis, passenger and freight transport, motorized and non-motorized traffic, removals, parking.

Mobility plans developed by European cities to improve urban logistics are seen as part of the smart city program (Attaran, Kheibari, Bahrepour, 2022; Battarra, Gargiulo, Tremitterra, Zucaro, 2018; Raspotnik, Grønning, Herrmann, 2020; Winkowska, Szpilko, Pejić, 2019; Zapolskyt, Burinskienė, Trépanier, 2020). In a broad sense, a smart city refers to the need to combine ecological, environmental and social issues. It can be considered that it is a contemporary version of a sustainable city, in which the cooperation of various entities, integration of infrastructure solutions and services ensures the most optimal functioning of the city as a whole (Rui, Othengrafen, 2023). The smart city concept is a modern idea of city development that is a response to the increasing urbanization processes. Thanks to information and communication technologies, smart cities use available resources more effectively to improve the quality of life in the city and ensure its sustainable development.

Intelligent mobility in smart cities is primarily the adaptation of advanced solutions in the field of information technology, making it easier for residents to use all mobility services in the city, with particular emphasis on sustainable, environmentally friendly solutions-e.g. an intelligent transport and communication system based on advanced technologies (Oliveira, Gabrich, Ramalhinho, Oliver, Cohen, Ochi, Gueye, Protti, Pinto, Ferreira, Coelho, Coelho, 2020). Thanks to it, it is possible to use the existing infrastructure

rationally, without creating new facilities, and therefore no resources are wasted, including natural ones-which is the basis of the idea of sustainable development. The basic goals to be met by intelligent mobility in relation to this concept are to reduce pollutant emissions and, as a result, car traffic especially congestion.

Smart parking solutions fit very closely into smart mobility schemes, and smart city schemes in general (Fokker, Koch, Leeuwen, Dugundji, 2022; Janak, Pritikana, Sanjaykumar, 2020). City authorities see the costs associated with the impact that congested streets have on both the economy and the quality of life of residents (Yan-Ling, Xin, Ming-Chun, 2016). Therefore, the trend of creating smart parking lots is getting stronger (Chou, Dewabharata, Zulvia, 2021). The search for a parking space is one of the main factors generating the so-called senseless move. Multiple crossings while looking for a place are responsible for up to 30% of this phenomenon. The introduction of intelligent solutions can significantly reduce this factor (Bismantoko, Haryono, Widodo, 2018; Hilmaniy, Maizate, Hassouni, 2018).

Intelligent transport management systems not only improve the quality of life of residents, but also have a positive impact on the environment by reducing exhaust emissions. Intelligent urban traffic management and micromobility are one of the most important aspects of the functioning of modern smart cities (Olayode, Tartibu, Okwu, Uchechi, 2020; Pereira, Cunha, Lampoltshammer, Parycek, Testa, 2017; Tahmasseb, 2022). The concept of smart cities includes, among others: increasing road safety, as well as caring for the natural environment by reducing exhaust emissions. One of the biggest challenges faced by cities aspiring to become smart cities is sustainable transport, i.e. low-emission, safe, comfortable and economical transport. The authorities of smart cities promote alternative means of transport, such as city bikes, and encourage the use of public transport. It must ensure mobility for citizens, i.e. quick movement between different points of the city. The implementation of a system integrating various means of communication is also important. However, residents who stay with their own car must struggle with many problems. Finding a free parking space becomes quite problematic. A comprehensive solution to parking problems in a smart city is possible thanks to the integration of several systems, including: surveillance cameras, analytical tools and navigation applications. Such a system could, among others: generate warnings in case of incorrect parking. This would eliminate practices such as blocking entrances for emergency vehicles, blocking bicycle paths or leaving cars on lawns.

Parking problems in cities are not new. The issue of managing parking spaces and removing inconvenience to residents due to incorrect parking of vehicles was already known to city residents several dozen years ago. Already in the 1930s, the first mechanical parking meter was developed and installed in the USA. In Europe, the first parking meters were installed in the 1950s. In 1952 on the streets of Switzerland, two years later in Germany, and in 1958 in Great Britain.

Currently, the basic idea of smart cities is to provide their residents with a high standard of living through the use of modern technological solutions that facilitate everyday functioning. Here, the idea of Smart City is inextricably linked to the idea of IoT (Internet of Things)-interconnected devices can communicate with each other and share data with users via the Internet (Bellini, Nesi, Pantaleo, 2022).

The Smart City concept is characteristic of cities in which a number of projects and programs are implemented to implement modern technologies that facilitate the functioning of various areas of city life-from WiFi networks available in public spaces, through intelligent traffic control, the use of Big Data, to intelligent sensors. making it

easier, for example, to look for parking spaces in the city (Gebresselassie, Sanchez, 2018; Ouafiq, Raif, Chehri, Saadane, 2022; Ullah, Al-Turjman, Mostarda, Gagliardi, 2020).

The use of modern technological solutions, including the Internet of Things, is still not widespread enough. To ensure proper city management, it is advisable to implement intelligent solutions using the above-mentioned technologies.

An example of a city where solutions consistent with the Smart City idea are being implemented is Rzeszów. One of such solutions is the PPS implemented on December 20, 2021. This is the first solution of this type in Poland and one of the first in Europe.

The aim of this article is to present the capabilities of the PPS both in online applications and as a valuable source of data, the analysis of which may contribute to taking appropriate steps to enable effective city management, which will result in, among others: increasing the quality of life of residents. The article is divided into four sections. The first section presents general assumptions regarding the idea of sustainable development and smart city. The second chapter contains the characteristics of the city presented in the article and the intelligent parking system implemented in it and research methodology. The third chapter presents the results of the analysis of the collected data, the aim of which was to assess the functioning of the paid parking zone in Rzeszów (Poland). The whole article ends with a summary.

## 2. RESEARCH OBJECT AND RESEARCH METHODOLOGY

A voivodeship city from south-eastern Poland was chosen as an example for analysis. This city is Rzeszów with an area of 129.01 km<sup>2</sup> and over 197 000 inhabitants. Rzeszów is an economic, industrial, commercial, academic and cultural center. The city is located close to the borders with Slovakia and Ukraine. In recent years, there has been an increase in the number of inhabitants and the number of registered passenger vehicles. This is shown in Figure 1. With the development of population, the city area increased and thus the length of the routes necessary to travel between the place of residence and the destination increased.

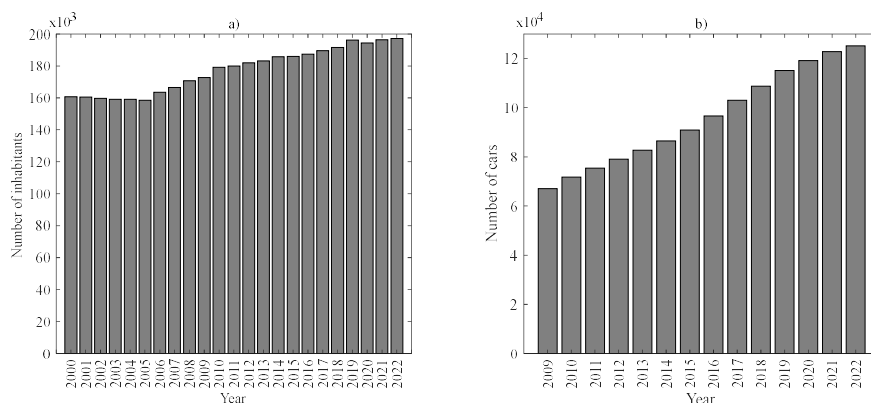


Figure 1. Indicators characterizing the city: a) number of inhabitants, b) number of passenger cars

Source: Prepared on the basis of (<https://bdl.stat.gov.pl/bdl/dane/podgrup/teryt>).

In Rzeszów, transport needs are met by public and individual transport (Dobrzański, Śmieszek, Dobrzańska, 2020; Śmieszek, Dobrzańska, Dobrzański, 2016). In the case of

individual transport in the city, access to infrastructure is necessary in the form of, among others: parking spaces. On public roads in the city of Rzeszów, from January 1, 2016, a paid parking zone was introduced, in which two paid parking zones were distinguished.

In 2020, the area of the paid parking zone was expanded and divided into subzones: “blue”, “orange”, “green”, “red”. Fees for parking motor vehicles on public roads in the Zone are collected on weekdays, Monday to Friday, from 8:00 a.m. to 8:00 p.m. The location of parking zones is shown in Figure 2.



Figure 2. Parking zone in the city of Rzeszów

Source: Prepared on the basis of (<https://bip.erzeszow.pl/120-miejska-administracja-targowisk-i-parkingow/4852-strefa-platnego-parkowania/4853-mapa-strefy-platnego-parkowania.html>).

In 2021, in cooperation with the City of Rzeszów and Asseco Data Systems, the PPS was implemented. At that time, Rzeszów was the first city in Poland to implement a solution for monitoring the status of available parking spaces. PPS allows Rzeszów to become part of the Smart City idea.

Data on parking lot occupancy is collected in the field 24 hours a day and sent for analysis using neural networks in the Supervision Center system at the headquarters of the Municipal Administration of Markets and Parking Lots (MAMPL). They are obtained from cameras and sensors detecting parking vehicles, and then displayed in real time on VMS information boards in the parking zone and the e-Parking mobile application. Video monitoring, which covers 2,200 parking spaces, required the installation of 338 cameras, 305 magnetic-radar sensors, 10 VMS information boards with a connection to the power supply and an IT network in the very center of Rzeszów. In addition to building a new parking metering infrastructure, it was also necessary to modernize the city's Data Processing Center to ensure efficient and reliable operation of the system. All elements of the solution were connected by a new fiber optic network (<https://www.assecods.pl/>). The e-Parking application was also implemented as part of the project. The creation of the system was co-financed by the European Union under the European Regional Development Fund, Operational Program Eastern Poland 2014–2020. The city authorities decided to implement this type of system for purposes closely related to the idea of sustainable urban development. The system makes it possible to shorten the time of searching for a parking space, reduce individual vehicle operating costs, and thus reduce air pollution emissions due to exhaust fumes and noise. The e-parking application works based on data from

Google Maps. Virtual, metered parking spaces were superimposed on the maps, showing the level of availability of parking spaces in particular areas. Screenshots of an example view are shown in Figure 3a.

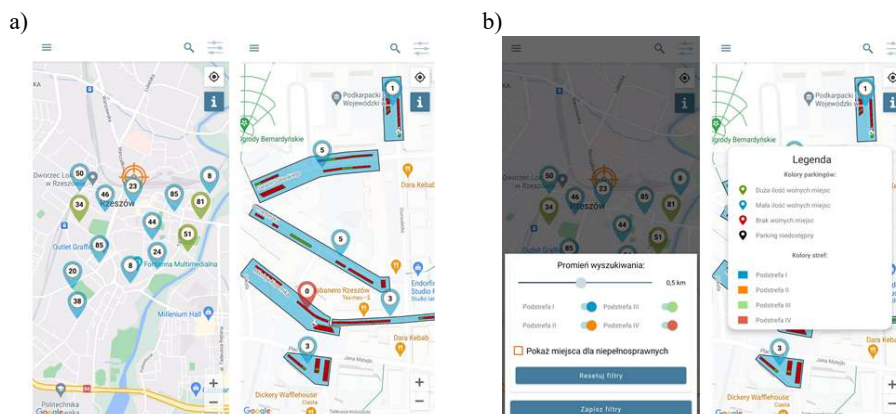


Figure 3. Maps with the level of availability of parking spaces in the e-parking application (a), Filters and legend of markings in the e-parking application (b)

Source: Prepared on the basis of ([https://play.google.com/store/apps/details?id=pl.assecods.matip&pcampaignid=web\\_share](https://play.google.com/store/apps/details?id=pl.assecods.matip&pcampaignid=web_share)).

The colored pins, which are visible in Figure 3a, show the number of free parking spaces in individual areas in the paid parking zone. Parking spaces come in different colors:

- green, meaning that the parking space is free;
- red, meaning that the parking space is occupied;
- black, meaning that the parking space is out of use.

In the application, it is also possible to enable navigation to the selected pin. In the application, it is possible to set filters that make it easier for users to use it and significantly speed up finding a free parking space. The possible use of filters and the legend of symbols are presented in Figure 3b. The user can also select a subzone in which can select a free parking space and specify whether the space should be adapted to the needs of people with disabilities.

In addition to the option to adjust the application settings and license conditions, the application also allows you to check the fee rates for parking in the paid parking zone and browse applications that allow you to pay for parking your vehicle. Additionally, there is also an option to start a stopwatch that counts down the time until the end of the paid period. The application sends the user a reminder before the end of the time, which allows you to avoid additional fees related to exceeding the parking time. The number of spaces in the paid parking zone, including spaces for people with disabilities, which are subject to accessibility monitoring, is approximately 2,200. The number of metered spaces and their percentage share in the total number of parking spaces in individual subzones are presented in Table 1.

The measurement covers the entire subzone I, called “blue”, and subzone II, called “orange”, as well as part of subzone IV, called “red”-approximately 17.88% of parking spaces. The remaining part of the “red” zone and subzone III called “green” are excluded from monitoring. The reason for excluding these areas from metering is the fact that in

subzones III and IV, most parking spaces are located in housing estates and these spaces are mostly used by residents. Subzones I and II, as well as part IV, are established in the very center of the city and its vicinity. These areas contain mostly service and administrative points, which are often visited by people living outside these zones. The implementation of the monitoring system in these areas is intended to encourage drivers to park in these specific subzones, relieving the burden on subzones III and IV, which were introduced at the request of residents complaining about the shortage of parking spaces near their homes.

Table 1. Number of metered parking spaces in the paid parking zone and their share in the total number of spaces in the zone – data provided by the MAMPL in Rzeszów

Subzone	Parking spaces in the paid parking zone (including parking spaces for people with disabilities)	Parking spaces in the paid parking zone are covered by an occupancy measurement system	% parking spaces in the paid parking zone co-vered by an occupancy measurement system
Subzone I	1577	1577	100.00%
Subzone II	542	542	100.00%
Subzone III	919	0	0.00%
Subzone IV	453	81	17.88%

Source: Prepared on the basis of data provided by the MAMPL in Rzeszów.

The e-parking application was used to collect data. Data collection took place twice, 7 days each, for a total of 14 days, in the periods from November 8, 2022 to November 14, 2022 and from December 18, 2022 to December 24, 2022. Measurements were performed five times a day: approximately 9:00 a.m., 12:00 p.m., 3:00 p.m., 6:00 p.m. and 9:00 p.m. In total, data was collected from 70 time stops.

Parking spaces, including spaces for people with disabilities, covered by the occupancy measurement system are divided into 75 areas. The division into areas and the specification of streets are shown in Figure 4.

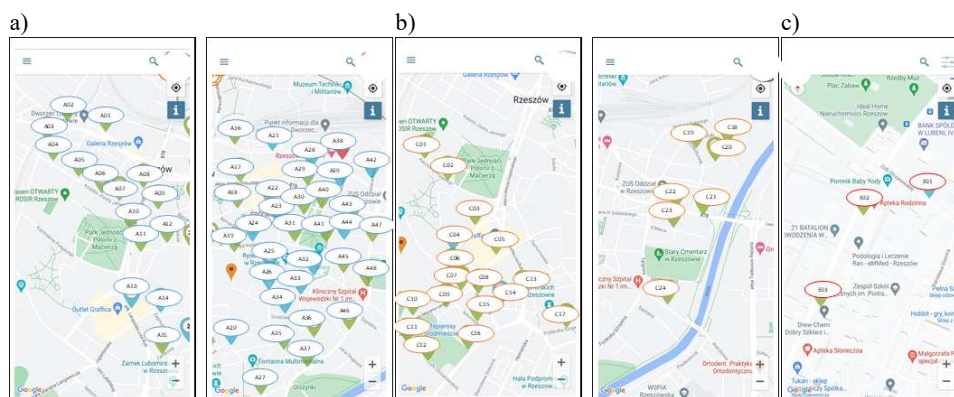


Figure 4. Locations of areas accepted for research in: a) I „blue” subzone, b) II „orange” subzone, c) IV „red” subzone

Source: Prepared on the basis of ([https://play.google.com/store/apps/details?id=pl.assecods.matip&pcampaignid=web\\_share](https://play.google.com/store/apps/details?id=pl.assecods.matip&pcampaignid=web_share)).



For subzone I, 48 measurement areas were designated. They were marked with the symbol AXX, where XX was the next number of the area. 24 areas have been designated for subzone II and marked with the symbol CXX. However, three areas have been designated for subzone IV, marked with EXX symbols.

Additionally, separate measurements were carried out only for places intended for people with disabilities. They were divided into 21 areas shown in Figure 5.

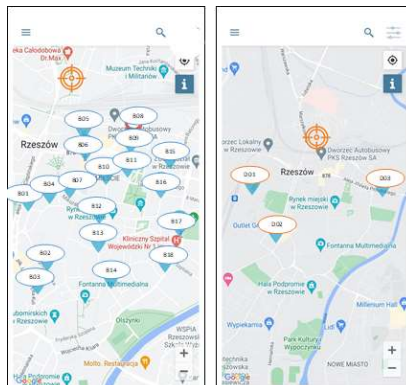


Figure 5. Locations of areas with parking spaces for people with disabilities accepted for research

Source: Prepared on the basis of ([https://play.google.com/store/apps/details?id=pl.assecods.matip&pcampaignid=web\\_share](https://play.google.com/store/apps/details?id=pl.assecods.matip&pcampaignid=web_share)).

It is worth noting that places for people with disabilities are metered only in subzones I and II. For subzone I, 18 measurement collection areas were designated and marked with the symbols BXX, where XX is the sequential number of the area. However, three areas have been designated for subzone II and are marked with DXX symbols.

### 3. RESULTS AND DISCUSSION

The analysis was divided into two measurement periods A and B. Period A can be characterized as a normal working week. Only November 11 (Friday) was a day off from work. Sunday, November 13, was a day off from trading. Period B is the week before Christmas. Due to the approaching Christmas holidays, greater traffic was expected in the center due to preparations for days off from work and trade. The last day of measurements, i.e. Saturday, December 24, was Christmas Eve. December 19 was the last trading Sunday before Christmas. Moreover, it is worth noting that before the beginning of period B there was heavy snowfall, and during the measurements there was snow on the streets and difficult road conditions.

First, the level of average occupancy of parking spaces in the paid parking zone was compared, divided into periods A and B and subzones. The obtained results are presented in Table 2.

The results indicate that both in periods A and B, the subzone that was most occupied was subzone I. In period A, parking spaces in subzone I were occupied by 68.37%, and in period B by 57.90%. This result results from the fact that subzone I covers the very center of the city, where there are many service points, places of culture and entertainment, as well as administrative organizations.

Table 2. Average occupancy level of parking spaces in the paid parking zone

Subzone	Period A	Period B	Average
Subzone I	68.37%	57.90%	63.14%
Subzone II	51.49%	50.93%	51.21%
Subzone IV	54.61%	27.94%	41.28%
<b>Average</b>	<b>58.16%</b>	<b>45.59%</b>	

Source: Own study.

In period A, subzone II was the least occupied 51.49% of parking spaces, and in period B, subzone IV 27.94%. The occupancy level of parking spaces in subzone IV in period B is less than half as compared to period A. This may be due to the fact that subzone IV includes parking spaces near housing estates. During the pre-Christmas period, residents could spend more time outside their homes, and thus their vehicles did not take up parking spaces.

The values for the entire paid parking zone covered by the occupancy measurement system, divided into two measurement periods, indicate that in November the overall occupancy of the zone (i.e. 58.16%) was higher than in December (i.e. 45.59%). It was expected that in December, during the pre-Christmas period, there would be higher parking space occupancy values, but this was not the case. Factors influencing the lower result in period B could include, among others: weather and road conditions. Snow on the streets could discourage drivers from using private vehicles in the city. Residents then stayed at home, giving up on pre-Christmas matters, or decided to use public transport services. An important factor could also be drivers' fear of difficulties in finding a free parking space during the busy pre-Christmas period. This element could also influence the decision to travel by public transport. Based on the data obtained, the occupancy rates of the subzones at particular times of the day were compared. The results for different periods are presented in the chart in Figures 6 and 7.

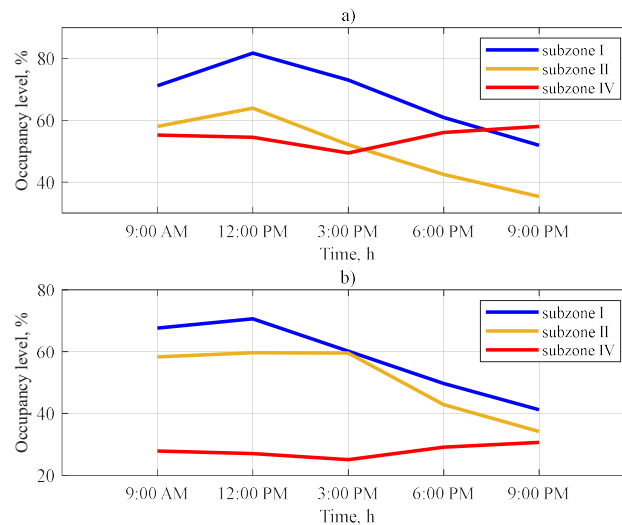


Figure 6. Paid parking zone occupancy level by hours in period A (a), period B (b)

Source: Own study.

Figure 6 clearly shows that the occupancy levels in subzones I and II increase from 9:00 a.m., peak around 12:00 p.m., and then decrease almost equally until 9:00 p.m. In period B, the peak occupancy of parking spaces in subzone II was extended and lasted from approximately 12:00 p.m. to 3:00 p.m. In subzone IV, occupancy levels decrease from 9:00 a.m. Then, around 3:00 p.m., parking lot occupancy levels are at their lowest point of the day, and from 3:00 p.m. to 9:00 p.m., occupancy levels increase. The charts presented in Figure 6 clearly show that subzone IV is an area dominated by housing estates. In the afternoon, most vehicles are parked within the boundaries of subzones I and II, covering the very center of the city, and outside these hours, when residents return to their homes after work or running errands, an increase in the occupancy rate of parking spaces in subzone IV is visible.

The average level of occupancy of parking spaces in the paid parking zone was also compared by day of the week. The results are presented in Figure 7.

In Figure 7, the dominance of subzone I in terms of the occupancy rate of parking spaces is clearly visible, regardless of the day of the week. It is worth taking a look at the results for Sunday in both periods.

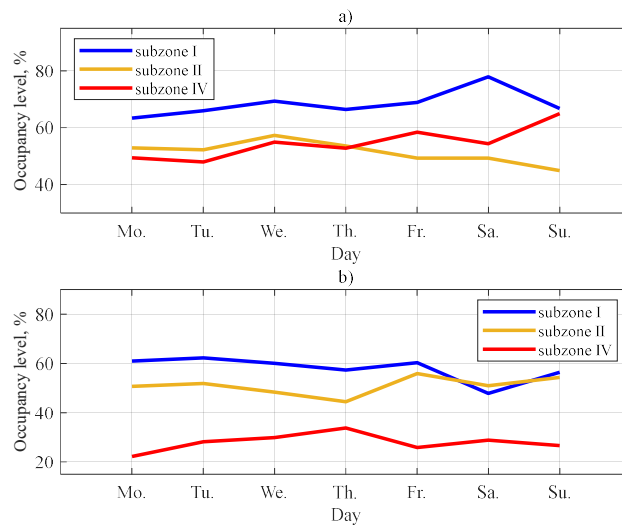


Figure 7. Paid parking zone occupancy level by days of the week in period A (a), period B (b)

Source: Own study.

In period A (Figure 7a), when the Sunday covered by the measurement was non-trading, there was a clear decline in the occupancy level of parking spaces in subzones I and II and a sharp increase in subzone IV. Due to the Sunday trading ban, drivers had no need to travel to the city center. The increase in occupancy in housing estates was caused by the fact that most residents decided to stay in their homes on that day. There is also an increase in interest in stopping in subzone I on Saturday during period A. This was most likely due to the preceding day off from work (i.e. Friday, November 11) and a non-trading Sunday on the following day. People most likely wanted to use this Saturday to do their business in the city center and use the services of the shops located there. In turn, in period B, when shopping Sunday fell, there was an increase in interest in parking in the city center

and a decrease in the level of occupancy in the area of housing estates. Also interesting is the phenomenon that became visible on Saturday in period B, i.e. December 24, Christmas Eve. The level of interest in parking in subzone I, in the city center, dropped sharply and was the lowest for this subzone during the entire two-week measurement period. Human behavior and attachment to tradition are clearly visible, consisting in giving up traveling to the city center on Christmas Eve, when time should rather be spent with family.

Analyzing data on the availability of parking spaces, there are clearly visible areas where there is a high demand for parking vehicles. The demand for parking spaces is associated with an indicator called the availability level. It was calculated for each of the 75 designated areas.

After calculating the accessibility level index for each of the subzones covered by the measurements, 10% of the areas with the greatest demand for parking spaces were determined. These areas are presented in Table 3.

Table 3. Areas in paid parking subzones where there is the highest demand for parking spaces

Subzone	Area	Streets covered by the area	Availability level
Subzone I	A32	B. Joselewicza	22%
Subzone I	A39	Kolejowa – S. Żeromskiego	51%
Subzone I	A25	J. Słowackiego	63%
Subzone I	A14	Zamkowa	65%
Subzone II	C04	M. Mochnackiego – ks. J. Poniatowskiego	32%
Subzone II	C01	K. Pułaskiego	49%
Subzone IV	E02	gen. J. Dąbrowskiego	54%

Source: Own study.

The lowest level of availability and therefore the highest interest in the entire paid parking zone occurs in the area of A32 at Berka Joselewicza Street. Ultimately, there will be 23 parking spaces there. The availability level is approximately 22%. The largest number of available parking spaces in this area throughout the entire period under study was 6, and the smallest was 1. It turns out that parking spaces on this street were occupied almost all the time. This phenomenon may result from the fact that Berka Joselewicza Street borders directly with the Rzeszów town square and the promenade in the very center of the city. The concentration of catering outlets, service outlets, municipal administration, schools and religious places in the immediate vicinity causes drivers to constantly be interested in this area to park their vehicles there.

The second area with the most critical accessibility indicator in the entire zone is area C04. It is the intersection of Maurycy Mochnacki and Książę Józef Poniatowski streets. The availability of parking spaces in this area is approximately 32%. A large number of medical points are located on the above-mentioned streets, such as clinics, private medical offices, laboratories, and the Municipal Social Welfare Center. There are also two schools, a kindergarten, the Chamber of Legal Advisers and a shopping mall in the vicinity.

Table 4 presents data on the number of vehicles and people living in Rzeszów and the borders of the adjacent Rzeszów county per one parking space in the paid parking zone. The analysis assumed that vehicles, including motorcycles and scooters, are mostly driven by people over 15 years of age. These people may need to use parking spaces in the paid

parking zone. When calculating the indicators, the number of vehicles and inhabitants in two counties was taken into account – in the county city of Rzeszów and the bordering Rzeszów county. It was calculated that there was more than one person per vehicle in both counties. Therefore, up to approximately 88 people in approximately 65 vehicles, assuming that all residents of both counties would like to park their vehicles in the zone at the same time, may request one parking space in the paid parking zone at the same time. However, it should be taken into account that the parking lots in the zone are used by also people from outside these two counties. However, if parking spaces in the paid parking zone in Rzeszów could only be used by city residents, the need would be reported by approximately 47 people in approximately 35 vehicles. However, the analysis of data from the obtained measurements and the determined occupancy rate indicate that the demand is actually lower. Therefore, it can be said that the number of parking spaces in the paid parking zone in Rzeszów is sufficient.

Table 4. The number of vehicles and people living in Rzeszów and the borders of the adjacent Rzeszów county per one parking space in the paid parking zone

	County City of Rzeszów	Rzeszów county	Total for both areas
Number of motor vehicles	122 830	102 342	225 172
Number of people over 15 years of age	164 145	142 237	306 382
Number of people per vehicle	1.34	1.39	1.36
Number of vehicles per parking space in PPS	35.18	29.32	64.50
Number of people per parking space in PPS	47.02	40.74	87.76

Source: Prepared on the basis of (<https://bdl.stat.gov.pl/bdl/dane/podgrup/teryt>).

Table 5 shows the average occupancy of places for people with disabilities in the metered part of the paid parking zone.

Table 5. Average occupancy of spaces for people with disabilities in the metered part of the paid parking zone

	Maximum number of parking spaces available for people with disabilities	Average occupancy during period A	Average occupancy during period B	Average occupancy in both periods
Subzone I	41	55.97%	46.20%	51.09%
Subzone II	7	38.72%	51.02%	44.87%
Total	48	47.35%	48.61%	47.98%

Source: Own study

Metered parking spaces for people with disabilities are located entirely in subzones I and II and constitute 100% of the total number of spaces for people with disabilities in these subzones. There are approximately 41 parking spaces in subzone I, and approximately 7 in subzone II. The remaining approximately 79 spaces for people with disabilities are located in subzone III and IV and are not covered by the occupancy monitoring system.

The overall average occupancy of metered parking spaces for people with disabilities was approximately 47.98%. In general, in subzone I there was a higher degree of occupancy of places for people with disabilities than in subzone II. In period A, a higher level of occupancy occurred in subzone I, while in period B-in subzone II.

Figure 8 shows the level of occupancy of places for people with disabilities in the paid parking zone, which varies at particular hours during the day. In order to achieve the results, data from a total of 14 days of the measured periods were compiled and averaged.

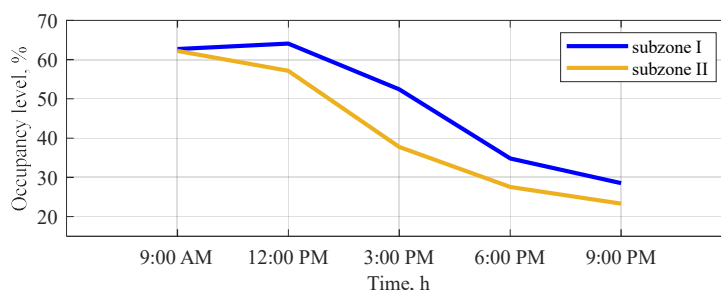


Figure 8. Occupancy level of places for people with disabilities in the paid parking zone by hours

Source: Own study.

The highest level of occupancy of places for people with disabilities in both subzones occurs between 9:00 a.m. and 12:00 p.m. and ranges from approximately 57.14% to 64.11%. After this period, the average occupancy of parking spaces for people with disabilities decreases to reach the minimum around 9:00 p.m., i.e. from approximately 23.3% to 28.54% of occupied parking spaces. It is noticeable that a higher average occupancy level occurs in subzone I, “blue”, than in subzone II, “orange”.

#### 4. CONCLUSIONS AND FUTURE STUDIES

Parking in cities is becoming more and more problematic. The increasing number of cars and limited space make finding a place to park more and more difficult. Not everywhere urban infrastructure allows for quick movement around the city without a car, which is why residents choose to travel by car. The purpose of the trip also influences the choice of traveling by car. The lack of parking spaces is one of the main problems in city centers, which is an everyday problem for residents especially and affects their quality of life. The ecological aspect should also be taken into account. Frequent and long searches for a free space increase the emission of greenhouse gases and other air pollutants. Residents of city centers are especially exposed to the negative effects of air pollution caused by excessive car traffic. One of the solutions that enables smooth management of parking zones in cities is the so-called intelligent parking solutions. An increasing number of cities use modern technologies to manage parking.

Intelligent parking solutions are not only a solution to drivers' current problems. Cities that implement this type of systems can manage their activities more efficiently by predicting the demand for parking spaces, and analyzing the data collected by the systems used can also indicate which areas require more attention or when to plan renovation and maintenance works.

Using the parking solutions offered by the Smart City concept, it is possible to develop strategies to optimize the management of existing parking spaces. The number of available parking spaces in cities can only be increased to a limited extent because they are a limited resource. The results presented in the article made it possible to isolate factors influencing the occupancy of parking spaces, such as weather anomalies or days off from work. The influence of these factors can be used in the development of optimization strategies.

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## COOPERATION IN THE FIELD OF MISSILE DEFENSE IN THE EURO-ATLANTIC AREA

An important feature of contemporary armed conflicts is the large-scale use of air attack. The events of the last two years have made many experts realize that the present air safety environment is increasingly uncertain, complex, and difficult to forecast. It is therefore justified to present current issues related to anti-missile defense – which, in the authors' opinion, is crucial for the functioning of NATO border states.

The aim of this article is to describe cooperation in the framework of anti-missile defense in the Euro-Atlantic area, which is characterized by a dynamic process of transformation, including ambitions among some countries to dominate in this dimension.

This study uses document research and quantitative and qualitative analysis. It reviews the scientific literature on the complex issue of cooperation in the field of missile defense, and uses publicly available information provided by interested institutions. The results show that this cooperation is not a new phenomenon, but it currently requires organized political and military actions from states, including their armed forces.

**Keywords:** air safety, air threats, missile defence.

### 1. INTRODUCTION

The contemporary air safety environment is characterized by a dynamic process of transformation of types of threats, which include, among others: ambitions of some countries to dominate in this dimension. In considerations regarding counteracting threats to state security in the air dimension, it is necessary to refer to similar efforts undertaken by the international community in the Euro-Atlantic area. In the case of Poland and Romania, cooperation within the North Atlantic Alliance is particularly important, as it is reflected in the functioning and development of the NATO Integrated Air and Missile Defense System – NATINAMDS.

An important element of ensuring the air security of Poland and Romania is cooperation in the field of air defense implemented within the European Union (EU) within the framework of institutionalized PESCO cooperation (*Permanent Structured Cooperation*).

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Finally, in considerations regarding counteracting threats to the air security of Poland (Romania), it seems necessary to take into account the international cooperation developing in various dimensions and formats in the Euro-Atlantic area in the field of anti-missile defense.

To better understand the implications of cooperation in the field of air defense in the Euro-Atlantic area for the air security of Poland (Romania), it is necessary to refer in more detail to the scope of cooperation, division of responsibilities and limitations to which such cooperation will be subject. The statements dominating in the public space that the North Atlantic Alliance will defend Poland (Romania) and the European Union will provide money are an oversimplification and do not reflect the actual implications of Poland's (Romania's) participation in NATINAMDS and PESCO or the anti-missile shield for the air security of our countries (Permanent Structured Cooperation, 2021; Terlikowski, 2018).

In recent years, the threat structure of our countries has changed significantly. Many new military threats have emerged and may develop into long-term crises or high-intensity armed conflicts. This assessment is confirmed by the events in Ukraine, i.e. Russia's aggression in 2022 and its consequences. In the authors' opinion, in this context, air defense (AD) of the territory as a border state of the North Atlantic Alliance and the European Union becomes particularly important for the security of Poland (Romania). Therefore, it is necessary to take into account the broader context of international cooperation in the Euro-Atlantic area to shape Poland's (Romania's) capabilities in ensuring air safety. In a narrower sense, this cooperation should be considered through the prism of increasing the ability to counteract threats to the state's air security.

Taking into account the issues discussed and due to the importance of air defense for the security of Poland (Romania), the authors in this article attempted to analyze and assess the political and military conditions of its functioning through the prism of cooperation in the Euro-Atlantic area as part of the construction of an anti-missile shield.

## 2. EVOLUTION OF THE ANTI-MISSILE DEFENSE CONCEPT

On May 12, 2016, i.e. on the seventeenth anniversary of Poland's accession to the North Atlantic Alliance, NATO Secretary General Jens Stoltenberg stated: "Our missile defense program represents a long-term investment against a long-term threat. Our goal is to achieve full coverage and protect NATO's European allies from ballistic missile attacks from outside the Euro-Atlantic area" (North Atlantic Treaty Organization, 2022). It can be said that these words are the culmination of many years of efforts, the consequence of which is the NATO BMD (*Ballistic Missile Defense*) anti-missile defense system and the American EPAA (*European Phased Adaptive Approach*) program. This event was the result of many years of discussions and work, the beginnings of which can be traced back to World War II.

Anti-missile defense can be defined in one sentence as: all projects and measures used to protect the population, territory and troops against all threats related to the use of missiles (AAP-6, 2017). Thus, anti-missile defense is a part of air defense focusing on repelling the enemy's air strike and destroying its air attack means (ABM), especially ballistic missiles and strategic aviation (Poland in the American missile defense system, 2008). Anti-missile defense can fulfill a number of functions, including strengthening the state security system and increasing the credibility of deterrence. Without going into the complex issue of classifying ballistic missiles, for the purposes of this study the classification by range is important because it corresponds to the division of anti-missile systems. Thus, ballistic

missiles are divided into four groups: 1) Short-Range Ballistic Missile (SRBM): range up to 1,000 kilometers (this group of missiles often includes battlefield missiles (*Battlefield Short-Range Ballistic Missile* – BSRBM) with a range of up to 150 km), 2) Medium-Range Ballistic Missile (MRBM): range from 1,000 to 3,000 kilometers, 3) long-range missiles intermediate (*Intermediate-Range Ballistic Missile* – IRBM): range from 3,000 to 5,500 kilometers, 4) intercontinental ballistic missile (ICBM): range over 5,500 kilometers (Carter, Schwartz, 1984).

The above division also serves to divide anti-missile systems intended to combat short-, medium- and intermediate-range missiles, respectively, and against intercontinental missiles. Reorientations in the approach of individual countries to the concept of missile defense can be broadly divided into two periods. The first covers the time from the end of World War II to the collapse of the USSR. The second one, in turn, is part of the period from the collapse of the USSR and the bipolar division of the world to modern times, which are characterized by a multipolar division of the world and conflicts in the Middle East and Ukraine.

It is worth emphasizing that the issue of ballistic missiles and their countermeasures, in the first period, was part of the broadly understood conflict between the USSR and the United States. It practically began when the Soviet Union, on August 29, 1949, carried out its first atomic weapon test. However, specific initiatives took place only after the USSR launched the R-7 rocket in August 1957, which two months later carried the first Soviet satellite – *Sputnik* – into Earth orbit. Until then, the superpowers focused only on developing air defense programs, because the main threat carrier was strategic aviation. However, since 1957, the problem of missile threats and anti-missile defense against intercontinental ICBMs has arisen (Roslan, 1985). Given the fact that Soviet ballistic missiles became the primary means of delivering nuclear warheads, the United States faced the challenge of building an effective Missile Defense (MD). Currently, this system consists of three basic subsystems: detection and guidance (radars and satellites), interception (interceptor missiles, laser), command and communications. Currently, to combat ballistic missiles, in individual phases of their flight and depending on their range, it is necessary to use various technical solutions, very often referred to as layered (multi-layer) anti-missile defense. This necessitates the use of various missile interception subsystems, which are deployed on land, creating an interception system in the initial phase, a defense system in the mid-flight phase, theater anti-missile defense systems, i.e. in the final phase of flight (PAC-3, MEADS, THAAD), and also at sea as the *Aegis* system and in the air based on the Boeing 747 aircraft.

It is worth emphasizing that not only the USA devoted its time to developing them. The Soviet Union also developed its anti-missile systems. There was a belief that anti-missile weapons could provide a specific advantage, because a country with effective defense would be able to launch a pre-emptive attack and would gain an advantage in inflicting retaliatory blows (Poland in the American missile defense system, 2008). During this period of competition, the *Star Wars* program announced by US President Ronald Reagan in the 1980s was important for modifying the concept of anti-missile defense. It not only contributed to laying the foundations for modern American missile defense, but also began an extremely dynamic period of technology development in this field.

### 3. POLISH APPROACH TO NEW CHALLENGES

The collapse of the Soviet Union ushered in a new international order, causing a far-reaching evolution of the security environment. The collapse of the bipolar world contributed to the emergence of the so-called asymmetric threats. The interpretation of these threats, which are part of the issues discussed, may be, for example, a terrorist attack using atomic, biological or chemical weapons, where the carrier will be missiles. This is facilitated by the dynamic proliferation of nuclear and missile technology to countries contesting the order in their regional environment. These events necessitated the evolution of the American missile defense concept. Therefore, the issue of the anti-missile shield did not disappear with the end of the Cold War rhetoric. This was reflected in the announcement by US President G. Bush of the shield initiative, which was initially intended to cover only the United States and, as a consequence, was extended to its *allies and friends* (Poland in the American missile defense system, 2008).

From the Polish point of view, an important element in the development of the American missile defense concept were consultations on the deployment of its elements on Polish territory, which had been conducted since 2002. During the tests, various factors determining the arrangement of selected elements of this system were assessed. Consequently, of all the locations, the military complex in Redzikowo turned out to be the best of all the options considered. Polish-American consultations ended with the signing on August 20, 2008 of the Agreement between the Government of the Republic of Poland and the Government of the United States on the deployment of anti-ballistic defense interceptors on the territory of the Republic of Poland. It assumed the deployment of ten GBI interceptor missiles in Poland<sup>3</sup>. Initially, the operation of the base in Redzikowo was to be supported by a radar station located in the Czech Republic. Also initially, the American version of the anti-missile shield, proposed by George W. Bush, assumed stationing only long-range anti-missiles in Poland. It was, however, thoroughly modified by the next American administration (National anti-missile system, 2012).

The next significant stage for Poland on the path to creating a coherent anti-missile defense system is set on September 17, 2009, when the President of the United States, Obama, changed the concept of the architecture of the American anti-missile defense system in Europe. At the same time, it was agreed that the new allied system would be built based on the American missile defense installations being built in Europe. This was reflected in decisions defining the assumptions for the staged development of these capabilities (EPAA). Pursuant to these provisions, first of all, capabilities are provided to defend against short- and medium-range missiles, and then also intermediate-range ones. At the same time, thanks to the extensive use of mobile systems in the architecture, it is to be adaptive to newly emerging threats.

The EPAA project is being implemented in three phases, gradually increasing the range of Europe's defense against ballistic missiles from the Middle East (Information material, 2015). And so, the first phase ended in December 2011. As a result, *Aegis*-class ships equipped with SM-3 IA anti-missiles were deployed in the Mediterranean Sea and the AN-TPY-2 mobile radar was deployed in Turkey. The aim of this phase was to provide point defense of critical infrastructure and troops in Southeastern Europe against short-

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<sup>3</sup> GBI – *Ground Based Interceptor*. GBI is a three-stage anti-ballistic missile designed to operate as part of a ground-based anti-ballistic defense system in the mid-flight phase; it is complemented by the ground part of the American Missile Defense anti-ballistic system (*Ground-Based Midcourse Defense* – GMD).

and medium-range ballistic missiles. The second phase, which was initially scheduled to end in 2015, involved the deployment of sea-based and ground-based SM-3 IB anti-missiles at the Deveselu base in Romania (so-called *Aegis Ashore*). It also resulted in the deployment of advanced radar systems, ensuring the defense of larger areas of Europe against short- and medium-range missiles. The last, third phase includes the deployment of land-based SM-3 IIA anti-missiles in Poland and Romania and at sea, capable of defending the entire European NATO territory against short- and medium-range missiles and, to a limited extent, intermediate-range missiles.

To sum up, as a consequence of the arrangements between the US and NATO, the American contribution to the European anti-missile system is the project of a multi-layer EPAA system, within which an anti-missile launcher will be located on Polish territory. It should be emphasized that the American system will not be a closed system, but will be successively modernized along with the ongoing development of technology. In turn, the multi-layer nature of the new anti-missile system means that enemy missiles can be combated in various phases of flight, even right after take-off – although in this case only using the most technologically advanced systems.

It is worth mentioning once again that the current American concept of the anti-missile shield is based on the so-called multi-layer defense of a tactical, operational and strategic nature, which is to be created by four subsystems. The first is a laser subsystem, which is planned to be installed on board special aircraft performing patrol flights in the most sensitive regions of the world. The task of this subsystem will be to try to destroy the enemy missile at the most convenient moment – right after its launch, in the so-called ascent phase. Another is the *Aegis* anti-missile subsystem deployed on warships, equipped with SM-3 (*Standard Missile-3*) missiles, intended to detect and destroy ballistic missiles, especially in their initial phase of flight. The next element is the *Patriot*-type land-based anti-aircraft and anti-missile defense subsystem, or more precisely, its latest generation – PAC-3. The task of this link, commonly referred to as *the last-chance defense measure*, is to destroy ballistic missile warheads in their last, final phase of flight. The last one is the land-based element of the anti-missile defense subsystem intended to combat enemy ballistic missiles in their mid-flight phase using the so-called kinetic interceptors (Orłowski, Bil, 2007).

From the Polish point of view, the last of the above-mentioned components of the anti-missile shield is of particular importance – the mid-flight, land-based anti-missile defense system, the essential part of which are land-based interceptor missile launchers. It is the elements of this system that will be deployed on the territory of the Republic of Poland.

#### 4. GERMAN POINT OF VIEW

From the perspective of the discussion on the Polish air defense system (anti-aircraft and anti-missile), it is also necessary to mention the importance of the same system for the German Armed Forces (Gotkowska, 2018). The modernization of the German air defense system is perceived as important for conducting missions outside the NATO treaty area, defending the territory of allies and for Germany's political-military and military-technical position in the Alliance<sup>4</sup>. At the same time, there may be a different opinion that the mentioned modernization may influence the choices of other NATO member states (Gotkowska, 2013). Thus, both the assumptions of the current reform and the direction of

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<sup>4</sup> TLVS (*Taktisches Luftverteidigungssystem*) is a German program for the modernization of medium-range anti-aircraft and anti-missile defense.

the evolution of German security policy will influence Germany's approach to political and military cooperation within NATO and the EU.

In 2011, between the Georgian-Russian war and the occupation of Crimea and the Ukrainian crisis, the reform of the Bundeswehr began, the aim of which was to *re-construct* the German armed forces in the political, military and social dimensions (Gotkowska, 2012). In the political dimension, the role, goals and principles of its use were redefined. Thus, it was determined that the new Bundeswehr would be an instrument to support and protect German interests in the world. In the military dimension, the goal of the Bundeswehr reform is to create a smaller but more effective army, well trained and equipped with modern equipment (Gotkowska, 2012).

The assumptions of the reform of the German Armed Forces and the directions of transformation of German security policy fit into the examined issues, therefore, in the authors' opinion, it is worth getting acquainted with its general assumptions. Thus, politically, the Bundeswehr is moving away from the expeditionary capabilities of the army developed after the end of the Cold War and the slow increase in Germany's participation in NATO, EU and UN operations in favor of tightening military cooperation within the Alliance and the European Union. At the same time, fearing excessive dependence on its most important European partners (France and Great Britain), Germany wants to maintain its independence. Therefore, according to the new assumptions, German politicians and military officials will only engage in cooperation projects that do not limit the possibility of autonomous and flexible action and generate military and political benefits in selected areas<sup>5</sup>.

In the field of missile defense, the Bundeswehr is developing capabilities in two areas. Firstly, in the context of protecting German military bases during foreign missions. The MANTIS<sup>6</sup> anti-missile, anti-artillery and anti-mortar system is to be used for this purpose (the Bundeswehr has ordered four such systems). Secondly, Germany participates in the NATO anti-missile defense program ALTBMD (*Active Multi-Layer Theater Ballistic Missile Defense*), which is designed to protect NATO troops during operations against ballistic missiles with a range of up to 3,000 km and which is part of the NATO system NATO BMD missile defense. After the reform, the German contribution to ALTBMD will probably be fourteen batteries of the *Patriot* short-range missile defense system, modernized to the PAC-3 version, and the SAMOC mobile surface-to-air missile operations center<sup>7</sup>.

As a result, Germany, which declared in 2015 that it would purchase MEADS instead of Patriots, saved the program. The Bundeswehr decided to use the results of the MEADS program to build a German medium-range anti-aircraft and anti-missile defense system in cooperation with France and possibly Italy. This system is intended to provide the Bundeswehr with protection against short-range ballistic missiles (up to 1,000 km). At the same time, it is planned to become part of the NATO anti-missile defense system, just like the German Patriot systems. This is to be an introduction to increasing Germany's participation in the NATO anti-missile defense system and an announcement of the

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<sup>5</sup> In the context of the economic crisis and defence savings in the EU, Germany's goal is, among others, maintaining production capabilities and guaranteeing the technological development of German arms companies.

<sup>6</sup> MANTIS – short-range defense system from Rheinmetall.

<sup>7</sup> The SAMOC system is a mobile command and control facility dedicated to the air defence brigade level.

possible acquisition or development of defense systems against medium, intermediate and long-range ballistic missiles (up to 3,000 km, 5,500 km and above). However, the decisions depended on many political, military and financial factors.

To sum up, taking into account the issues discussed and the challenges faced by the Polish air defense system, it is worth emphasizing that the German systems currently used and planned are *Patriot* sets (and their possible successors), which are to become part of the NATO anti-missile defense system. At the same time, the Alliance agreed that the NATO ALTBMD program, in which Germany has been participating since 2005, together with American missile defense installations in Europe (EPAA), is to be included in the NATO system.

## 5. NEW CHALLENGES

An important topic, which can also be treated as a separate study, is the integrated air and missile defense system of the US Army, i.e. the United States Army – *Integrated Air and Missile Defense* (AIAMD). The United States Army's AIAMD program is intended to enable the integration of various AMD (*Air and Missile Defense*) air and missile defense systems into one system. Its most important element is to be the network-centric command and control system IBCS<sup>8</sup>, the main contractor of which is Northrop Grumman. The philosophy of this system is to connect separate elements via the IFCN (*Integrated Fire Control Network*) network, including: *Patriot* system radar stations, *Patriot* system missile launchers, as well as modified *Sentinel* radar stations. In the future, this system will also provide the ability to command and control elements of the THAAD anti-missile defense system and the newly created short-range anti-missile system IFPC Inc 2-I (*Indirect Fire Protection Capability Increment 2-Intercept*). Moreover, the network-centric IBCS air defense command and control system is also to have the ability to communicate with other command and reconnaissance systems (Delay AIAMD, 2021).

This issue is interesting because the Polish Ministry of National Defense became interested in the command post of the IBCS air defense command and control system in 2017, carrying out work as part of the *Wisła* program (Maciejewski, 2017). Unfortunately, trying to characterize the IBCS system is difficult because it is a product that is still in the design phase and there is no model set. Also, the technical future of the IBCS air defense command and control system is still uncertain. However, it is worth noting, from the point of view of the topic discussed, that anti-aircraft and anti-missile defense systems are integrated at all possible levels as part of the general air defense system. Thus, this reflects the American approach to consolidating systems that will jointly ensure in the future the implementation of the concept of multi-layer anti-aircraft and anti-missile defense of all protected elements, starting from the state's critical infrastructure and ending with the protection of troops operating outside the country's territory (in the crisis area).

A noteworthy example illustrating the tightening of cooperation between the United States and the Alliance in the area of developing anti-missile defense capabilities is also the construction of the territorial anti-missile defense system (NATO BMD), in which the assumptions regarding the evolutionary development of the system and its adaptability to emerging threats are consistent with those presented for EPAA. This is primarily due to the basing of NATO BMD on the architecture of the EPAA system.

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<sup>8</sup> IBCS – *IAMD Battle Command System* – network-centric air defence command and control system.

## 6. CONCLUSION

To sum up, the development of a Polish or Romanian air defense system, compatible with the capabilities of allied and American systems, will significantly strengthen the defense of Poland (Romania) against a wide spectrum of air (missile) threats. Thus, the Polish (Romanian) armed forces will be able to detect, recognize and combat short-, short- and medium-range missiles in their final phase of flight, as well as other means of air attack (planes, helicopters). In turn, defense against long-range ballistic missiles would be the task of the American and allied systems.

An interesting summary may also be the words of Peter Flora, former NATO Deputy Secretary General for Defense Investments, who said:

NATO's greatest strength is the power of its unity. Community of commitment and community of action. That is why we support a Community approach that leaves no nation behind, equips NATO with a missile defense shield to protect all its inhabitants, and provides the highest degree of confidence that any missile threat, whether from hostile countries or terrorists, will be defeated.

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## SELF-COMPASSION AND THE RATIONALITY OF PRAXEOLOGICAL LEADERSHIP

The aim of the theoretical analysis is to define the connections and dependencies between the rationality of decisions made and personality determinants, in this case the construct of being good to oneself. The achievement of the intended goals was based on a systematic review of the literature on the subject, referring to the results of foreign and domestic empirical research, mainly in the field of social sciences and philosophy. The implementation of the theoretical goal complements the research gap that comes from the fact of inflation in the field of *self-compassion* and *praxeological leadership*, and their mutual functional connections. The practical usefulness of the conducted analysis is an interesting and solid contribution to asking research questions and planning further research on the participation of personality factors in decision-making processes in leadership.

As a result of the critical analysis, a concept of praxeological leadership was presented, which highlighted the role and importance of self-compassion, indicating the positive and negative aspects of the analyzed correlation in the decision-making process in management and leadership.

**Keywords:** leadership, self-compassion, decision-making, cognitive processes.

### 1. INTRODUCTION

Praxeology focuses on the analysis of the conscious actions of human individuals and the logic of their actions. The praxeological method is based on deductive reasoning, which allows drawing conclusions about an individual's behavior in the context of achieving their goals. Praxeology studies the decision-making process and actions of individuals, analyzing their logical relationships and rationality, and assessing the pragmatism of the effects.

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Rationality is mentioned as one of the basic properties of effective action. In itself, it is the unconditional domain of praxeology and as such it became the subject of this analysis. However, this concept occupies a special place in science, language and culture (Łukaszyński, 2002; Haus, 2005; Draskovic, Bauk, Delibasic, 2016; Jokiel, 2017; Jankowska-Mihułowicz, 2012; Masiukiewicz, 2018; Piaseczny, 2005; Kotlarek, 2014; Kalinowski, 2014; Niemczuk, 2019; Nogal, 2014; Lisak, 2016). Every action, in order to be considered effective, efficient, beneficial, and productive, is also rational in itself. Particularly socially important are various perspectives of decision-making processes, whose subjectified rationality refers to personalized power in heterogeneous organizational domains (types of organizations), and nominal varieties of the managerial function (manager, supervisor, commander). Therefore, *the rationality analyzed in the presented considerations refers to the decision-making process within various managerial roles played in the management process, which is supported by leadership*. This rationality of decision-making processes in management and leadership and its personal determinants, mainly self-compassion as a kind of universal attitude, constitute the goal of the theoretical analysis undertaken and determine its application value.

The rationality of managerial decisions can be considered in terms of *substantive rationality* and *methodological rationality*. Praxeological leadership should be perceived in two forms – ontological and methodological leadership; the one which is naturally innate, and that which is assimilated. In other words, an ontological leader is a natural leader, a methodological leader is a professionally educated manager. In the light of the above distinction, real leadership occurs in an ontological version, and in this form it is determined by personality, including the attitude of compassion towards oneself. A specific prototype of the ideal of praxeological leadership would be the combination and unification of both aspects mentioned, ontic and methodological, into one compatible whole. This theoretical and application goal guides this analysis, which is the starting point for further, more detailed research work.

The *substantive rationality* of a decision consists in adapting the choice made "to the circumstances and in general to everything that can be stated in a true court of law". A rational decision in the substantive sense, transformed into an executive action, fully corresponds to reality and transforms it in accordance with the laws governing it, including psychological, personality, decision-making, behavioral regularities, etc., including self-compassion as a relatively permanent personality disposition.

When the choice in action is made in accordance with the *decision-making rules* based on the information available to the decision-maker, we are dealing with a *methodologically rational* decision. In this case, self-compassion would be an aspect of knowledge, self-awareness, self-reflection, self-knowledge, the effect of introspection, etc., which is related to how the decision-maker perceives themselves while making the decision and after it has been made and potentially implemented.

One may wonder whether substantive rationality – which is ontologically, i.e. inextricably and permanently related to the decision-maker – is also based on personality traits, as well as situational conditions. If so, is it also based on mental properties, which by their very nature constitute a source of ambivalent, probable and potential conditions. One type of personality trait that is controversial in terms of leadership is the attitude of self-compassion. Due to the fact that self-compassion is a common social attitude and decision-making is based on rationality, the question of the relationship between the process of leadership and self-compassion as a personality property (trait) becomes

important. Situational determinants of rationality have been excluded from these considerations as issues that go beyond the scope of this analysis.

In relation to the two aspects of rationality mentioned above, a common type of attitude was analyzed, namely self-compassion. In order to answer the question about the relationship – positive, negative or ambivalent – between the rationality of praxeological leadership and self-compassion, the hypothetical relationships must be subject to logical, theoretical and deductive analysis. The phraseological discrepancies appearing in the paper are the result of the semantic limitations of the term: *self-compassion*, which each time mean the same personality aspect.

Self-compassion means being sensitive to your own suffering, and at the same time showing a feeling of care and kindness towards yourself. It involves accepting one's own failures and imperfections without judging them negatively. Self-compassion can also be understood as a state or trait consisting of three components: *kindness, reflection, and a sense of community with people*. Kindness is about showing understanding and kindness towards one's own weaknesses and mistakes. Reflectivity means focusing on current experience and awareness of emotions, without judging or criticizing them. A sense of community with people is about seeing your situation as something that may also concern other people.

## 2. LEADERSHIP AND A COGNITIVE PROCESS

Leadership is a type of conscious and purposeful human behavior that takes place in some social structure. However, the influence of power on leadership is expressed in two important social functions, namely in the *social roles played and interpersonal relations*. The determining role of power in relation to leadership means that the phenomenon of power influences the final shape of leadership in a specific situation. This should be understood in such a way that the process and mechanism of leadership are revealed in precisely defined and real, often formalized social and organizational circumstances. Leading is a form of playing a social role, in which the personality, motivation and various attitudes of the role player play an important role.

The process of playing a leadership role takes place in an established position and in a specific organizational structure. The result of the above implication is the assumption that:

leadership is the influence of the person playing this role on a specific individual, group and organizational social entity in precisely defined situational conditions. It is a relationship between the leader and the subject of leadership influence, which is based on mutual trust, trust and attachment (Nagody-Mrozowicz, 2021).

Cognitive processes in the sense of cognitive psychology and cognitive science are sets of activities undertaken to create and determine specific cognitive structures using the cognitive system (mind) (Maruszewski, 1983), which are also the basis for the information processing process within the functioning of the nervous system of a given organism. (Maruszewski, 2017). The activation of the cognitive process by the organism indicates not only the need to acquire or change knowledge about the environment, including its properties, but also the process of shaping behavior in a specific environment and receiving information from it, storing and transforming it, and returning it to the environment in forms of reactions, referred to as feedback (Nęcka, Orzechowski, Szymura, Wichary, 2020).

The concept of cognitive processes in the form of a classical definition, described as the simplest form of a real definition, providing the characteristics of the defined species (definiendum) by specifying its superior genus and the so-called species difference (definiens, differentia specifica) (*Encyklopedia PWN*, <https>), contains the ontological and functional definiens of the concept of leadership. The leadership has been defined below.

Leadership is a cognitive process that requires not only interpersonal skills, but also the ability to analyze and understand complex problems and make appropriate decisions. Leaders must be well-informed to be able to effectively manage their team and achieve their goals.

Leadership as a cognitive process involves the ability to recognize and analyze the needs of one's subordinates and the situation in a given organizational structure. The leader must be able to understand what the expectations of their team are, and what factors influence the functioning of the organization as a whole.

An important skill of the leader is the ability to think creatively and make innovative decisions. Leadership is not only about directing the actions of other people, but also about the ability to introduce changes and improve the activities of specific organizational structures. Leadership as a cognitive process requires understanding the meaning and conscious use of resources in order to achieve intended goals.

Leadership requires communication skills. The leader must be able to clearly convey information and direction and listen to their subordinates. Communication is crucial to effective leadership because it allows one to build trust, resolve conflicts and motivate the team.

Leadership requires constant development and learning. Leaders should be open to new ideas and perspectives in order to adapt to changing conditions and expectations. Leadership is a continuous process that requires constant development of one's skills and knowledge in relation to the characteristics of the external environment. These processes begin with self-awareness.

*Praxeological leadership* is an approach to leadership based on practice and experience. It is a form of leadership that focuses on applying practical skills and techniques in managing and leading a group or an organization (Nagody-Mrozowicz, 2023). *Praxeological leadership* is a conglomerate of a complex, multidimensional nature, in which personalistic, intellectual, volitional, teleological and behavioral components can be distinguished. This applies to both the dimension of motivation, as well as established dispositions and attitudes, and should be expressed in adequate behaviors with a strongly emphasized role of effectiveness. The pragmatic dimension is the measure of things and the main evaluation criterion for these events.

### 3. LEADERSHIP RATIONALITY

Initial attempts to determine the characteristic content and connotations of the concept of rationality show that this concept belongs to a group of concepts that have the so-called families of meanings.

The scope of such concepts is not, as we know, a group of objects characterized by a set of features common to all elements of this scope and only them, but it is many subsets, connected only by partial similarities. In this way, these subsets create a family to which a family of meanings corresponds, constituting the meaning of the concept (Pawłowski, 1986).

Amsterdamski notes that:

For many years, science was treated as the embodiment of human rationality (...), a specific feature of our culture, its development was presented as the result of the consistent application of a rational research method... no one questioned the rationality of science and its development... Despite epistemological discrepancies regarding how rational knowledge is possible and what its method consists in, and despite axiological conflicts regarding the role of science in culture, ... there was a common consensus within which these disputes took place. It was defined by... such a concept of human rationality and such an ideal of scientific knowledge that on their basis the question about the rationality of science did not arise at all (Amsterdamski, 1994).

A comparative analysis of the types of rationality distinguished in contemporary semantic and methodological literature creates the opportunity to alleviate misunderstandings and antagonisms related to the concept of rationality. The main causes of these misunderstandings, such as the lack of a clear definition of the scope of the concept of „rationality”, the difficulty in distinguishing between descriptive and evaluative features, and changes in the concept of human rationality and the ideal of scientific cognition, can be resolved through the analysis and presentation of different types of rationality (Pawłowski, 1986). Presenting the types of rationality allows one to understand that there are many different approaches and perspectives on this concept. There is no one universal definition of rationality or one appropriate method of determining what is rational, and this means that it can be understood and assessed differently in the context of axiology, culture, nation and – obviously – the scientific field.

Rationality is a necessary condition for all discourse; it is an autonomous value in our civilization, it is also related to ethics because rational action requires strength of character and has great social significance. To attribute rationality to an opinion, action or person is to define it positively. To deny them rationality is to show disregard, to exclude them from the scope of permissible controversy. Meanwhile, many misunderstandings have accumulated around the concept of rationality (Tałasiewicz, 1995).

The authors of this work do not intend to resolve the existing polemics, emphasizing only a few main aspects of the resulting difference in views.

At the beginning, it is necessary to distinguish two terms, rationalism and rationality, which are understood as synonyms, but in fact they have a slightly different meaning, are ambiguous and require clarification (Bombik, 2001). Ajdukiewicz stated that the concept of ”rationalism” is not clearly defined enough (Ajdukiewicz, 2004), and on the basis of this argument, the word ”rationalism” is understood to mean relatively clearly defined philosophical directions, the representatives of which consider reason to be the most valuable cognitive power of man and attribute it to the derivation of judgments and drawing conclusions have a principled role in the cognitive process (Stróżewski, 2005). ”Rationality” is a concept whose understanding is determined by the stage in the progress of science, and its etymology derives it from the Latin word ”ratio”, which is ambiguous in itself (Jasiński, 2022), meaning both reason, the basis, principle and a cause (Morawiec, 2014). It determines the semantic framework of the feature that belongs to its object, because it has a reason for its existence and content. Reason is rational since it is discovered

by mind, and rational because it is consistent with reason as a human faculty. As Herbut writes:

In the cognitive domain, the word "reason" describes the logical basis for recognizing certain sentences as true, and in the domain of action – the norms of conduct considered to be binding (Herbut, 1997). Morawiec states that "The closest meaning of the Latin word *ratio* is the one thanks to which this word refers to the words of the Polish language: reason, or principle (Morawiec, 2014).

Tischner also points to a similar etymology of the word "rationality", linking rationality, especially with acts of human thinking (Tischner, 2000). According to Wojewoda (Wojewoda, 2010), the understanding of rationality is related to the narrative and metaphors present in culture, history and tradition. The decision to choose a tradition is determined by respect, the power of arguments, the ability to explain facts and the influence of authority. As a result, the belief in the existence of an objectified criterion of rationality is erroneous, and the search for such a criterion is doomed to failure. It turns out that establishing one model of rationality is impossible, which should teach a person intellectual humility and respect for different ways of interpreting the world (Wojewoda, 2010), including the cultural conditions of understanding rationality (Sztajer, 2009). For the considerations carried out here, the fact that "rationality" refers to the ontic and epistemic spheres is not more important, because although in both trends it indicates the existence of specific reasons, principles, foundations and causes of the existence of being and its cognition, but the argumentation carried out it is not focused on the analyzed variables, self-compassion and leadership (Jasiński, 2022).

The concept of rationality can be understood in various contexts and perspectives, which also contributes to a considerable diversity of its meanings. For instance, in a philosophical context, rationality may be understood as a person's ability to think logically and make rational decisions, while in a scientific context, rationality may refer to the application of scientific methods and logical reasoning in the research process. Moreover, the concept of rationality can be used in moral, economic, political, etc. contexts, where it has different meanings and connotations. Therefore, to precisely define the characteristics and connotations of the concept of rationality, it is necessary to take into account the different contexts and perspectives in which it is used. The authors of the presented analysis show the relationship between rationality and self-compassion.

The multitude of related meanings revealed by the semantic and methodological analysis of the concept of the name "rationality" can be organized in various ways. The adopted criteria for the division of objects constituting designates of the name "rationality" and the criteria for grouping features constituting the characteristic content of individual subsets allow, in the sense of the concept of "rationality", distinguishing smaller wholes called types of rationality (Bombik, 2001).

A comparative analysis of the scope and content of the classified types of rationality allows a closer explication of the entire family of meanings of this concept. However, due to the objectives of the research undertaken and the amount of space determined by the editorial rules, the authors decided to limit themselves to presenting one selected typology of rationality, omitting from the query very valuable scientifically, cognitively and applied concepts: Życiński (Życiński, 1983; 1985), Kleszcz (Kleszcz, 1998; 2003), Bombik



(Bombik, 2001), Tałasiewicz (Tałasiewicz, 1995), Bronk (Bronk, 2009) and Sztajer (Sztajer, 2009).

As part of the understanding of rationality in three orders, Morawiec explains (Morawiec, 2014) that in the first order regarding being, rational action consists in a thoughtful and logical ordering of various parts of a given object of action (e.g. the decision-making process itself). In the second order, concerning cognition, rationality results from maintaining the logical order of cognitive activities. Here, the rational approach is one that is guided by the laws of being and cognition, i.e. the principles of logic and scientific research methods (i.e. the decision-making process would be based on available scientific data). In the third order, rationality concerns action, and the motive is the purpose of the action. An action is considered rational when it is subordinated to achieving a specific goal. This means that rationality involves choosing actions that bring the expected results, i.e. are pragmatic.

Morawiec mentions two more concepts of rationality: objective and subjective. The objective concept of rationality is the improvement of an object or situation through an action. This means that the action that seeks to improve a given item or improve a given situation is rational. The subjective concept of rationality assumes that a man is the measure of rationality. This means that what is rational is what is consistent with an individual's own values, goals and preferences, including other personality properties (Morawiec, 2014). In both of these approaches, the authors of this work perceive the importance of self-compassion as a personality property that influences the decision-making process in management and leadership. Identifying such a relationship is important not only for diagnostic, research and theoretical purposes, but also for prognostic and application purposes, which can be used in broadly understood economic practice.

#### **4. THEORETICAL FOUNDATIONS OF SELF-COMPASSION AND ITS RELATIONSHIP WITH MANAGEMENT AND LEADERSHIP**

Self-compassion will be defined according to Neff (2003a, b) as

being sensitive and open to one's own suffering, while experiencing a feeling of care and kindness towards oneself, by adopting an understanding, non-judgmental attitude towards one's own failures or imperfections, being aware that one's own experience is part of the common experience of people.

It can be understood as a trait, but also as a state (Neff, 2003a, b; Leary et al., 2007; Neff, Hsieh, Dejitterat, 2005). It consists of three components: *kindness, reflection, and community with humanity*. The first involves being kind and understanding in the face of one's own weaknesses and mistakes. The second is to focus on experiencing the present moment, being aware of your own experiences, without judging, criticizing or repressing them. The third is the ability to perceive one's situation as an element characteristic also of others (Neff, 2003a, b; 2004). The above dimensions are theoretically and definitionally separate, but they interact with each other, creating one common variable that is deductively and practically related to objective and subjective rationality.

Self-compassionate people are statistically significantly more extroverted, i.e. friendly, talkative, prone to fun, seeking stimulation, optimistic in life, with a cheerful mood, agreeable, i.e. positive attitude towards others, conscientious, i.e. organized and persistent in action according to the five-factor model personality (Neff, Rude, Kirkpatrick, 2007). They also show significantly higher life satisfaction (Neff, 2003a, b; Wei, Liao, Ku,

Shaffer, 2011; Neff, Pisitsungkagarn, Hsieh, 2008), and higher mental well-being (Baer, Lykins, Peters, 2012; Neely et al., 2009), level of optimism (Neff, Rude, Kirkpatrick, 2007), empathy (Wei et al., 2011), lower empathic sensitivity and tendency to feel personal distress when confronted with someone's negative emotions (Dzwonkowska, Żak-Łykus, 2014), greater ability to regulate one's own moods (Neff, 2003a). They are characterized by a lower level of fear of failure (Neff, Hsieh, Dejitterat, 2005), a lower tendency to avoid people and fear of being close to them (Wei, Liao, Ku, Shaffer, 2011). Self-compassion according to Neff (2003a, b) is by definition directly related to compassion and care for others, but it does not mean being selfish, self-centered, or choosing one's own needs over the needs of others. A self-compassionate person recognizes that suffering and failings are part of human nature and therefore all people, including themselves, are worthy of compassion (Neff, 2003b). Self-compassion is not the same as self-pity (Goldstein, Kornfield, 1987, as cited in Neff, 2003b). It is neither synonymous with self-esteem, nor the same as self-esteem (Neff, 2003b, Dzwonkowska, 2011), although it is associated with certain elements of self-esteem. The negative aspects of self-esteem are related, among others, to self-absorption, narcissism, and concentration on oneself, with a simultaneous lack of interest in others (Damon, 1995; Seligman, 1995, as cited in: Dzwonkowska, 2013). Nevertheless, it is difficult not to mention the construct of self-esteem, because in psychology it is understood as „a person's affective reaction to himself. Like other affective reactions, self-esteem may have the character of both a »hot«, intense emotion and a »cold«, intellectualized judgment” (Strelau, Doliński, 2015).

In Rosenberg's (1965) definition, ”self-esteem is a positive or negative attitude towards the self, a kind of global self-assessment”. (...) High self-esteem means the belief that one is ”good enough”, a valuable person, while low self-esteem means dissatisfaction with oneself, a kind of rejection of one's own Self. Therefore, by assumption, we should not expect real self-esteem, but one that uses the available awareness, attitudes and beliefs, i.e. opinions about oneself. Other researchers have described self-esteem as unconscious, hidden, revealing spontaneous affect towards oneself, activated automatically, without conscious reflection (Bosson, 2006; Greenwald and Banaji, 1995; Greenwald and Farnham, 2000; Gregg, 2003). An implicit attitude is an unidentified or incorrectly identified trace of past experience that may influence an individual's behavior. Implicit appraisal is not introspectively accessible by definition (Greenwald, Ganaji, 1995), although more recent research results call this statement into question (Gawronski, Bodenhausen, 2006). In management and leadership, which are the subject of our considerations, high optimal (secure) self-esteem is of particular importance, as opposed to high but fragile (defensive) self-esteem and low self-esteem. High, secure self-esteem allows one to shape and strengthen positive self-esteem, most often well-established in the early period of development (Kernis, Paradise et al., 2000), which in turn enables you to take care of yourself and feel compassion for yourself.

Self-compassionate people have less desire to satisfy the needs of others and greater ability to say no to requests (Barnard, Curry, 2011); this competence is exceptionally useful for managers and leaders due to their generally very active and stressful lifestyle and way of functioning, it allows them to take care of themselves, maintain balance and psychosomatic health.

Research using fMRI technology (Longe et al., 2009, cited in: Neff, Pommier, 2012; Neff, Costigan, 2014) has shown that when self-compassion is aroused, neural areas responsible for feeling general compassion towards others, very similar to those related to empathy. While self-compassionate people report being as kind to themselves as they are

to others, people with low levels of self-compassion report being more kind to others than to themselves (Neff, 2003b). Pommier (2011) did not obtain a significant relationship between self-compassion and compassion for others. The relationships between these constructs were obtained in other studies (Neff, Pommier, 2012), they depended on: stage in life, experience in meditation, gender. The relationships between compassion for oneself and others, as Neff writes, constitute a new but interesting area requiring further research (Neff, Pommier, 2012; Neff, Dahm, in press). People with a higher level of the described disposition cope better with activities in the space of social life (Allen, Goldwasser, Leary, 2012), have a higher level of compassion towards humanity and other people, altruism, the ability to forgive, and taking someone else's perspective (Neff, Pommier, 2013), a sense of closeness to other people (Neff, 2003b), personal readiness for change and self-development (Neff, Rude, Kirkpatrick, 2007), they better perceive other people's competences (Neff, Hsieh, Dejitterat, 2005). People with a higher level of self-compassion are more willing to resolve interpersonal conflicts by balancing their own and others' needs, and the results indicate that thanks to this trait they can resolve conflicts in a healthy and productive way (Yarnell, Neff, 2013).

When defining self-compassion, it is worth looking at the more general concept of compassion since these terms are directly related to each other (Neff, 2003a, b; 2004; Pommier, 2011). Compassion appears when a person notices the suffering of another person, is not indifferent to the situation, therefore does not avoid it, but shows kindness towards the person and the desire to alleviate their suffering (Wispe, 1991). Compassion for others is underpinned by three dimensions: kindness, reflectivity, and communion with humanity (Pommier 2011). Research on compassion shows that it is an important element of professional life (Atkins, Parker, 2012, Lilius, et al., 2008, Frost et al., 2006). Received compassion among employees supports organizations during critical moments, contributes to the increase of employee commitment, and thus improves organizational performance (Lilius, et al., 2008). Compassion-related behaviors in organizations are accompanied by an increase in helpful behaviors, trust, support towards others and cooperation. Individuals who experience compassion in the workplace cope better in difficult circumstances, manage problematic situations better and are able to overcome them (Lilius et al., 2011). Thanks to acts of compassion, organizational relational resources, shared values and beliefs of employees, and interpersonal skills are created, which can create the ability to cooperate in the organization (Dutton et al., 2007). Compassion shown to colleagues at work can strengthen emotional bonds and increase employees' ability to be effective (Dutton, Frost, Worline, Lilius, Kanove, 2002, Frost, Dutton, Worline, Wilson, 2000).

The sense of self-efficacy (competence) is an image of a person's competences, providing them with the means to carry out designated activities (Bandura, 1997, after: Juczyński, 2000). The stronger the beliefs regarding self-efficacy, the higher the goals set, the stronger the commitment to the intended action, even in the face of failures (Locke, Latham, 1990, as cited in: Juczyński, 2000). Self-efficacy influences the choice of a situation, that is, its rejection or acceptance, depending on the expected consequences. At the same time, the competence attributed to oneself determines the strength of involvement in a given activity as well as perseverance in pursuing the chosen goal (Nagody-Mrozowicz, 2023).

Hope for success, i.e. the belief in the possibility of achieving goals, the certainty that if the goal appears, all actions will be taken to achieve it (Snyder, 1994, after: Martowska, 2012). Its function refers to social activity and its goals, which may include, for example, establishing contacts or cooperation (Zięba, Łągona, Trzebiński, 2005). The hope for

success is related to effort, which, together with perseverance, contributes to success in the area entrepreneurial activities (Markman, Baron, Balkin, 2005). In a manager's work, an important function is related to reformulating the meaning of difficult situations into challenges (Porzak, Sagan, 2013). It determines greater social competences and better social functioning (Łaguna, Trzebiński, Zięba, 2005).

Social competences are understood as skills that determine the efficiency of self-management and the effectiveness of coping with social situations, i.e. those which other people are involved in. They are related to the ability to communicate with others, cooperate, and exert influence (Smółka, 2008, Matczak, 2001, 2007, Martowska, Matczak, 2013a, b). Martowska and Matczak (2013a, b) distinguished, among others, assertive, cooperative and sociable competences. The first one is useful for people in managerial positions. The second ones are related to highly developed interpersonal skills, the ability to care for others, provide them with support and help, mitigate conflicts, and cooperate effectively with others. The third one is related to the ability to initiate and maintain informal contacts.

Interpersonal conflicts are related to the perceived divergence of interests as a result of the conflict of two motives: maximizing one's own interest and the partner's interest (Thomas, Kilmann, 1974). Depending on how far an individual takes into account their own and their partner's interests, five styles of dealing with a conflict situation can be distinguished: competition, cooperation, adaptation, avoidance, compromise. Competition is related to maximizing one's own interest while minimizing the partner's interest. Winning is the goal, relationships with others do not matter. Cooperation related to simultaneous maximization of one's own and the partner's interests. The result is placed on an equal footing with the relationship by both sides of the conflict. Adaptation is related to maximizing the partner's interest while minimizing one's own interest. A one-time result doesn't matter, what matters is maintaining proper relationships with others. Avoidance associated with minimizing one's own and the partner's interests. Both sides ignore mutual relations and the tasks assigned, because they are not important enough to engage in the conflict. Compromise means partially taking into account your own interest and that of your partner. Goals and relationships are important to both sides of the conflict to some extent. The presented strategies are not evaluative in nature, each style may be useful in a manager's work (Blake et al., 1964, after: Kłusek-Wojciszke, 2009; Thomas, 1992; Balawajder, 1992).

Self-compassion can play an important role in the ability to effectively balance one's own needs and the needs of others (Yarnell, Neff, 2013). Balancing needs is often perceived as crucial for healthy mental development (Bowlby, 1988, cited in: Yarnell, Neff, 2013), and for the ability to function in healthy interpersonal relationships (Grotevant, Cooper, 1986, cited in: Yarnell, Neff, 2013). Self-compassion enables good contact with the world of one's own emotions, understanding emotions is an important regulator in interpersonal contacts.

A review of research results regarding self-compassionate people and other dimensions of personality, emotional functioning (cf. Dzwonkowska, 2013) and social functioning (cf. Dzwonkowska, Żak-Łykus, 2015) indicates their positive attitude towards themselves and the surrounding world. Compassion appears to be an important factor organizing people's functioning in the workplace and allowing them to effectively cope with difficult situations (Atkins, Parker, 2012; Lilius, et al., 2008; Frost et al., 2006). The style of conduct in a conflict situation is an important element of relationships with others (Klinger, 1977; Argyle, 1988; Argyle, Henderson, 1985, as cited in: Balawajder, 1992), and solving this

situation requires making a balance and choosing between the needs of others and one's own (Thomas, Kilmann, 1974). Effective functioning at work requires highly developed social competences as their lack is related to social maladjustment (Martowska, Matczak, 2013a, b). The question arises: What is the relationship between managers' self-compassion and their attitudes towards others: compassion towards others, social competences, conflict resolution styles in the work environment?

In the review of research on self-compassion, no studies were found that directly related to the social functioning of managers. Research in the Turkish work environment has shown a relationship between self-compassion and higher job satisfaction (Abaci, Arda, 2013). Compassion for others in the organization was measured as the perceived level of compassion given (Dutton, Frost, Worline, Lilius, Kanove, 2002; Frost, Dutton, Worline, Wilson, 2000), no research was found that would examine compassion for others as understood by Neff in the workplace. The only research examining the relationship between self-compassion and styles of orientation towards oneself or others in a conflict situation concerned close relationships and showed a relationship between variables conditioned by the closeness of this relationship (Yarnell, Neff, 2013). Research has shown that people with high self-compassion are generally more socially competent in all indicators of social competence: in close interpersonal contact, in situations of social exposure and in situations requiring assertiveness (Dzwonkowska, Żak-Łykus, 2014).

Managers who have effective relationships with themselves are able to create effective relationships with co-workers (Drucker, 1994). The higher the position in the organization, the more important interpersonal competences are (Kaźmierczak, 2004). The competencies that distinguish the best directors in Asia, the Americas and Europe are intellectual advantages, personal emotional competences and social skills (Spencer et al., 1993, cited in: Goleman, 1999). Giving encouragement, developing conflicts, and communicating frequently with employees, clients, and partners is related to understanding others (Kaźmierczak, 2004). Strategies of conduct, goals set, actions taken, and building interpersonal relationships are related to the way we think about ourselves and the environment. A positive attitude towards oneself contributes to success and coping with difficult situations (Łaguna, 2010). Compassion is treated as a means not only of healing, but also of building the quality of interpersonal relationships between employees (Dutton, Lilius, Kanov, 2007).

When making risky decisions, the direction in which self-compassion can lead decision-makers is unclear. The assumption that self-compassion inhibits risk-taking may be justified in several ways, starting with reference to other personality correlates of self-compassion (Bailis et al., 2022). Research has shown that self-compassion is positively associated with self-esteem, conscientiousness and emotional intelligence, and negatively associated with impulsivity, avoidance-oriented coping, general risk of psychopathology, and in particular with the risk of substance abuse (Barnard and Curry, 2011; Mantzios, 2014; Phelps et al., 2018). With the exception of self-esteem, which may promote confidence in risky situations (Baumeister et al., 1989; Brunell, Buelow, 2017; Cameron, Granger, 2019), most of these correlated personality traits promote less risky decision making. By the same token, if self-compassion opens people's minds to the possibility of making a mistake, maintains their affective balance, and reduces their need to regain their standing after loss, it should also inhibit the risk-taking that results from opposing states. Crocker and Park's (2004) research shows that high, secure self-esteem, which builds positive self-esteem, minimizes engaging in risky behaviors; the individual does not perform activities that would generate unnecessary emotional costs.

Najavits' pilot study (Najavits et al., 2013) on self-compassion related directly to gambling. Over the 6 months from admission to the end of the cognitive behavioral therapy process, participants demonstrated increased self-compassion and reduced gambling-related cognitive distortions. These findings may suggest that increasing self-compassion is associated with reducing gambling risk. However, the pilot study was small (with 7 participants) and did not include a control group, or examine correlations between measures of self-compassion and gambling. Bailis et al. (2021) measured self-compassion and tested casino gambling decisions among 240 customers aged (18–85). This study found that higher self-compassion was associated with less risky decision-making, in an environment where problem gambling was common and gambling behavior could also occur.

Self-compassion has been linked to self-regulation outcomes with putative probabilistic decision-making in domains other than gambling. With respect to the concept of reduced defensiveness, several studies have positively associated self-compassion with admitting and correcting mistakes among people who are conscientious or motivated in building and maintaining social relationships (Baker, McNulty, Citation 2011; Neff, Beretvas, 2013, cited in: Bailis et al., 2021).

On the other hand, people with higher levels of self-compassion may demonstrate greater risk-taking tendencies to the extent that self-compassion reduces self-criticism or negative self-talk when making decisions that would otherwise help inhibit risk-taking. Regarding the concept of reduced self-criticism, research on the related phenomenon of self-forgiveness supports its association with prolonged and increased risk. Squires' et al. (2012) study of Canadian college students who had at least 1 symptom of problem gambling on the DSM-IV checklist found that those with more symptoms expressed greater willingness to change their behavior away from gambling - but the relationship this was mediated by the relative lack of self-forgiveness in the more symptomatic group. In relation to self-compassion, self-forgiveness more strongly emphasizes the process of accepting responsibility for one's own harmful behaviors and thus eliminates self-condemnation for them. Nevertheless, as analyzed by Wohl et al. (2017), self-compassion and self-forgiveness may be functionally similar in maintaining these problematic behaviors if the appropriate process is engaged while these behaviors are still ongoing.

## 5. CONCLUSIONS

In the light of the conducted systematic analysis, which was based on a detailed analysis of the results of empirical research exploring theoretically and methodologically diverse correlates of the attitude of *self-forgiveness*, several noticeable regularities were found. Their role in the decision-making process, based on multiple domains of rationality determined by the personality traits of the decision-maker (manager, supervisor, chief, commander, etc.), influences the quality of shaping the effectiveness of leadership behaviors and the leadership process.

*Praxeological leadership*, anchored in the pragmatic layer of managerial action, is subject to the influence and impact of the analyzed, variable – *self-forgiveness*. Implicitly, a "praxeological leader" has a mature and coherent personality, which is characterized by well-developed emotional intelligence and social competences, which, as exemplary personality traits, are exemplified by the disposition to forgive oneself.

A *praxeological leader* has a realistic, stable self-esteem and is goal-oriented, pursuing it in an empathetic way with a sense of mission and responsibility for others. It is the

quintessential antithesis of Lowney, who, after many years of experience in the Jesuit order, states that: "What is often considered leadership today is in fact a cheap and shallow technique - a substitute for real substance" (Lowney, 2011). The Jesuits prepared their novices for success by shaping them into leaders who: understood their strengths and weaknesses, values and worldviews, courageously innovated and adapted to meet the changes taking place in the world, attracted others with a positive and loving attitude, added themselves and others by awakening heroic ambitions (Lowney, 2011).

The analogy of inferring the rational basis of leadership is undoubted, although the paths to reaching this implication were different. In the case of the authors of the article, they led to visualizing the relationship between the rationality of decision-making processes and self-forgiveness, while in the case of the cited author of the concept of "heroic leadership", they were the result of the experimental method and participant observation (Lowney, 2011).

The coherence of conclusions is also reflected in Krzyżanowski concept, which defines the differences between the factors defining management, leadership and true leadership (Krzyżanowski, 1999). With regard to the effectiveness of managerial activities, which generally refer to the effectiveness of controlling social systems of various types of organizations, several management determinants can be indicated, which include: the basis of power, the title to management and types of management (Krzyżanowski, 1999). A decision-maker with a high level of developing the disposition to forgive oneself (Neff, 2004, etc.), making decisions in the conditions of subjective and objective rationality (Morawiec, 2014), has potential conditions and predispositions to develop "heroic leadership", which Krzyżanowski defines, as true leadership (Krzyżanowski, 1999). It is the result of improving one's own personality and character traits, such as: openness, courage, commitment, decision-making, then self-awareness and the ability to communicate and communicate with others, team management, building a good team, and then the desired work atmosphere, up to difficult skills of coping with difficult employees and resolving conflicts (Gierczak, 2021).

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## ENVIRONMENTALLY FRIENDLY PRODUCTS – HOW CUSTOMERS FROM GENERATION Z IN V4 COUNTRIES ASSESS THIS APPROACH<sup>6</sup>

Funding information: International Visegrad Fund Grant Number IVF 22230264. This article presents the results of a survey conducted in the first half of 2023. A total of 812 questionnaires were obtained from current and potential consumers (individual and B2B) in the Visegrad countries. The survey's goal was to find out how consumers perceive and evaluate the quality and pro-ecological factors/challenges of the products of the electrical machinery industry, in the context of their declared personal purchases. Among other things, it sought to establish the actions consumers expect from manufacturers if they want to increase the market share of good-quality and environmentally friendly products. Improvements to the quality of products, with reductions in their negative environmental impact throughout their life cycle, were noticed most in Hungary and Poland. In all countries surveyed, consumers agreed most strongly with the statement that to increase the market share of good quality and environmentally friendly products, producers should enable recycling, disposal, and so on, and improve the availability of information.

**Keywords:** green product, pro-ecological product management, purchase factors, pro-ecological consumer behavior, circular economy.

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## 1. INTRODUCTION

The European Union (EU) has established ambitious environmental objectives for 2050 as part of its strategy to combat climate change and promote sustainability. These objectives encompass (European Commission):

- **Climate Neutrality:** The EU aims to achieve net-zero greenhouse gas emissions by 2050, necessitating the implementation of measures such as carbon removal and emission reductions to offset any remaining emissions.
- **Renewable Energy Transition:** By 2030, the EU seeks to increase the proportion of renewable energy sources in its energy mix to a minimum of 32%, with further increases targeted by 2050. This transition entails reducing dependence on fossil fuels and bolstering investment in renewable energy technologies like wind, solar, and hydroelectric power.
- **Energy Efficiency Improvement:** The EU targets a minimum 32.5% improvement in energy efficiency by 2030 compared to 2007 levels. This endeavor involves reducing energy consumption across sectors such as buildings, transportation, and industry through initiatives like deploying energy-efficient appliances, enhancing building insulation, and promoting transportation electrification.
- **Biodiversity Preservation:** By 2050, the EU aims to halt biodiversity loss and restore degraded ecosystems. This encompasses safeguarding and rehabilitating habitats, advocating for sustainable land use practices, and preventing the extinction of plant and animal species.
- **Circular Economy Realization:** The EU endeavors to transition to a circular economy model by 2050, characterized by enhanced resource efficiency, minimized waste generation, and the design of products for reuse, recycling, and repair. Achieving this objective entails enacting policies to foster eco-design, prevent waste, and encourage recycling, alongside promoting sustainable consumption and production practices.

These objectives are delineated in various EU policy documents such as the European Green Deal and the EU's long-term climate neutrality strategy for 2050. They underscore the EU's commitment to addressing environmental concerns and fostering a sustainable future for its populace.

The essence of the circular economy is to provide optimal conditions for population development while respecting the earth's resource constraints (Šimková, Bednárová, Danda, and Derkawi, 2023; Szczygieł et al., 2022). As part of the circular economy, a pro-environmental approach to products at their life cycle every stage is becoming more significant. Since it became clear that human activities are some of the most harmful factors in the deterioration of the environment and natural resources, environmental issues have become a priority for governments, organisations, and individuals (Ardito, Dangelico, 2018; Buysse, Verbeke, 2003; Michelino et al., 2019; Szczygieł 2020). As a result, it is an increasingly common theme both in the literature and in the business practice of various organisations.

Companies also engage in green practices to improve their reputation in the eyes of customers (Griskevicius et al., 2010; Lit. 2010) and to attract a broader customer base, that is, consumers who are more in-tune with environmental issues (Peattie, 2001) when they make their own assessments during purchasing decisions (Truffer et al., 2017). Sustainability issues of environmentally oriented business operations are becoming an intriguing topic of research discussion amidst business dynamics and competitive

advantage escalation (Wang, 2019; Soewarno et al., 2019; Fura, 2022; Wang, 2018; Barbu et al., 2022). Growing public concern over the environmental problems endangering our world has increased the public interest in “green” corporate practices (Centobelli, Cerchione, Esposito, 2020).

The topic of consumer decision-making has received extensive analysis in international literature (Kucera, Kaderabkova, 2023). In recent years, marketing professionals have paid increasing attention to the growing importance of pro-environmental determinants taken into account during consumer choices (Mazurek-Łopacińska, Sobocińska, Krupowicz, 2022; Deng, Yang, 2022). The factors influencing consumers' intention to make green purchases can be divided into three main groups (Zhuang, Luo, Riaz, 2021): cognitive factors, individual consumer characteristics, and social factors. Customers recently tend to prefer natural and environmentally friendly products, so such products will have a good image and satisfy customers. Certain product groups are bought on impulse, and some purchases result from the conscious choices of customers, influenced by, among other things, the culture of the country of origin and the process of self-education (Saracevic, Schlegelmilch, 2021). Canadian studies highlight the behaviour category of health-seeking, resulting from lifestyle and environmental factors (Lalonde, 1974). The research of evolving declarations, attitudes, and pro-environmental behaviours among consumers, producers, governments, and third- and fourth-sector organisations over time is especially valuable in the context of cultural similarities and differences. Knowledge in this area is the basis for building effective and efficient strategies for different stakeholder groups and enabling the implementation of the assumptions of the circular economy (Zhou et al., 2018; Mentel, Hajduk-Stelmachowicz, 2020; Zhou et al., 2021).

The article aims to present opinions on how consumers from Poland, Slovakia, Hungary, and the Czech Republic perceive and evaluate quality and pro-ecological factors/challenges relating to products from the electromechanical industry in the context of personal purchasing decisions. Pro-ecological purchase motives and factors shaping consumer behaviour are vitally important given the challenges posed by globalization. Consumers can significantly influence producers (Liao, Liu, 2021) through their actions (such as boycotts), and bring about a pro-ecological evolution or even revolution in their business strategies.

## 2. MATERIAL AND METHODS

A survey questionnaire containing different types of wording was used to carry out the research, including: Specify to what extent you agree with the following statements regarding the quality and environmental aspects of the products. Participants (consumers) were instructed to rate each statement's compliance on a five-point Likert scale (1 represented the interviewee's complete disagreement with the suggested sentence, and 5 showed the total agreement). Several respondents from V4 countries provided the data for the survey. The questionnaires were distributed via email, LinkedIn, WhatsApp, and Facebook and gained through face-to-face interviews conducted by the research team members. The questionnaire was developed in English. A total of 812 questionnaires were submitted, but only 796 of them were approved for further examination after data accuracy and completeness checks. A total of 80 respondents (20 from each of the four countries surveyed) participated in the pilot tests. At the stage of pilot studies, attempts were made to check the correctness of the formulated questions and their correct interpretation (due to cultural and linguistic differences), the credibility of the answers, and the correctness and

completeness of the data for further analysis. Following suggestions for improving the survey instrument, the modified questionnaire from English was translated into national languages for delivery to the target groups in each country. The maximum age for respondents was left unspecified, but they were all at least 18 years old. Detailed characteristics of the respondents in terms of such socio-economic characteristics as country of origin, marital status, gender, education, employment, and number of people in the household are presented in Table 1.

The findings were presented in percentage tables, the quantitative data were described using basic descriptive statistics, and the non-parametric Kruskal-Wallis ANOVA test was used to look for differences and relationships (Gopal 2006; Kennard, Gould, Putz, Fredericksen, Morales 2002, Aczel, 2018).

Table 1. Characteristics of respondents

Features	%(N)	Features	%(N)
Country		Marital status	
Poland	52% (415)	single	64% (508)
Czech Republic	17% (138)	married	6% (46)
Hungary	17% (133)	partners relationship	29% (229)
Slovakia	14% (110)	widow/divorced	1% (13)
Gender		Education	
Male	36% (285)	elementary	17% (134)
Female	61% (489)	medium	50% (397)
I don't want to answer	3% (22)	higher	33% (265)
Employment		Number of people in the household	
Student	82% (651)	one	3% (23)
Employee	13.5% (109)	two	12% (98)
Other	4.5% (36)	three or four	26% (203)
		over 4	59% (472)

Source: own study based on research results.

This test is the non-parametric equivalent of a single-factor analysis of variance. The test checked whether  $n$  independent samples come from the same population or a population with the same median. The abundance of each specimen need not be the same. At most ten groups can be compared. The null hypothesis ( $H_0$ ) says that the distribution functions in the compared populations are equal, i.e., that the variables under study do not differ or depend on one another. The results of the analyses were presented on frame charts. The research was conducted at the significance level of  $\alpha=0.05$ . It is presumptive that: when  $p<0.05$ , there is a statistically significant relationship (indicated by \*);  $p<0.01$ , there is a highly significant correlation (\*\*);  $p<0.001$ , there is a very high statistically significant relationship (\*\*\*)

### 3. RESULTS

For each statement, the average values of the concordance evaluation were calculated, as well as the modal value (the value that appears most frequently in the assessment) and the indicators of variation in the assessments (standard deviation and coefficient of



variation). The data are included in Table 2. The statements are ordered from highest average to lowest (lowest concordance).

Table 2. Descriptive statistics of agreeing with individual statements

	$\bar{x}$	Mo	NMo	$\sigma$	Vz
To increase the market share of good quality and environmentally friendly products, you should: enable recycling, disposal, etc.	3.5	4	273	1.01	28%
To increase the market share of good quality and environmentally friendly products, you should: improve information availability	3.48	4	319	0.96	27%
To increase the market share of good quality and environmentally friendly products, you should: extend service life	3.46	3	287	0.99	28%
In the last 5 years, the number of good quality and environmentally friendly products increases	3.44	4	324	0.94	27%
To increase the market share of good quality and environmentally friendly products, you should: reduce price	3.38	3	285	1	29%
To increase the market share of good quality and environmentally friendly products, you should: better to expose	3.33	3	323	0.93	28%
I notice an improvement in the quality of products and, at the same, time a reduction in the negative impact on the environment throughout their life cycle	3.07	3	347	0.97	31%
In terms of products, I believe that the EU's environmental goals by 2050 will be achieved	2.95	3	313	1.07	36%
In the last 5 years, the number of good quality and environmentally friendly products stays unchanged	2.61	3	279	1.05	40%
In the last 5 years, the number of good quality and environmentally friendly product decreases	2.58	3	260	1.09	42%

Legend: Respondents from Poland, Czech Republic, Slovakia, Hungary were asked: N=796. "You should" should be understood as "producers should".

Source: Own study based on surveys carried out in Poland, Slovakia, Hungary, The Czech Republic.

After examining the information in Table 2, it can be found that most respondents agreed that to increase the market share of good quality and environmentally friendly products, you should: enable recycling, disposal, etc. (mean score of 3.5). Similarly high was the rating of agreement with the statement that to increase the market share of good quality and environmentally friendly products, you should: improve information availability (mean score of 3.48). In the above cases, the dominant score was 4 points (median also 4 points). A slightly lower score was assigned to the statement that in the last 5 years, the number of good quality and environmentally friendly products increases (3.44).

Respondents were least likely to agree with the statement that: In the last 5 years, the number of good quality and environmentally friendly products decreases (mean score of

2.58). In this case, the coefficient of variation was also the highest, at 42%. That means the rating distribution was the most diverse (as shown by the highest standard deviation value of 1.09).

It was examined whether the country of origin and socio-economic characteristics influence opinion on Statements regarding the quality and environmental aspects of the products. Table 1 presents the findings.

Table 3. Kruskal-Wallis ANOVA test results. Statements regarding the quality and environmental aspects of the products vs country

	Country
I notice an improvement in the quality of products, and at the same time, a reduction in the negative impact on the environment throughout their life cycle	0.0417***
In the last 5 years, the number of good quality and environmentally friendly products decreases	0.0017
In the last 5 years, the number of good quality and environmentally friendly products stays unchanged	0.0014
To increase the market share of good quality and environmentally friendly products, you should: Enable recycling, disposal, etc.	0.0075

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

The analyses show (Table 3) that the country of origin influenced the assessment of the degree of concordance with the statements: 1) I notice an improvement in the quality of products and, at the same time, a reduction in the negative impact on the environment throughout their life cycle  $p < \alpha$  ( $p=0,0417$ ), 2) In the last 5 years, the number of good quality and environmentally friendly products decreases  $p < \alpha$  ( $p=0,0017$ ), 3) In the last 5 years, the number of good quality and environmentally friendly products stays unchanged  $p < \alpha$  ( $p=0,0014$ ), and the opinion: 4) To increase: you should: enable recycling, disposal, etc.  $p < \alpha$  ( $p=0,0075$ ).

In all the Visegrad countries surveyed, the statement (Figure 1) that to increase the market share of good quality and environmentally friendly products, you should enable recycling, disposal, etc., was indicated by respondents the most times. In each of the aforementioned countries, this response received the highest overall score (average score of 3.48 in Poland, 3.42 in Slovakia, 3.38 in the Czech Republic, and 3.78 in Hungary). Residents of Hungary agreed with this statement the most (3.77) and the Czech Republic the least (3.78).

Respondents were least likely to agree with the statement relating to the opinion that: In the last 5 years, the number of good quality and environmentally friendly products decreases. Of the nations surveyed, the few Hungarians (mean score of 2.32) and Slovaks (2.41) found this statement to be factually accurate. The statement: In the last 5 years, the number of good quality and environmentally friendly products stays unchanged received the highest mean score (2.75) among respondents in the Czech Republic.

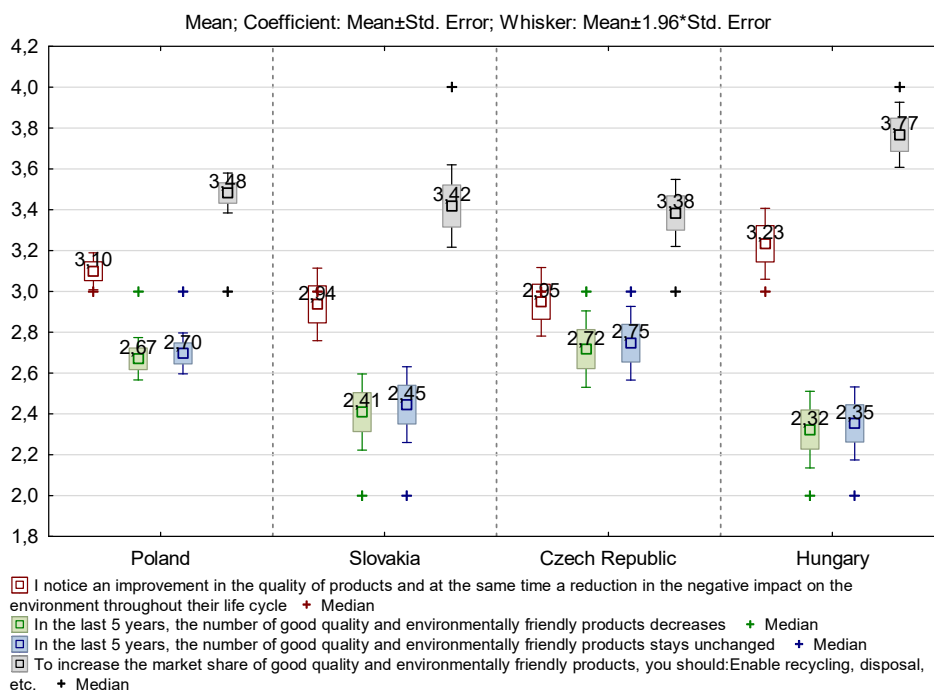


Figure 1. Statements regarding the quality and environmental aspects of the products vs. country

Source: Own study based on surveys in Poland, Slovakia, Hungary, Czech Republic, N=796.

An improvement in the quality of products and, at the same time, a reduction in the negative impact on the environment throughout their life cycle was noticed to the greatest extent by Hungarians (mean score of 3.23) and Poles (3.10).

Table 4. Kruskal-Wallis ANOVA test results. Statements regarding the quality and environmental aspects of the products vs gender

	Gender
In terms of products, I believe that the EU's environmental goals by 2050 will be achieved	0.0000
To increase the market share of good quality and environmentally friendly products, you should: improve information availability	0.0321
To increase the market share of good quality and environmentally friendly products, you should: better to expose	0.0302

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

From the analyses of the results of our own research (Table 4), it can be seen that gender influenced the evaluation of the following statement: In terms of products, I believe that the EU's environmental goals by 2050 will be achieved  $p < \alpha$  ( $p=0,0000$ ). In addition, the gender of those questioned played a role in indicating response options relating to the

statements: To increase the market share of good quality and environmentally friendly products, you should: 1) improve information availability  $p < \alpha$  ( $p = 0,0321$ ) or 2) better to expose  $p < \alpha$  ( $p = 0,0302$ ).

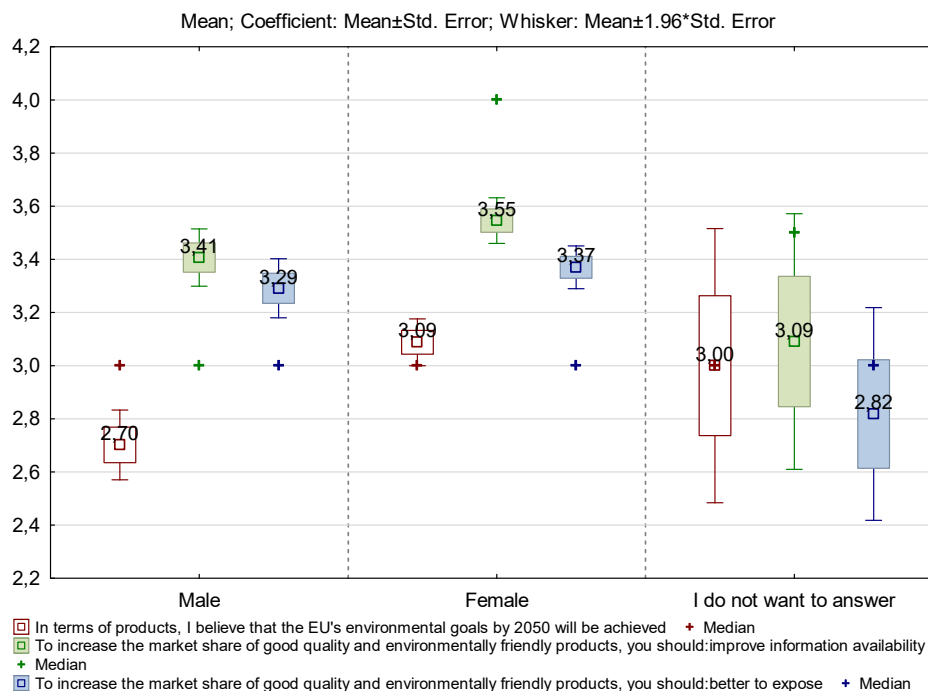


Figure 2. Statements regarding the quality and environmental aspects of the products vs. gender

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

Analysis of the data visualized in Figure 2 shows that men (score of 2.70) from the V4 countries were least likely to agree with the statement that: In terms of products, I believe that the EU's environmental goals by 2050 will be achieved. Women declared a significantly more optimistic attitude on this issue (3.09). In addition, women indicated more frequently the importance of the availability, transparency, unambiguity, and reliability of information confirming a product's environmental and qualitative properties (3.55). This group of respondents also emphasized the importance of better exposition of high-quality products as well as of environmentally friendly characteristics in order to distinguish them from others (3.37). Interestingly, the highest number of respondents who did not wish to be differentiated by gender (2.82) disagreed with the statement on the need for better product exposition.

Women have strictly assigned social roles within which they are strongly responsible for organising and running the household (Hajduk-Stelmachowicz, Stelmachowicz, 2019). This is associated with decision-making processes related to, among other things, more frequent purchases of certain groups of products than is the case for men. This may partly explain the cited research results.

Table 5. Kruskal-Wallis ANOVA test results. Statements regarding the quality and environmental aspects of the products vs education

	Education
In the last 5 years, the number of good quality and environmentally friendly products increases	0.0006
To increase the market share of good quality and environmentally friendly products, you should: improve information availability	0.0312
To increase the market share of good quality and environmentally friendly products, you should: Enable recycling, disposal, etc.	0.0061

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

The statistical analyses also show that education had an impact on the evaluation of the statement (Figure 3): In the last 5 years, the number of good quality and environmentally friendly products increases  $p < \alpha$  ( $p=0,0006$ ), and on the evaluation of the variants of the statements: to increase the market share of good quality and environmentally friendly products, you should: improve information availability  $p < \alpha$  ( $p=0,0312$ ), and to increase the market share of good quality and environmentally friendly products you should: enable recycling, disposal, etc.  $p < \alpha$  ( $p=0,0061$ ).

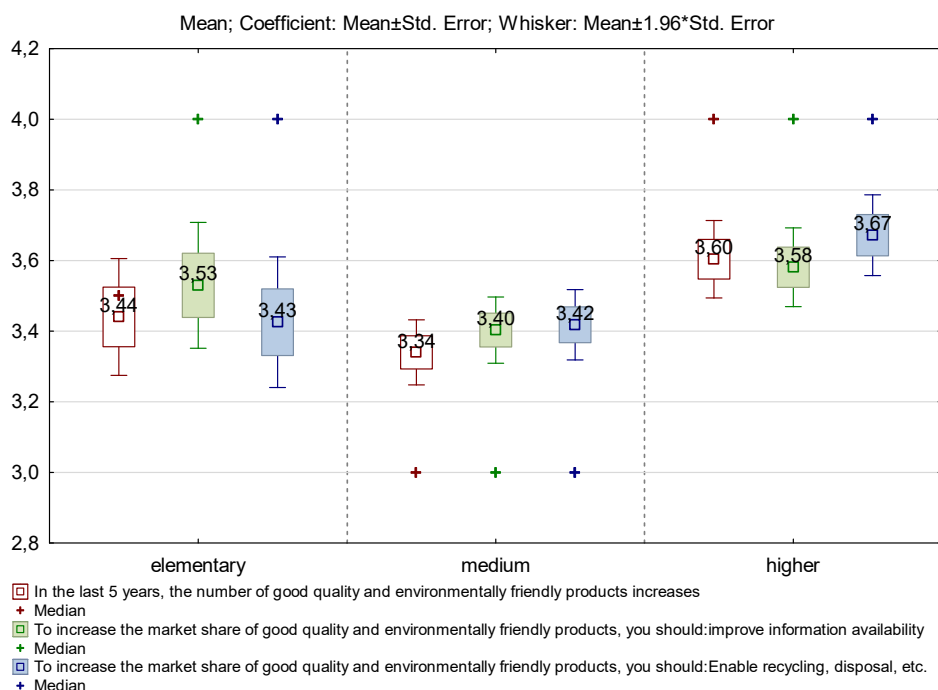


Figure 3. Statements regarding the quality and environmental aspects of the products vs. education

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796

Respondents with higher education were the most likely to agree with the statements cited in Figure 3 relating to enabling recycling and disposal (3.67) and improving information availability (3.60). They also rated the positive changes relating to the increase in eco-friendly product availability the highest. Surprisingly, respondents with a medium level of education were least likely to see the need to improve information availability or to see an opportunity for product market development by enabling recycling, disposal, etc. Those with higher education evidently had a higher level of environmental awareness, which may have been reflected in their views, preferences, attitudes, behaviour, and expectations regarding decisions to consider quality and environmental determinants when purchasing products.

The analysis of previous research results from Polish companies implementing organisational eco-innovation also indicates the importance of the level of schooling, education, and knowledge in the context of implementing eco-innovative solutions in the personal and professional sphere (Hajduk-Stelmachowicz, 2016; 2021).

Table 6. Kruskal-Wallis ANOVA test results. Statements regarding the quality and environmental aspects of the products vs employment

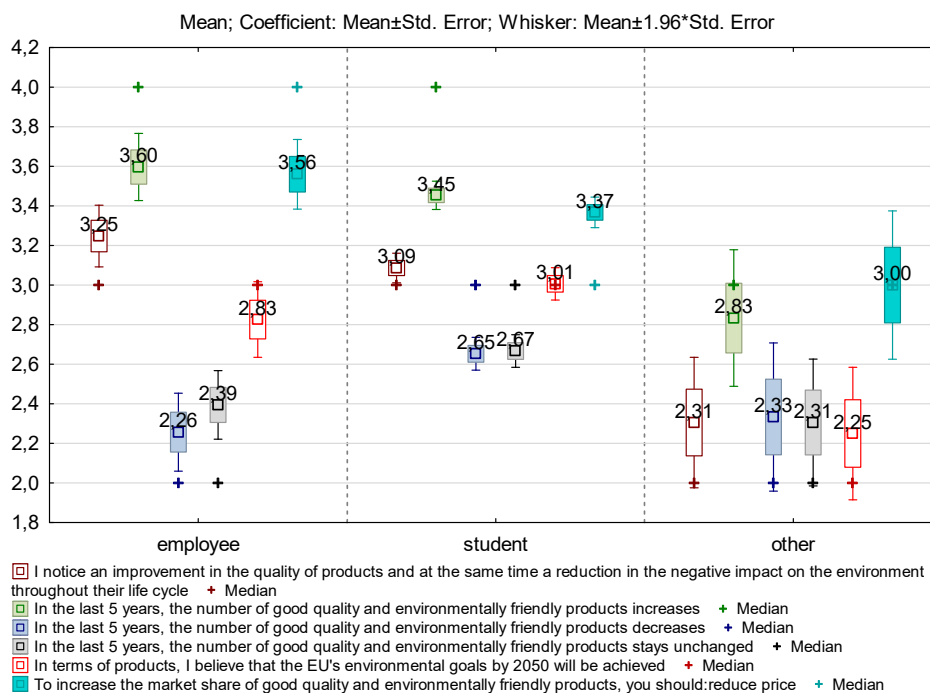
	Employment
I notice an improvement in the quality of products and, at the same time, a reduction in the negative impact on the environment throughout their life cycle	0.0000
In the last 5 years, the number of good quality and environmentally friendly products increases	0.0002
In the last 5 years, the number of good quality and environmentally friendly products increases	0.0006
In terms of products, I believe that the EU's environmental goals by 2050 will be achieved	0.0001
To increase the market share of good quality and environmentally friendly products, you should: reduce price	0.0075
To increase the market share of good quality and environmentally friendly products, you should: Enable recycling, disposal, etc.	0.0043

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

The results of the statistical analyses also indicate that issues related to the fact/form of employment had an impact on the evaluation of statements relating to product quality and environmental characteristics in the Visegrad countries (Figure 4).

With the statement: To increase the market share of good quality and environmentally friendly products, you should: reduce price to the greatest extent agreed firstly by employees (3.56), secondly by students (3.37). The 'others' group (including self-employed, employer, registered as unemployed, farmer, a firm, retired/pensioner) identified with the statement to the lowest extent (3.0). The same was true for the sentence that the respondents notice an improvement in the quality of products and, at the same time, a reduction in the negative impact on the environment throughout their life cycle (mean scores of 3.25 for employees, 3.09 for students, 2.39 for others).

Students expressed the highest confidence that, in terms of products, the EU's environmental goals by 2050 will be achieved (3.01). As before, the 'others' group was the least convinced that the indicated targets would be achieved by the target date (2.25).



Legend: other includes self-employed, employer, registered as unemployed, farmer, B2B, retired/pensioner)

Figure 4. Statements regarding the quality and environmental aspects of the products vs. employment

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

The perspective of those with more work experience (including post-career experience) and those who are employers or entrepreneurs, differed markedly from the optimistic statements of the students. People running a business/businesses encounter formal and legal barriers daily and understand that the implementation of assumptions is associated with, for example, financial investments, capital (including intellectual, social, tangible, relational, and cultural), economic stability, and politics. Other studies also unequivocally demonstrate this (Okrah, Hajduk-Stelmachowicz, 2020; Małkowska et al., 2022). Unemployed people with a limited disposable budget, often affected by energy poverty, understanding their economic situation, showed great scepticism in this respect.

To the statement that in the last 5 years, the number of good quality and environmentally friendly products increases, employees (3.60) agreed to the greatest extent, followed by students (3.45). The group of others agreed to the quoted opinion to the lowest degree.

The analyses of the own research results show that marital status also (Table 7, Figure 5) had an impact on the assessment of, i.a., what pricing strategy to use to generate more profits by eco-innovative enterprises.

Table 7. Kruskal-Wallis ANOVA test results. Statements regarding the quality and environmental aspects of the products vs material status

	Marital status
I notice an improvement in the quality of products and, at the same time, a reduction in the negative impact on the environment throughout their life cycle	0.0217
In the last 5 years, the number of good quality and environmentally friendly products increases	0.0032
In the last 5 years, the number of good quality and environmentally friendly products decreases	0.0018
In the last 5 years, the number of good quality and environmentally friendly products stays unchanged	0.0014
In terms of products, I believe that the EU's environmental goals by 2050 will be achieved	0.0098
To increase the market share of good quality and environmentally friendly products, you should: reduce price	0.0214

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N=796.

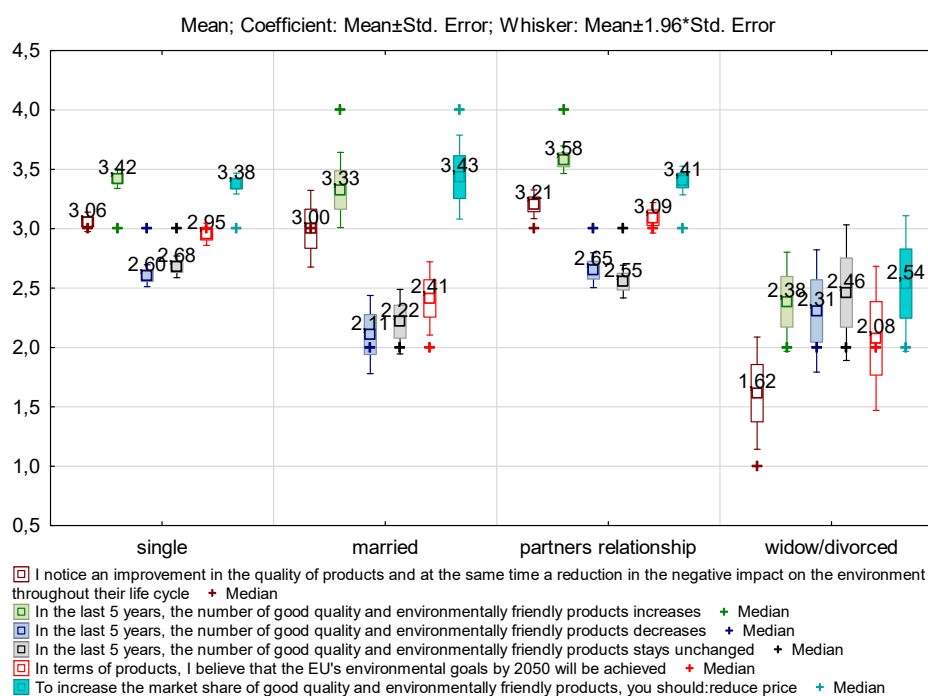


Figure 5. Statements regarding the quality and environmental aspects of the products vs. marital status

Source: Own study based on surveys conducted in Poland, Slovakia, Hungary and the Czech Republic, N= 796.



The statement that the price should be lower in order to increase the market share of high-quality pro-ecological products was mostly agreed by married respondents (average score 3.43) and those remaining in other relationships, e.g., partnerships (3.41) (Figure 5). This is justified mainly by the fact that persons in formal or informal relationships provide not only for themselves and their partners/spouses but also for children. Referring to Engel's law, the structure of expenses resulting from, among others, the so-called life cycle of a family/relationship (especially those with offspring) depends on the level of disposable income and determines purchasing decisions.

An improvement in the quality of products and, at the same time, a reduction in the negative impact on the environment throughout their life cycle was noticed by persons remaining in partner relationships (average 3.21), single (3.06), married (3.00). The widows/divorced group was the most critical of this statement (1.62). Similarly, its representatives showed the highest pessimism (2.08) that the EU's environmental goals will be achieved by 2050. The interviewed group of widows/divorced indicated that they noticed an increase in the number of good quality environmentally friendly products to the lowest extent in the last 5 years (2.38).

#### 4. DISCUSSION AND CONCLUSIONS

A global survey conducted among nine developed countries indicates that 50% of the respondents are willing to purchase green products, and 24% of them prefer to pay more for green products (Ranjan, Jha, 2019). Concern for the environment has been found to positively influence the willingness of Gen Z consumers to pay more for green products. (Gomes et al., 2023).

Personal, self-reported purchasing behaviour as subjective norms and willingness to pay does not always transfer to factual purchasing behaviour. (Moser, 2016). For example, some survey results revealed that 65% of the respondents expressed a desire to purchase environmentally friendly products, and only 26% of those individuals actually followed through with their intention, highlighting a contradictory aspect of consumer behaviour in this context (White Hardisty, Habib, 2019). This discrepancy suggests that personal subjective norms and willingness to pay, as self-reported measures of purchasing behaviour, do not always translate into real-world consumer choices (Moser, 2016).

The design and manufacture of high-quality, environmentally friendly products throughout the life cycle requires more financial outlays, which entail costs (e.g., reliability, safety, etc.), which are reflected in the price. Consumers, guided by fashion, the constant need to change to a newer model, fearing deliberate aging of the product, may forget about pro-ecological issues - especially those relating to benefits in the long term. In the era of a pandemic, high inflation, recession, and energy poverty, the higher price of a pro-ecological product, when confronted with household budget constraints (e.g., as a result of loans taken), may lead to resignation from purchasing pro-ecological products from the electromechanical sector. In this case, pro-environmental shopping can be an expression of fashion, a desire to belong to a specific social group, the luxury. In present reality, many manufacturers omit the so-called external effects during valuations with impunity. It makes their products seemingly cheaper. In this area, the institutions of individual countries are still inefficient. The subject of shaping the prices of pro-ecological products in such a way that they are economically justified and acceptable on the market is an area of interest to a wide range of stakeholders from Europe, the USA, and Asia in

the era of globalization. Research is being undertaken on the issues of designing green products in competitive supply chains (Zhu He, 2017).

The findings from Malaysia demonstrate that environmental attitude, eco-labelling, and cultural value (specifically man-nature orientation) have a significant impact on green purchase intention. Surprisingly, the results indicate that premium price does not moderate this relationship, contradicting previous studies and opinion polls that suggested it is a prominent barrier for consumers to act in line with their environmentally conscious beliefs. Furthermore, the study reveals that education level and gender play a significant positive moderating role. This implies that highly educated individuals, particularly female consumers, exhibit robust motivational factors toward green purchase intentions (Brahim et al., 2016).

The findings from a survey conducted among 956 consumers in the United Kingdom and China indicate a noteworthy and statistically significant correlation between consumers' awareness of the environmental benefits of green products and their intention to make purchases. However, it was observed that certain consumption ideals significantly moderated this relationship. In the United Kingdom, for instance, a heightened environmental consciousness strengthened the connection between awareness of green benefits and purchase intention. Conversely, in China, the relationship was bolstered by status consciousness and value-for-money consciousness (de Silva et al., 2021).

As the performed analysis shows, the impact of pro-environmental aspects on customer purchasing decisions is becoming increasingly important, not only in the food, cosmetics, pharmaceutical, and fashion sectors (The Economist, 2021) but also in industrial processing. Decision-making itself, in turn, depends on many aspects. The methodology presented in the article and the obtained research results allowed receiving answers to all the posed questions and to formulate conclusions.

Poles and Hungarians noticed the most improvement in the quality of products while reducing their negative impact on the environment throughout the life cycle.

Respondents from all the surveyed countries of the Visegrad group most often indicated that producers should enable recycling, disposal, etc., to increase the market share of good quality and environmentally friendly products. In second place were recommendations concerning the expectation of better availability of information (regarding quality and environmental friendliness). Customers (especially women) expect producers, the government, and research organizations to take specific actions in this regard.

Women from the surveyed countries are more likely than men to believe that the EU's environmental goals by 2050 will be achieved. This group of respondents also emphasized the importance of better exposure to high-quality parameter products, such as pro-ecological ones, in order to distinguish them from others.

The statement that to increase the market share of high-quality pro-ecological products, their prices should be lower was indicated the most by the respondents who were married and staying in partnerships.

Further issues related to a comprehensive quality and pro-ecological approach to the product throughout its life cycle in not only the electromechanical sector require continued research – both from the customer and the enterprise or the state. There is a research gap here. The issue of a systemic, strategic approach to environmental management requires understanding the needs, motives, and other specific conditions affecting specific behaviours of consumers and producers. It will be the subject of further scientific and research studies.

Limitations: The research was conducted in 2023. Unfortunately, achieving similar numbers in the compared groups of respondents was not possible. Nevertheless, through the use of non-parametric statistics, a comparative analysis was conducted between the studied countries of the Visegrad Group, albeit to a limited extent.

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## CYBERCRIME OF READING INFORMATION OBSTRUCTION UNDER ART. 268 OF PENAL CODE AS A THREAT TO SECURITY OF THE REPUBLIC OF POLAND

This article presents issues that determine the protection of the security of the Republic of Poland against the threats posed by computer crime. In particular, it discusses cybercrime under Art. 268 of the Penal Code. The crime of obstructing the reading of information, regulated by Art. 268 § 2, provides for criminal liability of persons whose conduct prevents or significantly impedes the access of an authorized person to important information stored on an IT data carrier. In Art. 268 § 3 of the Penal Code, however, an aggravated type of crime is provided for, which involves causing significant property damage.

**Keywords:** cybercrime, information protection, security, penal code.

### 1. GENERAL ISSUES

Cyberspace, understood as a communication space created by a system of Internet connections, has already become almost the basic channel for information exchange, both between private individuals and public institutions. In today's reality, computer systems control or collect information in almost every area, unfortunately they are also an attractive platform for criminal activities, thus posing a threat to generally understood security.

Recent decades have brought significant civilizational progress, particularly noticeable in the area of information production, processing and transmission. The possibility of using advanced information technologies is usually perceived as an element stimulating the development of many areas of activity of a developed country, as well as conditioning its efficient functioning.

There is a problem of how to properly protect IT data, or entire computer systems and ICT networks against unauthorized interference, especially when it has a criminal basis. The importance of this issue is also reflected in criminal law, which typifies a number of crimes directed against cyberspace.

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## **2. OFFENSE OF OBSTRUCTING THE READING OF INFORMATION UNDER ART. 268 OF PENAL CODE**

The crime of obstructing the reading of information regulated in Art. 268 Penal Code it had no equivalent in the Penal Code of 1969 (Penal Code Act, 1969). It was introduced into the Penal Code of 1997 due to the growing importance of information for the proper functioning of various areas of life and the serious negative consequences of disruption of the system of collecting and using information, especially in the field of computer information playing an increasingly important role (Kalitowski, 2006).

The crime of obstructing the reading of information has two forms: the classic version regulated in § 1 and the version constituting a cybercrime regulated in § 2. Pursuant to Art. 268 § 1 of the Penal Code, unauthorized behavior consists in destroying, damaging, deleting or changing the recording of important information, or otherwise preventing, or significantly hindering an authorized person from getting to know, is subject to criminal liability. However, the offense specified in § 2 of Art. 268 Penal Code occurs when the above-mentioned act concerns recording on a computer data carrier (Stefański, 2002).

The subject of protection is a crime under Art. 268 of the Penal Code, is the integrity of information and the right to uninterrupted access to it by an authorized person (Lach, 2020). However, this provision does not protect the general right to obtain information, including public information (Uchwała, 2016).

The subject of the crime under Art. 268 Penal Code can be anyone (common crime). The analyzed crime is a general crime, which means that it may be committed by any person capable of being held criminally liable, with the exception of persons authorized to perform the activities listed in Art. 268 Penal Code. The examples of authorized activities include, for example, authorization for service providers resulting from Art. 14 section 2 and 3 of the Act of 18 July 2002 on the provision of electronic services (Act on the provision of electronic services, 2002) – in terms of preventing entities from accessing data due to their unlawful nature.

Offense under Art. 268 Penal Code it is an intentional crime that may be committed with both direct and eventual intent.

Offense under Art. 268 Penal Code consists in: preventing or significantly hindering the access to important information by an authorized person. The legislator lists as examples of ways of thwarting or obstructing: destroying, damaging, deleting or changing the recording of important information (Kłaczyńska, 2014; Janas, 2009). Inducing changes in the information record does not have to result in property-related consequences (Kardas, 2000a). Information subject to protection referred to in Art. 268 § 1–3 of the Penal Code must contain some intellectual content that a person can become familiar with. They cannot, for instance, be exclusively strings of characters without cultural significance that are important for the processing of IT data. In turn, recording information means a specific way of recording it. The fact that information is recorded on a computer data carrier is a qualifying circumstance. It is assumed that a type of recording on an IT data carrier is also a "cryptocurrency" (Opitek, 2017). The IT data carrier is, in accordance with Art. 3 point 1 of the Act of February 17, 2005 on the computerization of the activities of entities performing public tasks, "material or device used for recording, storing and reading data in digital form" (Act on Informatization..., 2005). This type of media is in particular: a computer hard disk, various types of portable memory, or a computing cloud. The medium can be both digital and analog, as long as it allows information to be recorded in electronic form (Lach, 2020).



The common element of the functional features of the crime under Art. 268 Penal Code is the perpetrator's lack of authority to interfere with the recording of information (Szewc, 2007). Such authorization may result from: legal provisions, a contract, or the consent of the information holder (Kozłowska-Kalisz, 2015). The provision of Art. 268 Penal Code does not specify the perpetrator's goal, but they should, as indicated above, act without authorization (Siwicki, 2010).

The perpetrator's behavior must be directed against the record of information that can be assigned the feature of significance, which should be assessed objectively (Bakalarz, 2011). However, it is possible to take into account criteria relating to the interests of the information holder. This is an evaluative mark, therefore it will be helpful to refer to the standard applicable in a given field, covering primarily the purpose and usefulness of the information, its content, importance and meaning. Recognizing information as important depends on the relevance it has for its holder, as well as on the purpose which the information served or was intended to serve for (Kalitowski, 2016). The assessment of whether a given piece of information is significant should be made on the basis of objective and subjective criteria, i.e. from the point of view of the person authorized to read the information (Piórkowska-Flieger, 2016). It will not constitute a prohibited act under Art. 268, behavior directed against information that is irrelevant, and, therefore, not useful, already used, etc. Similarly, the elements of the crime under Art. 268 Penal Code in the case of a slight change or damage to important information, which, however, does not destroy its essence (Marek, 2010).

Preventing an authorized person from getting to know important information involves completely preventing that person from assimilating or understanding the information (Lipiński, 2021).

Making it difficult to get acquainted with information is creating an obstacle to its assimilation. The difficulty in getting acquainted with information must be "significant", and therefore qualified, not easy to overcome, requiring a lot of effort or time. This type of effect will not occur if the keeper can easily consult a copy of the information. A significant difficulty may lie in the fact that reading the information requires a significant amount of time or effort, or in the fact that the information read by the authorized person is incomplete or significantly distorted (Postanowienie, 2009).

Destruction and damage may concern both the information itself and the medium on which it was recorded. Damaged information may be incomplete or distorted, and therefore, impossible to reproduce and assimilate. The destruction of an information record may involve both the physical destruction of the medium of a given information, and the fact that the information record itself is erased from the medium. In such a case, we can also talk about deleting the record. Damage to the information record may lead, above all, to significant difficulties in its understanding by the authorized person. Damage to an information record resulting from damage to the medium or deletion of part of the record differs from changing the record in that it leads to a violation of the reasonableness of the record. A damaged record contains incomplete information with unclear content, the reconstruction of which, at least in part, requires interpretation procedures that go beyond the usual limits or activities related to the technical repair of the information carrier.

Deleting information means that it cannot be recovered (restored) using ordinary means. This will primarily be its irreversible deletion (erasure) from the medium (Lipiński, 2021). Changing the information record involves its modification. It may lead to damage to this record, but most often it involves changing the content of the information (Kardas, 2000b). The amended entry presents legible information, but its content differs from the

original information. Changing a record may consist in deleting parts of the record, adding new elements to it, as well as changing the order, replacing some elements with others, changing the encryption method, etc. The change must be such that it leads to a distortion of the meaning of the original record. It should be assumed that a change in the record will also involve encrypting information with unchanged content in a new way. A change of information that does not affect its content does not constitute a crime (Sakowicz, 2013).

The perpetrator of a crime under Art. 268 Penal Code may also otherwise make it impossible or significantly difficult for an authorized person to read the information. Its behavior does not have to refer to the information recorded on the medium, or to the medium itself. For other behaviors that will constitute the elements of a prohibited act under Art. 268 Penal Code include, for example: hiding an information medium with data stored on it, affecting the computer network making it impossible to read e-mail, unauthorized change of password for access to databases, accounts on social networking sites or e-mail boxes. To commit an offense under Art. 268 Penal Code will also occur when the perpetrator introduces particular difficulties in access to the medium or to the information itself. Preventing or making it difficult to read information may also involve changing the configuration or destroying the computer program enabling reading of information or blocking the functioning of computer equipment (Wróbel, 2017).

However, it does not constitute the fulfillment of the features of a prohibited act under Art. 268 Penal Code affecting only the information holder, by which he is deprived of the ability to receive information or this reception is significantly disrupted (Wróbel, 2017). The destruction of one of many copies of the information record does not constitute a prohibited act specified in this provision, unless reading the information contained in the remaining copies is significantly difficult (Radoniewicz, 2016). The provision of Art. 268 Penal Code will also not be applicable when the difficulty in reading the information is the result of behavior consisting in disrupting the operation of the network, because it will then be absorbed by the aert command. 268a of the Penal Code or 269a of the Penal Code (Radoniewicz, 2013).

§ 3 provides for a qualified type of damage involving significant property damage (Lach, 2020). Significant property damage is the one that exceeds PLN 200.000 at the time of the act (Article 115 § 7 in connection with § 5 of the Penal Code). It must be a consequence of the perpetrator's interference in the information recording (Lipiński, 2021). A special effect is characterized by the qualified type specified in Art. 268 § 3, which consists in causing significant property damage to a person whose access to information was prevented or significantly hindered. Significant property damage cannot consist solely in property damage resulting from the destruction or damage of the IT data carrier itself. Property damage referred to in Art. 268 of the Penal Code, must result from a violation of the right to dispose of information, and not be solely a derivative of a violation of the property right to a data carrier. The damage will, therefore, include all normal costs that will be generated as a result of the criminal violation of the right to dispose of information. Property damage may also result from a prohibited act specified in Art. 268 Penal Code when the injured party, due to the inability to read specific information, makes financial decisions that cause him losses, cannot complete a work that would have a certain financial value as the subject of copyright, or cannot run an online store (Wróbel, Zając, 2017).

The functional features used by the legislator determine that the crime under Art. 268 Penal Code is of a material (effectual) nature. The result is that the authorized person is prevented or significantly hindered from obtaining the information. In the case of the

qualified type referred to in § 3, the result is also the occurrence of significant property damage (Piórkowska-Flieger, 2016).

Prosecution of crimes under Art. 268 § 1–3 of the Penal Code depends – in accordance with § 4 of this article – on the submission of an application by the injured party.

Offense under Art. 268 § 1 of the Penal Code is punishable by a fine, restriction of liberty or imprisonment for up to 2 years, § 2 regulates the qualified type, constituting cybercrime, which is punishable by imprisonment for up to 3 years, and § 3 regulates the qualified type by causing a significant property damage, which in turn is punishable by imprisonment from 3 months to 5 years.

Currently, according to police statistics (the availability of which on a national scale covers the period until 2020), the crime of obstructing the reading of information under Art. 268 Penal Code remains at a similar level. Only in 2018, there was a significant increase in the number of crimes detected, which may be explained by the final conclusion in this period of proceedings that were initiated in previous years. Over the years 2014–2020, the number of crimes committed under Art. 268 Penal Code was as follows:

Table 1. Number of offences under Art. 268 Penal Code

Offence under Art. 268 Penal Code							
Year	2014	2015	2016	2017	2018	2019	2020
Number of proceedings initiated	743	759	712	654	530	868	911
Number of offences confirmed	572	579	789	703	2432	642	761

Source: Own study based on the Police statistical data (<https://statystyka.policja.pl/st/kodeks-karny/przestepstwa-przeciwko-14/63626,Udaremnienie-lub-utrudnienie-korzystania-z-informacji-art-268-i-268a.html>) [Access: 21.11.2023].

### 3. CONCLUSIONS

Information technologies are among the fields that are subject to rapid technical progress, which on the one hand results in an increase in the standard of living of society, as new solutions facilitate and diversify the functioning of society, but on the other one, it enables the development of cybercrime and favors the emergence of previously unknown threats. They may affect everyday life, but there is also a fear of attacks on state-wide strategic goals that may even lead to the destabilization of the entire state IT system. Therefore, one should be particularly sensitive to the development of this field and the related new threats to state security. In particular, it is necessary to respond quickly to potential attacks and update the legal system to adapt it to new aspects of cyber threats.

Crime in the area of cyberspace usually constitutes a global, technical, cross-border and anonymous threat to various types of information systems, now considered crucial for the efficient, effective and uninterrupted functioning of the state and its citizens.

Cybercrime is a side, negative effect of the ongoing evolution in the field of information and communication technologies. The catalog of cybercrimes is very large and not uniform in nature. We can include both prohibited acts committed using the achievements of new technologies and violating legal rights "classically" protected under the provisions of criminal law, as well as computer crimes in the strict sense of the word, i.e. crimes directed against the security of electronically processed information (Adamski, 2000).

In the doctrine, some authors also distinguish a subgroup of computer crimes, which includes attacks committed using modern techniques for electronic data collection and

processing (Kardas, 2000b). Virtually unlimited opportunities for perpetrators of computer crimes are provided by the Internet, which gathers the largest number of users while offering them a wide range of online services (Kamuda, Trybus, 2013).

Computer crime is constantly changing due to the extremely rapid development of ICT technologies. Therefore, the subject matter under consideration is and will be subject to constant evolution in the future, progressing in parallel with the ongoing process of globalization, socio-economic changes, and the implementation of solutions based on modern technologies, which are directly related to both the understanding of the concepts of security and the procedure, and methods of its protection.

Ensuring and protecting security is an extremely important area of activity of the state and its bodies. It should be borne in mind that the development of cybercrime carries many previously unknown security threats, which creates the need to constantly analyze and adapt the legal system to the surrounding reality. The intensity of changes may vary at a given stage, but they are undoubtedly most noticeable in the area of the security protection system in cyberspace.

The law, constantly updated to these conditions, decides on the rules and principles which security protection is based on. A system intended to ensure safety should first of all meet several conditions: it should be precisely defined, simple and consistent – that is, effective. Most often, however, the final appropriate assessment of the effectiveness of legal regulations in the field of safety is issued post facto. It is also important to try to develop a relatively coherent and uniform conceptual framework that would be appropriate for both technical and social sciences, which would undoubtedly enable the development of more effective legal solutions in the field of combating crime in cyberspace, both internally and internationally.

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## BUREAUCRATIC CORRUPTION AND LIBERAL SOLUTIONS

There is a common belief that social systems are sensitive to any disruptions due to the fit of the individual elements of the social mechanism. That is why bureaucracy was created, as an organizational step towards rationality and efficiency on a large scale. The conditions for getting rich were created by capitalism, but there was a need to structure and establish rules for the functioning of society coupled with the free market. Bureaucratic organizations develop mainly where there is social differentiation, and appropriate resources are mobilized to solve problems, reaching various groups and spheres of life. It might seem that it is impossible to fight bureaucracy, but after joining the European Union, it began to develop and grow. The so-called statistical taxpayer does not understand that he is the main payer of taxes and contributions for bureaucratic extravagances. However, bureaucracy, contrary to widespread criticism about its inadequacy in the face of complex reality, is changing under the influence of modern concepts of public management. The aim of this article is to show the connections between bureaucracy and corruption, and the thoughts of libertarians on this administrative phenomenon.

**Keywords:** administration, bureaucracy, corruption, liberalism.

### 1. INTRODUCTION

“Bureaucracy” (French bureau, from bure “thick cloth”; Greek kretein “to rule”) was preceded by a concept known in antiquity – “administration” (Latin: administrare – to be helpful). The words “minister” and “altar boy” also come from the verb ministrare (Latin: to serve), meaning: “to serve”, “to manage” and “to direct”. The term “bureaucracy” appeared in 1745. The French physiocrat Jean Claude Marie Vincent de Gournay, as the first critic, saw offices as another, fourth or fifth form of government. Bureaucracy considered one of the greatest threats to the EU. And fraud and corruption pose a serious threat to the security and financial interests of the European Union. Therefore, neoliberals

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justify that extensive state activity is harmful because it strengthens unnecessary bureaucracy and promotes corruption,

## 2. BUREAUCRACY AND CORRUPTION

Corruption (Latin *corruptio*) means corruption, demoralization, loosening of moral principles among society, English *corrupt*, corruption means destruction, demoralization. In the Bible, there was a “temptation” of fruit in the form of a bribe – Eve was corrupted by a snake. Already in the 6th century BC the harsh Persian king Cambyses sentenced the corrupt judge Sisamnes to death, and the judge's chair was upholstered with his skin. In ancient Greece, people, both receiving and giving bribes, were punished with a penalty of ten times the value of the bribe. Sentencing to the maximum penalty was also a severe, draconian punishment. In Rome, corruption attached itself to many people; provincial governors, factory owners, mine tenants, and tax collectors. The concept of corruption was used by philosophers such as Plato, Machiavelli and Montesquieu, who related this phenomenon to the moral condition of society. Aristotle believed that the ideal system was an aristocracy since those in power were rich enough not to be tempted by bribes. Martin Luther protested theologically, through his theses opposed the selling of indulgences. Corruption has survived to the present day and occurs regardless of the political system, cultural or religious traditions.

R. Klitgaard (Klitgaard, 2002) expressed corruption with an appropriate equation:

$$\text{Corruption} = \text{monopoly} + \text{discretion} - \text{responsibility}.$$

The Daily Nation recalled the situation from October 28, 1997:

This morning, the government established a special anti-corruption group to investigate the activities of the anti-corruption office, which was responsible for supervising the anti-corruption service set up to audit the special commission of inquiry for investigating corruption among high-ranking members of the government.

World Bank experts distinguish two basic types of corruption:

- State capture. Activities of individuals/interest groups that aim to influence the shape of laws, regulations, etc. in their favor by providing high-ranking public officials with illegal and secret material benefits. “The involved” create new rules, usually affecting the economic sphere.
- Administrative corruption. An intentional by a public figure to circumvent or distort the application of existing legal provisions in order to provide benefits to others, in exchange for providing the public person with secret and illegal private benefits. “The involved” receive individualized exceptions to generally applicable rules.

Heidenheimer, in turn, distinguishes three different assessments of corruption in society (Heidenheimer, 1989):

- White corruption: Corrupt behavior is encoded in a tolerant way. It is typical in systems traditionally based on the family, as well as in systems based on the caregiver-caretaker relationship;
- Gray corruption: Corruption is seen as a disgrace. According to public moral standards, corruption is a reprehensible phenomenon, but those involved in it often avoid the direct consequences of inappropriate conduct. This is typical of countries



with a modern system, and countries in the process of transformation towards a democratic political culture;

- Black corruption: Corruption is generally perceived as a severe violation of social moral and legal norms. It is characteristic of contemporary democratic societies.

There have been numerous studies on corruption, including:

- Gunnar Myrdal, referring to the report of the Santhanam Commission, established in 1962 to investigate the extent of corruption in India, pointed out that corruption introduced irrationality into economic decision-making and economic development planning. Corrupt officials deliberately delay decisions to extort bribes from entrepreneurs (Myrdal, 2005).
- Paulo Mauro, economist of the International Monetary Fund, relied on quantitative data on 63 countries. Mauro concluded that corruption in the bureaucracy reduced private investment, thereby leading to slower economic growth (Mauro, 2005).
- Daniel Kaufman and Shang-Jin Wei, based on three international surveys conducted among entrepreneurs in 1996–1997, examined the relationship between paying bribes and bureaucratic harassment. The authors found that where more and more bribes were paid, more time was wasted on “bureaucracy”, capital costs were higher and regulations were perceived as more burdensome (<http://siteresources.worldbank.org/> 2011).

The government's activities are criticized due to links with corruption, which also limits economic freedom. Paldam (Paldam, 2002) notes that corruption is negatively correlated with economic freedom indices. His research results are supported by regressions on a sample of 77 countries using multiple control variables. According to Sandholtz (Sandholtz, 2000) and Kunicova (Kunicova, 2002), officials, taking advantage of the complexity and excessive number of regulations, can discretionarily refuse to issue a positive decision or delay its issuance. This practice is particularly well recognized in the examples of countries undergoing political transformation (Hellman, Jones, Kaufmann, 2003). Corruption develops in a situation of ineffective regulations and unclear rules created in order to obtain an excuse to demand bribes.

Another area important from the point of view of the problem presented here is Southeast Asia. The so-called Asian way of doing business was considered a factor that for three decades, until the financial crisis in 1997, promoted economic development in countries such as South Korea, Taiwan, Singapore and Malaysia. Dwight Perkins believes that for a long time, social relations between the Asian world of business and politics were functional because, in the conditions of an undeveloped rule of law, ties of kinship and loyalty were a form of securing economic transactions. Government elites provided support to specific business communities in exchange for specific financial support.

The nature of the administration's movement into the sphere of politics is illustrated by the typology presented by Jerzy Hausner, who points to the following levels of politics (Hausner, 2007):

- discursive sphere (power over meaning),
- structural sphere (power over the system),
- behavioral sphere (power over decision-making processes),
- functional and technical sphere (power over resources).

In Poland, during the partitions and occupation, bribery in many cases was an adaptation and became a patriotic act. Thanks to bribes, Polish families managed to protect their beloved ones from being deported to Siberia, and during the Nazi occupation, German

officials were corrupted, and in this way underground activists were bought out of prisons and concentration camps.

Prof. Michał Wojciechowski, reflecting on the problem of bureaucracy in contemporary Poland, notes that business owners are in many respects subordinates of officials since they depend on their decisions (if capitalists ruled, they would be given bribes), (Wojciechowski, 2001). An interesting example of entrepreneurs' addiction is forcing them to play the role of tax collectors. Income tax and contributions are paid by the employee, VAT and excise duty – the buyer of the goods, but they are collected and paid by the entrepreneur to the tax office or the Social Insurance Institution, which serves to mask the high amount of taxes from ordinary citizens, but also to pass on the costs of tax collection to companies.

Another manifestation of the advantage of the office over the capitalist is that, to some extent, getting rich directly depends on the decisions of the authorities, concessions, public procurement, changes in regulations and tax discounts for the selected few. This means that for a true capitalist – entrepreneur, competition is created based not on business, but on arrangements and corruption, on capital derived from bureaucracy.

Why is this system wrong? Firstly, because of costs. This is not only about salary expenses and corruption. Large losses are caused by waste and inefficiency of activities that are not economically motivated. The system also generates unnecessary costs for companies: complicated regulations result in wasteful work of lawyers and accountants.

The second reason is the restriction of freedom since bureaucracy derives its justification for its existence from the fact that it governs us and takes care of us in decisions – from serious ones, such as insurance and choosing a school for a child, to minor ones. The burdensomeness of these restrictions is alleviated by connections, money, low zeal of officials, mess, common sense, etc., but will it always be like this?

The third reason: bureaucracy must be inefficient; firstly, as the system is too large and complicated, and secondly, because a single officer bears little responsibility for decisions. And since this government depends little on the citizens, it cares little about what these citizens really need from the state. Therefore, he does not care about their external and internal security.

Andrzej Kojder writes about corruption:

its significant source is the right inherited from the Polish People's Republic (and expanded in the Polish Republic) to grant and provide various subsidies, permits, concessions, discretionary reliefs, limits, exemptions and the establishment of quotas by ministries and central offices. This vast sphere of discretion, freedom and excess of competences, which are often at the disposal of a minister, deputy minister, director or a single official, affects several dozen branches of the national economy. If obtaining a very profitable contract, import quota, government investment or concession depends on the signature of a minister or deputy minister, it is obvious that investors, importers, producers or entrepreneurs will seek this signature in every possible way. And so they do, and high officials with worn-out morals are easily tempted to get rich quickly (Kojder, 2001).

At all times, corruption was facilitated by the shortage of goods in the market and their bureaucratic distribution. This is particularly visible in two areas; meat supply and housing. The most widespread was the meat scandal in Warsaw, as a result of which over 400 people

were ultimately arrested. In 1972, losses caused by corruption in the meat industry were estimated at approximately PLN 80,000,000, and over 1,000 people were investigated. In a large part of the cooperatives, it was customary to give 20% of the apartments to the national councils, 30% to the Citizens' Militia and the army, and 20% to the management for bribes.

In addition to larger-scale scandals, petty corruption existed and was common; giving chocolate, vodka, cigarettes, etc. Edmund Wnuk-Lipiński writes:

corruption and theft (including spectacular economic scandals) occur often, which does not mean that in the Polish People's Republic these phenomena were not equally intense (and perhaps even stronger) present, of which the public was not aware because there was no free press (Wnuk-Lipiński, 2000).

We are aware of the fact that it was during the times of the Polish People's Republic that popular Polish folk proverbs were created, such as: “If one gives, one achieves”, “Today, only fish won't bite”, or “Claw me, claw thee”. While back then they referred to petty trickery, in recent years they have become rules in politics and business.

In the Third Polish Republic, the most widespread bribery of the Polish People's Republic – bribery in trade and services – died a natural death. The excess supply means that the customer can now do something. The free market and limiting the influence of the state turned out to be an irreplaceable remedy.

The assessment of the effectiveness of anti-corruption legislation made by the Supreme Audit Office in 2000 was unsatisfactory. The areas most at risk of corruption that should be subject to special supervision include: privatization, management of public assets, activities of special purpose funds and agencies, activities of customs services and tax administration.

Among the respondents of the Centre for Public Opinion Research respondents in 2000, the most common belief is that scandals and corruption are not related to the type of political system or which team is in power. Almost one third of respondents (30%) believe that regardless of the period, things have always been the same. Almost a quarter (23%) believe that current times are most conducive to corruption of public officials. The percentage of people who think that in this respect it was the worst in the period of the Polish People's Republic is slightly higher than the number who think that the times of the Solidarity government in 1990–1993 were the most corrupt.

Transparency International (<http://www.transparency.pl>) assessed Poland as the most corrupted country among the countries candidate to the European Union. In 2005, Poland took only 70th place in the Corruption Perceptions Index ranking, together with countries such as Burkina Faso, Croatia, Egypt, Lesotho, Saudi Arabia and Syria. In 2017, Poland took 29th place in the latest ranking of the state of corruption in the world, out of 176 classified countries. The data from the International Monetary Fund show that in corrupt countries; there is a smaller inflow of investments, general costs of business activity are higher, and market disturbances occur which negatively affect competition.

In the case of less developed countries, i.e. Bulgaria, Romania, Turkey, Latvia, Hungary, Poland, Estonia and Slovakia, a noticeable positive effect in the fight against corruption is also accompanied by an increase in the economic development measure. All these countries, except Turkey, are members of the European Union. It is, therefore, possible that, along with the ongoing globalization processes in less developed countries, there has been a reduction in society corruption.

In Poland, as part of attempts to fight for healing the system where officials are called “activists” and “sacred cows”, an appropriate act on employees of state offices and the Code of Ethics for the Civil Service were introduced. Other measures aimed at the efficient functioning of administration include (Inglot-Brzęk, 2009):

1. Maintaining political neutrality. The idea is that the administration should not be a “booty” that is taken by the election winner each time, but become like a “concert piano” in which “replacing the keys alone does not disturb the order of the entire instrument. Even if government changes, the state should continue to function”.
2. Separation of the private and public spheres and creation of security mechanisms public interest.
3. Creation of a civil service corps characterized by ethics and professionalism, based on tradition.

In 2006, the Central Anticorruption Bureau was established – a special service intended to fight corruption in public and economic life. The Central Anticorruption Bureau was equipped with special competences, including investigative powers, and the ability to apply the most radical measures of direct coercion, which aroused numerous controversies from the beginning. Despite this, the service survived the change of government and plays an important role in investigating corruption and punishing corruption crimes. According to the calculations of the Central Anticorruption Bureau, in 2010, 13,938 corruption crimes were registered, mainly bribery, paid patronage and various abuses of public functions (Mapa korupcji w Polsce, 2011). From the point of view of public finances, the financial consequences of the most frequently occurring corruption crimes (revealed by law enforcement authorities) in 2010 exceeded PLN 11,000,000.

It is also worth noting that the way societies perceive corruption evolves over time. Until 1977, American companies could legally pay bribes to conclude a contract abroad, and in many countries such incentives were legal until 1997. The most famous arguments supporting corruption (Grosse, 2000):

- Corruption can boost economic efficiency, and especially increase the level of investment, mainly because it improves administrative procedures and speeds up decisions beneficial not only to the company applying for it, but also to the entire national economy. This is the famous argument about corruption that “oils faulty institutional mechanisms”. The authors of this statement cited as an example the dynamic development of some Asian countries, which are also known for their enormous tendency to corruption.
- In competition regarding administrative decisions (e.g. public procurement), similar laws apply as in the free market, i.e. the more enterprising and offensive the company, efficient and better organized – the greater the bribe it will offer. In other words, competition between bribers is supposed to reflect the rules of the market, and the entrepreneur who wins such competition is de facto the best from an economic point of view.
- Time is as important a business category as financial resources. Therefore, projects that shorten the time of administrative procedures or aim to obtain information needed for business activities are worth bribes, just like any other investment or promotional activity.
- Corruption takes advantage of the relatively low salaries of officials. In this way, budget expenditures can be kept at an appropriately low level, as officials compensate for their remuneration in corrupt activities. Small budget expenditures

for this purpose indirectly support the economic development of a given country because they allow maintaining an appropriate level of macroeconomic indicators.

### 3. A LIBERAL APPROACH TO BUREAUCRACY

Nowhere have accusations against bureaucracy been so accurately and clearly formulated as in circles referring to the ideas of classical liberalism (Szczerki, 2004). Bureaucracy is often presented in these magazines as the enemy of freedom – civil (individual) and economic.

Ludwig von Mises, author of the fundamental work “Bureaucracy”, notes: “the terms bureaucrat, bureaucratic and bureaucracy are, of course, invectives” (Von Mises, 1998). No one calls themselves a bureaucrat or their own bureaucratic management methods. These words always express a condemnatory attitude. They always suggest degrading criticism of people, institutions and procedures. There is no one who would doubt that bureaucracy is thoroughly evil and that in a perfect world it should not exist. And he predicts: “the paradise of the future is seen as an all-embracing bureaucratic apparatus” (Von Mises, 1998).

Ludwig von Mises believes that bureaucracy thrives under socialism. And no wonder, because, as he says, “Lenin built an ideal bureaucratic state, modeled on the organization of the state post office. Lenin turned every citizen into a ring in a great bureaucratic machine. Lenin's ideal compels us to show the inferiority of bureaucratic methods compared to those of private enterprise” (Von Mises, 1998). He notes that no reform can remove the signs of bureaucracy from state institutions. The reason is simple: state offices lack a reliable measure of success and failure, and they do not operate like profit-oriented companies, according to financial calculations. The bureaucracy is focused on serving itself, and the petitioner is served on occasion. The greater obstacles bureaucracy creates for citizens, the more important it is.

Von Mises also noted that the Roman Catholic Church organized after the Council of Trent, as it emerged after the Counter-Reformation, was a perfect bureaucracy. The Church takes into account the need for flexibility and entrepreneurship to the greatest extent possible. It is based on planning and appropriate selection of personnel. The methods of selection adopted by the Church are very effective methods of governance adopted by a group that strictly adheres to a set of rules and regulations that are non-negotiable and immutable. This body perfectly selects the guardians of the eternal treasury of doctrine. Therefore, the Church's bureaucracy has become a model for contemporary secular bureaucracies, which, however, are doomed to imperfection in the realities of the constant struggle to improve human laws and principles.

Lord Acton, one of the greatest thinkers of the 19th century, combined liberal themes with principles flowing from the deep Catholic faith in his reflections on politics. In the works: “History of Freedom” and “Towards Freedom”, he considered freedom as one of the most important concepts and traced its history, understood as the history of the struggle between freedom and power. By freedom he understood a state that guarantees every person protection in doing what he considers his duty, against the pressure of power, the majority, custom and opinion. The state has the right to assign duties, and define the boundary between good and evil only in the sphere that directly concerns it. Outside the scope of matters necessary for his well-being, the state can only provide indirect help in life's struggles by supporting areas that help combat temptations – that is, religion, education and the distribution of goods.

Lord Acton added that the mark of a true bureaucracy was the sincere belief of its staff and supporters that it met all, or at least all, essential needs in terms of body and mind. It follows that other “suppliers are unnecessary”. Bureaucracy is inevitable when social beliefs about what the state and the public sphere are supposed to be. In addition, bureaucracy promotes laziness, constantly strives for reproduction and multiplication, and is monopolistic and despotic in nature.

Characteristic features of bureaucracy (Acton, 1995):

- There must be a sufficient group of educated hired workers among citizens, i.e. people with the ability to manage others who do not have their own tools or workshops (such as e.g. merchants, farmers, landowners).
- Bureaucracies of lawyers, clergy, physiologists, economists, teachers, philosophers, paternalistic administrators have always had some panacea for sick humanity, a special medicine that had to be pushed into it, whether it wanted it or not.
- Bureaucracy itself involves the desire to take control of our lives. It is guided by the belief that the authorities know better what is good for us, and the shockingly pedantic goal of measuring our work, supervising our studies, assigning us our views, taking responsibility for us, giving us porridge, putting us to sleep, checking whether we are well covered, and whether we really put on a nightcap.
- Every general education system has a disastrous tendency to become overgrown with unbearable bureaucracy, and it encourages the development of bureaucratic habits among teachers and their students.
- Bureaucracy has an unbearable tendency to treat citizens with superiority and the state is organized like a pedantic educational institution in which adults are treated like unruly children.

On mises.org, Loyd S. Pettegrew, Carol A. Vance presented: “The Seven Principles of Democracy” (<http://mises.pl/wp-content/uploads/2012/12/Pettegrew-Vance-siedem-zasad-biurokracji.pdf>). Let's list the most important of them:

- Rule No. 1. Keep the problem at all costs! Problems are the basis of power, benefits, privileges and security. Teasley rightly notes that problems, not solutions, are the basis of bureaucratic power, benefits, privileges, and political security. In politics, the more difficult a problem seems, the more resources need to be allocated to it. Bureaucrats promising to solve problems pursue political careers. The problems included:
  - a) War on poverty. Texas A&M University economics instructor Edgar K. Browning estimates that 80 federal, state and local government programs are the legions in this war. According to the US Census, the poverty rate was 15% in 1964 and 15.1% in 2010.
  - b) The war on drugs. For the need of this war, the Drug Enforcement Administration, the Office of National Drug Control Policy (ONDCP) and its chief bureaucrat, the Drug Tsar, the National Youth Anti-Drug Media Campaign, the Treasury and General Government Appropriations Act, and Drug Free Media Campaign Act were created. The growing cost of the futile war on drugs can be most easily seen by following recent changes in the annual budget. From 2008 to 2012, the president's war budget increased by \$1,700,000,000.
- Rule No. 2: Take advantage of crisis and perceived crisis to strengthen your power. The attack on the World Trade Center in 2001 is the most typical, but also the latest in a series of crises that were used to increase the government's power and

control over the country. And the Department of Homeland Security is a new, expensive bureaucracy.

- Rule No. 3: If there aren't enough crises, create them – even where none exist. Bureaucracies are still looking for a new crisis. Three examples; the Gulf of Tonkin incident, the attribution of weapons of mass destruction to Saddam Hussein, and man-made global warming.

[...]

- Rule No. 5: Increase publicity – build cover on the universal need to help others. The government bureaucracy was developed on populist rhetoric, the so-called "helping others". It is a transformation of the human approach to media relations, taught as the best method for promotion and arousing media interest. Almost any government program – regardless of the financial costs and restrictions on personal freedom associated with it – can be sold as positive through the media, as long as it is advertised as a program for children, the environment, the elderly, the poor, the homeless, national defense, national security or sick.

Liberals also point out that the fight against bureaucracy is difficult, also in Europe and in Poland – within the European Union. The EU spends €4,500,000,000 on administration and employs 33,000 officials. Several dozen of the highest-ranking EU officials (including 25 commissioners) earn approximately PLN 1,200,000 annually (not including additional powers). Approx. 6,600 officials for European affairs should be employed in the Polish public administration – according to information from the Office of the Committee for European Integration regarding the preparation of the Polish administration for membership and the recruitment of Polish citizens to work in the EU institutions. EU indicators predict that for every EUR 2,000,000 of EU subsidy, there should be one official who coordinates the distribution of these funds. To effectively use our membership, it would be necessary to employ 21,000 people in the administration and conduct 30,000 training courses, but above all, it would be necessary to guarantee the functioning of the civil service.

Liberal economist Tomasz Cukiernik criticized the central planning that we have already undergone and calculated that the management of EU funds involves; Agency for Restructuring and Modernization of Agriculture, Ministry of Economy, Labor and Social Policy, Agriculture and Rural Development, Infrastructure, Finance, National Education and Sports, Polish Agency for Enterprise Development, National Fund for Environmental Protection and Water Management, Marshal's Offices, Scientific Research Committee, Office of the Plenipotentiary Government for Disabled Persons and Equal Status of Women and Men, General Directorate for National Roads and Motorways (<http://tomaszcukiernik.pl/artykuly/teksty-o-unii-europejskiej/krytyka-dotacji-z-ue/>). Such socialist creations are being set up as the National Development Plan for 2004–2006, which includes six sectoral operational programs (<http://tomaszcukiernik.pl/artykuly/teksty-o-unii-europejskiej/krytyka-dotacji-z-ue/>): Transport and maritime economy, Human resources development, Restructuring and modernization of the food sector and rural development, Fisheries and fish processing, Increased competitiveness economy, Operational Program – Technical Assistance and Integrated Regional Development Operational Program and provincial operational programs.

Let us also mention the “bureaucrat's code”, which, according to the liberal “Wprost” (Zieliński, Pawelczyk, 2003) should:

- a) be suspicious, generally accusing the applicant of fraud, theft, or membership in organized crime,
- b) assume that the petitioner is a brainless, evolutionarily lower species of mammal,
- c) assume that the basic goal in the life of the petitioner is to maintain the official in an official, semi-official, or even quarter-official or even unofficial way,
- d) delay the resolution of each matter indefinitely,
- e) believe that the above-mentioned villainy is committed in defense of the state and the law,
- f) for PLN 500, PLN 1,000 or PLN 10,000 (or more depending on the circumstances) become more flexible, nicer, more human, find a quick and beneficial solution to the situation.

#### 4. CONCLUSIONS

Bureaucracy, despite liberal and common criticism about its inadequacy with the complex reality, is changing. The best example of this is the observation of the results of implementing the desiderata formulated in contemporary concepts of public management in relation to the modernization of administration. In the matter of corruption, it is also worth emphasizing that modern society is very sensitive to any signs of lack of objectivity and ethical action on the part of entities that exercise power in the state (including public administration). Even though the Poles have consistently recognized corruption as a widespread social phenomenon over several decades of political transformation, no grass-roots, spontaneous movement was created during that time that would demand the fight against this phenomenon.

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## INNOVATION-FRIENDLY PUBLIC PROCUREMENT: A FIRM-LEVEL ANALYSIS FOR POLAND

The aim of the paper is to identify the drivers of innovation-friendly procurements. The research sample consists of 307 firms acting as contractors in public procurement in Poland. Our dataset has been constructed by utilizing data gathered in 2020 within the framework of the DIALOG 0260/20185 project, funded by the Ministry of Science and Higher Education. We apply the logit model with the propensity for innovation related to public procurement as the dependent variable and possible drivers of innovation-friendly procurement as the independent variables. Our main findings reveal significant distinctions between firms that introduced innovations related to public procurement and firms that did not, in particular with respect to firm size and scale of activity, orientation on public sector, and cooperation with the universities.

**Keywords:** Innovation, innovation activity of enterprises, public procurement, innovation policy.

### 1. INTRODUCTION

Public procurement means acquisition of goods and services by governments and state-owned firms. In recent years, public procurement has been regarded as a demand-side policy meant to spur innovation. An increasing shift of emphasis in innovation policy away from that supply-side instruments, e.g. R&D subsidies, to the demand-side incentives, e.g. innovative public procurement, is a phenomenon encountered in all EU Member States. In his seminal paper, Gerowski (1990) provided many arguments in favour of the use of public procurement to stimulate innovation and against over-relying on R&D subsidies. Despite increasing interest of authorities and policy-makers, there exists a very limited statistical evidence on the linkages between public procurement and innovation (Appelt and Galindo-Rueda, 2016). An excessive deficit exists in empirical studies on innovation-friendly

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procurement and its drivers. As suggested by Landerink et al. (2022), this type of public procurement may affect innovation to a greater extent than procurement of R&D services, due to lower financing and time needs.

To fill the gap in the literature, our study aims to identify the drivers of innovation-friendly procurements. The research sample consists of 307 firms acting as contractors in public procurement in Poland. Our dataset has been constructed by utilizing data gathered in 2020 within the framework of the DIALOG 0260/20185 project, funded by the Ministry of Science and Higher Education. We applied the logit model with the propensity for innovation related to public procurement as the dependent variable and possible drivers of innovation-friendly procurement as the independent variables. Our main findings show important differences between firms with innovations related to public procurement and firms without innovations related to public procurement, in particular with respect to firm size and scale of activity, orientation on public sector, and cooperation with the universities.

The remainder of the paper is structured as follows: the literature review section focuses on the link between public procurement and innovation, the following two sections present the methodology of research and the results, and the summary addresses limitations of the study and provides suggestions for future research.

## 2. LITERATURE REVIEW

In general, public or government procurement refers to the acquisition of goods and services by government or public sector organisations (Uyarra and Flanagan, 2010). It accounts for a considerable share of total demand for goods and addresses a complex set of social needs. Although the main goal of public procurement is to acquire goods and services of suitable quality that are essential for the operation of public entities and institutions, it may carry out other goals, including stimulation of innovation. Given the systemic approach to innovation process, firms' interactions with public institutions that purchase goods or order services may lead to new solutions. This is all the more important because innovations in the form of new or improved products or business processes play a crucial role in growth of organizations, regions, and countries. Public procurement has the potential to improve innovativeness, to stimulate innovation diffusion and, thus, to increase total factor productivity and economic development (Edquist, Hommen, 2000; Shin, Lee, 2022).

For a long time, public procurement has been considered as an innovation policy tool. For example, Rothwell and Zegveld (1981) found that R&D subsidies were less effective than public procurement in stimulating innovation. Several possible mechanisms of the impact of public procurement on innovation are discussed in the literature. As suggested by Cave and Frinkin (2003), there may be a direct or an indirect demand-pull impact. The former means a situation when the intention of a public institution is to procure innovative goods and services. In the nomenclature adopted by the European Commission (2014), this type of public procurement is called public procurement of innovative solutions and refers to procurements where contracting authorities act as a launch customer of innovative goods and services, which are not yet available on a large-scale commercial basis and may include conformance testing. In this case, public sector can be regarded as an experimental user. The latter is often referred to as innovation related to public procurement or innovation-friendly procurement. Unlike public procurement of innovative solutions, innovation-friendly procurement is not usually related to the development of new products or

technologies. In line with argumentation of Aschhoff and Sofka (2009), innovation can be regarded as a potential by-product of regular procurement. From the suppliers' point of view, innovation related to public procurement is desirable mainly for two reasons, including the enhancement of the value-for-money of procured products and services and the increase of competitiveness.

The growing interest in the use of public procurement as innovation policy tool is mainly due the fact that supply-side innovation policies (such as R&D public subsidies and tax incentives) are deemed to be insufficient to meet the current challenges in promoting competitiveness (Edler and Georghiou, 2007). However, as argued by Sánchez-Carreira et al. (2019) the innovation related effectiveness of procurement policies is also shaped by their interactions with other policy tools. Guerzoni and Raiteri (2015) put a particular emphasis on the phenomenon known as the 'hidden treatment', which tends to manifest when the results of a certain policy are affected by the concurrent application of other policies. Consequently, the influence of public procurement on innovation is assessed not only in isolation but also in conjunction with supply-push policies. The study by Caravella and Crespi (2021) suggested that the composition of policy measures is crucial, with their efficacy being enhanced when policy instruments targeting both the demand and supply sides are implemented concurrently.

Cabral et al. (2006) delineated three distinct forms of indirect impacts that public procurement exerts on innovation: first, by expanding the market for novel products; second, by easing the integration of new standards; and third, by changing the market structure in a manner that fosters a more innovation-friendly environment (dynamic effects). As argued by Mazzucato (2015), public sector funding contributes to much more than fixing market failures as it can push forward the boundaries of technologies, drive industrial renewal and structural change processes rather than just incentivizing or stabilizing existing markets or sectors.

Taking up innovation activities related to public procurement depends on several firms' characteristics. The key determinant of firms' propensity to innovate, when innovative activities are undertaken as part of a public procurement contract, is their size. The size of a company is frequently identified as the primary determinant for securing public procurement contracts (Blind et al. 2020). The empirical results suggest that procuring to the public sector is found to be associated with an increase in the probability of innovating in micro and small firms (Augliera, 2022). Micro and small enterprises can leverage public procurement as a strategic tool to alleviate their financial limitations or enhance their market reputation and credibility. This strategic positioning can, in turn, enable them to garner additional resources, paving the way for the pursuit of innovative projects. Small and medium enterprises (SMEs) especially have an important part in using public procurement to drive innovation (Geroski, 1990). However, as revealed by Uyarra et al. (2014) smaller firms face great difficulties with innovation related to public procurement contracts, connected for example with the size of contracts, the absence of constructive feedback or the ineffective dissemination of opportunities.

It can be also assumed that firms involved in public procurement contracts, especially those focused on innovation implementation, are expected to be more engaged in innovative activities and equipped with internal financial, human, and technical resources dedicated to R&D. As demonstrated by Georghiou et al. (2014), the level of firms' innovativeness determines their success in receiving public procurement contracts and delivering or bidding for public sector contracts contributes to increase of firms' R&D expenditures.

Moreover, prior experience in public procurement contracts is also important for innovation performance as firms may be better positioned to innovate due to familiarity with the process. Augliera (2022) provided a convincing evidence that engagement in public procurement in the past influences firms' innovative output in the future. For example, it may be expected that firms with past public contract experience have the capacity to anticipate contractors' requirements and adapt innovative solution to them.

The firm's propensity to innovate can be stimulated by the opportunities that may occur within public procurement contracts for collaboration between public sector entities and private firms. Participation in innovation systems strongly facilitates knowledge exchange and collaboration that induce innovations. Empirical studies reveal that firms profit from the collaboration with universities and research institutions. Moreover, a closer relationship with the procurer facilitates new knowledge acquisition, development of R&D, and induces collateral innovation. Divella and Sterlacchini (2020) hypothesised that the more firms are open to frequent interaction with different external actors and sources of knowledge (especially with potential public procurers), the higher the likelihood they will come up with innovations induced by public procurement contracts.

### 3. DATA AND RESEARCH METHODS

Our dataset has been constructed by utilizing data gathered in 2020 within the framework of the DIALOG 0260/20185 project, funded by the Ministry of Science and Higher Education. Employing the Computer-Assisted Telephone Interviewing (CATI) method, the investigation engaged a representative sample of 307 entities acting as contractors in public procurement in Poland. We have built the sampling frame of ordering entities and contractors involved in public procurement in 2018 on the basis of data

Table 1. Response and explanatory variables

No.	Variable name and its measurement	Symbol
Response variable		
1.	Introducing innovations as a result of the public sector contracts (1 if yes, and 0 if no)	INN
Explanatory variables		
2.	SME membership (1 if yes, 0 if no)	SME
3.	Number of completed public procurements	NPP
4.	Supply to the public sector (1 if supply to the public sector exceeds 30% of the total sale, and 0 otherwise)	SPU
5.	Experience in supply to the public sector (in years)	EPU
6.	Cooperation with the university (1 if yes, and 0 if no)	UNI
7.	Number of employees	EMP
8.	Service sector (1 if the company belongs to the service sector, and 0 otherwise)	SER
9.	Trade sector (1 if the company belongs to the trade sector, and 0 otherwise)	TRA
10.	Domestic market (1 if the company sells mainly in the domestic market, and 0 otherwise)	DOM
11.	International market (1 if the company sells mainly in the international market, and 0 otherwise)	INT
12.	Annual gross revenue (in PLN millions)	REV

Source: Own elaboration.

provided by the Public Procurement Office. Then, in order to identify firms carrying out innovation related to public procurement, we have created a binary variable equal to 1 if a firm has declared to have undertaken innovation as part of public procurement, and 0 otherwise. The set of explanatory variables consists of firm-related characteristics. Table 1 presents the description of the variables used in the analysis. The binomial logit model (Wooldridge, 2002), has been employed to study the link between public procurement and innovation.

#### 4. RESULTS

Table 2 presents the descriptive statistics of all variables. Concerning the dependent variable in our analysis, 76% of companies declared the introduction of innovations as a result of the public sector contracts. The sample includes 77% SMEs. As regards the sectoral composition of the sample, 64% of companies were operating in the services sector, 17% in the trade sector, and 19% in the manufacturing sector. From the standpoint of market reach, 38% of enterprises sold their products or services in the local or regional market, 47% in the national market, and 15% in the international market. The employment in companies ranged from 1 to 1,500, and with the average of 114. The data shows that 63% of enterprises stated that their supply to the public sector exceeded 30% of the total sales. In turn, 21% of companies declared cooperation with universities. The gross revenue ranged from 0.1 to 35 million PLN, with the average of 11.4 million PLN. The average number of public sector contracts signed by enterprises was 119, while the average experience in implementing public sector contracts was 17 years. The largest number of contracts reached 6000 and the longest experience – 86 years.

Table 2. Descriptive statistics of variables

Variable	Mean	Std. dev.	Min	Max
INN	0.758	0.428	0	1
SME	0.771	0.420	0	1
NPP	119.12	595.04	0	6000
SPU	0.626	0.484	0	1
EPU	16.91	14.38	2	86
UNI	0.206	0.405	0	1
EMP	113,59	163,15	0	1500
SER	0.641	0.480	0	1
TRA	0.170	0.376	0	1
DOM	0.466	0.499	0	1
INT	0.152	0.359	0	1
REV	11.383	12.910	0.125	35

Source: own elaboration.

Table 3 presents the results of the logit model. Given the nonlinear nature of logit models, we report odds ratios, which are equal to 1 when there is a 50/50 chance that the event will occur with a small change in the independent variable. Negative coefficients lead to odds ratios lower than 1, whereas positive coefficients result in odds ratios exceeding the value of 1.

Table 3. Logit model estimates

Response variable: INN	Coeff.	Odds ratio
const	-2.931**	-
SME	1.901**	6.690
NPP	0.004	1.004
SPU	1.159***	3.187
EPU	-0.015	0.985
UNI	0.872*	2.392
EMP	0.004	1.004
SER	1.011	2.747
TRA	0.513	1.670
DOM	0.875*	2.400
INT	2.107**	8.221
REV	0.021	1.021
Likelihood ratio test ( <i>p-value</i> )		33.195 (0,001)
Ratio of correct predictions		79.7%

Notes: \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% level.

Source: own elaboration.

First of all, the total prediction accuracy is 79.7%, which indicates that our model's performance is acceptable. What emerges from the estimates is that SMEs were more eager to introduce innovation related to public procurement than large firms. In general, the significant contributions of SMEs to innovation have been widely demonstrated in the literature (Odei, Hamplová, 2022). SMEs are seen as the most active and vibrant enterprises undertaking numerous innovative activities. Interestingly, our findings suggest that business ties with the public sector through sale affect innovation. In a more detailed way, firms which supply to public sector exceeds 30% of their total sales tend to be three-times more likely to introduce innovations as a result of the public sector contracts than the enterprises with a lower share. On the other hand, the number of completed public procurements and time experience in supply to public sector appeared to be insignificant in our analysis.

As regards other factors relevant to innovation-friendly procurement, it should be noted that cooperation with universities significantly increases the probability of introducing innovations (almost 2.5 times). Similarly, firms selling their products or services in the domestic market are 2.4 times more likely to introduce innovations than companies selling them in local or regional market, and this ratio is even higher for companies selling in the international market.

## 5. CONCLUSIONS

Public procurement is regarded as an attractive demand-side instrument for the implementation of innovation policy. It is important to notice that public procurement may stimulate innovation in private firms either directly or indirectly. The propensity of firms to engage in innovation activities for the purpose of public procurement depends on many factors. Our empirical analyses revealed that higher volume of sales to the public sector was associated with an increase in the probability of innovating. Moreover, we found that



SMEs and firms operating in domestic and international markets were more willing to introduce innovation related to public procurement than large firms and firms operating in a local market. Finally, it appeared that cooperation with university made firms more innovative. Given that Poland's business environment is primarily composed of micro and small enterprises, public procurement may serve as a policy instrument aimed at fostering their innovation performance. More specifically, policymakers should promote regulatory frameworks that explicitly allow for innovation, for example the adoption of procedures which enable negotiations with potential suppliers.

The pioneering nature of this study translates to some note-worthy limitations. First, we focused on innovation-friendly procurement, quite apart from the fact that there are other approaches to stimulate innovation through public procurement (e.g. procurement of R&D services). Second, the set of determinants of innovation related to public procurements is mainly limited to firms' characteristics. To overcome these limitations, future studies should consider other forms of public interventions that may complement innovation-friendly procurement. Moreover, they ought to extend analyses to a contractor's perspective.

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## DIFFERENT VALUES AS THE PREDICTORS OF VARIOUS FORMS OF CIVIC ENGAGEMENT: THE POLISH CASE

This article aims to examine the relationships between various forms of civic engagement and values, using a four-form model of civic engagement and the Shalom Schwartz model of values. The forms of civic engagement are social involvement, social participation, individual political activity, and political participation. The study was conducted on a sample of 203 respondents from various regions of Poland. The regression analysis revealed that the different forms of civic engagement were explained by a specific set of values. Service-oriented activity (social involvement and social participation) was more strongly associated with values than political activity. Poland is characterized by the insignificance of universalism in explaining various forms of civic engagement, while power and security are important in explaining individual political activity. The article also outlines the limitations of the current study and provides directions for future research.

**Keywords:** civic engagement, psychological perspective, Schwartz's model of values, service and political activity, four-form model of civic engagement.

### 1. INTRODUCTION

Civic engagement is an essential element of citizenship (Dahl, 1998; Putnam, 2000). It is an area of research and analysis not only in the sociological and political but also in the psychological field of study (Conover, Searing, 2002; Fattori, Pozzi, Marzana, Mannarini, 2015). This kind of activity has positive effects for an individual personally, for communities, and for society as a whole, while low levels of civic engagement result in negative social and political consequences – e.g. weakened partnership between the government and citizens or low levels of social development (e.g. Dahl, 1998; Pancer, 2015; Putnam, 2000, Wray-Lake, DeHaan, Shubert, Ryan, 2019).

Unfortunately, the overall level of civic commitment is not high even in countries with a stable democracy (Putnam, 2000). Data from the European Social Survey shows that this problem particularly applies to the countries of Central and Eastern Europe, also Poland (Nyćkowiak, 2009; Radkiewicz, Skarżyńska, 2006). Therefore, the significant importance of civic engagement and low level of activity results in the need to search for motives and conditions that activate and strengthen this type of social activity.

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Values are one of the rudimentary motivational factors in social and political activities. The research to date indicates the importance of different categories of values in civic engagement (Bekkers, 2005; Caprara, Schwartz, Capanna, Vecchione, Barbaranelli, 2006; Feldman, 2003; Marzana, Marta, Pozzi, 2012; Omoto, Snyder, Hackett, 2010; Radkiewicz, Golec De Zavala, Skarżyńska, 2008). The Shalom H. Schwartz's model of values shows us interesting possibilities to explain the level of involvement in different forms of civic engagement (Schwartz, 2012).

However, civic engagement is a complex issue involving many different activities and it is classified by different models into different forms (e.g. Bekkers, 2005; Omoto et al., 2010; Zaff, Malanchuk, Eccles, 2008). Nevertheless, research often accounts for a multitude of activities within one general category of civic engagement or focuses specifically on some of its forms only. There is still a lack of a theoretical model that could also be used in research and cover the entire set of complex activities undertaken in the framework of civic engagement.

In the presented article we propose a new four-form model of civic engagement that takes into account often used formal classifications (political – social and individual – collective) in order to generate both a more precise characterization and as well as compare its different forms (Klamut, 2015).

The main goal of the article is to investigate the relationship between four forms of civic engagement and values according to Shalom H. Schwartz's well-known model.

## 2. CIVIC ENGAGEMENT

Civic engagement is one of the basic categories of democracy (e.g. Dahl, 1998; Putnam, 2000). Citizens without a sense of belonging to a society and without involvement in civic activities in country or community, would not be able to exist in a good manner nor develop (Dahl, 1998; Pancer, 2015; Wray-Lake et al., 2019; Zaff et al., 2008). However, this kind of human activity is very firmly established in human nature. This was already indicated in antiquity: man is, by nature, a being who lives in sociality and working for his community. Aristotle (1885) defined a human as a political being (political animal – ζῷον πολιτικόν) and politics as a fundamental public activity focusing on the common good (Conover, Searing, 2002; Dekker, 2009). Nowadays, this, the widest understood political (or civic) activity, is realized by two paths: social (service), aimed at improving the quality of life of fellow citizens, and political more narrowly understood (power), aimed at influencing the people in power, to improve the quality of life (e.g. Adler, Goggin, 2005; Barrett, Brunton-Smith, 2014; Bekkers, 2005; Dekker, 2009). So, as helping those in need and/or influencing those who govern. Adler and Goggin (2005) wrote that civic engagement refers to the ways in which citizens participate in the life of a community in order to improve conditions for others or to help shape the community's future. These two paths or goals of acting allow one to create order in the complexity of civic engagement while accounting for the criterion: areas of engagement.

Civic engagement is an activity carried out in communities (Pancer, 2015; Putnam, 2000). However, many activities are undertaken by individuals, and others are undertaken as a team. This aspect is evident in the other definition of civic engagement: "individual and collective actions designed to identify and address issues of public concern" (American Psychological Association, n.d.). Adler and Goggin (2005) even indicate a continuum, spanning from the private to the public sphere. Collectivity (level of community) is the

second important criterion organizing the theoretical description of civic activity (cf. Zaff et al., 2008).

These criteria are reflected in the categorization of civic engagement in different theoretical models (e.g. Bekkers, 2005; Caprara et al., 2006; Ekman, Amnå, 2012; Fattori et al., 2015; Feldman, 2003; Krzywosz-Rynkiewicz, Zalewska, Karakatsani, 2017; Marzana et al., 2012; Zaff et al., 2008), but have not yet been applied together in one model. The adoption of both criteria simultaneously allows one to distinguish the elements that constitute the four-form model of civic engagement. There are: social involvement, social participation, individual political activity, and political participation (Klamut, 2013; 2015), identified and described in Table 1.

Table 1. The characteristics of the two-dimensional model of civic engagement

		<i>Level of community</i>	
		Individual activity: independently of a group	Group activity: depending on a group
<i>A r e a o f</i>	Public engagement: <u>service</u>	<u>social involvement (SI)</u> – <i>individual activity for other people's benefit;</i> – <i>taking care of law and order - responding to violations of the rules by other people;</i> Commitment to helping others	<u>social participation (SP)</u> – <i>activity in social organizations (associations, NGO's, organised groups)</i> Cooperation as a member of the organization
	Political engagement: <u>authority</u>	<u>individual political activity (IPA)</u> – <i>individual activity in the perspective of authority:</i> – <i>evaluation of the authorities;</i> – <i>effort to better understand political and social relations;</i> Individual impact on democratic representation and the functio- ning of the state	<u>political participation (PP)</u> – <i>participation in political – political parties, public institutions (including trade unions);</i> Impact on law creation and the procedural functioning of the state (nationally, locally, or even in terms of the European Union) within the framework of political organizations

Source: Based on Klamut (2013).

Social involvement is a kind of individual actions aimed at improving the quality of life of other people, especially those in need. These actions can be as a reaction to some situation, e.g. natural disasters, as well as permanent voluntary help, e.g. sacrificing time and work due to some inner calling. It is combined with culture capital (Putnam, 2000). Social participation encompasses activities of people as members of organizations focused on public benefit. The essence of this type of collective activity is working individuals, who feel that they belong to a group and participate in activities together with others (Klandermans, 2003). Individual political activity covers the activities of individuals who, as citizens, are active participants to a greater or lesser extent in the political life of a country. They follow information about the decisions of government or political leaders and create their own image of political reality (Barrett, Brunton-Smith, 2014). The results of this evaluation may be participation in elections, as well as in demonstrations, protest

marches, strikes, signing petitions, etc. The essence of political participation is cooperation in the structures of power, political parties or other organizations with political influence. These include activities such as participation in election campaigns, organizing demonstrations, protest marches, strikes, or signing petitions.

Many citizens are not passive recipients; they want to act and do so for the benefit of the environment they live in (Taber, 2003), but it does not apply to all. The big question becomes: what can motivate people to become active citizens? Taber (2003) writes that what constitutes motivational power is self-interest, values, and group identification. In turn, civic engagement is seen as an effect of an individual hierarchy of values that tends to predict political activities better than personality traits do (Bekkers, 2005; Caprara et al., 2006; Radkiewicz et al., 2008). In the presented article, we will seek answers in the area of values.

### 3. VALUES

Values are among the primary motivating factors behind any human undertaking. Nowadays, the most popular concept of values, both in terms of theoretical explanations and conducted research, is Shalom Schwartz's theory (Feldman, 2003; Schwartz et al., 2012). Values are defined therein as beliefs referring to goals and actions outside specific situations (Schwartz, 2012). The theory allows for the classification and ordering of values in a circular motivational continuum (Cieciuch, Schwartz, 2012). Those that are close to each other are similar in terms of motivation and thus may be implemented in a single action, or they may trigger a particular action that will lead to its realization. Those that are located the farthest to each other within the model (on the opposite side of the circle) are contrastive psychologically and it is significantly difficult to realize them simultaneously (Schwartz, 2012).

However, as Schwartz (2007) writes elsewhere, each behavior is triggered by a larger number of values, sometimes also contrastive with each other. Therefore, individuals must make trade-offs between them on the basis of personal priorities. The result is a complex model of dependencies between a set of values and behaviors.

The basic model consists of 10 types of values, but Schwartz also describes values in a higher-order level in four categories and more detailed level, composed of 15 or even 19 types of values (Cieciuch, Schwartz, 2012; Schwartz et al., 2012). Table 2 presents a description of the values in the basic, 10-type model, as follows, by setting the main goals (Schwartz, 2002).

Ten basic types of values are arranged in a higher-order level in four categories. These are: openness to change built by self-direction, stimulation and hedonism; self-enhancement built by achievement and power; conservation built by security, conformity and tradition, and also self-transcendence built by benevolence and universalism (Schwartz, 2012).

When seeking predictors of civic engagement, it is interesting to examine which sets of values are significant for explaining different forms of civic engagement. Some relationships have already been identified in previous studies. However, the results are not clear-cut.

Table 2. The descriptions of values with regards to the main goals

Types of values	Main goals
self-direction	independent thought, action and choice, creation, exploration
stimulation	excitement, novelty, and challenge in life
hedonism	pleasure and sensual self-gratification
achievement	personal success by demonstrating competence according to social standards
power	social status and prestige, control or dominance over people and resources
security	safety, harmony, and the stability of society, relationships, and self
conformity	restraint of actions, inclinations and impulses likely to upset or harm others and violate social expectations or norms
tradition	respect, commitment, and acceptance of the customs and ideas that traditional culture or religion provide the self
benevolence	preserving and enhancing the welfare of those with whom one is in frequent personal contact (the "in-group")
universalism	understanding, appreciation, tolerance, and protection of the welfare of all people and nature.

Source: Based on Schwartz (2007; 2012).

#### 4. VALUES AND CIVIC ENGAGEMENT

Values are relevant for the purposes of socio-political reality and, as a result, in undertaking actions for the good of their fellow citizens (e.g. Caprara et al., 2006; Feldman, 2003). Although Zaff et al. (2008) indicate that despite the theoretical justification there have not been many studies on the importance of personal values related to civic activity and what is true is that some confirmations of this relationship exist. Firstly, in relation to the general understanding of civic activity, broader categories of values, such as altruistic/communalistic are found. Those values, that are correlated with civic engagement to a greater degree, are ones directed externally towards the outside world as well as empathic concern (Omoto et al., 2010). In the Polish reality, collectivist values, motives of power and social impact, affiliation, support, and non-materialistic orientation are important (Radkiewicz, Skarżyńska, 2006).

Values are also connected with service-oriented activity realized as volunteering. Kenrick, Neuberg, and Cialdini (1999) evoke two results: 87% of volunteers indicated personal values as a reason for helping others and also 87% of volunteers helping AIDS sufferers indicated their own values as their reason for doing so. Broad categories of social values are considered in the research as the most important motives for action to help people in need: values associated with positive attitudes toward others such as altruism or humanitarianism and a sense of community (Clary, Snyder, 1999; Omoto et al., 2010).

The second set of dependencies between values and civic engagement are analyzed in the area of political action. Vecchione et al. (2015) analyzed the relationships between political activism and values of the Schwartz model in various countries. Political activism was described as, for example, participating in public demonstrations, contacting politicians, working for political organizations, so without differentiating the individual or collective doing, and without voting. The values were analyzed with different levels of specificity – higher-order and the more specific 15 types of values. This research was based on the European Social Survey (ESS, round 1 2002–2003) from 20 European countries and on a self-report study from 14 countries. At the higher-order level of values, the results from all countries indicated that political activism was positively related to self-

transcendence and openness to change and negatively to conservation values. At the more specific level stimulation, benevolence, universalism, and self-direction-thought correlated positively with political activism and conformity; tradition and personal security were negatively correlated. In Poland the results were slightly different. Political activism correlated positively with self-enhancement and negatively with self-transcendence and conservation. At the more specific level of values, it was correlated positively with power and self-direction-thought and negatively with security-personal, conformity and universalism-concern.

Thirdly, there are also studies analyzing the relationship between more detailed forms of civic engagement and the values of the Schwartz model. The differentiation of the values in undertaking social and political participation was examined in Italy (Luengo Kanacri, Rosa, Di Giunta, 2012). Participation in social organizations was predicted by benevolence, while participation in political organizations was predicted by power. However, a significant limitation of these studies was the inclusion of only three out of ten types of value (benevolence, universalism, and power).

More detailed analyses from ESS were presented by Schwartz (2007). He analyzed the relationship between values and political activism (without differentiating the individual or collective work), and also social involvement and membership in voluntary organizations that correspond to social involvement and social participation in Klamut's model (2013; 2015). Political activism was associated with universalism, stimulation, self-direction (positively) and conformity (negatively). Social involvement was associated positively with benevolence, hedonism, and stimulation. Membership in voluntary organizations involved universalism, benevolence, stimulation, and self-direction.

The results to date confirm the existence of a dependency, but show that the different values are associated with different types of actions for public benefit. This diversity is, on the one hand, a result of adopting various value classifications. In this matter, the Schwartz model of values classifies the whole perspective of values and allows one to describe the motivational diversification of undertaking separate forms of civic activity (Luengo Kanacri et al., 2012; Schwartz, 2007; Vecchione et al., 2015). On the other hand, discrepancies in the characteristics of various categories of civic engagement result from the lack of a clear classification of activities that consist of the entire phenomenon of civic engagement. In turn in this matter, the Klamut (2013) four-forms model of civic engagement based on theoretical justifications and clear criteria allows one to consider the whole phenomenon and compare his forms with each other. These forms of engagement are so separate that in the area of basic motivational factors – that is, values – one may expect distinct sets of values that underline the reason for participating, as was indicated by previous research (Luengo Kanacri et al., 2012; Schwartz, 2007; Vecchione et al., 2015).

## 5. PRESENT STUDY

The conducted research aims to verify the dependency between values and civic engagement. In this research, we will examine the relationship of the values at two levels of precision – the four higher-order values as well as the ten basic values – with the four forms of civic engagement. The importance of sex and age will also be analyzed.

First, we hypothesize that the higher-order level of values will explain less than the ten basic values of the specificity of the researched dependency (Hypothesis 1). Previous research has used a narrower and a broader level of values. The results point to more



complex sets of values from different higher-order level categories as predictors of civic engagement (Vecchione et al., 2015). In turn, as Schwartz (2007, 2012) wrote, there are conflicts between contrasting values, which at the higher-order level may lead to their individual effects being cancelled out.

Hypothesis 2 concerns more specific dependencies between values and civic engagement. We assume, social involvement will be predicted by self-transcendence values, especially benevolence (Hypothesis 2a). Social participation will be predicted by benevolence and the values of openness to change, stimulation especially (Hypothesis 2b). Individual political activity will be predicted by values from three of higher-order level categories: stimulation and self-direction (openness to change values) and also power (self-enhancement values), and security (conservation values) (Hypothesis 2c). Political participation will be predicted by power and security, and also stimulation (Hypothesis 2d).

In the research to date, social activities (service) have been explained by prosocial/altruistic values (Clary, Snyder, 1999; Omoto et al., 2010) – in the Schwartz model – by self-transcendence values, such as universalism and benevolence (Luengo Kanacri et al., 2012; Schwartz, 2007). On the other hand, the political activism in various studies has been predicted by almost all values from the Schwartz model, but in different sets (Radkiewicz et al., 2008; Schwartz, 2007; Vecchione et al., 2015). Adding the second criterion to differentiate civic engagement, the level of community, may help to better understand the relationship studied. However, there is a lack of research on distinguishing the importance of values in individual and group civic action. Some empirical evidence has been found in the analyses of Schwartz (2007), where in service activities, in addition to self-transcendence values, openness to change values also played an important role: hedonism with stimulation in individual activities and stimulation with self-direction in association activities. It seems that openness to change values should predict group participation. Because in addition to the realisation of social goals, membership in a group/organisation is important, where one needs to be in contact with others (Omoto, Packard, 2016) and also to have energy (stimulation) to cooperate. In individual service, only empathic concern should be enough (Omoto et al., 2010; Stukas, Hoye, Nicholson, Brown, Aisbett, 2016).

In political activities, understanding the socio-political reality, caring for the public interest and influencing the governing group are the most important factors (Bekkers, 2005). The motivation for such activities comes from many sources and different values appear as predictors (Schwartz, 2007; Vecchione et al., 2015). The starting point is the pursuit of one's own power or the struggle for one's own or group/social interests (cf. Schwartz, 2012). Therefore, in individual political activity, self-enhancement values (power) (Luengo Kanacri et al., 2012; Radkiewicz, Skarżyńska, 2006), conservation values (security) and openness to change values (stimulation, self-direction) (Schwartz, 2007; Vecchione et al., 2015) appear in research as predictors. Political participation, a collective activity aimed at influencing the governing group, should be strongly predicted by self-enhancement values and also by openness to change values due to being an active member of an organisation (Feldman, 2003; Schwartz, 2002; Turner, 2005).

We also expect, that the Polish people have a lack of universalism value in predicting service activity and the presence of power and security values as predictors of political activity (Hypothesis 3). The basis for such assumptions can be found in research (Luengo Kanacri et al., 2012; Radkiewicz et al., 2008; Radkiewicz, Skarżyńska, 2006; Vecchione et al., 2015).

To provide a more complete picture of the relationship between values and civic engagement, basic demographic factors such as sex and age are also taken into account. The patterns of dependency analysed in previous studies are not explicit. Women were more likely to be involved in social activities (Bekkers, 2005; Stukas et al., 2016), while in political activities – depending on the research – more men (Barrett, Brunton-Smith, 2014) or women (Bekkers, 2005) participate or there is no difference (Vecchione et al., 2015). Age is positively correlated with different types of activities (Bekkers, 2005) or not (Vecchione et al., 2015). In the present research, we would also like to analyze the role that demographic factors play in different forms of civic engagement.

## 6. METHOD

### 6.1. Participants

203 people participated in the study, adults, aged between 19 and 54 ( $M = 24.67$ ,  $SD = 6.56$ ), 67 men, 136 women (67% of the study group) living in different regions of Poland (South East, East, North). In this group, 133 people (65.5% of the study group) were MA students from different fields of study, and 70 people (34.5% of the study group) were working adults. The students responded during the classes; the adults filled out the surveys provided by trained students in their homes. The respondents gave their informed consent to be included in the research. The researched group was not homogeneous to capture a broader spectrum of citizens. A convenience sample was used as the recruitment method. Participation was voluntary, anonymous, and unpaid. As verified, the power analysis using G\*Power 3 (Faul, Erdfelder, Lang, Buchner, 2007) showed that the size of the group was sufficient to conduct the analysis in this research.

### 6.2. Measures

The *Civic Engagement Questionnaire* (CEQ) consisting of 17 items set on a five-point Likert scale (Klamut, 2015) was used in the current study to investigate four forms of civic engagement presented above.

Social involvement (SI), social participation (SP) and political participation (PP) were described by four statements; the sample items are respectively: 'I help people in need of my own accord, contributing my own time and work', 'I work for non-governmental organizations', and 'I work for an organization focused on political activity'. Individual political activity (IPA) was described by five statements, e.g. 'I create my own assessment of the actions of the political class in my country'.

The CEQ gives an empirical estimation of the level of each form of civic engagement that allows for analysis and comparison of each form against each other.

The results confirm the theoretically assumed distinctiveness of each of the examined forms of civic engagement. The CEQ measure was validated in the research on a group of 749 participants in Poland (Klamut, 2015). Theoretical accuracy was confirmed by a confirmatory factor analysis indicating a four-factor model. The examined results were accurate enough to prove that the model was well-matched to the empirical data (Kline, 2011):  $\chi^2(113) = 142.6$ ;  $p < 0.05$ ;  $\chi^2/df = 1.26$ ; RMSEA = 0.04; SRMR = 0.07; GFI = 0.92; CFI = 0.87. The four-factor model was also confirmed by confirmatory factor analysis in the presented research, the results were very similar:  $\chi^2(113) = 171.7$ ;  $p < 0.01$ ;  $\chi^2/df = 1.52$ ; RMSEA = 0.05; SRMR = 0.06; GFI = 0.91; CFI = 0.94.

The level of CEQ reliability was satisfactory. In the validated research, Cronbach's alphas were: 0.76 (social involvement), 0.76 (social participation), 0.77 (individual

political activity), and 0.82 (political participation) (Klamut, 2015). In this research: 0.76, 0.75, 0.77, and 0.82, respectively. Test-retest reliability ( $n = 45$ ; two weeks) scored:  $r(\text{SI}) = 0.70$ ;  $r(\text{SP}) = 0.76$ ;  $r(\text{IPA}) = 0.67$  and  $r(\text{PP}) = 0.57$ .

*Portrait Values Questionnaire* (PVQ-40) consisting of 40 items measured on a six-point scale was used to measure the values (Cieciuch, Schwartz, 2012). It is at present the most popular questionnaire used for measuring values and is widely validated (e.g. Schwartz et al., 2012). A Polish language version was created and validated by Cieciuch and Zaleski (2011). The PVQ measures the 10 basic categories of values and also provides the opportunity to study the higher-level values. This measure includes 40 short verbal portraits of people. Each portrait describes a person's goals, aspirations or wishes that point implicitly to the importance of a value. The respondents indicate how similar a particular person is to themselves. Cronbach's alpha coefficients obtained in this study were comparable to those obtained in previous research (Cieciuch, Schwartz, 2012; Cieciuch, Zaleski, 2011) and amounted to: 0.68 (power), 0.80 (achievement), 0.76 (hedonism), 0.69 (stimulation), 0.64 (self-direction), 0.77 (universalism), 0.65 (benevolence), 0.59 (tradition), 0.65 (conformity), and 0.66 (security). In general there is a problem with the reliability of some scales (Schwartz, 2007; 2012), but the research are conducted. Schwartz (2007; 2012) justifies the use of the tool in terms of the considerable validity of the tested model.

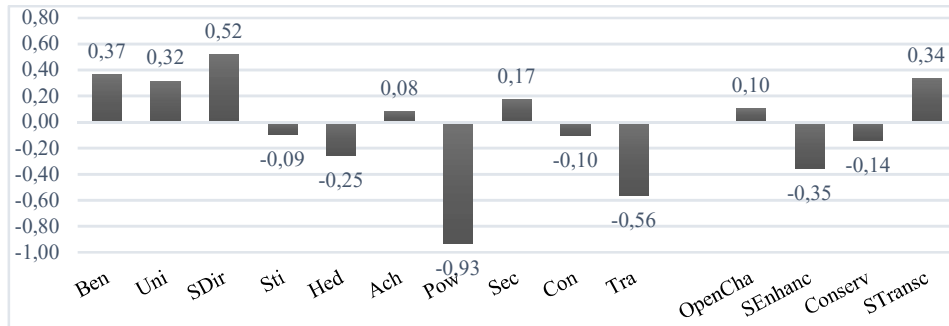
### 6.3. Data analysis

The study was based on a hierarchical linear regression analysis including the demographic variables and values in separate blocks. Analyses were conducted separately for each level of specificity (four higher-order values and ten basic values) and for each form of civic engagement. According to the recommendations (Schwartz, 2007), the scores of values were centred. However, this procedure has some consequences. To avoid multicollinearity, we rejected one of the four higher-order values (self-enhancement values in service activities and self-transcendence values in political activities) and two of the ten basic values (achievement and conformity). The rejected values were the least correlated with civic engagement.

## 7. RESULTS

### 7.1. Descriptive statistics

Among the distinguished forms of civic engagement, individual activities were more common than collective activities: social involvement ( $M = 2.95$ ,  $SD = 0.86$ ) and individual political activity ( $M = 3.21$ ,  $SD = 0.88$ ). The collective service activities were less common: social participation ( $M = 2.20$ ,  $SD = 0.92$ ) with political activities being the least common: political participation ( $M = 1.50$ ,  $SD = 0.58$ ). In the Schwartz model, values are shown according to relative importance (centred) (Schwartz, 2007) and the profile of the centred means of values hierarchy characterizing the researched sample of Poles is illustrated by Figure 1.



Notes: Ben – benevolence, Uni – universalism, SDir – self-direction, Sti – stimulation, Hed – hedonism, Ach – achievement, Pow – power, Sec – security, Con – conformity, Tra – tradition, OpenCha – Openness to change, SEhanc – Self-enhancement, Conserv – Conservation, STransc – Self-transcendence

Figure 1. Value hierarchy profile in Poland. Centred means

Source: on study.

The average value hierarchies in the researched group were as follows: benevolence, self-direction, and universalism are the most important while power, and tradition are the least important.

## 7.2. Different forms of civic engagement and values

Regarding the higher-order values, they only played an important role in terms of social activities (Table 3). There was a 13% variance explained in the results of social involvement and a 5% variance in social participation. Only one of the four values (self-transcendence) was an important predictor (respectively:  $\beta = 0.36$  and  $\beta = 0.20$ ). Age for social involvement ( $\beta = 0.18$ ) and sex (men) – for social participation ( $\beta = 0.18$ ) – were important predictors of civic engagement. Other forms of activity scored insignificant effects, but demographic factors were significant in explaining individual political activity (males  $\beta = 0.29$  and age  $\beta = 0.23$ ).

The results concerning 10 basic values as predictors of the distinguished forms of civic engagement indicate that three out of four forms were explained by values and two were explained by age and sex (Table 4). Activities focused on service are explained by the values at the level of 17% for social involvement and 20% for social participation. Individual political activity is explained at the level of 9%, and collective political participation are not explained at any significant level. In sum, Hypothesis 1 received support.

The only, but important predictor of social involvement is benevolence ( $\beta = 0.29$ ). Social participation is also explained by benevolence ( $\beta = 0.22$ ), but even more so by stimulation ( $\beta = 0.31$ ) and hedonism (negatively) ( $\beta = -0.35$ ). Individual political activity, in which none of the higher-order values played an important role, was motivated by four values at this level of precision: self-direction ( $\beta = 0.23$ ), stimulation ( $\beta = 0.19$ ) power ( $\beta = 0.26$ ) as well as security ( $\beta = 0.26$ ). Hypotheses 2a, 2b, 2c received support, while Hypothesis 2d did not.

Table 3. Hierarchical Multiple Regression Analysis for particular forms of civic engagement and sex, age, and four categories of value

N=203	SI		SP		IPA		PP	
	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$
Step 1		0.06**		0.02		0.13***		0.02
Sex	-0.09		0.13		0.29***		0.03	
Age	0.22**		0.09		0.24***		0.15*	
Step 2		0.13***		0.05*		0.01		0.01
Sex	-0.02		0.18*		0.29***		0.02	
Age	0.18**		0.07		0.23***		0.15*	
Self-transcendence	0.36***		0.20**		-		-	
Openness to change	-0.05		-0.01		-0.06		0.17	
Self-enhancement	-		-		0.01		0.15	
Conservation	-0.01		0.07		-0.02		0.27	
$F(5, 197)$		6.46**		3.09**		5.96***		1.44

Notes: SI – social involvement; SP – social participation; IPA – individual political activity; PP – political participation; self-enhancement values were rejected from regression analysis in service activities and self-transcendence values in political activities

\* -  $p < .05$ ; \*\* -  $p < .01$ ; \*\*\* -  $p < .001$ ;

Source: on study.

Table 4. Hierarchical Multiple Regression Analysis for particular forms of civic engagement and sex, age, and 10 basic values

N=203	SI		SP		IPA		PP	
	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$
Step 1		0.06**		0.02		0.13***		0.02
Sex	-0.09		0.13		0.29***		-0.03	
Age	0.22**		0.09		0.24***		0.15*	
Step 2		0.17***		0.20***		0.09**		0.06
Sex	-0.01		0.12		0.26***		-0.01	
Age	0.21**		0.07		0.23***		0.16*	
Benevolence	0.29**		0.22*		0.15		0.13	
Universalism	0.02		-0.08		-0.02		-0.09	
Self-direction	-0.13		-0.08		0.23**		-0.08	
Stimulation	0.07		0.31***		0.19*		0.18	
Hedonism	-0.16		-0.35***		-0.06		0.02	
Achievement	-		-		-		-	
Power	-0.15		0.06		0.26**		0.24	
Security	0.01		-0.01		0.26**		0.15	
Conformity	-		-		-		-	
Tradition	-0.17		0.10		0.18		0.17	
$F(10, 192)$		5.74***		5.61***		5.31***		1.78

Notes: SI – social involvement; SP – social participation; IPA – individual political activity; PP – political participation; achievement and conformity values were rejected from regression analysis;

\* -  $p < .05$ ; \*\* -  $p < .01$ ; \*\*\* -  $p < .001$ ;

Source: on study.

Of all the basic values analyzed, four are not associated with any form of civic engagement: universalism, conformity, tradition and achievement. Hypothesis 3 received support in terms of the value of universalism. In turn, the values of power and security are predictors of political activity as we expected, but only of individual activity. In addition, the demographics were important for social involvement (age) and for individual political activity (age and sex – males).

## 8. DISCUSSION

The aim of the present work was to investigate how values play a role in actions that benefit the common good. The significance of demographic variables was also included. In this research a new model of civic engagement, verified empirically, was used (Klamut, 2013, 2015). The adoption of formal criteria such as area of engagement and level of community provides an opportunity to cover a great variety of activities in one model. It allows not only to distinguish involvement in social or political activities, but also to more accurately characterize the specificity of voluntary actions and political activism, from the perspective of individual or collective action. Previous studies often lack theoretically justified criteria differentiating the classification of studied activities.

The adopted model of differentiation of civic engagement (Klamut, 2013) allows also to show the specificity of incentive in the context of values in presented research. As we assumed in Hypothesis 1, the four higher-order values are too complex to explain the specificity of different forms of civic engagement (e.g. Schwartz, 2012; Vecchione et al., 2015). The stronger dependencies relate to the ten basic values. A good example is social participation, in which the level of explained variance increases from 5% to 20% and individual political activity, which is not significantly explained by values at higher level, but is significantly related to values at a more specific level.

Particular forms of civic engagement are motivated by separate, specific sets of values, belonging to various higher order categories, as we assumed in Hypothesis 2. The intention of helping others is an important factor in undertaking social involvement (Omoto et al., 2010; Sagiv, Roccas, Cieciuch, Schwartz, 2017); therefore, benevolence is an important value (Schwartz, 2012), and Hypothesis 2a received support.

Social participation, as we assumed in Hypothesis 2b, is explained by the values of two out of the four higher-order values, focused on growth (Schwartz et al., 2012): self-transcendence (focused on caring for others) and openness to change (focused on self-expansion). Benevolence (self-transcendence) is important for both forms of activities aimed at service because it relates to actions taken for others (Pancer, 2015; Schwartz, 2012). However, if action is taken on a team basis, values from the area of openness to change (stimulation and lack of inclination to hedonism) are also needed. Hedonism in the Schwartz theory is opposite to benevolence, so an activity that is just not focused on self-gratification is well understood in pro-social (and group) engagement (Omoto et al., 2010; Schwartz, 2007).

Hypothesis 2c also received support. Commitment to individual political activity depends on the most complicated set of values. The values of self-direction and stimulation (openness to change values) are preferred, which means that independence and creativity in thinking are important. So a politically active person cares about important personal issues. This may be a subjective interest or it may concern the existing social order (Schwartz, 2012). Simultaneously, power (self-enhancement) and security (conservation) are important, both of which lead to avoiding or overcoming threats related to the control

of relationships and resources (Schwartz, 2002). This set of values in the context of individual political activity is not verified in other countries and may depend on a specific political situation, as in Poland.

What is interesting is the lack of importance values in terms of motivating collective political activity (Hypothesis 2d). However, the political activism analyzed in ESS (Schwartz, 2007; Vecchione et al., 2015) was rather characterized by individual activities and some values revealed as important in the analyses (stimulation and self-direction) connected with this research predicted individual political activity. Collective engagement in politics in Klamut's model (2013) includes the point of view of ordinary members, who work in political organizations as a team rather than as leaders. Perhaps in this form of engagement other factors than values, like needs or personality traits are more important (Bekkers, 2005; Caprara et al., 2006; Feldman, 2003). Summing up, in hypothesis 2, three out of four assumptions concerning the model of the studied dependence were confirmed. The results show that there are sets of values that are predictors of three forms of civic engagement.

Analyzing the results concerning demographic variables, we see that they play a role in individual activities, age in both social and political (cf. Bekkers, 2005), and sex in individual political activity (cf. Barrett, Brunton-Smith, 2014). They add a few percent points to the explained variability of civic engagement results. In individual political activity they play a greater role than values.

The presented study was conducted in Poland, and this proves significant in the context of drawing conclusions and posing further research questions. The specificity of civic engagement in Poland and the countries of Central-Eastern Europe is observable in many works (Nyćkowiak, 2009; Radkiewicz et al., 2008; Schwartz, 2002; Vecchione et al., 2015), including the presented research.

As we expected in Hypothesis 3, there is a lack of universalism in explaining various forms of civic engagement, while power and security emerge as relevant in terms of explaining political activity. Probably the lack of relationship between civic engagement and universalism in Poland is the effect of a low level of general social trust, and this aspect of trust is connected with universalism (Schwartz, 2007). People from Poland as well as Central-Eastern European countries generally do not trust strangers, but those with whom they are in a close relationship (Lewicka, 2011). The significance of power and security, and the lack of universalism indicates that political engagement in Poland is more strongly motivated by self-protection values than in other countries (Schwartz, 2012).

On the other hand, the scores obtained in Poland and other countries show some similarities. Benevolence in service activity, self-direction in political activity and stimulation in both play similar roles, which indicates greater universality of the described dependencies (Vecchione et al., 2015).

## 9. LIMITATIONS AND FUTURE DIRECTIONS

The conducted research, however, faced certain limitations. Some of the PVQ scales did not meet reliability cut offs, which can put a question mark over the obtained results. Although similar levels of Cronbach's alpha are also indicated in other studies (Cieciuch, Zaleski, 2011; Schwartz, 2007), one should be aware of the insufficient accuracy of the scales used.

Yet another restraint on the broad understanding of the obtained results is the fact that the research was conducted in one country only. Thus, there is a need for comparative

research aiming to verify whether the studied relations are universal, whether they are specific to Poland, or more broadly to the countries of the Central-Eastern Europe, which still struggle to leave the Soviet sphere of influence (Nyćkowiak, 2009; Radkiewicz et al., 2008; Vecchione et al., 2015). Interesting are the insignificance of universalism in elucidating various forms of civic engagement and the importance of power and security in explaining individual civic activity. Comparative research could provide answers to the above questions, and the four-form model of civic engagement may well prove valuable (Klamut, 2015).

Values are an important factor in explaining why people undertake activities in the public interest. However, values as a motivational factor play a role when they are personally relevant (Schwartz, 2007). Therefore, knowledge of values relevant for various forms of civic engagement can facilitate a better understanding of social processes, and also have some practical significance in building the quality of social and political functioning among both children and adults. It can be used in the upbringing of children (cf. Krzywosz-Rynkiewicz et al., 2017), as well as in motivational or persuasive processes (Omoto et al., 2010; Stukas et al., 2016). The promotion of specific values (e.g. benevolence) by parents, school or media can increase the motivation to engage in civic engagement and bring benefits to society (Sagiv et al., 2017).

It is worth noting that values in a 10-type model account for no more than 20% of the variance in results for different forms of activity. The scores received show that it would be worth repeating this research, with 19 more narrowly defined values (cf. Schwartz et al., 2012). In motivational models explaining involvement in different forms of civic engagement, other more basic factors like needs should also exist, dependently on the form of activity (Omoto et al., 2010; Stukas et al., 2016). The context of upbringing processes, that is important in building the system of values (Schwartz, 2007) should also be included (Krzywosz-Rynkiewicz et al., 2017; Zaff et al., 2008). We already know a lot, but much is still to be discovered. This should be an area for future research.

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## COORDINATION OF OPTIMISATION TARGETS AT DIFFERENT LEVELS OF CHARGING INFRASTRUCTURE DEVELOPMENT MANAGEMENT

The work considers the problem of optimising the urban charging infrastructure as a multi-channel mass service system with a queue. Queues at charging stations are due to the shortage of energy resources in the studied region. An algorithm has been developed and implemented to optimise a charging station for electric vehicles based on the criterion of meeting charging demand has been developed and implemented. At the same time, the main parameters of the system during peak hours were taken into account. The algorithm allows to determine the optimal number of chargers at the station depending on the target value of the demand for charging in the customer radius area. To implement the charging station optimisation model, taking into account the requirements of the entrepreneur, an algorithm has been developed to determine the average queue length based on dynamic data structures. The algorithm is based on an object-oriented modeling paradigm and supports the possibility of using variable statistical values that change during the day. The optimisation algorithm in the charging infrastructure development management system at the business level uses parameters obtained at the customer and society levels. Thus, the connection between the levels of management of the development of the urban charging infrastructure and the possibility of their consistent application has been proven.

**Keywords:** charging infrastructure, electric vehicle, optimisation problem, queuing model.

### 1. INTRODUCTION

In order to meet the growing demand for electric vehicles, it is necessary to ensure uninterrupted and efficient charging. The application of programmes to optimise and develop the charging infrastructure will make it possible to easily expand their network as the demand for electric vehicles grows. There are several strategies for the development of

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charging stations: planning their placement (Thingvad et al., 2021; Unterluggauer et al., 2022; Liubiyi et al., 2020; Zhenzhao, 2019; Gavranovic et al., 2014; Shengcan Yu, 2019; Hisatomo Hanabusa et al., 2011), development of fast charging infrastructure (Mohammed et al., 2024), integration with intelligent networks (Wadi et al., 2023; Sun et al., 2020), implementation of client incentive programmes (Azin et al., 2023), development of mobile applications and adapted on-line platforms, integration with renewable energy sources (Barman et al., 2023; Allouhi, Rehman, 2023). Most strategic solutions and existing optimisation methods can be adapted to manage the development of any enterprise and its infrastructure. The above strategies are generally defined by global or local social problems and rely on methods and algorithms based on forecasted charging demand. In the process of choosing a strategy, it is necessary to simultaneously take into account the goal of optimising the charging infrastructure from the point of view of various stakeholders. Śmieszek et al. (2023) performed a mathematical formulation of the problem of multi-criteria optimisation of the charging infrastructure for three vectors of development: based on the requirements of customers, entrepreneurs (businesses) and society. But the algorithm for solving the given task was developed only at the level of society's needs. The completed formulation of the problem does not take into account the load limitation that the network infrastructure can support. In addition, there is a difficulty in bringing the proposed objective functions to a common criterion due to the use of incompatible methods of their determination.

The requirements of different interested parties can be taken into account by agreeing on common parameters in separate optimisation criteria. If we consider a charging station as a mass service system, the number of charging points, the intensity of arrival of electric vehicles at the station, the average charging time and others can be determined among the common parameters. At the same time, the moments when customers arrive at a charging station in the model of a multi-channel mass service system are subject to the Markov (Poisson) distribution law (Mohammed et al., 2024). Based on the cost model for queuing systems (Taha, 2007) Śmieszek et al. (2023) proposed a criterion to optimise the charging infrastructure at the business level. The criterion minimises the sum of costs for servicing charging points and losses from delays of electric vehicles in the queue per unit of time. Gulbahar et al. (2023) also uses a queuing decision model to determine the optimal number of charging stations and charging points. Their cost model takes into account the cost of building a new charging station (if necessary), the cost of installing a new charger and penalty costs for not meeting charging needs on the motorway. This model is adequate only under the following assumptions: there is no queue, the electricity supply in the charging system is not limited, there are no electric trucks and motorcycles among the customers. The intensity of the arrival of customers at the station is determined based on the analysis of time series. In the described cost models (Śmieszek et al., 2023; Gulbahar et al., 2023), restrictions are imposed on their parameters.

This paper is a continuation of the authors' research on determining the demand for charging electric vehicles (Tarandushka et al., 2022) and modeling the task of optimising the charging infrastructure (Śmieszek et al., 2023).

The purpose of this article is to develop algorithms for optimising the charging infrastructure at the customer and business level based on queuing models. It is also important to integrate different levels of optimisation through the reconciliation of results obtained by different criteria.

The article consists of an introduction, three main sections and conclusions. The introduction substantiates the relevance of the research topic, defines the purpose of the

research. In the first section, the approach to solving the optimisation problem at the level of customers of the charging station is considered. The second chapter describes the charging station optimisation algorithms at the business level. In the third, the relationship between the levels of development of the charging infrastructure is defined; an attempt is made to integrate three optimisation criteria in the generalized algorithm. The conclusions highlight the strengths and weaknesses of this study, as well as directions for future research.

## 2. IMPLEMENTATION OF THE GOAL AT THE CLIENT LEVEL

In the course of a previous study (Tarandushka et al., 2022), the task of designing a new network of charging stations for electric vehicles was solved based on the number of electric vehicles predicted for 2025 in the city of Cherkasy, Ukraine. The number of electric cars was determined by the profile of a potential owner of an electric car. Due to martial law, there is a lack of financial resources for complete restructuring of charging station networks in small cities in Ukraine. Based on this, it is urgent to reorganise the work of individual stations in the existing network.

We will consider a city charging station for electric cars as a queuing model of the  $(M/M/c)$  type, where  $c$  – the number of charging places (Mohammed et al., 2024). Then, within the customer radius, the target function of the station optimisation problem (Śmieszek et al., 2023) at the customer level can be reduced to a ratio that determines the proportion of satisfied demand among the incoming customer flow:

$$TF_1 = \frac{EfDemand}{ForecDemand} \sim \frac{\lambda_{eff}}{\lambda} = \frac{(1-p_N) \times \lambda}{\lambda} = 1 - p_N \rightarrow Threshold \quad (1)$$

where  $EfDemand$ ,  $ForecDemand$  – effective and predicted charging demands, respectively (Śmieszek et al., 2023),  $\lambda$ ,  $\lambda_{eff}$  – the intensity and effective intensity of customers visiting the charging station,  $p_N$  – steady-state probability of  $n$  clients,  $N$  – station capacity (number of places for charging (station capacity) and additional places for waiting),  $Threshold$  – target value, which is determined from given additional conditions.

The EcoFactor Charging Station, Cherkasy, Ukraine, was chosen as the research object. This station contains 7 charging points. Śmieszek et al. (2023) investigated the state of the electric vehicle fleet in Ukraine and showed that the most popular brand in the Cherkasy region is the Nissan Leaf. Therefore, we will take the average indicators of the mass service system for this model. The EcoFactor Charging Station is equipped with three chargers for Nissan Leaf. The station is located in the city centre. Within a radius of 500 m from the station, there is a central market, a shopping centre, office premises, residential buildings, a stadium, the Main Department of the National Police of the region, small shops, city transport stops. The client radius area is very busy. The main roads of the city pass here. Many visitors from other cities in the Cherkasy region enter the customer radius every day. The situation is complicated by the fact that, starting from February 2022, there are many refugees from the occupied territories in this region. Therefore, it is not possible to calculate the intensity of the incoming flow of customers based on the number of registered cars in the customer radius area.

According to Taha (2007), the probability that there will be no free places on the territory of the station is determined as follows:

$$p_N = \frac{\rho^N}{c!c^{N-c}} \times p_0 \quad (2)$$

$$p_0 = \left[ \sum_{n=0}^{c-1} \frac{\rho^n}{n!} + \frac{\rho^c \left(1 - \left(\frac{\rho}{c}\right)^{N-c+1}\right)}{c! \left(1 - \frac{\rho}{c}\right)} \right]^{-1}, \rho \neq c \quad (3)$$

$$p_0 = \left[ \sum_{n=0}^{c-1} \frac{\rho^n}{n!} + \frac{\rho^c}{c!} (N - c + 1) \right]^{-1}, \rho = c \quad (4)$$

where  $\rho$  – the intensity of the outgoing flow of customers of the station,  $\rho = \lambda/\mu$ .

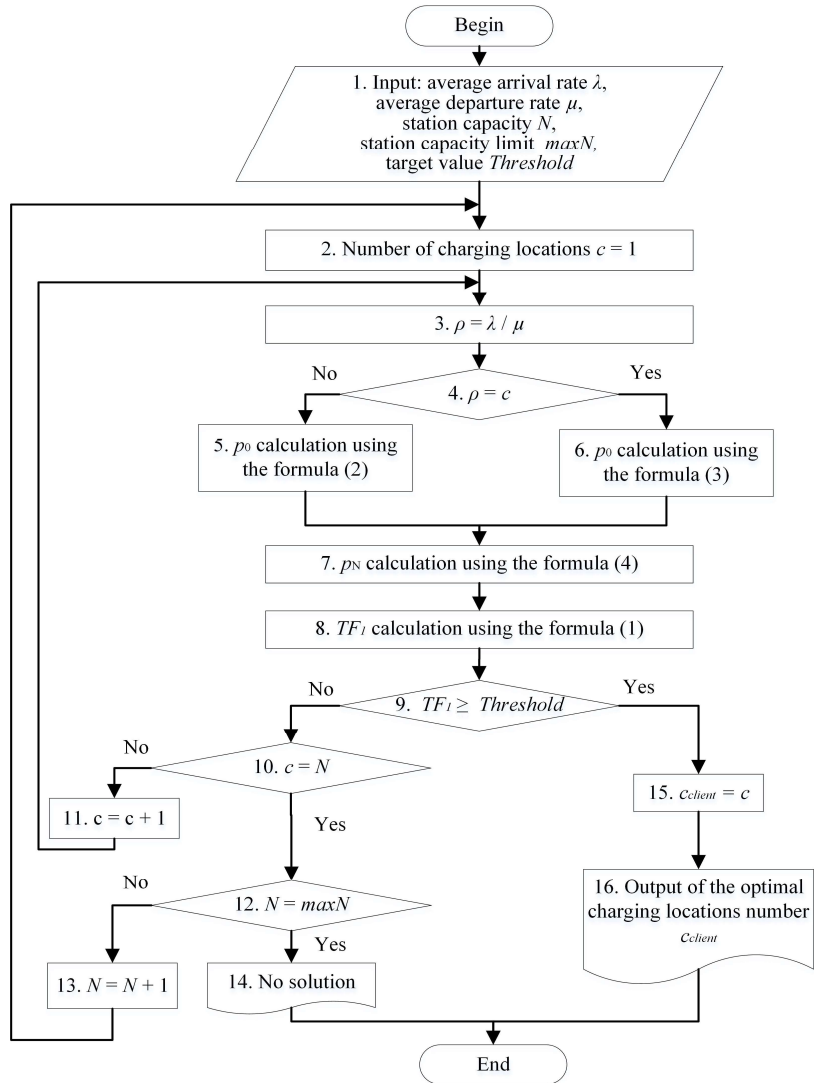


Figure 1. Optimisation algorithm at the client level

Source: own work.



The optimisation parameter is the number of charging places  $c$  under the condition of the constant power of the station  $N$ . The power of the station can be increased subject to the available land and financial resources, which are determined by the constraints of the optimisation task at a higher level of management (levels of society). If correlations between the power of the station and other system parameters are determined, then it is appropriate to choose the customer radius and the customer loyalty ratio as optimisation parameters (Śmieszek et al., 2023). A consolidated optimization algorithm at the client level is presented in Figure 1.

Based on observations and a questionnaire of Nissan Leaf owners, it was determined that the average daily frequency of visits to the  $\lambda$  station is 7 car/hour, the time for fast battery charging for the Nissan Leaf  $t_{charge} = 30$  min,  $\mu = 0.5$  car/hour. Nissan Leaf cars can use 3 of the seven charging points,  $c = 3$ . The station has two additional parking spaces for station customers only. Therefore, the capacity of the station is  $N = 5$  cars. The maximum station capacity  $N_{max}$  is determined on the basis of social indicators (Śmieszek et al., 2023). Taking into account the lockdowns and peak hours at this station, there was often a queue for charging points. Despite the availability of parking spaces along the adjacent streets, all of these spaces are usually occupied. Electric cars that did not get to the station are forced to look for another charging station. When determining the optimal number of charging points, it is not enough to take into account only the average length of the queue. It is necessary to take into account the maximum possible length of the queue during peak hours. Because we accept the target value of customer satisfaction  $Threshold = 0.9$ . That is, only 10% of electric car owners are expected to be able to get to the station. Intermediate results on individual iterations of the algorithm (Figure 1) are shown in Table 1.

Table 1. Intermediate results of the charging station optimisation algorithm at the client level

$N$	$c$	$p_0$	$p_N$	$TF_1$
5	1	0.001360718	0.714674491	0.2853
5	2	0.013712204	0.450119178	0.5499
5	3	0.027906526	0.271426495	0.7286
5	4	0.033904665	0.185493395	0.8145
5	5	0.035210945	0.154112070	0.8459
6	1	0.000388625	0.714396750	0.2856
6	2	0.007670268	0.440624707	0.5594
6	3	0.021194869	0.240504932	0.7595
6	4	0.029170153	0.139641901	0.8604
6	5	0.031782318	0.097373903	0.9026
6	6	0.032306621	0.082483543	0.9175

Source: own work.

The values of  $TF_1$  in Table 1 show that increasing the number of charging places at the expense of parking places does not give the target value of customer satisfaction. It is necessary to increase the capacity of the charging station by one place  $N = 6$  cars. At the same time, the minimum number of chargers is  $c = 5$ , and the minimum number of additional waiting places is 1.

### 3. IMPLEMENTATION OF THE GOAL AT THE BUSINESS LEVEL

At the business level, the charging station optimisation target is set by a cost model (Śmieszek et al., 2023). This model attempts to balance service costs with service delay losses. The last indicator depends linearly on the length of the formed queue. To determine the average length of the queue, an algorithm is proposed, the block diagram of which is presented in Figure 2. The algorithm is based on the use of a dynamic data structure Queue.

The main subroutines for working with the Queue have been applied for the specified structure: checking the fullness of the queue `QU.IsEmpty()`, determining the current number of electric cars in the queue `QU.GetCount()`, adding to the queue `QU.Add()` and removing electric cars from the queue `QU.Extract()`, obtaining the time intervals between the arrivals of individual electric vehicles at the charging station `QU.GetWait()`, viewing the current state of the queue `QU.Show()`.

The algorithm simulates the movement of electric vehicles at the charging station during the day (arrival at the station, waiting in line and at charging points, departure). At stages 1-5, initial statistical information is entered. At stage 7 a queue is formed, which is empty at the beginning of the algorithm. At the beginning of a new day, the counter of electric vehicles that have arrived at a charging station is assigned a zero value (stage 8).

The cycle counter (step 9) takes the value of the current time of day from the beginning to the end of the movement in minutes. The traffic at the charging station can last 18 hours (from 5:00 a.m. to 11:00 p.m.). A curfew has been implemented in the region at night due to the introduction of martial law on the territory of the country. At each iteration of the cycle, it is checked which period of the day the current time belongs to (stage 10), as well as the conditions for the arrival of a new electric vehicle at the station (stage 13) and the performance of fast charging (stage 15). If conditions 15 and 19 are fulfilled, then the first electric car in order is removed from the queue (stage 20) and the total waiting time of all customers who used the services of the charging station (cycle 22) is calculated according to formula (5):

$$WaitTime = \sum_{j=1}^n \sum_{k=1}^L Wait_{jk} \quad (5)$$

where  $n$  – the number of electric cars that have reached the charging points and therefore are removed from the queue,  $L$  – the current length of the queue,  $Wait_{jk}$  – the arrival interval between electric cars in the queue after the  $j$ -th customer (may differ depending on traffic intensity).

Thus, the waiting time of each customer is defined as the sum of the time intervals between the arrival of those electric cars that managed to drive to the charging station for the given  $k$ -th electric car until the moment it is connected to the charger.

The algorithm provides a review of the current status of the electric vehicle service system at the charging station in 30-minute increments. The average length of the queue can be determined in alternative ways to stage 25 if it is impossible to determine the effective intensity of arrivals at the station.

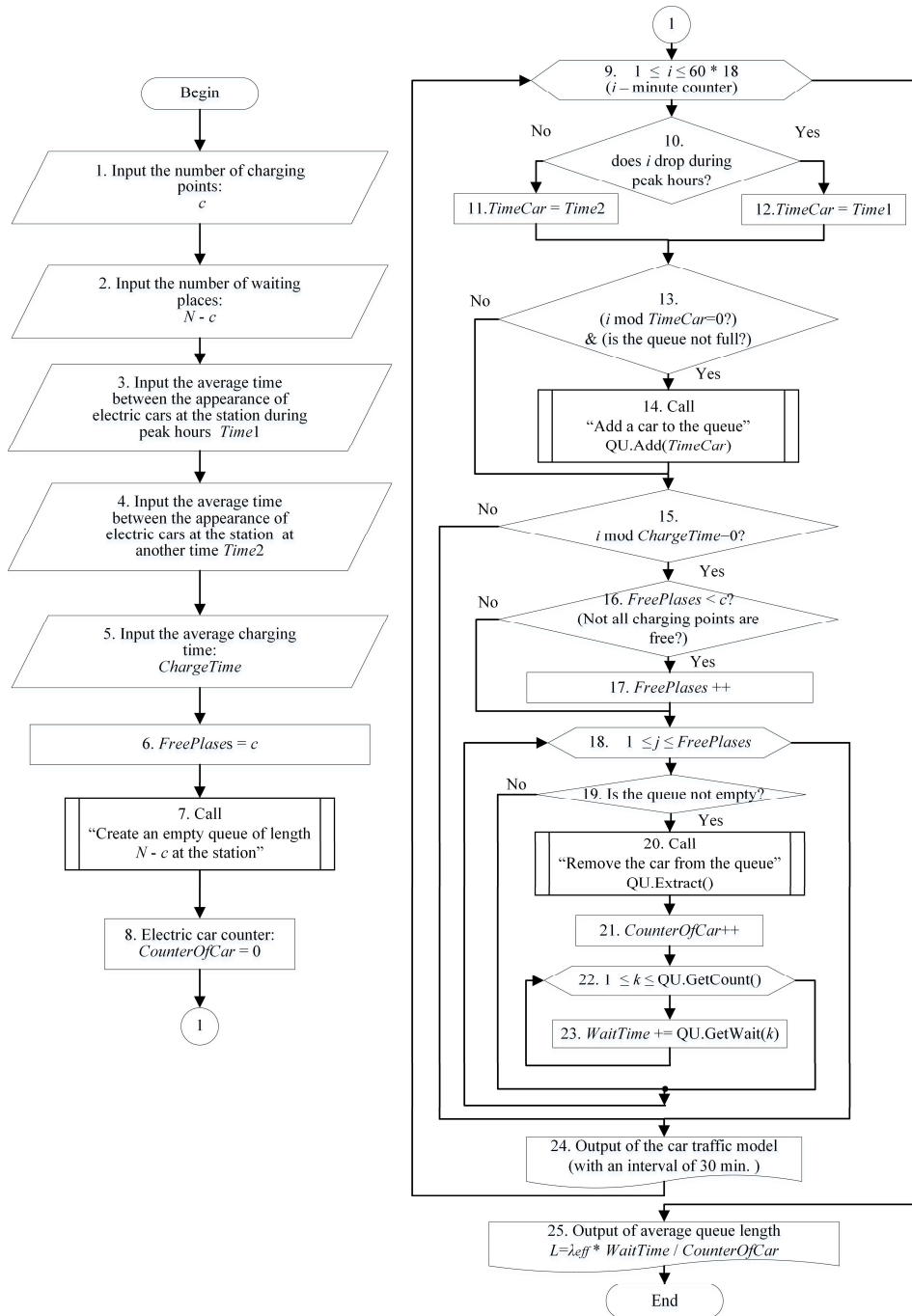


Figure 2. Defining the parameters of the target function at the business level

Source: own work.

The optimal capacity of the charging station (number of chargers) is determined similarly to the model at the client level. The objective function at the business level ( $TF_2$ ) is correlated with the average queue length (Śmieszek et al., 2023). Therefore, we repeat the algorithm (Figure 2) each time when the number of chargers  $c$  increases by 1. In the previous iterations,  $TF_2$  increases when  $c$  increases. When  $TF_2$  decreases, the execution of iterations is completed. The optimal value of the chargers is taken to be  $c$ , which corresponds to the maximum value of  $TF_2$ . In this way, a balance is achieved between service costs and customer losses.

#### 4. CONCLUSIONS

Based on previous research (Śmieszek et al., 2023), it became possible to develop algorithms for multi-criteria optimisation of charging stations in the management system for the development of charging infrastructure at the client and business level. It turned out to be impossible to combine the target functions of different levels of management into an integral function for the given task, since the implementation of the goal at the level of society is not based on analytical dependencies, but on the use of soft technologies. When applying the algorithmic approach, it was possible to combine the procedures for achieving individual optimisation goals into a single logical sequence. The algorithms developed in this article are fully consistent with the optimisation algorithm at the level of society in a multi-level management system (Śmieszek et al., 2023). In the formulated optimisation problem, the charging station is considered as a multi-channel mass service system with a queue. The existence of a queue is justified based on the conditions of operation of the network of charging stations in the studied region. The existing methods for determining the structure and capacity of the charging infrastructure do not ensure the adequacy and implementation of appropriate models and methods in unstable conditions of shortage of energy resources. The proposed method will allow to reduce financial costs in the process of managing the development of the charging infrastructure and takes into account the specifics of the location. At the level of society, the limitations of the parameters of the charging infrastructure are identified, and requirements regarding the energy efficiency, environmental friendliness and safety of the stations are formed. Identified limitations must be taken into account at the client and business level. At the customer level, the effective demand for charging and the minimum number of charging points are determined. This value is specified at the level of the entrepreneur and is within the limits defined at the other two levels of management. In this study, the case where the charger is operated by an electric vehicle of another brand (in the presence of several connectors) was not foreseen. This case reduces the power of the station. Additionally, there are no ways to determine the target threshold at the client level. The problem is solved under the condition of a probable loss of 10% of the forecasted demand for station services. Further research will be aimed at extending the proposed methodology to the urban network of charging stations for electric vehicles.

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## THE END OF THE UKRAINIAN-RUSSIAN WAR: NEW/OLD THREATS TO POLISH INTERNAL SECURITY AND PUBLIC ORDER

This article raises the issue of the threat that may be posed to Polish internal security after the end of hostilities in Ukraine by former soldiers and volunteers fighting on the Ukrainian side. When discussing cross-border crime, the author points to areas that may be of interest to informal veterans' organizations, as well as to the possibility of penetrating the criminal world of former military personnel. Presenting threats, the author also points to tasks for the Polish border protection system in the field of combating organized crime.

**Keywords:** internal security, border protection, smuggling, cross-border crime, Ukrainian-Russian war, armed forces, combating organized crime.

### 1. INTRODUCTION

The ongoing armed conflict directly across Poland's eastern border caused by the brutal aggression of the Russian Federation against Ukraine since February 24, 2022, since February 24, 2022, must sooner or later end due to the strategic advantage of one of the parties and the inability of the defeated side to continue military operations. Many contemporary analysts and commentators of events are already asking themselves: when and under what conditions will the Ukrainian-Russian war end?, what will the world look like after the end of the largest and bloodiest war that took place on the European continent after World War II. What will the "new order" in Europe be like after the end of the war? Will Ukraine return to its pre-2014 borders and what will the relations of the democratic world with post-Putin's Russia look like?

The end of modern armed conflicts is usually preceded by a truce between the warring parties, followed by arduous political negotiations, during which negotiators try to force the warring parties to end hostilities and start peace talks. It is also the preparation of an international peace conference under the aegis of the UN or the OSCE just after the suspension of hostilities between Ukraine and Russia. A conference at which new security mechanisms in Europe and the world will be determined. Discussions between diplomats and experts will probably take place along the lines of the existing peace conferences in

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Versailles after the<sup>2</sup> First World War and in Potsdam<sup>3</sup> after the end of World War II. It will be a period of intense negotiations in the privacy of the cabinets of experts in the fields of international law, security, diplomats, and the military. During the backstage talks, issues concerning the creation of a new system of international security by improving the existing one will be discussed. During the talks, the issues of guarantees for individual states participating in the conflict and newly written guarantees regarding the inviolability of national borders will be discussed, in short, a new political order will be created in Eastern Europe. Given the above, the question arises whether, during future peace talks, there will be time to raise the issue of securing weapons and ammunition that have been accumulated by both sides of the conflict and how to manage the released human resources after the demobilization of the armed forces of both armies. How to ensure safety in the areas covered by the fight and how to reduce the occurring pathologies in these areas.

Therefore, the purpose of the above article is to indicate what possible threats may arise to the internal security system of the state, the system of state border protection, and public security of Polish citizens, at the end of hostilities on the Polish-Ukrainian border, on the territory of Poland and the territory of the European Union. How this event will have an impact on the possible increase in crime in Poland? It is also an indication of new tasks arising in this area for Polish services responsible for the system of state border protection and cross-border security, which is mentioned by the author of this article during classes in the field of internal security with students of the National Academy of Applied Sciences in Jarosław in the subjects of State Border Protection and Cross-border Crime. Not without significance for the presented content is the fact that the author has professional experience in this area gained from the period of service in the Border Guard. This is a discussion article and is the basis for future reflections on the creation of a new security strategy for the Republic of Poland in this area.

## **2. THE PROBABILITY OF THE FORMER UKRAINIAN ARMED FORCES SOLDIERS, PARTICIPATION IN ORGANIZED CRIME IN THE TERRITORY OF THE REPUBLIC OF POLAND**

While signaling in the introduction to the article about the threats to Polish internal security immediately after the end of hostilities in eastern Ukraine, it should be stated that it may cover the following areas:

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<sup>2</sup> The armistice signed on 11 November 1918 formally ended hostilities in Europe. The next stage aimed at the definitive end of the war were peace negotiations with the participation of the parties to the conflict. A peace conference was therefore convened in Paris. The meeting lasted in Versailles from January 28th, 1919 to January 21st, 1920. The conference was attended by representatives of the 27 victorious states. As a consequence of the talks, on 28th June 1919, a peace treaty was signed ending the First World War, new borders were established and confirmed, and a new political order in the world was defined. The treaty was signed in the Hall of Mirrors of the Palace of Versailles by the Allies and by defeated Germany (more precisely: Batowski, 2001),

<sup>3</sup> The Potsdam Peace Conference lasted from 17 July to 2 August 1945. The deliberations took place at Cecilienhof Palace in Potsdam. It was the last meeting of the Big Three. The peace conference was attended by the leaders of the anti-Hitler coalition. The purpose of the peace conference was min. establishing a new political order after the end of World War II, determining the fate of defeated Germany, liquidating the effects of diplomatic decisions from 1938–1945, and punishing Nazi war criminals. The consequence of the conference was the division of Europe into two rival political and military blocs. It also means leaving Polish in the sphere of Soviet influence (more on: Wieczorkiewicz, 2014).



- the creation of informal veterans' organizations bringing together former soldiers and volunteers fighting on both sides, which will take control of the criminal world;
- smuggling of weapons and ammunition from Ukraine and Russia to Poland and the European Union;
- the illicit production and subsequently smuggling of drugs, alcohol, and tobacco products;
- the emergence of human trafficking on a wider scale;
- money laundering and counterfeiting of payment methods and securities;
- the emergence of groups involved in imposing "specific levies" on business entities legally operating in Poland and the European Union established by Ukrainian citizens;
- an attempt to take control of financial resources and the redistribution of economic aid coming from around the world as part of the Ukrainian reconstruction plan (more precisely: Hołyst, 2000).

The above-mentioned areas related to international crime that may appear immediately after the end of hostilities require new attempts to define the border crime of foreigners<sup>4</sup> and define tasks for individual services and inspections forming a Polish state border protection system. When analysing the above threats, they should be considered in the context of the border and borderline and the function that the state border borderlines play in the internal security system (for more information: Donnan, Wilson, 2007). Not without significance for the safety of the local community living in the border area is the presence of border services involved in combating organized and cross-border crime. It is on their effectiveness that the state of security depends, but also the level of public trust in the State, which remembers and "cares" about its borderlands. Returning to the issue of border protection, it is necessary to present, which will be important given the issues raised, the functions of the border:

- military – protection, and defense of the territory of the Republic of Poland against foreign military intervention and against penetration of foreign intelligence services;
- economic – protection of its own market and state control over the flow of goods;
- social – through the process of border control, the impact on the movement of people between bordering countries and thus on the state of security;
- psychological – creating negative or positive ideas about people living on the opposite side of the border.

When presenting the functions of the state border in the twenty-first century, it is necessary to mention the entities forming the system of Polish border protection. According to the study by Andrzej Wawrzusiszyn, the Polish border protection system is based on two pillars: the command subsystem and the executive subsystem, which includes: the consular service, border guards (Border Guard and National Tax Administration), the

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<sup>4</sup> According to Magdalena Perkowska, border crime includes the following acts: crimes concerning the compliance of crossing the state border with the regulations, crimes concerning the credibility of documents entitling to cross the state border, fiscal crimes referred to in Article 134§ 1 point 1 of the CCC, crimes, and offenses specified in the Act on Foreigners and in the Act on granting protection to foreigners on the territory of the Republic of Poland, crimes related to crossing the state border or movement across the state border of excise goods and goods, objects specified in the provisions on weapons and ammunition, on explosives and in the regulations on counteracting drug addiction as well as those specified in the regulations on population registration and identity cards (more: Perkowska, 2013).

Office for Foreigners and Polish special services (Internal Security Agency, Foreign Intelligence Agency, Central Anti-Corruption Bureau, Military Intelligence Service and Military Counterintelligence Service). The activities of these services are supported by separate structures of institutions, services, and inspections (Wawrzusiszyn, 2020).

Approaching the main topic of the publication, which is to signal the threat that they may pose to the internal security system of the European Union countries, these Polish were international volunteers and soldiers of the Armed Forces of Ukraine after demobilization. The outbreak of a full-scale war between Russia and Ukraine contributed to the fact that in the face of an external threat, Ukraine needed military support, including volunteers who would undertake the effort of defending the state. To meet this demand, literally three days after Russia's aggression against Ukraine, on February 27th, 2022, the President of Ukraine Volodymyr Zelensky signed a decree allowing the creation of the International Legion of Territorial Defense of Ukraine, thus opening the way for recruitment of volunteers from other countries. This event resulted in the fact that the armed forces in Ukraine soon included representatives from over 52 countries, including Poland. Over time, these forces grew into national legions, including those formed by citizens of Russia and Belarus. It is interesting that in the initial period, people from criminal circles managed to infiltrate the ranks of the fighting volunteers in Ukraine. An example of this can be the story of the commander of one of the volunteer legions, a citizen of the Republic of Poland, temporarily residing in Ukraine, Piotr Kapuściński (<https://www.dw.com/pl/ukraina-czy-by%C5%82y-polski-gangster-dowodzi-legionem-mi%C4%99dzynarodowym/a-62982598>), a gangster from Pruszków, wanted by a Warsaw court for crimes committed in Poland. How large the scale of people fighting in the ranks of the Ukrainian army with a criminal past, today is difficult to determine because probably no one kept such statistics. However, the participation of these people in the armed forces of Ukraine raises concerns. This is because the joint fight of international volunteers, against the Russian aggressor side by side with Ukrainian soldiers has created strong ties based on mutual relations, it is also the creation of a network of mutual connections. The relations established during the struggle between their participants will in the future be maintained within the framework of several types of often informal veterans' organizations or "Brotherhoods" gathering former soldiers of the Armed Forces of Ukraine. These organizations will transfer from the army to the civilian side the system of organization, the hierarchy of service, and the principle of loyalty to the members of the brotherhoods, which will make them hermetic. This will contribute to the fact that they will be difficult to survey by Polish special services dealing with combating organized crime. At that moment, it is very difficult to determine how many volunteers passed through the ranks of volunteer units, as well as through the armed forces of Ukraine. According to various estimates, it is assumed that about 20.000 soldiers serve in international volunteer legions, and about 750.000 Ukrainian soldiers in the Ukrainian army alone in 2023.

At this point, it should be emphasized that once hostilities end, the Ukrainian Armed Forces will face a peaceful footing, i.e. to the level of about 300–350 thousand soldiers. This means that the process of reducing the armed forces must take place in a brief time. The demobilisation will involve over 400,000 soldiers, including international volunteers, in connection with the dissolution of all volunteer units operating in Ukraine so far. It should be noted that the same process also awaits the Russian side<sup>5</sup>. For the vast majority

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<sup>5</sup> Dismissal of Yevgeny Prigozhin, the head of a private military company, the so-called Wagner Group, will release about 32.000 criminals pardoned by the Russian president who had previously

of soldiers, the end of the war will mean a return to normality, to everyday reality, to civilian life outside the army, and to the loss of income from the pay paid by the Ukrainian state. However, for a small group of former soldiers and volunteers, a new stage in life will begin; Looking for a way of life, they will infiltrate criminal groups. Having acquired qualifications during military training, combat experience gained during combat in Ukraine, as well as international contacts gained from the time of service at the front will become ideal candidates for criminal groups capable of performing almost any task. To this category of people should be added Ukrainian soldiers who, having great merits in the defense of the homeland, for various reasons were omitted by the existing system of awards and promotions by their superiors. Being, in their opinion, harmed by the system, and forgotten by the state heroes of the fights, they will try to compensate for their alleged moral losses by participating in criminal activities.

Weapons are a commodity that is in constant demand in criminal circles, and their trade brings certain profits to arms traffickers. Therefore, the illegal arms trade is another threat to the internal security of the Republic of Poland and European Union countries. Criminal groups are interested in weapons that are not registered anywhere, come from abroad, tested on the battlefield. At present, the ideal place to obtain this type of weapon and ammunition is the territory of Eastern Ukraine. This situation is because, over the past months, the Ukrainian armed forces have received support from the democratic world in the form of weapons and ammunition worth a total of US\$130–150 billion. In addition to specialized defense systems and modern military technology, military assistance also included equipment and personal weapons for Ukrainian soldiers, which are also in high demand among criminal groups. These weapons came from the arms depots of a broad coalition of countries supporting Ukraine in the fight against Russia and include various types and systems. Today it is difficult to determine precisely how many of these weapons were actually delivered to Ukraine as part of the aid packages. It is worth emphasizing here that the combat operations are dynamic, which means that no one really holds the fighters accountable for the consumption of ammunition and personal weapons on an ongoing basis, as well as no one tries to collect and secure them after the fighting. This, in turn, will make the battlefields of Mariupol, Bakhmut, Avdiyivka, and other similar places on the front line a place where significant amounts of ammunition, munitions, and weapons abandoned by the warring parties will be located. Another issue may be the illegal sale of weapons coming directly from military resources by dishonest employees and soldiers of the Ukrainian armaments service who want to make money from this practice. This creates easy access for those interested in weapons and ammunition in Ukraine, which may automatically translate into an increase in smuggling to Poland.

Given the above, the question must be asked, whether this is a large-scale phenomenon. Everything indicates that this may be the case. It is an open question to find a “safe” way to smuggle it across the borders to Poland and then to Western European countries. The

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been recruited to fight in Ukraine, will create a problem for the internal security system of the Russian Federation. It should be emphasized here that former members of the Wagner group, taking advantage of the amnesty as free citizens of Russia, will not be able to move freely outside the country. Traveling around the world, they will carry various pathologies behind them, and thus contribute to the increase in crime in the countries of their temporary residence. Another example of the threat posed to internal security by private armies operating on both sides of the front in the absence of state supervision over these formations may be the unsuccessful coup attempt of the Wagner Group that took place in Russia on June 23–24, 2023.

answer to this is the recent scandal with Ukrainian grain. It would seem that these are two different issues that have nothing to do with each other. Well, combining the facts, there are many indications that it may be one of the safe routes for smuggling various goods, including weapons and ammunition to Poland. Not so long ago, the Polish media circulated information that over 4 million tons of grain entered Poland in the last 8 months. Illustrating the scale of this phenomenon, journalists used the comparison that over 60 000 wagons were needed to transport such a large amount of grain<sup>6</sup>. Taking into account that on the Polish-Ukrainian border there are 5 active railway crossings in Dorohusk, Hrebenny, Krościenko, Przemysl, and Werchrata, as well as the time needed to clear bulk goods, which was grain, it should be assumed that the clearance of such a number of freight wagons by the border guards was almost illusory. This means that practically everything could enter Poland in the grain transports, including hidden weapons, ammunition and explosives.

Another place through which smuggling of this type of goods can take place are active road border crossings with Ukraine. In this scenario, we can talk about an attempt to smuggle individual pieces. It should be remembered that weapons are generally small size, and after disassembling them into parts and properly hiding them in transportation, they are extremely difficult to detect by border guards. Another issue may be the fact that these weapons can be brought to Poland as a trophy or a souvenir from their stay in Ukraine, by people who are not connected with the criminal world. An example of this is the famous case of the accidental use of a grenade launcher from Ukraine in December 2022 in the building of the Police Headquarters in Warsaw by the Chief of Police, General Jarosław Szymczyk. However, returning to the issue of smuggling weapons, ammunition, and explosives across the border, it should be stated that the “protective umbrella” over this criminal activity will possibly be spread by former soldiers of the Ukrainian army and volunteer units.

Another issue that may affect the state of internal security is the emergence of a large-scale phenomenon of human trafficking<sup>7</sup>. This crime will affect areas destroyed by hostilities, and the victims of this practice will be people who, due to the actions of the Russian aggressor, have lost their property, have been deprived of their livelihood and have lost the possibility of earning a living. Left without the care of state organizations and non-governmental institutions, in order to survive, will benefit from various suspicious job offers in Poland and other European countries. It is worth pointing out here that the armed conflict that is taking place in our eastern neighbour has caused a refugee crisis, and contributed to the mass migration of people from the areas affected by the fighting, which is an internal migration – the relocation of residents from the eastern regions of Ukraine to areas of Western Ukraine, which are relatively safe for civilians or international migration. It was a dramatic decision of millions of Ukrainian citizens to leave their homeland and

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<sup>6</sup> The number of wagons indicated above by the media is quite imprecise because the modern Tagnpps grain wagon produced in Poland by Ermewa SA has a loading capacity of 95 m<sup>3</sup>, a load capacity of 69.7 t. This means that over 57.000 wagons with the above capacity should be used to transport over 4 million tons of grain.

<sup>7</sup> The contemporary phenomenon of human trafficking includes various forms: sexual exploitation, forced begging, forced crime, domestic slavery, forced labour combined with extortion of loans, forced marriages and obtaining cells, tissues and human organs contrary to the law (more information: Wawrzusiszyn, 2020).

seek a safe shelter in neighbouring countries and in the European Union<sup>8</sup>. The emergence of traffickers in devastated areas without infrastructure is a typical activity described in the literature on the subject, which usually occurs in countries at war or affected by natural disasters. Therefore, according to the author of this article, it will also apply to the areas of Eastern Ukraine. This type of crime should be linked to the entry into the criminal structures of former soldiers and volunteers fighting in the Ukrainian armed forces, who, while in these areas, have a good understanding of the real situation of the inhabitants, as well as by virtue of their service in this area, can inspire confidence in potential victims of human trafficking. The participation of Ukrainian citizens in the organized smuggling of people on the Polish-Belarusian border is confirmed by press releases of the Polish Border Guard.

Another problem posing a threat to the internal security of the Polish state and Ukrainian citizens temporarily staying on the territory of Poland, which requires a broader discussion, is the attempt of “illegal taxation” by criminal groups of legally operating business entities established by Ukrainian citizens, as well as people who work legally in Poland and the European Union. According to statistical data from the Polish Economic Institute, only in 2022 Ukrainian citizens established approx. 15 000 companies (so-called sole proprietorships) and over 4000 companies with Ukrainian capital (<https://ksiegowosc.infor.pl/obrot-gospodarczy/dzialalnosc-gospodarcza/5649709,20-tys-firm-zalozyli-w-2022-roku-Ukraincy-w-Polsce.html>) in Poland. At the same time, the number of established companies in Poland is increasing every day, which means that the circle of people and companies that may be of interest to criminal groups from across the eastern border is potentially increasing. The imposition of various types of tributes in exchange for the care and protection of these institutions and the people working in them will be one of the main sources of financing criminal groups. In many cases, the motive for this type of action, especially for groups composed of former front-line soldiers, will be the belief that “they” fought for free Ukraine, spilled blood in the fight against the Russian aggressor, and at that time the owners of operating companies in Poland and the European Union lived normally, and by doing their business they were getting richer. This sense of injustice and lost time at the front will be the motive for former soldiers of the Ukrainian army to undertake criminal activity. Therefore, the “moral obligation” of Ukrainians staying at that time in Poland and other countries of the European Union will be to share the profits with veterans – to compensate for the blood spilled. As the previous experience of this type of organized crime activity in Poland indicates, these activities are of a brutal nature, aimed at intimidating potential victims by criminals through beatings, arson, and kidnapping of family members for ransom. This, in turn, will create a spiral of crime in Poland. A side effect of the anticipated events, which is extremely important for the sphere of broadly understood security, will be the loss of trust of Polish citizens and foreigners staying on the territory of Poland (benefiting from the protection of the Polish state) in public security organs and state authorities.

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<sup>8</sup> According to the data of the Border Guard, from 24.02.2022 to 27.04.2023, 11.44 million refugees entered Poland through border crossings with Ukraine, of which about 9,663 thousand returned to Ukraine during this period. This means that out of the total number of people who entered through Polish border crossings, about 1.8 million refugees remained in Poland and in the European Union. Precise information on the number of refugees from Ukraine in Poland is contained in data published by the Office for Foreigners, which show that at present 1 million Ukrainian citizens enjoy temporary protection in Poland, while over 1.4 million people have the right to stay in Poland.

End of the war The Ukrainian-Russian state is the beginning of a lengthy process of rebuilding the destroyed Ukrainian state, which, according to various estimates, will last several years and will be expensive. According to estimates from the World Bank, a huge sum of over \$410 billion (<https://forsal.pl/swiat/ukraina/artykuly/8695673,koszt-odbudowy-ukrainy-wyliczenia.html>) will have to be allocated to the reconstruction of the destroyed Ukrainian state. These amounts far exceed the financial capabilities of the Ukrainian state, which will therefore have to benefit from international support. This, in turn, will contribute to the fact that international companies and construction companies from around the world will be involved in the reconstruction of Ukraine. Therefore, the transfer of the necessary funds, technologies, construction equipment and materials will take place from the European Union to Ukraine, among others, through the Polish area. As in the case of arms supplies to fighting Ukraine, in this case Poland, having experience in this area, will become a great logistics hub and transfer centre for people traveling to Ukraine. This fact will mean that the transport of necessary equipment and materials will take place along communication routes running through the Podkarpackie and Lubelskie provinces bordering Ukraine. The insufficient infrastructure of border crossings, complicated customs procedures, and long queues of trucks waiting for border clearance will give rise to various pathologies in the field of customs circulation of goods imported into Ukraine.

This situation will make the borderlands and border crossings a place where organized crime will accumulate. It should be assumed that the other side of the conflict – Russia – will take all measures to prevent or slow down the process of rebuilding Ukraine from the devastation of war. As part of the hybrid warfare<sup>9</sup>, it will support criminal activity in this area by all possible means. A form of action of criminal groups will be collecting a kind of "toll" on goods moving across the border, for passing heavy goods out of turn, customs fraud when invoicing transported goods across the border, or proposing protection of convoys with equipment and building materials that will be used for reconstruction. It is also an increase in cases on both sides of the common Polish-Ukrainian border, attempts to corrupt border guards and various types of inspections responsible for the internal security of the state through organized crime.

As in the case of Ukrainian companies operating in Poland and the European Union, criminal groups will use the same technique of extortion or extortion against domestic and foreign companies operating in Ukraine. Veterans will offer their protection and care to investors operating in Ukraine in exchange for a share in the profits of these companies. They will also try to invest their capital from trafficking in people, weapons, drugs, and other criminal activities in legally operating Ukrainian or foreign companies. By introducing criminal funds into legal circulation, criminal groups will gain the opportunity to legalize their income and gain influence over the rebuilt Ukrainian economy. This, in turn, will provide them with a share in the profits from the financial assistance that will flow to Ukraine. At this point, it should be emphasised that the problem of combating corruption is treated very seriously in the European Union, and the lack of an effective response from the Ukrainian side to this phenomenon may result in the suspension of

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<sup>9</sup> According to the definition quoted by Yuri Hajduk and Tomasz Stepniewski - hybrid war is a combination of different actions, i.e. irregular tactics of warfare, terrorism, and crime at the same time and on the same battlefield in order to achieve the political goals pursued by the opponent. For more information (see Hajduk, Stepniewski, 2015).

investment programmes in Ukraine, as well as the suspension of Ukraine's integration process with the European Union, which would be a success for Russia.

### 3. SUMMARY

To sum up, it should be stated that the end of the war will undoubtedly generate new undefined threats in the sphere of Ukraine's internal security, and this will have a direct impact on the internal security of neighbouring countries. The old types of organised crime that have existed so far will evolve rapidly, change their nature, intensify, change in size and scale, become difficult to identify, and then liquidate by public security organs. The brutalization of public life, and the appearance on the Polish territory, of former soldiers of various trained and armed formations, capable of performing any task, will also pose a threat to the life and safety of law enforcement officers who will stand in their way when performing official tasks. Therefore, whether this will happen will largely depend on how the Ukrainian state deals with the problem of veterans of the Russian-Ukrainian war. Will it be able to use their potential in the process of rebuilding the state, creating favourable conditions for them to operate broadly within the framework of the applicable law, or will it leave former soldiers alone? This, in turn, will contribute to the fact that some of them, looking for their idea for further life, will go down the criminal path. Ending the war will require the large-scale introduction of various types of educational and assistance programs that will allow soldiers to switch to life in a new role. Leaving war veterans to fend for themselves, the lack of action on the part of the Ukrainian state concerning this category of people will contribute to an increase in the level of dissatisfaction, frustration in their ranks, and in extreme cases to entering the criminal world. What scale it will be – it is difficult to determine today. It will depend on various factors. Nevertheless, the four areas of criminal activity mentioned by the author, over which veterans' circles can take control, should be monitored by Polish special services, diplomatic missions and border guards, to respond to the threats on an ongoing basis. This requires a new approach to the border protection system by increasing intelligence activities far beyond national borders, as well as strengthening international cooperation between services in the fight against corruption and organized crime, including cross-border crime. This will require close cooperation with the Ukrainian law enforcement authorities. It is also an indication of the role that Polish consular services are to play in this process in the field of visa policy, whose task will be to filter people applying for a Polish visa in consular offices based on cooperation with border services, to prevent people suspected of participating in organized crime from entering the European Union.

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## THE CONCEPT OF CUSTOMER COST ACCOUNTING IN CUSTOMER RELATIONSHIP MANAGEMENT

In any enterprise, the customer plays a key role as the main “provider” of revenue. The profitability of a particular enterprise depends on appropriate customer relations. Profitable customer relations are crucial for conducting and continuing business. The purpose of this article is to present the author’s concept of customer cost accounting, which will effectively support decision-making in optimizing customer relations. The main basis for the conceptual work on the customer account is research conducted on 178 companies, the results of which clearly indicated the need to analyze the profitability of customer relationships. The research used a survey questionnaire and statistical tools. First, basic statistical measures were applied. Non-parametric tests were used to evaluate the relationships between variables: Pearson’s chi-square test, Spearman’s rank correlation, and the Kruskal-Wallis ANOVA test. Through the research, three theses were falsified and confirmed.

**Keywords:** customer, costs, customer relationship management.

### 1. INTRODUCTION

The main goal of any business is to achieve a positive financial result. This statement is particularly relevant in the short term, because in the long term, business owners expect the value of their enterprises to increase. However, value growth for owners is not possible without sustained maintenance of a positive financial result in the operational dimension. For this reason, the actions of business managers are constantly evaluated through a financial prism. The profitability of a given action justifies the legitimacy of its performance.

Profitability, in general, is defined as the achievement of business revenues that exceed the costs of doing business (Drabik, Kubiak-Sokół, Sobol, Wisnikowska, 2009). Profitability is also a measure of the effectiveness of an activity, and that of an effective activity. Efficiency is a measure that determines the ratio of the results of an activity to the expenditures an enterprise has incurred to achieve those results. Efficiency, on the other

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hand, is the ability to achieve the desired results (Drabik et al., 2009). It is often measured in terms of binary or percentage performance.

Profitability will present a certain dichotomous perception of business: on the one hand, it concerns revenues that increase this profitability, and on the other hand, one must reckon with the costs that are inevitably associated with the generation of revenues.

Presenting a simplified model of an enterprise, it can be said that its registration and subsequent operation entails costs (Lew, 2019), and the enterprise obtains revenues from its environment. "Donor" of these revenues are customers.

Drucker P. stated explicitly that there is only one valid definition of business purpose: to create a customer. The customer is the foundation of the business and sustains its existence (Drucker, Maciariello, 2004).

Many scholars have argued the importance of customers to the ability to conduct and profitably continue business, identifying the customer as a key source of value for the enterprise. Seybold P., based on her research, has shown that the value of a business is derived from the value of future cash flows expected from customers (Seybold, Marshak, Lewis, 2001).

The importance of the customer to businesses has been called customer value, which has been attempted to be represented by various models. One of them was the customer value model developed by S. Gupta D.R. Lehmann and J.A. Stuart, through which they proved the relationship between the market value of a company and the profitability and loyalty of its customers. They believe that customers are an important intangible asset of a company, which should be measured and properly managed (Gupta, Lehmann, Stuart, 2004). In turn, H.H. Bauer, M. Hammerschmidt, M. Braehler propose a model (Bauer, Hammerschmidt, Braehler, 2003) that takes into account many different categories resulting from customer relationships arguing that all of them are important in creating customer value. Customers as an asset of a company in the form of customer relationships are treated by R.K. Srivastava, T.A. Shervani, L. Fahey because they increase shareholder value by accelerating and increasing cash flow (Srivastava, Shervani, Fahey, 1998). Polish researchers also argue that the vast majority (about 90%) of the company's value is created by customers, who imply cash flow, the amount of profit earned (Dobiegała-Korona, 2011).

The analysis of the scientific literature showed that companies should orient their activities towards customers and create profitable and long-term relationships with them. For this reason, the authors recommend that business managers implement and apply management accounting methods that will effectively support their decisions in creating and maintaining profitable customer relationships. There is still a lack of studies on applicable tools to support the maintenance of profitable customer relationships. The authors resolve to conduct research on the relevant criteria affecting customer relationships and propose a customer cost accounting model that supports customer relationship management by providing reliable information on the profitability of these relationships.

The purpose of the article is to present the author's concept of customer cost accounting, which would effectively support decision-making in optimizing customer relationships. As support for the goal, three theses were put forward, the falsification of which will help realize the main objective of the research:

T1: Employees in the surveyed entities are aware that customers are the main source of revenue for companies.

T2: The main criteria that customers consider when buying from a supplier are quality and price.

T3: Business managers are aware of the need to study the profitability of customer relationships, and this type of research is carried out in companies all the time.

The research used methods of scientific literature review and critical analysis, survey method, statistical methods, primarily for quantitative research results such as Pearson's chi-square test, Spearman's rank correlation and Kruskal-Wallis ANOVA test. Modeling, which is one of the main research methods in the social sciences, was also used.

## 2. CUSTOMER RELATIONS – A REVIEW OF THE LITERATURE

Customers are seen as part of a company's environment, without which the creation of company value is not possible. For this reason, companies must provide them with goods and services that will meet their expectations. In order to attract and retain customers, they are “condemned” to the need to collect, process and properly use information on all forms of relationships occurring between the enterprise and the customer. Efficient acquisition and transfer of information depends on the quality of communication with customers.

In the current stage of development of markets, it is extremely important to be able to maintain long-term effective relationships with customers. Maintaining long-term relationships with customers means continually satisfying their changing needs over time. A need is defined as an objective property of an organism or a subjective feeling of lack (Reykowski, 1970). A need is defined differently by J. O'Shaughnessy, who defines it as an inclination to use or have (O'Shaughnessy, 1994).

Relationships with customers are relationships linking an enterprise and the customers of that enterprise (Otto, 2004; Dembińska-Cyran, Hołub-Iwan, Perek, 2004). Authors of accounting studies view customer relationships in a transactional context, i.e. as the sum of all sales transactions whose financial effect is revenue (Hendriksen, van Breda, 2002). However, such a view of customer relations is too narrow and significantly distorts the ability to manage them.

In contemporary trends in business management, more and more attention is paid to the importance of long-term, effective relationships with customers (Kubacka 2023). H. Mintzberg, too, believes that establishing and maintaining external contacts and creating advocacy groups outside the enterprise are activities to which managers must devote a lot of time (Mintzberg, 2012). A trend known as customer relationship management (*CRM*) will develop in theory and practice (Wereda, 2009; Dyche, 2002; Kevork, Vrechopoulos, 2009). Customer relationship management is the cornerstone of a business philosophy oriented toward analyzing, planning and controlling customer relationships using the latest information and communication techniques (Dobiegała-Korona, 2006). Sales departments do not focus on maximizing the profitability of individual transactions. Customer profitability, that is, profitability over the long term and the creation of customer value, is considered a key concern.

In order to create customer value, an enterprise must take appropriate actions that will contribute to increasing customer value or satisfying the needs of the enterprise (Miler, 2000). The concept of creating customer value grows out of the theory of demand economics, goods (products) are perceived by customers as a set of characteristics, i.e. quality, functionality, physical and chemical form, price and others, which can be freely shaped to meet their expectations. Customers may have different degrees of preference for the above-mentioned characteristics, which allows companies to differentiate their sales policies towards different customers or groups of customers (Nita, 2006). In view of the above, companies can undertake various activities aimed at creating value for customers

of a given product so that it finds recognition with them. These activities, although performed to optimize sales revenues will, of course, generate certain costs. These costs will largely depend on the type of activities used to achieve the objectives.

In order to identify the activities that contribute most to gaining and maintaining competitive advantage, they should be analyzed. As part of the analysis of activities, they should be divided into value-creating and non-value-creating activities for owners or customers. Activities in a company are primarily performed for three reasons (Blocher, Stout, Cokins, 2010):

- Are necessary to meet customer needs and expectations,
- are needed to sustain the enterprise as a whole,
- benefit the company.

When offering a product to a customer, an enterprise creates a commercial service through its activities that make up the internal value chain. Since every activity in an enterprise should be subordinated to the creation of enterprise value, enterprises must be able to identify those activities that create this value. For the reason that the main source of value creation for an enterprise is customers, activities should be considered in the context of activities that create the customer perceived value (CPV) or do not create it. And in the context of these activities, it is necessary to be able to determine their costs, which will determine, of course, together with the revenue generated through these customers, the profitability of the customer relationship.

### 3. MATERIALS AND RESEARCH METHODS

The analysis of the scientific literature showed that companies should orient their activities towards customers and create profitable and long-term relationships with them. For this reason, the authors recommend that business managers implement and apply management accounting methods that will effectively support their decisions in creating and maintaining profitable customer relationships. There is still a lack of studies on applicable tools to support the maintenance of profitable customer relationships. The authors resolve to conduct research on the relevant criteria affecting customer relationships and propose a customer cost accounting model that supports customer relationship management by providing reliable information on the profitability of these relationships.

The empirical research conducted began with the formulation of research problems. In the second stage, research methods and techniques were selected. The research procedure used a quantitative method, which consisted of face-to-face surveys using the survey technique, conducted among employees of enterprises with at least 50 employees. The purposive selection was dictated by the results of various scientific studies indicating that more advanced methods of management accounting are used primarily by medium and large enterprises. This is related to the capital capabilities and management needs of these enterprises and resulting from the size and thus the potential of a given enterprise. In addition, statistical methods were used, which included primary data analysis techniques. The analysis was carried out using STATISTICA™.

It is not easy to determine the exact number of the general collective, as the number of enterprises in Poland is very large. According to GUS (Central Statistics Office), the number of non-financial enterprises in Poland in 2019 was 2211.6 thousand entities. Due to such a large number of business units and the associated difficulties in conducting the survey effectively, a decision was made to purposively select the enterprises participating in the survey. The questionnaire of the survey was addressed to nearly 600 enterprises that

operate in southeastern Poland. A return in the form of correctly completed questionnaires was received from 178 respondents.

The final stage of the research procedure consisted of data processing and analysis, STATISTICA™ software was used to code and analyze the data. The analysis resulted in compiled summaries using basic statistical measures, such as count, mean, median, modal, first quartile, third quartile, standard deviation and coefficient of variation.

It was also examined whether there were or were not relationships between certain variables (quantitative, qualitative). The basis for making verification decisions was the comparison of  $\alpha$  (significance level) and  $p$  (test probability). A significance level of  $\alpha = 0.05$  was adopted if  $p < \alpha$  between variables there are relationships, while if  $p \geq \alpha$ , there are no statistically significant relationships between variables.

Non-parametric tests were used to assess the relationships present between variables: the Pearson chi-square test, Spearman's rank correlation and Kruskal-Wallis ANOVA test.

Fewer trade enterprises (41) than service (68) or manufacturing (69) took part in the survey, due in part to the survey group's limitation on the number of employees (more than 49). Information on the number and structure of the surveyed manufacturing, service and trade enterprises is provided in Table 1.

Table 1. Type of business conducted by the surveyed companies

Type of activity carried out	Number	Percentage
Manufacturing	69	39%
Service	68	38%
Commercial	41	23%

Source: own study.

Another criterion for the characteristics of the surveyed enterprises is the number of employees employed. Basic descriptive statistics on the number of employees employed at the surveyed enterprises are shown in Table 2.

Table 2. Number of employees in the surveyed companies - basic descriptive statistics

Specification	N	M	Me	Mo	N <sub>Mo</sub>	Min	Max	Q <sub>1</sub>	Q <sub>3</sub>	Std.dev.	V <sub>z</sub>
Number of employees	178	763	138	60	11	50	33000	84	250	3405	446

Symbols: N – abundance, M – mean, Me – median, Mo – modal, N<sub>Mo</sub> – modal abundance, Min – minimum value, Max – maximum value, Q<sub>1</sub> – first quartile, Q<sub>3</sub> – third quartile, Std.dev. – standard deviation, V<sub>z</sub> – coefficient of variation

Source: own study.

Analyzing the data in Table 2, it can be concluded that the surveyed companies have an average of 763 employees. The smallest number of employees is 50, and the largest is 33,000. Half of the enterprises have 138 employees or less, and half have more than 138 employees. Enterprises with 60 employees were the most likely to participate in the survey, with 11 such enterprises. One in four enterprises has 84 employees or fewer. Also, one in four enterprises employs 250 people or more. The high value of the standard deviation

(3405 people) and the high coefficient of variation (446%) testify to the very high diversity of the surveyed enterprises in terms of employment size.

#### 4. RESEARCH RESULTS

In the survey questionnaire, respondents were asked to identify the people (groups) through whom companies most influence revenue. The response was made by assigning a point scale to each response option, where 1 - no influence of the person on the factor, 9 - the greatest influence of the person on the factor. The results are shown in Figure 1 and Table 3.

The results obtained confirm that respondents rated customers as the people through whom the company generates revenue to the greatest extent, as many as 44% assigned customers a rating of 9. In contrast, respondents considered that no or little influence on the generation of revenue is had by other people not mentioned in the question.

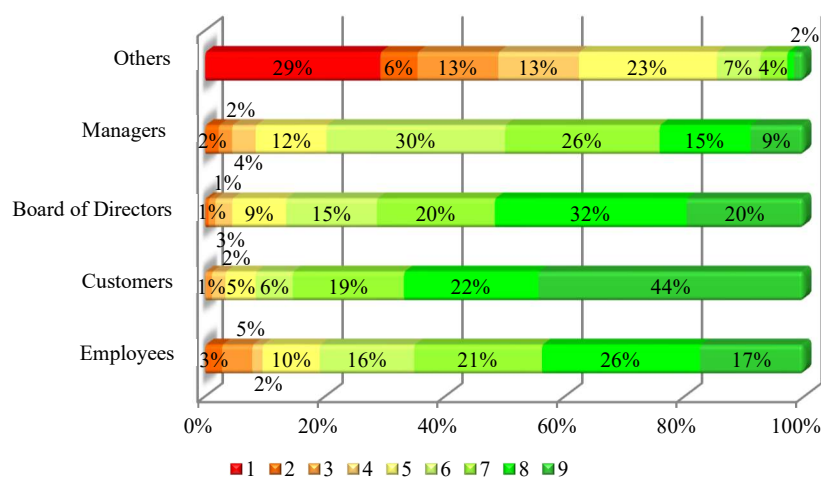


Figure 1. Degree to which a person influences a company to earn revenue – percentages

Source: own study.

Table 3. Degree to which a person influences a company to earn revenue – basic descriptive statistics

Specification	N	M	Me	Mo	N <sub>Mo</sub>	Min	Max	Q <sub>1</sub>	Q <sub>3</sub>	Std.dev.	V <sub>z</sub>
Employees	178	6,87	7	8	47	2	9	6	8	1,78	25,89
Customers	178	7,84	8	9	79	3	9	7	9	1,40	17,85
Management	178	7,22	8	8	57	2	9	6	8	1,47	20,31
Managers	178	6,48	7	6	53	2	9	6	7	1,52	23,39
Others	178	3,51	4	1	52	1	9	1	5	2,08	59,28

Symbols: N – abundance, M – mean, Me – median, Mo – modal, N<sub>Mo</sub> – modal abundance, Min – minimum value, Max – maximum value, Q<sub>1</sub> – first quartile, Q<sub>3</sub> – third quartile, Std.dev. – standard deviation, V<sub>z</sub> – coefficient of variation

Source: own study.

Analyzing the average rating that respondents assigned to individuals, the highest rating was given to customers (7.84), followed by company managers (7.22) and employees (6.87). The most common rating given to customers was 9 (79 respondents). Next, respondents indicated management (57 respondents assigned a rating of 8) or employees (47 respondents assigned a rating of 8). No one felt that customers had no impact on the company's revenue (they did not receive a score of 1 or 2).

Of the responses that respondents were asked to choose, the lowest standard deviation value (1.40) and coefficient of variation (17.85) were calculated for customers, that is, this response had the least variation in terms of assigned scores from others. Mainly, high scores were assigned to customers, so they were judged to have a high impact on the revenue obtained by the company. The results of the survey confirm thesis T1.

Respondents were asked to indicate the factors that influence a customer's repeat purchase of a product or commodity, where 1 – the least important factor, 9 – the most important factor. Based on the results obtained, basic descriptive statistics were calculated, which are included in Table 4.

Table 4. Degree of influence of given factors on customer purchase of enterprise products – basic descriptive statistics

Specification	N	M	Me	Mo	N <sub>Mo</sub>	Min	Max	Q <sub>1</sub>	Q <sub>3</sub>	Std.dev.	V <sub>z</sub>
High quality product/goods	178	7,94	8	9	72	3	9	7	9	1,24	15,57
Staff competence and knowledge	178	6,81	7	8	46	3	9	6	8	1,56	22,93
Reception and customer service	178	6,77	7	7	53	1	9	6	8	1,62	23,91
Access to additional services	178	5,67	6	6	42	1	9	5	7	1,82	32,08
Attractive product/goods price	178	7,12	8	8	46	2	9	6	9	1,71	23,95
Individual approach to the customer	178	6,69	7	9	40	2	9	5	8	1,90	28,36
Convenient location of the enterprise	178	4,20	4	3	39	1	9	3	6	2,02	48,06
Reputation of the company	178	5,49	6	6	36	2	9	4	7	2,19	39,94
Other	178	2,44	1	1	102	1	9	1	4	2,04	83,44

Symbols: N – abundance, M – mean, Me – median, Mo – modal, N<sub>Mo</sub> – modal abundance, Min – minimum value, Max – maximum value, Q<sub>1</sub> – first quartile, Q<sub>3</sub> – third quartile, Std.dev. – standard deviation, V<sub>z</sub> – coefficient of variation

Source: own study.

Among the most important factors influencing a customer's repeat purchase of products or goods were the high quality of the product or goods (average rating of 7.94), the attractive price of the product or goods (average rating of 7.12), and the competence and

knowledge of the staff (average rating of 6.81). The factors ranked in order of the average rating they received are shown in Figure 2.

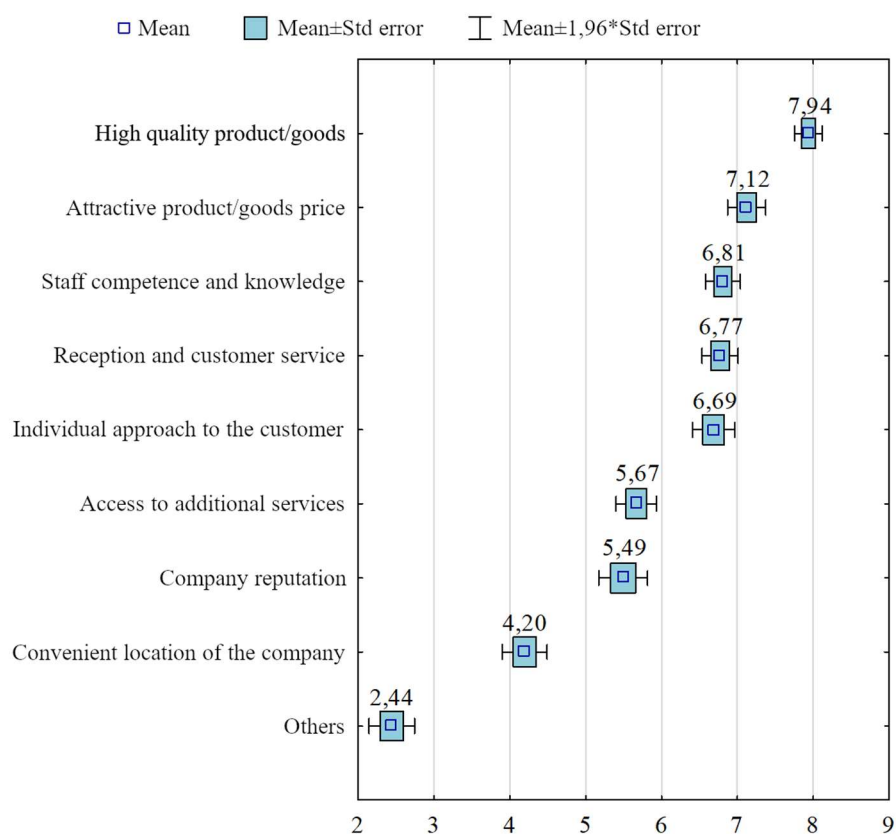


Figure 2. Average rating of the degree of influence of a factor on a customer's repeat purchase of a company's products or goods

Source: own study.

Factors that did not receive a rating lower than 3 were the high quality of the product or commodity and the competence and knowledge of the staff. All of the factors mentioned in the question received a score of 9 at least once (each factor, was considered the most important by at least one respondent). Most often, respondents considered the high quality of the product or goods as the most important factor (72 indications), as well as the individual approach to the customer (40 indications). The lowest value of coefficient of variation (15.57%) and standard deviation (1.24) has the high quality of the product or commodity, this means that when indicating the rating for this factor, respondents were most unanimous and mainly attributed to it a strong influence on whether the customer will purchase the product or commodity again.

Next, it was examined whether what factors, influencing a customer's repeat purchase of a product or commodity, were indicated by the respondents were influenced by the respondent's employee group or length of service and the type or size of the company. The



results of Pearson's chi-square test and Spearman's rank correlation analysis are included in Table 5.

Table 5. Degree of influence of given factors on the customer's repeat purchase of the company's products or goods vs. selected characteristics from the metric. Results of Pearson's chi-square test and Spearman's rank correlation analysis

Specification	Business type	Business size	Employee group	Internship work
	<i>p</i>			
High quality product/goods	0,1316	0,2125	0,1614	0,2460
Staff competence and knowledge	0,1664	0,0003***	0,2603	0,0316*
Reception and customer service	0,1642	0,0005***	0,3435	0,0131*
Access to additional services	0,3442	0,0029**	0,6379	0,8900
Attractive product/goods price	0,2672	0,0184*	0,1146	0,2410
Individual approach to the customer	0,2082	0,1935	0,0583	0,0285*
Convenient location of the enterprise	0,0349*	0,0393*	0,3946	0,0176*
Company reputation	0,0001***	0,0000***	0,0341*	0,0030*

Source: own study.

Service enterprises rated the convenient location much higher (average 4.65) than manufacturing enterprises (average 3.94) or trade enterprises (average 3.88). This is understandable, since services must be provided by employees in person, while in trade or manufacturing enterprises there are much more opportunities to transport products or goods. The company's reputation was also rated highest in service enterprises (average score of 6.21).

The size of the enterprise influenced the evaluation of the competence and knowledge of the staff ( $p < \alpha$ ,  $p = 0.0025$ ), reception and customer service ( $p < \alpha$ ,  $p = 0.0102$ ), access to additional services ( $p < \alpha$ ,  $p = 0.0029$ ), attractiveness of the price of the product, goods, ( $p < \alpha$ ,  $p = 0.0184$ ), convenient location of the enterprise ( $p < \alpha$ ,  $p = 0.0393$ ) and reputation of the enterprise ( $p < \alpha$ ,  $p = 0.0000$ ).

The respondent's employee group affiliation had little effect on the rating of factors influencing the customer's repeat purchase of the product. Those working in the accounting or similar department rated the company's reputation the highest (average rating of 5.77), and other employee groups rated it the lowest (average rating of 4.41).

Correlation analysis showed that a significant relationship occurred between seniority and ratings of staff competence and knowledge ( $p < \alpha$ ,  $p = 0.0316$ ), reception and customer service ( $p < \alpha$ ,  $p = 0.0131$ ), personalized approach to customers ( $p < \alpha$ ,  $p = 0.0285$ ), convenient business location ( $p < \alpha$ ,  $p = 0.0176$ ) and business reputation ( $p < \alpha$ ,  $p = 0.0031$ ). All coefficients are statistically significant, but the strength of the relationship is not high, ranging from 0.16 to 0.22.

The results obtained in this part of the study confirm T2.

Analyzing the obtained results of the research, it should be concluded that both managers and employees of enterprises are aware of the importance of customer relations for the success of business operations. They are also aware of the main factors determining the creation of customer value, which is crucial to the ability to establish and maintain profitable relationships with customers.

Respondents were also asked whether they thought it was worthwhile to measure the profitability of customer relationships, and if so, whether any form of such analysis is done at their companies. The results of such questions are shown in Figures 3 and 4.

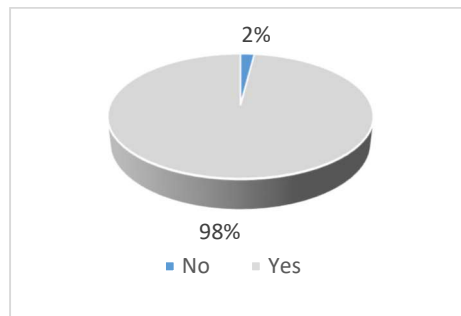


Figure 3. Response statistics for the question: Is it worthwhile to study the profitability of customer relationships?

Source: own study.

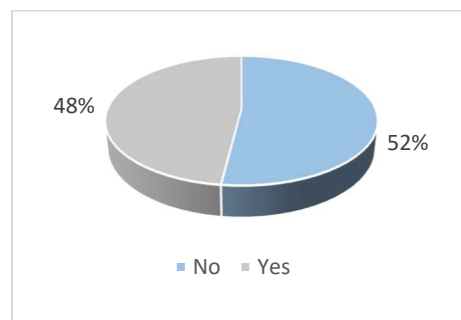


Figure 4. Response statistics for the question: Do you measure the profitability of your customer relationships?

Source: own study

Although the majority of respondents believe it is worthwhile to study customer profitability, only 48% said they measure the profitability of their customers. Among the ways to measure customer profitability, respondents cited revenue and cost analyses, margins, value and purchase frequency, among others. The lack of measurement of customer profitability in enterprises is a negative phenomenon, which may be due to insufficient knowledge of how to measure such profitability or ineffective management of the entity. By measuring such profitability, companies would gain additional information about customers that could influence the building of relationships with them.

The results of this part of the survey help to partially confirm T3. Respondents are indeed aware of the need to determine and analyze the profitability of customer relationships, however, less than half of the companies where they work do such analyses.

This is a reason to conduct further research looking for management accounting methods that would effectively support managers in their ability to determine the profitability of customer relationships (Bochenek, 2019; Bochenek, 2023, Kubacka, 2020).

## 5. CUSTOMER COST ACCOUNTING MODEL

A basic concept that has the potential to support managers in making decisions that shape profitable customer relationships is dedicated customer costing (Lew, Pacana, Kulpa, 2017). Deductive research, which at its core is theoretical in nature, uses modeling, among other things. Modeling and models are a basic tool of scientific cognition (Flejterski, 2007). Modeling is a way of abstracting, leading to the representation in the abstract of the essential features of the reality under study (Gomolka, 2000). The product of modeling is a model, which is an approximation of a certain slice of the real sphere, used to explain and understand it, to study it more closely, and to interpret it. M. Smith (2014) lists inference on the basis of model building as one of the basic research methods in management accounting.

Thus, the customer cost accounting model is a simplification of reality, constructed in order to understand the account and be able to design it in practice. The implementation of such a model in a specific enterprise additionally implies the need to take into account the information expectations of the managers managing it, the state of its environment and many other situational factors. Therefore, the presented model of customer cost accounting is descriptive in nature.

The general model of customer cost accounting in its universal form (Lew, 2015; Lew, 2016), which can be detailed to fit the specific needs of individual companies, and its place in the customer relationship scorecard is shown in Figure 5.

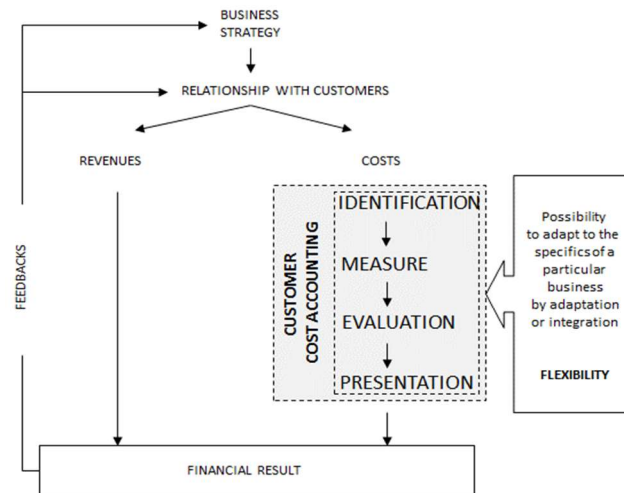


Figure 5. The general model of customer cost accounting and its place in the customer profit and loss account.

Source: own study.

In general terms, customer cost accounting includes four essential, interrelated components:

1. Identification – of cost objects and activities belonging to them that cause costs in customer relations.
2. Measurement – the method used to determine the value of individual customer relationship costs.
3. Valuation – determining the value of individual customer relationship costs.
4. Presentation – communication, in the content and form desired by managers, of cost information on customer relations.

These four elements are the starting point for building dedicated customer cost accounts for individual enterprises. Customer cost accounting in its construction should take into account the size of the enterprise, intellectual resources, business environment, capital resources and management needs of the individual enterprises interested in this account.

## 6. DISCUSSION AND CONCLUSIONS

Customer cost accounting should also support managers in identifying value-creating and non-value-creating activities for customers. Proper identification of activities that create value for customers will determine their use in building profitable customer relationships. In turn, identifying activities that do not create value for customers will allow them to be eliminated or reduced.

A value-creating activity is one that increases the value of the commercial service to the customer or is essential to the operation of the business. Value for the customer is perceived by them as a set of desirable characteristics that a commercial service should have. The basic component of this service is the goods in which these customers are interested. The basic characteristics of a commercial service that can potentially create value for the customer include: quality of the offer and/or goods, availability, reliability, price.

These features in various configurations can be enhanced or muted in a way that ensures that the needs of individual customers are met. The products offered by companies, together with accompanying services, should create an offering that maximizes the effect of value for the customer, while maintaining an acceptable level of cost for these services.

In identifying activities that create value for the customer, the problem is to estimate the value that customers ascribe to the commercial service. Value for the customer can be defined as the buyer's willingness to pay a given amount for the goods offered to him by the trading company, together with the services accompanying them. This definition of value implies the two-sidedness of the relationship between the enterprise and the customer, and that the value to the customer is the difference between the benefits he received and the price he had to pay for it.

Customer value-creating activities, therefore, are those that significantly affect a customer's perception of a commercial service, and in particular relate to its quality and usefulness.

Activities that do not create customer value are those that consume time inefficiently, unnecessarily increase resource consumption, do not result in increased customer satisfaction, and do not increase the value of goods or commercial service in the eyes of customers.

Of course, value-creating activities should be considered not only in terms of the costs they generate, but primarily in terms of the revenues they generate. With this reasoning, it

should be assumed that the performance of value-creating activities for the customer contributes to an increase in the financial result realized from sales. It should be assumed that value-creating activities increase customer satisfaction. Then, activities that do not contribute to an increase in the bottom line, for example, in the situation of generating costs without increasing revenues should be considered as not creating value.

Customer relationships in the accounting framework are presented primarily as relationships of a transactional nature. This approach is evident not only in the financial accounting literature (Hendriksen, van Breda, 2002; Czubakowska, Gabrusewicz, Nowak, 2009; Świdarska, Więclaw, 2006), but also in management accounting (Piosik, 2006; Dobija, Kucharzyk, 2009). The concept of customer relations has gained a broader meaning in marketing publications (Otto, 2004; Mitreęga, 2008; Dembińska-Cyran, Hołub-Iwan, Perenc, 2004; Nowak, 2007).

Today, the view of customer relations goes far beyond the transactional view. Relationships with customers are seen as the totality of relationships linking a company and its customers. According to T. Sztucki (1998), the concept of customer relations is a concept of management and operation in the market, according to which the market effectiveness of companies depends on the establishment of partnership relations with market participants. This concept involves building loyalty relationships with customers and strategic alliances with business partners.

From an accounting perspective, it is significant that the modern view of customer relationships assumes that they are multilateral (Bochenek, 2022). Relationships with individual customers are not limited to single transactions, but to the whole series of them occurring during the entire life cycle of a customer in an enterprise. Relationships with customers develop not only as a result of actions taken in various functional areas of the business of trading enterprises, but also as a result of actions taken by customers themselves. In addition to customers, these actions are influenced by the rest of the enterprise's environment, among others: competitors, potential customers, local communities, the media, legal regulations, environmental aspects.

The complexity of customer relations, despite their multifaceted nature, can be put into three perspectives of the management analyses carried out. These include:

- the concept of customer perceived value (CPV),
- the concept of customer lifetime value (CLV),
- the concept of co-creation of value by a commercial enterprise and a customer operating in a specific environment.

This finding sets the next directions for research, which, according to the authors, should focus on building competencies that enable proper identification of customer costs and any activities that bring value to customers.

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## FROM INFORMATION POLICY TO STRATEGIC COMMUNICATION

In the era of modern threats, Strategic Communication (StratCom) has become a key capability in responding to hybrid threats, the vast majority of which are created in the Information Environment (IE), with particular emphasis on cyberspace. The transition from the information policies of individual armed forces to the comprehensive thought of strategic communication is the focus of the article below. For this purpose, an analysis of source documents was used, showing the development of the concept of strategic communication since 2001 in StratCom collections of documents, policies, doctrines, guidelines, manuals and framework concepts.

**Keywords:** information policy, strategic communication.

### 1. INTRODUCTION – INFORMATION POLICY

Information security and information sharing with the media are the basis of today's strategic communications. In NATO, the first edition of MC 0457 was created in 2001 in response to media needs and concerns the military role of NATO in the mission of forces and air campaign operations in Kosovo. The information policy developed was the result of experience and conclusions from all NATO operations and missions. In this document, which regulates the issue of communicating with the public on military matters, the overriding category is *public information* (in Polish contexts called “press and information activities”). It consists of activities involving the use of various forms and methods of *public relations* in the process of communicating about military and defense matters. The document favors fairly free access of the media to information and independent and independent transmission of information by press service employees. In the matter of contacts with the media, NATO emphasizes that every employee of a military institution must be prepared and trained to provide information. At the same time, it is noted that the

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main role in this task is played by commanders and staff officers. However, press personnel must comply with NATO guidelines and principles regarding relations with journalists.

General Massimo Panizzi (Public Affairs & StratCom Advisor International Military Staff) notes the importance of the military communications process, saying:

The Public Affairs officer is a key advisor to the NATO commander, and this policy is intended to assist him in his tasks. The challenge for Public Affairs officers is to explain to a wide and diverse audience, including the media, the complexity of military issues that respond to 21st century security challenges and that are supported by NATO's political decision-makers. This is especially important in times of crisis, when NATO actions are undertaken. Society often pays little attention to the significance of a crisis; they only see crisis, unless they come across more shocking news. There is a lack of context, and the media very often follows the principle "the harsher, the better". The gap between the reality of public perception, expectations and actions only ends in disbelief. It is therefore very important to provide the missing context. Educating and clarifying is intended to balance criticism and maintain credibility. Transparency tolerates criticism, but a lack of transparency, intentional or otherwise, certainly deserves condemnation (NATO Military Public Affairs Policy, 2011).

This means that press department employees should meet the needs of journalists. Therefore, the approach of limiting freedom in order to ensure personal safety is abandoned. Activities aimed at involving journalists in the work of military units are widely supported. This is done in close cooperation with the appropriate press office. Media materials shall not be subject to any censorship or review by NATO personnel. This also applies to information transmitted by NATO resources. This does not apply to reports, reports or other information sent via combat means of communication. The restrictions are intended to maintain the security of Alliance operations. In this case, the types of information or materials whose disclosure would threaten the security of current or future activities are always determined. Therefore, information cannot be provided regarding, for example, the weaknesses of the armed forces or others that may be used against the Alliance's forces. It is strongly emphasized that information held by the media that is embarrassing for commanders or other personnel cannot be censored. Information protection must be ensured at the source, therefore persons possessing classified information are responsible for protecting it. If journalists disclose information not intended for publication, such as a military operation plan, NATO press and command staff are obliged not to confirm the information. It is also recommended to immediately notify the press office in accordance with applicable procedures (Kryszka, 2006).

NATO standardization documents also specify the rules for informing the public about cooperation with the media in allied joint operations (NATO AJP 01/B) (NATO AJP 01/B, 2002). The Chairman of the NATO Military Committee, Admiral Giampaolo di Paola, said:

Our societies have a democratic right to know what the Alliance is doing on their behalf and why. NATO therefore has an obligation to report on its individual policies and activities, and in particular on its activities. Only reliable information should be provided to the public. It is the role of the NATO military public affairs official to provide this information. This requires high

professionalism, an analytical mind and strong commitment. The Public Affairs Officer is a key advisor to the NATO Commander and this policy is designed to assist him in his responsibilities (NATO Military Public Affairs Policy, 2011).

The Polish equivalent of the above document is the study *Joint Operations* (Szt. Gen. Wewn. 3/20/2001), in which reliable, accurate and quick information to the public via the media is defined as one of the most important tasks of the command during joint operations.

## 2. NATO STRATEGIC COMMUNICATIONS

The development of the concept of NATO's information policy and geopolitical needs led to its transformation into strategic communication. The very concept of strategic communication (StratCom) officially entered NATO terminology in 2008. Although already in 2006, StratCom was used by the US Department of State in the concept of: "focused processes and efforts undertaken to understand and engage key audiences (recipients) to create, strengthen or perpetuate conditions favorable to the implementation of national interests and goals through the use of coordinated information, topics, plans, programs and activities synchronized with projects implemented by other elements of state authorities" (QDR Execution Roadmap for Strategic Communication, 2006). Since then, many articles, analyzes and polemics have been published, the aim of which was to bring to a common denominator the activities carried out by the Alliance and the Alliance member states that have a significant impact on the information environment.

Starting from the Bucharest summit (2008), as well as subsequent summits in Kehl Strasbourg (2009), Wales (2014) and Warsaw (2016), NATO declarations listed among the priority issues adaptation to emerging threats from security environment and strategic communications, seen "as an integral part of our efforts to achieve the Alliance's political and military objectives" (Declaration from the NATO Summit in Strasbourg-Kehl, 2009). Thus, the creation of the NATO Center of Excellence for Strategic Communications in Latvia as one of the key tools for countering hybrid threats was appreciated in the Welsh Summit Declaration. The first definition of StratCom agreed by Allies identified it as "the coordinated and appropriate use of NATO's communications activities and capabilities – public diplomacy, public affairs, military public affairs, information operations and psychological operations, as appropriate – in support of Alliance policies, operations and activities, and in order to achieve NATO goals" (Strategic communication policy NATO, 2009). This definition emphasizes the importance of coordinating communication activities with allied activities or operations that could impact the information environment and audiences (Vasile, 2022). At the same time, it maintains the level of generality high enough to avoid possible doctrinal disputes caused by the difficulty (impossibility) of clearly separating activities consisting in informing recipients from activities of influencing them, as well as delimiting activities that are at the same time specific to PD, KLE, CIMIC or PPP. NATO Allied Command Operations Directive – ACO (AD) 95-2 Strategic Communications, adopted on May 21, 2012, confirmed this definition and described the specific roles, responsibilities and processes of StratCom. The document emphasizes that StratCom has a "political-military character (Directive NATO ACO, 2012), playing a "central role in all phases of the operation, from planning to execution" (Directive NATO ACO, 2012), which requires close "coordination among all elements of the information community" (Directive NATO ACO, 2012). During the NATO summit in Wales, Allies expressed their determination to significantly increase NATO's defense capabilities, ensuring that the Alliance "has the necessary tools and procedures required to deter and

effectively respond to threats related to hybrid warfare, as well as the ability to strengthen national forces" (Declaration from the NATO Summit in Wales, 2009; Vasile, 2022).

There are several definitions of StratCom. Most of them share a concept that describes communication processes (PD, PA, InfoOps, PsyOps) through the use of activities undertaken by ministries and state agencies in various fields: political, diplomatic, economic, cultural and military. Psychological Operations, Public Diplomacy, Military Public Affairs and Public Affairs are reflected in allied documents, the most important of which is NATO Military Policy on Information Operations MC 0628. StratCom is defined as a military function providing advice and coordination of troops' actions aimed at achieving the desired effect in the sphere of will to act (fight), perception and ability to conduct actions in support of the objectives of the operation implemented by the Alliance. Psychological Operations are psychological operations that are the planned use of information to influence the opinions, feelings, attitudes and behavior of groups of people. In turn, Public Diplomacy refers to the influence on social attitudes and, in this context, shaping the foreign policy of a given entity in the dimension of international relations. An important element here is shaping public opinion in other countries using economic and political marketing mechanisms (Kacała, 2011). The next element is military press and information activities (Military Public Affairs), focusing on promoting military goals and tasks among recipients, which is intended to result in increased awareness and understanding of the military aspects of the activities carried out among the public. Public Affairs is understood as social information, transfer of information from individual commands and building relations with society, both in the national and international dimension (NATO Military Public Affairs Policy, 2011; Public Affairs Handbook, 2020). Today, NATO must use a variety of channels, including traditional media, online media and public engagement, to build awareness, understanding and support for its decisions and operations. This requires a coherent institutional approach, coordination of efforts with NATO countries and among all their entities, as well as consistency in arrangements with other international entities and actions consistent with the procedures and principles applicable in the Alliance (Dmochowski, Wiśnicki, 2022).

The development of strategic communication thought is particularly developed in the USA. A pragmatic approach is presented by Richard Halloran, who already in 2007 proposed the following definition: "Strategic communication is a way of persuading other people to accept someone's ideas, policies or courses of action" (Halloran, 2007). This means that the most important thing is to build the institutional capacity necessary to support the implementation of strategic communication goals. They result from broadly understood strategic communication, which

means convincing allies and friends to side with you. This means convincing neutrals to come to your side or at least remain neutral. In the best of all worlds, this means convincing your opponents that you have the power and will to control them. Strategic communication is extremely important and involves persuading citizens to support the policies of their leaders in order to forge national will to achieve national goals. In this context, strategic communication is an essential element of national leadership (Halloran, 2007).

The proposed concept of strategic communication was introduced into official policy documents for the first time in the United States National Strategy for Public Diplomacy and Strategic Communication in June 2007. The strategy articulates the U.S. government's

communication objectives, key audiences, public diplomacy priorities, interagency coordination requirements, ways to monitor and evaluate implementation, communication channels and necessary resources, plan examples, themes, and messages.

As we have already written, the first allied document – NATO Strategic Communications Policy (NATO Strategic Communications Policy, 2009) was created in 2009 and was the basis for the activities of diplomatic and press services in the information environment, but did not provide a clear interpretation of such activities in relation to military capabilities in the area of strategic communication. Over the next few years, NATO consistently developed and improved its own and its member states' capabilities to function effectively in the information dimension of the international security environment. Such a specific action is, for example, the establishment of the Strategic Communication Center of Excellence (StratCom CoE) in Riga in 2014, of which Poland is also one of the founding countries (Niedzielski, 2022).

During its work on the development of a holistic strategic communication system, NATO constantly monitors activities in the information environment and takes into account the activities of the NATO Military Committee and the Allied doctrine of standardization of military strategic communications (Allied Joint Doctrine for Strategic Communications – AJP-10)<sup>4</sup>. This document is a supplement to the previously mentioned civil doctrine from 2009 and the guidelines for the implementation of strategic communication from 2017. All three documents together constitute the alliance's systemic approach to StratCom. The long time interval between the creation of individual documents resulted from the fact that for many years strategic communication was perceived mainly as the exclusive domain of public diplomacy with little military input. Only the hybrid attack of the Russian Federation on Ukraine in 2014 became a stimulus to raise awareness of the role of military aspects of strategic communication in effective influence and counteraction in the information environment. This initiated active work by NATO and individual allied countries to build, maintain and develop the military operational capabilities of StratCom (Niedzielski, 2022).

### 3. STRATEGIC COMMUNICATION IN THE EU

The situation is similar with communication and information policy in the European Union. The European Union's Common Foreign and Security Policy (CFSP) and Common Security and Defense Policy (CSDP) demonstrate both the will and concern of Member States to harmonize their efforts to develop common capabilities in strategic communications, which is “an important tool in implementing the overall EU policy objectives” (Strategic Communication Action Plan, 2015). Strategic communication is seen as a valuable tool for increasing the EU's resilience and ability to respond to hybrid threats and disinformation campaigns. That is why strategic communication is mentioned in the most important documents establishing a common CFSP and CSDP framework for countering hybrid threats, such as: Global Strategy for the European Union's Foreign and Security Policy” of 28 June 2016, EU Operational Protocol on Countering Threats Hybrid` of 7 July 2016 and the 'EU Security and Defense Implementation Plan' of 14 November 2016. As regards the strategic partnership with NATO, based on the 2002 EU NATO

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<sup>4</sup> The NATO Military Committee is the highest military authority of the Alliance. In relation to the North Atlantic Council, which is the highest political authority of the Alliance, the Council has an advisory function on military matters. This advice is based on a consensus developed jointly by all military chiefs of defense of NATO member states.

Declaration on European Security and Defense Policy, its importance was confirmed at the NATO Summit in Warsaw by the new EU NATO Joint Declaration, adopted on July 8, 2016. The document emphasized the need to urgently adopt procedures agreed by both organizations in order to

increase our ability to counter hybrid threats, including by strengthening resilience, cooperation in terms of analysis, prevention and early detection, through timely exchange of information and, where possible, exchange of intelligence between staffs; and cooperation in the field of strategic communication and strategic response (Joint declaration of the President of the European Council, 2016).

Strategic communication has become an integral part of the EU's activities and is now used to promote its core values, principles and goals among international and European audiences, as well as to increase public awareness of how to counteract false information and disinformation activities.

#### 4. CONCLUSION

To sum up, strategic communication, which since 2001 has been shaping the image of the army in society, like many other public institutions, and translates into its efficient operation. It is currently a dynamically developing area of activity of both NATO and individual member states. Its growing importance is particularly visible in the era of development of mass media, especially the Internet and the so-called social media, which have made both information and disinformation widely available on a global scale, competing in the race to convince increasingly larger groups of recipients. A message that is properly tailored to a specific recipient has become a weapon in the global information war waged by all players in the global security environment. The above applies to states, groups, coalitions, non-state players, and international organizations such as the UN, European Union or NATO.

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## HUMAN RIGHTS AND THE IDEA OF NATURAL RIGHTS

Based on the findings of other publications, this paper attempts to assess whether the ideas of natural rights and human rights can be understood as identical. The first part of the paper outlines, from a historical perspective, the idea of natural rights; the second part presents elements of the conception of human rights. The third part sets out arguments against considering these two ideas as equivalent. The assumption that a better understanding of the conception of human rights can be obtained by demonstrating its relationship with other ideas will contribute to achieving the objective.

**Keywords:** natural rights, human rights.

### 1. INTRODUCTION

It is difficult to point to a conception that has been as popular as the idea of human rights since the second half of the 20th century. I mentioned *popular* on purpose, as the assumption that an individual is entitled to certain rights due to the fact that he or she is a human being is not merely a moral postulate, which has significantly influenced contemporary legal systems. It is also, or perhaps above all, a conception which, without undue exaggeration, has become part of modern culture or even pop culture. The very conception, being separated from strictly legal considerations, has become an argument for changing existing social relations. This may not be surprising, if we consider, for example, the fact that the sources of the modern conception of human rights (by *modern* I mean the second half of the 20th century) are not merely more or less vague philosophical ideas, not only the experience of wars and totalitarianisms, but also transformations taking place in Western societies, which both shaped and were shaped by the central tenets of the conception of human rights, that is to say, mainly by the postulate of equality. However, it must be noted that the consequence of the role the idea of human rights plays nowadays is, among other things, a kind of “dilution” of the concept of an individual’s inalienable rights, or even an expansion of the list of rights that are referred to as human rights. Accordingly, an in-depth analysis of the idea of human rights seems to be necessary, however, it cannot

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be conducted without reference to the sources that have shaped the modern understanding of the conception.

## 2. IDEA OF NATURAL RIGHTS

Pondering the conception of natural rights, it is necessary, in the first instance, to draw attention to a problem that is relatively common in the literature dealing with both philosophical and legal matters, namely, understanding the terms *natural law* and *natural rights* as identical. As aptly noted by M. Łuszczynska, “these terms are used interchangeably by most authors” (Łuszczynska, 2005–2006), as a consequence of which the boundary between these two expressions is blurred, leading to extremely significant implications. If we define natural-law theories as the conceptions built on the assumption that there is a normative system other than positive law (irrespective of whether that system originates from divine precepts, the nature, human reason, etc.), we will discern the whole “metaphysical baggage” that has been rejected, to a large extent, within the framework of modern legal and theoretical considerations. By saying so, I do not intend to claim that even today there are no theorists who adopt natural-law perspectives or that we cannot identify in the theories of natural law, whether classical ones or those with a variable content, any themes that may still be inspiring even nowadays. Nevertheless, when the idea of natural law is understood as identical to the natural rights conception, which is completely different, then the latter may be deemed useless in a modern discourse on law and this can also affect, and indeed, it does affect, the evaluation of the conception of human rights, which is sometimes regarded as identical with the doctrine of natural rights.

In order to give at least a simplified answer to the question about the possibility of understanding the conception of natural rights as identical to the idea of human rights, a brief introduction is necessary. There is a lack of consensus in the literature about when the idea of an individual’s inalienable rights fully developed and what its origins are. To give an example, one may refer to the perception of Grotius as the founding father of the theory of subjective rights (*Grundungsheros*), being “the initiator of the conception of rights arising from subjective rights” (Kolarzowski, 2009) – such a view has a long tradition which dates back to Pufendorf (Tierney, 1998). Some researchers (although they are definitely among the minority) emphasise the role of Hobbes, who finally severed all connections between natural law and natural rights (Rommen, 1998). Moreover, despite the fact that many authors deny that the English thinker’s conception can be identified with the contemporary perspectives on the idea of natural rights, it is maintained that the definition of subjective rights, which originates from the Hobbesian tradition, nowadays, plays a pivotal role in decisions of constitutional courts, as well as of the European Court of Human Rights – “the theory of the will determines the fundamental manner in which subjective rights are construed at the constitutional level” (Stępkowski, 2013). Later in this article, attention will also be devoted to Locke’s works, as this thinker is probably most often recognised, if not as the father of the idea under discussion, then at least as the originator of its most significant variety.

At this point, it is expedient to briefly present the periods of the development of the idea of natural rights. One may not contend that the period covering antiquity and the Early Middle Ages witnessed the emergence of the idea of natural rights (although many researchers strive to discern, more or less aptly, philosophical currents that might have given rise to the conception under discussion). During the Late Middle Ages and early modern times, considerations and, above all, new definitions of old terms emerged,

providing the basis for the conception of an individual's inalienable rights or for the development of such terms as a subjective right. The third period, the beginning of which is most often associated with Grotius, is the time when the idea of natural rights sparked off a heated debate and eventually became, in the form primarily put forward by Locke, the foundation of modern legal systems and the Enlightenment conception of human rights. While even a cursory examination of the first of these periods would go beyond the scope of this paper, the period when the foundations of the idea of an individual's inalienable rights evolved deserves attention. Nevertheless, it must be also noted that the literature on the subject distinguishes two ways that allowed for framing the modern conception of natural rights (and enabled its implementation in Enlightenment documents). On the one hand, this is the English way, which was initiated along with Magna Carta (at least such a starting point was indicated in the modern era, giving rise to a kind of a legend associated with this document), and on the other hand, the continental tradition, which is closely linked to the Christian philosophy (Sójka-Zielińska, 2000). The second of the aforesaid ways started in the Late Middle Ages with the dispute over investiture and the beginning of the separation of the church and the state (Dubel, 2003) and evolved during the discussion between the pope and the Franciscans about the status of private property (Bounamano, 2008). Nevertheless, it must be stressed yet again that the conception of natural rights or human rights was not framed in the course of medieval discourse in which the most prominent figures were, among others, William Ockham or Marsilius of Padua, but, as noted by Tierney, in the course of debates "then the reshaped language of rights was available for use in later contexts where it took on new significances and found new applications" (Tierney, 1991). Changes that occurred as part of the scholastic discourse are presented in detail by B. Tierney, who refers, among others, to the 12th century thinkers who more or less consciously began to use the term *ius* not to mean *ius naturale*, but to signify some kind of "power" or ability inherently associated with humans, which has proved, over time, to be a key precondition for shaping the idea of natural rights. What deserves attention, according to Tierney, is the fact that the way *ius* was seen, namely as some kind of authority or power, was based from the very beginning on a particular vision of the human nature, rationality and moral responsibility, however, it was rather not derived directly from the Christian revelation (Tierney, 1998). The opportunity to put the new terms into practice arose relatively quickly, which coincided, as a matter of fact, with the discovery of America and activities of thinkers belonging to the so-called School of Salamanca, whose output is open to very different interpretations even nowadays (Brett, 2003). Thinkers such as F. Vitoria, B. Las Casas applied scholastic formulas to solve new problems primarily related to the determination of the legal status of Native Americans (Castro, 2007). It seems that it was the school's achievements that enabled during the Renaissance, when lawyers were reluctant to engage in "scholastic" discussions, the conception of natural rights not only to survive, but also to become an instrument designed to solve practical problems falling outside academic disputes. As already mentioned, it is Grotius who is often mentioned to be the father of the idea of an individual's inalienable rights. In the doctrine of this thinker, *ius* is no longer the conformity of, for example, claims with natural law, but becomes something that an individual *has* (Haakonssen, 1985). In this manner, the theory assumes a non-theistic character (Tuck, 2002). Breaking with theism, and consequently, with the Christian doctrines of natural law, can be perfectly observed in Hobbes' thinking, whose achievements in the field discussed in this work are evaluated very differently. This stems from the fact that, on the one hand, many researchers who perceive Hobbesian rights as physical freedom consider them thoroughly different from

the contemporary models of an individual's rights (Cronin, 1992), but on the other hand, it is difficult not to arrive at the conclusion that Hobbes' philosophy is full of criticism that is centred on the perception of rights as what is just. Hobbes' rights, which are devoid of any obligations correlated with them, become truly subjective and, in a sense, universal (Malcolm, 2006). This doctrine completely rejects the previous understanding of the role of natural law, which loses its previous functions: it is no longer a moral basis for the norms of positive law, it is neither a determinant for justice nor a criterion for evaluating positive law (Rommen, 1998).

The above remarks, which are intended to imply that the doctrine of natural rights is based directly on thinkers' works dating back to the Late Middle Ages, do not change the fact that the conception of natural rights, as proposed by Locke, is considered the most significant Enlightenment project of an individual's inalienable rights. And while one can argue about the novelty of the doctrine presented by the English thinker, the fact is that due to its incorporation into normative acts, particularly in the United States at the time the country was coming into existence, its importance is unique. Some even maintain that if a term such as *natural rights*, which is used in Locke's doctrine, was replaced by the term *human rights*, the very doctrine would not lose anything of its internal coherence, which must not be construed, as a matter of fact, that it could provide axiological justification for the contemporary extensive list of human rights, which also encompasses economic, cultural or social rights (Machaj, 2010). And while it is impossible even to briefly discuss the doctrine in question here, what deserves attention is the fact that by rejecting the Aristotelian way of perceiving an individual and the society, Locke builds a theory in which an individual ontologically precedes the state (Lowe, 2005). It seems that Locke can be aptly regarded as a thinker whose doctrine crowns a long-established tradition, the most essential element of which is the granting of special status to an individual who becomes the subject of rights comprehended independently of obligations. Rights framed in this way are an expression of (negative) human freedom, but not an expression of ties between an individual and the society (Shortall, 2009).

### 3. HUMAN RIGHTS

To formulate a definition of human rights is extremely difficult. Although it can be formulated (in simple terms) in a manner that describes the shape of an idea emerging whether from the Polish law or pieces of international legislation or works of a particular thinker, it must be remembered that the idea in question is deeply rooted in the philosophy of law or ethics. Naturally, any attempt to formulate a definition must involve making certain assumptions, many of which will be controversial. This issue is referred to, among others, by M. Freeman, who differentiates between an ideal theory, which does not describe reality, but instead, formulates arguments for specific theses, and a non-ideal theory, whose object is to examine reality (Freeman, 2007). Moreover, it is not only the need to make certain assumptions, as mentioned above, attention should also be given to the fact that there were a number of factors that influenced the shape of the modern idea of human rights. In addition to historical events (World War II, the civil rights movement, etc.), we must take into account the philosophical and legal tradition, in particular, the achievements in the field of the natural rights theory, which are outlined above, as well as the fact that the very conception underwent the process of positivisation, which began at the end of the 18th century, continued also in the 19th century, to grow in importance in the second half of the 20th century. Having considered both the sources of the very conception and the

process of its adaptation to both international law and legal systems of individual states, we can notice that the issue under discussion must have been to some extent part of the dispute between the natural-law vision of law and legal positivism. Even if we assume, and that assumption would be legitimate in all respects, that the conception of natural rights, at least in its most significant manifestations, represented a break with the “classical” natural law doctrines, the “natural-law label” is still, even today, often assigned to the conception of natural rights, and consequently, to the conception of human rights.

As it appears, Dworkin was right when he claimed that the assumption of the existence of rights individuals have with regard to authorities must be based on the adoption of one of two assumptions. The first of them is the recognition of an individual’s dignity – the idea associated with Kant, but found in many philosophical doctrines. The second one is related to political equality, which entails the protection of both weak and strong members of the community (Dworkin, 1978). The role of this view is emphasised, among others, by Z. Rau, who noted that these principles are the basis for both the idea of human rights and Western liberalism (Rau, 2013). This rather general view of the idea of human rights can be juxtaposed with example definitions. Thus, for example, the *Encyclopedia of Human Rights* describes human rights as “entitlements due to every man, woman, and child because they are human” (Wiseberg, 1996). The *Stanford Encyclopedia of Philosophy*, on the other hand, considers human rights to be “norms that aspire to protect all people everywhere from severe political, legal, and social abuses” (Nickel). Even a cursory examination, not only of the definitions cited above, but also other definitions, shows how much the idea of human rights, analysed on the level of positive law, requires reference to strictly philosophical issues. Human rights are very frequently seen as norms stemming from the fact that an individual having these rights is a human being, and therefore has a special moral status. Furthermore, human rights are often referred to as standards (usually minimal ones) that must be included in a normative system. However, the foregoing cannot lead to the conclusion that the discussion centred nowadays on the conception of human rights may be limited to simple juxtaposition between the positivist conception and the natural rights theories (or even the natural law) (Zajadło, 1998). Analysing the contemporary discourse on human rights, we can notice that one of the key issues is their justification, which takes various forms (Langlois). To give an example, one can point to attempts to base the idea in question on:

- a) Dignity (which is inalienable and possessed by all human beings);
- b) Reason (as a fundamental characteristic that distinguishes humans from other creatures);
- c) Autonomy (capacity for self-determination);
- d) Equality (all people have the same moral value);
- e) Needs (common to all people);
- f) Capabilities (neo-Aristotelian focus on human potential);
- g) Consensus.

It seems that despite the fact that there are many definitions and various justifications, it is most often accepted that human rights are those rights to which an individual is entitled for he or she is a human being, which makes them independent (at least to some extent) of the norms of positive law (Piechowiak, 1997). However, such a view is not typical only of philosophical argumentation, but is also seen in positive law – the articles, for instance, of the Universal Declaration of Human Rights set out the rights that a human is endowed with precisely by reason of his dignity, and it is through dignity that an individual is perceived as a subject of law (Dearden, 1970).

#### 4. NATURAL RIGHTS AND HUMAN RIGHTS – CONCLUSIONS

By analysing the modern conception of human rights, we are able to establish its relationship with past ideas; nonetheless, this does not mean that we can say the terms are understood as identical or even claim that ideas dating back to the Middle Ages or even ancient times have been simply transferred to the modern deliberation. However, contemporary attempts to define human rights make some researchers claim that these are “rights for lawyers, not rights for philosophers” (Nickel, 2007), which, as mentioned by J.W. Nickel, stems from the fact that the term *human rights* is used to describe legal norms that were initially shaped in the interwar years and further developed after 1945. This author has determined the relationship between the conception of human rights and the idea of natural rights, however, argues that these ideas are completely different, and the existence of certain philosophical assumptions in documents of international law does not mean that they require special justification.

A view which is opposite to the one presented above is sometimes referred to as *naturalistic*. According to that view, human rights are rights possessed by all human beings always and everywhere, simply by reason of humanity, and are therefore natural rights, which means that they cannot be forfeited by an individual (Simmons, 2001). Nevertheless, as noted by Ch. Beitz, naturalistic conceptions assuming that the modern conception of human rights “inherits” certain elements directly from the idea of natural rights have different variations, however, what is common to all of them is the presence of two key elements: first, they are based on the distinction between human rights and rights originating from positive law – in such a view, human rights are most often seen as moral standards which serve, however, as the criterion for assessing the legitimacy or fairness of the norms of positive law (as was the case with the classical natural-law conceptions). The second element, common to naturalistic perspectives, is the recognition that an individual is entitled to human rights due to the fact that he or she is a human. Given this view, the term *human rights* is simply a new incarnation of the term *the rights of man*, which in turn replaced the term *natural rights* (that reverts to pondering about an individual’s rights in the second half of the 20th century). It is worth noting that the naturalistic vision of human rights, which corresponds to the popular presentation of this idea, based to a large extent on Locke’s works, needs to take into account the transformations that occurred after 1945. Traditionally, that is to say, in the spirit of Locke, rights of an individual are not difficult to institutionalise, as they assume the existence of a sphere of an individual’s freedoms. Their protection requires, first and foremost, the existence of a legal system that recognises and protects them. However, economic and social rights require, rather than interference in the sphere of an individual’s freedoms, positive actions taken by governments, which may, to a large extent, hinder the recognition of these rights as human rights (Cranston, 1983).

Researchers who do not agree that natural rights can be understood as identical to human rights, despite recognising historical links between these two ideas, do not acknowledge that all the key features of the first conception can be identified in the other one. Moreover, one can spot the problem which arises when we endeavour to understand the analysed ideas as identical, namely, the problem which is related to a multitude of their forms. Contemporary human rights are justified in philosophical discourse in various ways. Whereas, the very idea of natural rights, although commonly seen from the angle of Locke’s works, took and still continues to take many forms. Assuming that natural rights are most frequently defined as the rights an individual has regardless of whether any legal

system exists or not, Ch. Beitz mentioned four basic features of doctrines, which must be taken into account. First of all, natural rights are not conditional on morality or positive law. It seems that this feature can be attributed also to human rights, if both them and natural rights are considered critical standards. Second, natural rights, especially as proposed by Locke, were seen as pre-institutional (in a logical, but not in a historical sense), which stemmed from the role of this conception, namely, it was to curtail government activities. It seems that the underlying principle behind the human rights system is something more than just the protection of an individual's freedoms: it is the definition of an individual's decent living conditions. Another feature of the idea of natural rights is its "eternity", independence from time and place. It seems that also this feature cannot be attributed to human rights, at least if we analyse their normative form (human rights can be of relevance only in societies that meet certain conditions, for example, have a developed legal system). It appears that the correspondence between the theory of natural rights and the conception of human rights is very visible because both are most often based on the assumption that rights belong to humans as such by reason of humanity (Beitz, 2009). It seems that the conclusions presented above are accurate. It is impossible to reject the historical influence of the conception of natural rights on the way the idea of human rights has been shaped, however, there are no grounds, as it appears, to understand these two terms as identical. We should note that the term *natural rights* puts emphasis on the human nature and possibly bears some relationships with the conception of natural law, but primarily the Locke's tradition. Whereas the term *rights of man* presupposes that a human is the source of rights, laying stress on his or her moral and rational nature and being identified with the revolutionary period, the term *human rights* is free of "defects" (i.e. has no reference to any idea of natural law) and is most often used, both in the academic discourse and normative acts (Donnelly, 1982). It seems that the modern idea of human rights is a conception which is so intricate and so multidimensional that to call it simply a new incarnation of the natural rights doctrine would be an oversimplification.

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## LIVING STANDARDS OF POLISH AND LITHUANIAN RESIDENTS AFTER THE COVID-19 PANDEMIC: THE IMPACT ON LIVING CONDITIONS

This article aims to analyze living conditions in Poland and Lithuania after the COVID-19 pandemic, using Eurostat data for seven chosen indicators. The dynamics indices were used to examine the changes in the analyzed indicators over the studied period. Stepwise regression method was used to investigate the impact of the highlighted variables on GDP *per capita*. The indices allowed us to interpret whether there was a decrease or an increase in the variables throughout the analyzed period, as well as to compare the results for individual years. The results should help the authorities of the analyzed EU countries to make decisions regarding the objectives of the 2030 Agenda. The research shows that the GDP *per capita* variable is influenced by the inflation rate, people's inability to "make ends meet," and the share of people living in under-occupied dwellings. The dynamics of people at risk of poverty in Lithuania have increased by 1.5% since 2013. Based on the results for both Lithuania and Poland, the implementation of the main principles of the sustainable development goals, including the elimination of poverty and hunger, may be at risk. If the governments of these countries do not take decisive steps, the achievement of the SDGs by 2030 may be threatened.

**Keywords:** living standards; Human Development Index (HDI); econometric models; EU countries.

### 1. INTRODUCTION

Theoretically, measures of household wealth can be reflected by income, consumption, or expenditure information. However, the collection of accurate income and consumption data requires extensive resources for household surveys. Social economic theories may

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differ from conventional beliefs about economics. Traditional schools of thought often assume that actors are self-interested and make rational decisions. Social economic theories often consider subjects outside the focus of mainstream economics, including the effect of the environment and ecology on consumption and wealth.

In a dynamically changing reality, there is the need to create indicators of the conditions of social life that will be sensitive to the processes occurring in individual countries. Since the synthetic measure should be supplemented with additional determinants (Science and Technology and Living conditions), it can be called a new measure of the study of social and economic development (Mięgała-Warchoł, 2021).

When describing the living conditions, the average usable floor space per household member is considered, as well as its equipment, among others, with sanitary installations, water supply system, and central heating. However, today, the above installations are not a major challenge, and therefore it should be considered whether these aspects should be considered in the study of socio-economic development. A more key issue in the analysis of living conditions is problems related to financial issues, i.e. income and expenses of an individual.

The outbreak of war in Ukraine, and what is associated with it, the increase in oil prices and high inflation, which numerous countries in the world are facing, will inhibit economic development in the countries of the European Union. The only right solution will be the effective management of the funds that EU countries obtain, as well as a properly conducted monetary policy for these countries (Mięgała-Warchoł, Surówka, 2022). The research object of this article is the standards of living in Poland and Lithuania. The aim of the article is to analyse living conditions in Poland and Lithuania between 2013 and 2022.

In the article, the impact of economic and financial variables on the standard of living of residents of Poland and Lithuania will be examined. The following research questions arise from this: Have living conditions in Poland and Lithuania improved in recent years? We want to investigate whether the outbreak of the war in Ukraine has not worsened the living conditions of the inhabitants of Poland and Lithuania. Has the percentage of people unable to make ends meet decreased since 2013? We will use econometric models to determine the impact of economic and financial variables on living conditions in Poland and Lithuania.

## **2. LITERATURE REVIEW (AND HYPOTHESES DEVELOPMENT)**

The analysis of the standard of living has always been at the centre of the attention of scientists. It is related to the evaluation of the living conditions of the society. Living conditions are one of the basic determinants of socioeconomic development. Living conditions are an important determinant of the standard of living of the population.

Franses and Hobijn (2001) analysing the standard of living and living conditions, additionally evaluate four additional indicators that we use daily calorie supply, daily protein supply, infant mortality rates, and life expectancy at birth. According to these scientists, convergence in real GDP per capita does not imply convergence with other social indicators.

Dowrick, Dunlop, and Quiggin (2003) while researching the standard of living, thing that neither GDP rankings, nor the rankings of the Human Development Index (HDI) are consistent with the partial ordering of revealed preference. They think that the set of consumption items that make up the GDP index omits important elements of well-being, such as health status.

Fleurbacy and Gaulier (2009) suggest applying international comparisons based on GDP *per capita*, the measure incorporates corrections for international flows of income, labour, risk of unemployment, healthy life expectancy, household demography, and inequalities.

Oulton (2012) suggests applying a general algorithm for calculating true cost-of-living indices when demand is not homothetic and when the number of products may be large. The algorithm is illustrated by applying it to estimating true PPPs for 141 countries and 100 products within household consumption, using data from the World Bank's latest International Comparison Program.

Kelly, Gráda (2013), Allen, Bengtsson, Dribe (2005), Breinlich, Leromain, Novy and Sampson (2022) argue that inflation has a direct negative impact on changes in living standards.

Cantillon (2013), while researching the standard of living, thinks that it would be appropriate to investigate differences in living standards between spouses within households. Adopting a specially adapted standard poverty measurement approach, non-monetary indicators, it explores differences between spouses in terms of possessions and access to certain goods and services, and the control and management of household resources.

Paxot, Rentería, Souto, Peet, Fink, Fawzi (2015) analysing the standard of living and living conditions, noticed that during the observed period, the effect of population has been quite positive, because of the effect of migration, so the economic support ratio has increased. Nevertheless, the positive effect of population age structure is ending, and the opposite effect is expected for the next decades with the baby boom retirement.

Rao and Min (2017) suggest applying a universal, irreducible, and essential set of material conditions for achieving basic human well-being, along with indicators and quantitative thresholds, which can be operationalised for societies based on local customs and preferences – decent living standard (DLS). The DLS offers a normative basis for developing minimum wage and reference budgets and for assessing environmental impacts, such as climate.

To assess poverty, a multidimensional poverty index (MPI) can be used, considering various indicators that were previously overlooked (Shinice, Derek, 2023).

Ngo (2018), Veneri, Murtin (2019), Boter, Watts, Paul, Sen (2020), while researching the standard of living, offers to apply welfare called multidimensional living standards (MDLS) at the regional level. Scientists also show that metropolitan residents experience, on average, higher levels of MDLS and income than those in other regions.

Goldberg, Torras (2021), Guliyeva, Jones (2022), Capelloa, Cerisola (2023) while researching the standard of living, noticed that middle-class living standards have remained relatively flat over the past four decades, and substantial debt has been required to maintain consumption at customary levels.

Economic inequality can manifest itself in various forms: uneven distribution of income or wealth between different groups of people, regions, or countries. The unequal distribution of income in the world is reflected because today 10% of the world's richest population receives 52% of the world's income, while 50% of the poorest population earns 8.5% (World Inequality Report, 2022). On average, the representative of the wealthiest population of the world earns 87,200 euros (122,100 US dollars) per year, while the representative of the poorest population of the world earns 2,800 euros (3,920 US dollars) per year. Global inequality in the distribution of wealth is more pronounced than inequality in the distribution of income (Dluhopolskyi, Zhukovska, 2023).

A good way to improve financial condition and increase energy self-sufficiency may be to use the potential of biogas within cooperatives and energy clusters bringing together enterprises (Cierpień-Wolan, Stec-Rusiecka, Twaróg, Bilińska, Dewalska-Opitek, Wierzbński, 2022)

Sustainable inclusive progress, accompanied by an increase in the income and simultaneous enhancement of its economic opportunities, the level of security and quality of life, should be recognised as the main goal of economic development, not GDP growth, as previously thought (Dluhopolskyi, Zhukovska, 2023).

After reviewing research and scientific articles and their opinions on the standard of living and living conditions in the economy and society, it can be concluded that in all research only a few indicators can be identified and they cannot be supplemented with other indicators. Each research is a different view of standard of living. However, of course, there is a common base of indicators that describe standard of living.

In connection with this planned goal, these prior empirical results allowed to assume the following research hypotheses:

Hypothesis 1: Living conditions in Poland and Lithuania have improved in recent years.

Hypothesis 2: Since 2013, the percentage of people unable to make ends meet has decreased.

Hypothesis 3: The dynamics of people at risk of poverty have decreased compared to 2013.

### 3. RESEARCH METHODOLOGY

To achieve the objectives described, data taken from Eurostat databases on the following variables will be used:

1. Inflation rate (-).
2. Unemployment rate (-).
3. GDP *per capita* 1 (+).
4. The percentage of people who are unable to 'make ends meet' (-).
5. The rate of people at risk of poverty (-).
6. Share of people living in under-occupied dwellings by household type and income quintile (+).
7. Human Development Index (+).

People who are unable to make ends meet it means people who live in households that reported having difficulties in making ends meet (i.e. whose financial resources did not cover their usual necessary expenses). Share of people living in under-occupied dwellings means that people live in their dwellings mostly alone and they have lot of space in their apartments.

The paper uses fixed and variable dynamics indices to compare the results for both countries for the variables mentioned above. The indices allowed one to interpret whether there was a decrease or an increase in the variables analysed throughout the analysed period, as well as by comparing the results in individual years. In the last part of the article, a model was built in which the Y variable was the GDP *per capita*, while the variables 1–2 and 4–6 of the list appeared as independent variables X.

The dynamics indices were used to examine the changes in the analyzed indicators in the studied period. In order to investigate the impact of the highlighted variables on GDP *per capita*, the stepwise regression method was used. The stepwise regression model provide estimates of marginal effects for each of the variables used as well as the model fit

statistics. The progressive stepwise regression method is particularly useful when there are a large number of potential independent variables and the most relevant ones for the dependent variable are to be identified in the study. The progressive stepwise regression method will be used to obtain a set of variables that statistically significantly affect the dependent variable.

#### 4. RESULTS AND DISCUSSION

After applying a quantitative research approach, data from Eurostat databases regarding the above-mentioned variables were used. Table 1 presents the values of the HDI index for developed and developing EU countries for 2021.

Table 1. The developed and developing countries of the European Union by the Human Development Index

No.	Developed Country	HDI 2021	No.	Developing Country	HDI 2021
1	Denmark	0.948	9	Malta	0.918
2	Sweden	0.947	10	Slovenia	0.918
3	Ireland	0.945	14	Cyprus	0.896
4	Germany	0.942	16	Estonia	0.890
5	The Netherlands	0.941	17	The Czech Republic	0.889
6	Finland	0.940	19	Poland	0.876
7	Belgium	0.937	20	Lithuania	0.875
8	Luxembourg	0.930	22	Latvia	0.863
11	Austria	0.916	23	Croatia	0.858
12	Spain	0.905	24	Slovakia	0.848
13	France	0.903	25	Hungary	0.846
15	Italy	0.895	26	Romania	0.821
18	Greece	0.887	27	Bulgaria	0.795
21	Portugal	0.866			

Source: Author's calculations.

According to the UNDP HDI ranking for 2021, Poland is in the 19th place and Lithuania is in 20th place. The difference between these two countries in HDI value is 0.001. Compared to 2020, Poland obtained the same value, 0.876, while Lithuania fell from 0.879 to 0.875. Both countries are in the middle of the list of developing countries.

Tables 2–7 present the dynamics indexes for Poland and Lithuania for 2011–2022. For the variables, the rate of people at risk of poverty and the share of people living in under-occupied dwellings, the downloaded data relate to the 2013–2022 time series. For the variable the unemployment rate, the downloaded data relate to the 2009–2022 time series.

The results presented in table 2 indicate a significant increase in inflation in 2022 compared to 2021 for both Poland and Lithuania. In case of Lithuania, the inflation rate in 2022 was 18.9% and for Poland 13.2%. In both countries, these are double-digit values, which we have not observed in previous years. In Lithuania, the value increased by 310.9% compared to 2021, and for Poland, the value increased by 153.9% compared to 2021. Compared to 2011, for Lithuania, this indicator increased by 361.0%, for Poland, it

increased by 238.5%. Table 3 presents the unemployment rate dynamics indices for Poland and Lithuania for the years 2009–2022.

Table 2. Inflation rate for Lithuania and Poland for the years 2011–2022

Years	Lithuania			Poland		
	Inflation rate	Index with a fixed basis	Index with a movable basis	Inflation rate	Index with a fixed basis	Index with a movable basis
2011	4.1	100.0	-	3.9	100.0	-
2012	3.2	78.1	78.1	3.7	94.9	94.9
2013	1.2	29.3	37.5	0.8	20.5	21.6
2014	0.2	4.9	16.7	0.1	2.6	12.5
2015	-0.7	-17.1	-350.0	-0.7	-18.0	-700.0
2016	0.7	17.1	-100.0	-0.2	-5.1	28.6
2017	3.7	90.2	528.6	1.6	41.0	-800.0
2018	2.5	61.0	67.6	1.2	30.8	75.0
2019	2.2	53.7	88.0	2.1	53.9	175.0
2020	1.1	26.8	50.0	3.7	94.9	176.2
2021	4.6	112.2	418.2	5.2	133.3	140.5
2022	18.9	461.0	410.9	13.2	338.5	253.9

Source: Author's calculations.

Table 3. Unemployment rate for Lithuania and Poland for years 2011–2022

Years	Lithuania			Poland		
	Unemployment rate	Index with a fixed basis	Index with a movable basis	Unemployment rate	Index with a fixed basis	Index with a movable basis
2009	13.8	100.0	-	8.5	100.0	-
2010	17.8	129.0	129.0	10	117.6	117.6
2011	15.4	111.6	86.5	10	117.6	100.0
2012	13.4	97.1	87.0	10.4	122.4	104.0
2013	11.8	85.5	88.1	10.6	124.7	101.9
2014	10.7	77.5	90.7	9.2	108.2	86.8
2015	9.1	65.9	85.0	7.7	90.6	83.7
2016	7.9	57.2	86.8	6.3	74.1	81.8
2017	7.1	51.4	89.9	5	58.8	79.4
2018	6.2	44.9	87.3	3.9	45.9	78.0
2019	6.3	45.7	101.6	3.3	38.8	84.6
2020	8.5	61.6	134.9	3.2	37.6	97.0
2021	7.1	51.4	83.5	3.4	40.0	106.3
2022	6	43.5	84.5	2.9	34.1	85.3

Source: Author's calculations.

There is an improvement in the unemployment rate for both countries. For Lithuania, the unemployment rate for 2022 is 6%, for Poland 2.9%. For Lithuania, the value decreased by 15.5% compared to 2021, for Poland, the value decreased by 14.7% compared to 2021. Compared to 2009, this indicator decreased by 56.5% for Lithuania and by 65.9% for Poland.

The table 4 presents the GDP per capita dynamics indices for Poland and Lithuania for the years 2011–2022. There is an improvement in the GDP *per capita* for both countries. For Lithuania, GDP per capita for 2022 was 21788.2, and for Poland it was 19029.8. For Lithuania, the value increased by 9.4% compared to 2021, and for Poland, the value increased by 13.7% compared to 2021. Compared to 2011, for Lithuania, this indicator increased by 74.9%, for Poland, it increased by 60.1%. There is an increasing trend, with Lithuania and Poland.

Comparing the results obtained by Migąła-Warchoł, Surówka (2022) regarding the forecasting of GDP values for Poland, it can be concluded that with this variable, an ascending function trend was observed.

Table 4. GDP *per capita* for Lithuania and Poland for the years 2011–2022

Years	Lithuania			Poland		
	GDP <i>per capita</i>	Index with a fixed basis	Index with a movable basis	GDP <i>per capita</i>	Index with a fixed basis	Index with a movable basis
2011	12 455.4	100.0	-	11 886.8	100.0	-
2012	13 140.9	105.5	105.5	12 283.0	103.3	103.3
2013	13 847.8	111.2	105.4	12 318.3	103.6	100.3
2014	14 383.9	115.5	103.9	12 570.5	105.8	102.1
2015	14 980.5	120.3	104.2	13 087.6	110.1	104.1
2016	15 637.6	125.6	104.4	13 268.4	111.6	101.4
2017	16 614.5	133.4	106.3	14 056.8	118.3	105.9
2018	17 521.3	140.7	105.5	14 708.9	123.7	104.6
2019	18 444.8	148.1	105.3	15 437.2	129.9	105.0
2020	18 083.3	145.2	98.0	15 287.7	128.6	99.0
2021	19 908.1	159.8	110.1	16 740.3	140.8	109.5
2022	21 788.2	174.9	109.4	19 029.8	160.1	113.7

Source: Author's calculations.

Table 5 presents the percentage of people who cannot make 'ends meet' dynamics indices for Poland and Lithuania for the years 2011–2022. For Lithuania, the percentage of people who cannot meet their goals for 2022 was 2.4%, and for Poland was 3.7%. For Lithuania, the value decreased by 11.1% compared to 2021, and for Poland, the value increased by 12.1% compared to 2021. Compared to 2013, for Lithuania this indicator decreased by 79.1%, for Poland, it decreased by 70.2%.

Table 5. The percentage of people who are unable to ‘make ends meet’ for Lithuania and Poland for the years 2011–2022

Years	Lithuania			Poland		
	Inability to make ends meet	Index with a fixed basis	Index with a movable basis	Inability to make ends meet	Index with a fixed basis	Index with a movable basis
2011	11.5	100.0	-	12.4	100.0	-
2012	12.9	112.2	112.2	13.3	107.3	107.3
2013	9.6	83.5	74.4	12.7	102.4	95.5
2014	8.2	71.3	85.4	10.7	86.3	84.3
2015	6.8	59.1	82.9	10.2	82.3	95.3
2016	6.9	60.0	101.5	8.4	67.7	82.4
2017	7.1	61.7	102.9	6.8	54.8	81.0
2018	5.5	47.8	77.5	5.3	42.7	77.9
2019	3	26.1	54.5	4.5	36.3	84.9
2020	3	26.1	100.0	3.8	30.6	84.4
2021	2.7	23.5	90.0	3.3	26.6	86.8
2022	2.4	20.9	88.9	3.7	29.8	112.1

Source: Author’s calculations.

Table 6 presents the rate of people at risk of poverty dynamics indices for Poland and Lithuania for 2013–2022.

Table 6. The rate of people at risk of poverty in Lithuania and Poland for the years 2013–2022

Years	Lithuania			Poland		
	The rate of people at risk of poverty	Index with a fixed basis	Index with a movable basis	The rate of people at risk of poverty	Index with a fixed basis	Index with a movable basis
2013	20.6	100.0	-	17.3	100.0	-
2014	19.1	92.7	92.7	17	98.3	98.3
2015	22.2	107.8	116.2	17.6	101.7	103.5
2016	21.9	106.3	98.7	17.3	100.0	98.3
2017	22.9	111.2	104.6	15	86.7	86.7
2018	22.9	111.2	100.0	14.8	85.6	98.7
2019	20.6	100.0	90.0	15.4	89.0	104.1
2020	20.9	101.5	101.5	14.8	85.6	96.1
2021	20	97.1	95.7	14.8	85.6	100.0
2022	20.9	101.5	104.5	13.7	79.2	92.6

Source: Author’s calculations.

For Lithuania, the percentage of people at risk of poverty in 2022 was 20.9% and for Poland was 13.7%. For Lithuania, the value increased by 4.5% compared to 2021, and for Poland, the value decreased by 7.4% compared to 2021. Compared to 2013, for Lithuania this indicator increased by 1.5%, for Poland it decreased by 20.8%. The first goal of the



Sustainable Development Goals of Agenda 2030 is to end poverty in all its forms everywhere.

Table 7 presents the dynamic indexes of the share of people living in under-occupied dwellings for Poland and Lithuania for the years 2013–2022. For Lithuania, the share of people living in under-occupied dwellings for 2022 was 21.7%, and for Poland it was 16.5%. For Lithuania, the value decreased by 0.5% compared to 2021, for Poland, the value increased by 1.9% compared to 2021. Compared to 2013, for Lithuania this indicator increased by 13.0%, for Poland it increased by 46.0%.

Table 7. Share of people living in under-occupied dwellings in Lithuania and Poland for years 2013–2022

Years	Lithuania			Poland		
	Share of people living in under-occupied dwellings	Index with a fixed basis	Index with a movable basis	Share of people living in under-occupied dwellings	Index with a fixed basis	Index with a movable basis
2013	19.2	100.0	-	11.3	100.0	-
2014	19.1	99.5	99.5	11.6	102.7	102.7
2015	20.1	104.7	105.2	12.9	114.2	111.2
2016	22.7	118.2	112.9	14.2	125.7	110.1
2017	23.0	119.8	101.3	14.6	129.2	102.8
2018	24.3	126.6	105.7	14.4	127.4	98.6
2019	24.5	127.6	100.8	15	132.7	104.2
2020	27.5	143.2	112.2	15.9	140.7	106.0
2021	21.8	113.5	79.3	16.2	143.4	101.9
2022	21.7	113.0	99.5	16.5	146.0	101.9

Source: Author's calculations.

Tables 8–9 present the results of the estimation of the parameters of the stepwise regression model, where GDP *per capita* is the dependent variable.

Table 8. Parameters of the stepwise regression model

	Summary of dependent variable regression GDP <i>per capita</i> , R = 0,66 R <sup>2</sup> = 0,44 Modified R <sup>2</sup> = 0,39					
	b* (without intercept)	Std. error. b*	b	Std. error. b	t	p
<b>Intercept</b>			32922.79	2643.131	12.46	0.000
<b>Inflation rate</b>	-0.53	0.15	-740.52	215.179	-3.44	0.002
<b>Inability to make ends meet</b>	-0.45	0.15	-340.12	116.956	-2.91	0.008

Source: Author's calculations.

The results show that the GDP *per capita* variable is influenced by the inflation rate, inability to ‘make ends meet’, and share of people living in under-occupied dwellings. The stepwise regression model provide estimates of marginal effects for each of the variables: inflation rate, inability to ‘make ends meet’, and share of people living in under-occupied dwellings, as well as the model fit statistics. The marginal effects reveal the expected magnitudes of change in GDP *per capita* associated with one unit increase in the value of each variable used. The estimated marginal effects reveal that a one unit increase in measurement of the determinant is expected to decrease in the GDP *per capita* by 740,52 if the inflation rate is a determinant. The estimated marginal effects reveal that a one unit increase in measurement of the determinant is expected to decrease in the GDP *per capita* by 340,12 if the inability to make ends meet is a determinant (table 8).

Table 9. Parameters of the stepwise regression model

	Summary of dependent variable regression GDP <i>per capita</i> R = 0,58 R <sup>2</sup> = 0,33 Modified R <sup>2</sup> = 0,31					
	b*	Std. error b*	b	Std. error b	t	p
<b>Intercept</b>			17352.28	1697.84	10.22	0.000
<b>Share of people living in under-occupied dwellings</b>	0.58	0.16	146.70	41.58	3.53	0.002

Source: Author’s calculations.

The estimated marginal effects reveal that a one unit increase in measurement of the determinant is expected to increase in the GDP *per capita* by 146,70 if the share of people living in under-occupied dwellings is a determinant (table 9).

The results obtained indicate that for the remaining variables: the unemployment rate and the rate of people at risk of poverty, the values of their parameters were not statistically significant.

## 5. CONCLUSIONS

Agenda 2030 is a global action plan adopted by UN member states in 2015. Its main objective is to create a more sustainable, just, and prosperous world by 2030. Agenda 2030 focuses on three key aspects of the sustainable development, i.e.: economic, social, and environmental. The most well-known part of this agenda is the Sustainable Development Goals (SDGs), comprising 17 goals. These goals aim to address various global issues such as poverty, hunger, lack of access to education, social inequalities, health challenges, and environmental protection. Agenda 2030 is widely accepted internationally and emphasises partnerships between countries, public and private sectors, nongovernmental organizations, and civil society to achieve these ambitious goals by 2030 (<https://glorew.com/articles/17-sustainable-development-goals-united-nations/?gclid...>).

The calculated results should help the authorities of the analysed countries belonging to the European Union to make decisions regarding the objectives of the 2030 Agenda. The results show that the GDP *per capita* variable is influenced by the inflation rate, inability to ‘make ends meet’, and share of people living in under-occupied dwellings.

**Hypothesis 1** was confirmed, which assumed that living conditions in Poland and Lithuania have improved in recent years. Analysing the living conditions in Poland and Lithuania in 2013–2022, the results show that for both Lithuania and Poland, this value has increased by over 200% over the last 10 years.

**Hypothesis 2** was also confirmed: since 2013, the percentage of people unable to make ends meet has decreased. The research results show that in both countries Poland and Lithuania the percentage of people unable to make ends meet has decreased by 70% compared to 2013, so it can be said that both countries are doing better and better in this aspect.

Unfortunately, **hypothesis 3** was partially confirmed, which assumed that the dynamics of people at risk of poverty decreased compared to 2013. Research shows that the dynamics of people at risk of poverty in Lithuania increased by 1.5% compared to 2013. A different situation occurs in Poland, where the dynamics of people at risk of poverty decreased by 20.8%. Obtaining such a result requires additional research to be performed in Lithuania, which will answer the question: What factors influenced the increase in the dynamics of people at risk of poverty in this country, and what caused the deterioration of the situation in this aspect. The search for sustainability stems from the goal of humanity to develop an environment that enhances individual freedom, but also improves the range of choices associated with having a longer and healthier life. To achieve such a situation, it is necessary to combat poverty and introduce solutions that minimise poverty. Another issue that should be noted is the fact that EU governments should allocate more resources to health protection and improving the living conditions of the inhabitants of the European Union countries (Migała-Warchoł, Pichla, 2021).

In summary, it can be concluded that implementing the main principles of sustainable development goals, including the elimination of poverty and hunger, based on the results presented both in Lithuania and Poland, may be at risk. If the governments of these countries do not take decisive steps the achievement of the SDGs by 2030 may be threatened.

It is well known that the better the economic situation, the better standard of living people have. However, today we are currently facing some problems in Europe. One of them is the war in Ukraine, which caused inflation in all EU countries, as well as in Poland and Lithuania. The best solution to fight against it is to raise interest rates. However, this situation resulted in an increase in loan installments and politicians in Poland stopped raising interest rates.

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## THE MOST IMPORTANT CHANGES IN EU ASYLUM AND REFUGEE POLICY AFTER 2015

The current migration waves in the European Union, especially after the outbreak of war in Ukraine, are causing a lot of confusion. This has forced EU institutions and individual member states to rethink their policies towards refugees. Analysis of the migration phenomenon within the EU, due to its importance in both the European and international arenas, is crucial to achieving this goal. The research problem of this article is to discuss the impact of the migration and refugee crisis on EU refugee policy after 2015. The main hypothesis is that as a result of the “refugee crisis” in 2015, followed by the COVID-19 pandemic, a change occurred in the way EU security policy was conducted. An additional conditionality turned out to be the currently ongoing war in Ukraine, which caused a huge relocation of the population and, at the same time, revised the EU’s asylum legislation, showing its loopholes and inconsistencies. The research methodology includes a critical review of relevant literature, official documents, policy documents, primary and secondary legislation, statistical data, and content analysis.

**Keywords:** refugee policy, asylum, migration, European Union.

### 1. RESEARCH PROBLEM

Due to recent significant natural disasters, internal and international wars, strategic movements, and socioeconomic factors, the number of asylum seekers and refugees continues to rise day by day. Among the most significant regions affected by this mobility are unquestionably the nations of the European Union (EU). In this context, it results in numerous legal, social, and economic alterations and also structural transformations.

Since migration is a dynamic issue shaped by the constant mobility of people, it is anticipated that the relevant legislation will have a dynamic and flexible structure. The effects of the ongoing international migration and refugee crisis on the asylum policies of the member states of the European Union are discussed.

Due to key factors in 2020 and 2021, the current migration crisis has caused significant upheaval, compelling not only the institutions of the European Union but also the Member

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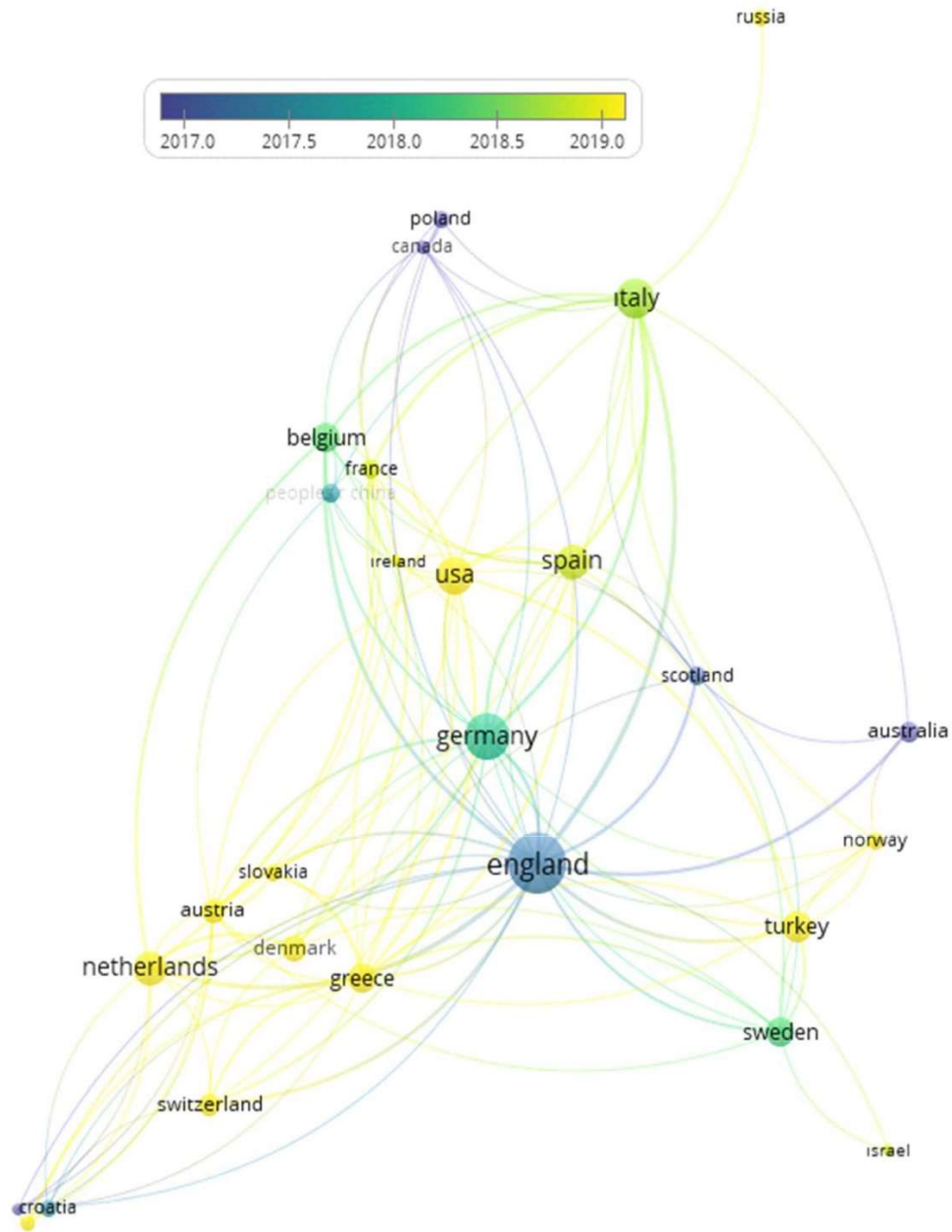


Figure 2. Overlay Visualization on Countries at Vosviewer  
Source: Own elaboration based on data from Eurostat.

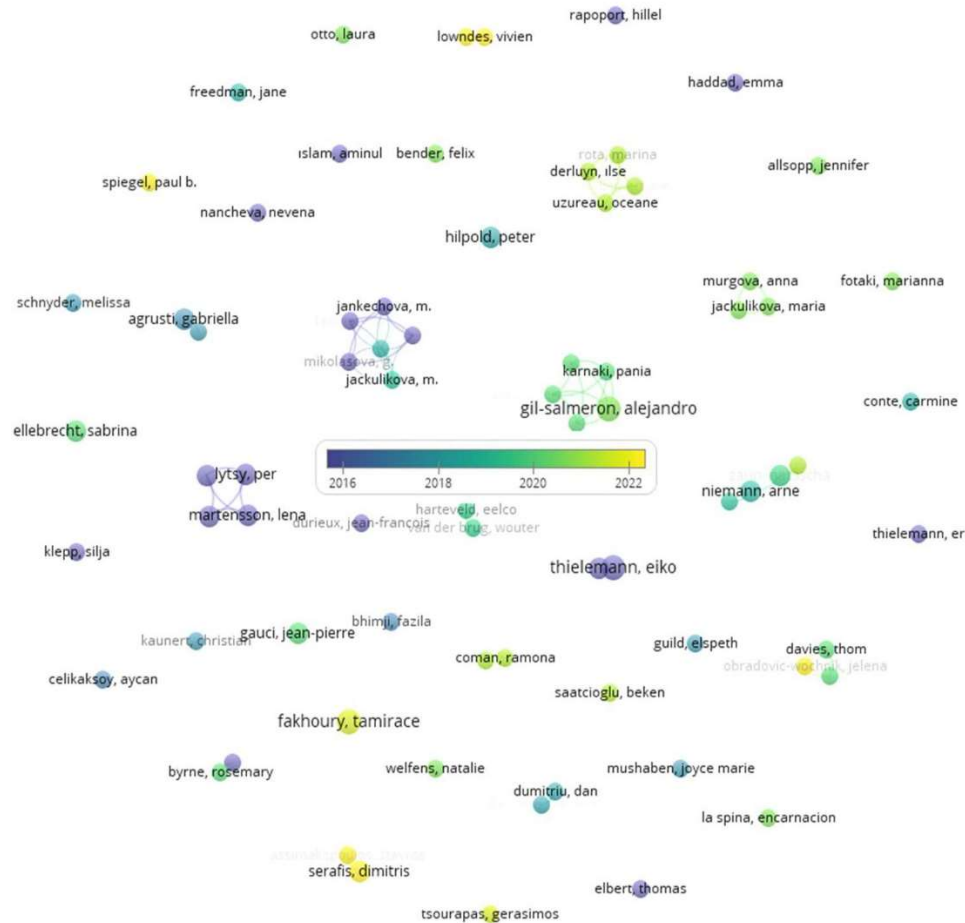


Figure 3. Overlay Visualization on Authors at Vosviewer

Source: Own elaboration based on data from Eurostat.

## 2. ASYLUM AND REFUGEE POLICY IN EU LAW

Refugee policy is closely linked to the European Union's asylum policy, which was created at a time of economic crisis. It aimed to limit the number of refugees and introduced certain restrictions. The first provision appears in the Single European Act citing the principles of respect for human rights. Mass refugee issues were instead regulated by Article 100c(2) of the Maastricht Treaty. Under the Amsterdam Treaty, asylum and migration issues were transferred from the third to the first pillar and thus became Community matters. Furthermore, if the European Union had failed to reach agreement on refugee rights standards this would have resulted in an increased influx of people to those countries where these rights were best protected (Hathaway, 1984).

After years of discussion among the Member States of the European Union, common criteria for the identification of persons in need of international protection were established in Community law as a guideline for national authorities applying the Convention rules.

At the outset, European Union primary law did not formulate a catalogue of individual rights. It dealt primarily with economic and administrative issues. The Treaty establishing the European Economic Community did not contain a catalogue of human rights and freedoms, hence only regulations concerning the so-called social dimension of the common market are relevant. Under the Treaty, any discrimination on the basis of nationality is prohibited (Fermus, Lis, 2016).

Refugee status and asylum-seeker status have significant similarities, as well as similar prerequisites for granting asylum or refugee status, but the similarities end there. Refugee status serves to guarantee international protection and involves a decision by an international authority or state. Asylum, on the other hand, is traditionally understood as the exclusive right of a state to protect a foreigner on humanitarian grounds (Jagielski, 1997).

New art. 2 Lisbon Treaty(TL) in conjunction with Article 3(2), states that the Union is founded on the values of respect for human dignity, freedom, democracy, equality, the rule of law and respect for human rights, including the right to freedom of movement or asylum. The placement in Article 3(2) of the Treaty on European Union (TEU) of the objective of providing its citizens with an area of freedom, security and justice in second place to the objective of 'promoting peace, its values and prosperity among its peoples' also underlines the importance that Member States give to cooperation in this area. It also points to a further stage in the development of cooperation in this matter, observed since the 1970s (Heinrich-Hamera, 2005; Grzelak, 2007).

The common refugee and asylum policy, in turn, finds its legal basis in Articles 77–78 and 80 of the Treaty on the Functioning of the EU (TFEU) and, according to it, is based on the previously mentioned Geneva Convention of 28 July 1951 and the New York Protocol of 31 January 1967 relating to the status of refugees. The Union's task is to establish and develop a common asylum policy aimed at granting appropriate status to any foreigner in need of international protection. As asylum policy is a shared competence between the Union and the Member States according to Article 4 TFEU, it is the primary task of the Council and the Parliament to establish a common asylum system which is to include:

- a uniform status for asylum
- a uniform status for subsidiary protection
- a common system of temporary protection;
- common procedures for granting and withdrawing uniform asylum or subsidiary protection status;
- criteria and mechanisms for determining the Member State responsible for examining an application;
- standards on reception conditions;
- partnership and cooperation with non-member states (Heinrich-Hamera, 2005).

Moreover, under Articles 67 and 78 of the Treaty on the Functioning of the EU, the Union has become an area of freedom, security and justice with respect for fundamental rights and the different legal systems and traditions of the Member States. As part of asylum policy, its primary task under Article 67(2) TFEU is the Schengen mission at internal borders, i.e. putting the Schengen acquis into practice by ensuring the absence of controls on persons at internal borders and developing a common policy based on solidarity between Member States. Under Article 78(3) TFEU, when one or more Member States are faced with an emergency situation characterised by a sudden inflow of third-country nationals, the Council, on a proposal from the Commission after consulting Parliament, may adopt

provisional measures for the benefit of the State concerned. Relocation is a mechanism for the practical implementation of the principle of solidarity and fair sharing of responsibility within the meaning of Article 80 TFEU.

This has already been done in Council Directive 2004/83/EC of 29 April 2004 on minimum standards for the qualification and status of third-country nationals or stateless persons as refugees or as persons otherwise in need of international protection and the content of the protection granted. This act also formulates for the first time a common definition of subsidiary protection status, on which the Geneva Convention is silent. The common definition criteria here are based on international human rights instruments and existing practices in Member States. The harmonisation of the rules on the recognition and substance of refugee status and subsidiary protection was intended to help reduce secondary movements between Member States of asylum seekers caused solely by differences in national legislation. The Community act applies to third-country nationals and stateless persons who are entitled to reside in the territories of the Member States for reasons of international protection needs and not on the basis of a discretionary appeal by state authorities to compassionate or humanitarian (Fermus-Bobowiec, Lis, 2016).

The Lisbon Treaty has transformed the action taken on asylum into a common policy. Its aim is no longer simply to establish minimum standards, but to create a common system with uniform statuses and procedures. The decision-making process in the EU has not been altered in any way by the treaty. However, judicial review by the Court of Justice of the European Union has been significantly improved. Any court of a Member State can now request a preliminary ruling, rather than only the national courts of last instance, as was previously the rule. This should allow the case law of the ECJ to develop in this area (Mickiewicz, Wyligala, 2009).

On 25 October 2011 (EU) No 1168/2011 of the European Parliament and of the Council was signed. The key changes concerned the strengthening of the agency's resources and increased protection of fundamental rights in the course of its operations. Frontex gained the power to acquire, alone or in co-ownership with a Member State, or to lease technical equipment for external border control. The Agency was also given new powers relating to the appointment of a pool of border guards for possible deployment during joint operations or pilot projects. In addition, the planning of border operations was improved, with a new regulation setting out how to adopt action plans which cover all the elements necessary for joint operations.

After two years, a new mechanism was established for evaluating and monitoring the application of the Schengen acquis in the Member States and introduced to the Schengen Borders Code. These made it possible to reintroduce border controls with the area – in the event of a country failing to meet its obligation to protect the Schengen external border and thereby jeopardising the security of the whole area – for a period of up to six months, with the possibility of an extension to a maximum of 2 years.

Member States rejected proposal to give the European Commission the power to decide on the temporary re-establishment of borders, defending their prerogatives in this regard. In the course of the dispute, the Community institutions, i.e. the Commission and the Parliament received a clear message that on the issue of immigration the MS want less and not more Europe (Gruszczak, 2012; Grzymała-Kozłowska, Stefańska, 2014).

The response of states to the increased wave of migrants and refugees has revitalised the debate on the substance of EU migration policy. The most important of these concerned: the Common European Asylum System, the protection of the external borders of the European Union and the governance of the Schengen Area (Kuczma, 2014).

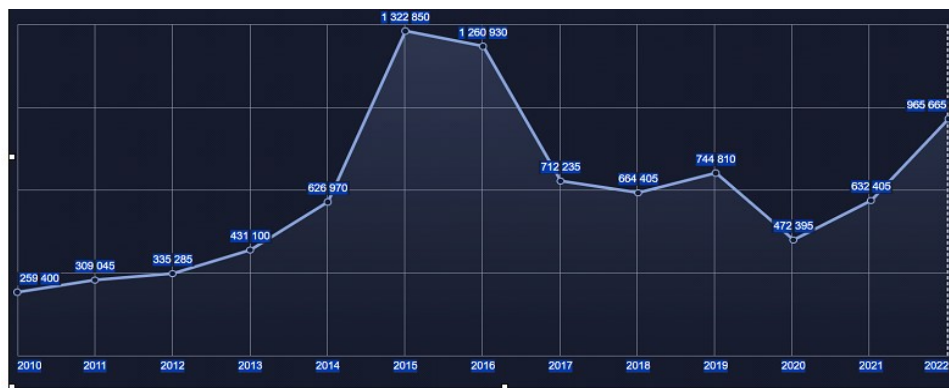
As part of the reform of the Common European Asylum System, Directive 2011/95/EU of the European Parliament and of the Council of 13 December 2011 on standards for the qualification of third-country nationals or stateless persons for the granting of refugee status and subsidiary protection was adopted in December 2011. The aim of introducing the new legislation was to eliminate the phenomenon of so-called asylum tourism. The Directive imposed an obligation on applicants: to present as soon as possible all the elements necessary to substantiate the application for protection. Under Directive 2011/95/EU of 13 December 2011, on standards for the qualification of third country nationals or stateless persons as beneficiaries of international protection, for a uniform status for refugees or for persons eligible for subsidiary protection, and for the content of the protection granted, a refugee is a third country national who, owing to well-founded fear of being persecuted for reasons of race, religion, nationality, political opinion or membership of a particular social group, is outside the country of which he is a national and who, being outside the country of former habitual residence, is unable or, owing to well-founded fear, is unwilling to avail himself of the protection of that country, or a stateless person, who, being outside the country of former habitual residence, is unable, owing to well-founded fear, to return or, owing to such fear, is unwilling to return to the country of former habitual residence, provided that the third-country national or the stateless person has not been excluded from being a refugee (Wróbel, 2012).

Asylum reform continued in 2013 when 3 documents were adopted: (1) the so-called Dublin III Regulation; (2) Directive 2013/32/EU of the European Parliament and of the Council of 26 June 2013 on common procedures for granting and withdrawing international protection; (3) Directive 2013/33/EU of the European Parliament and of the Council of 26 June 2013 on the establishment of standards for the reception of applicants for international protection. The first of the above-mentioned documents clarified the rules for determining the Member State responsible for examining an asylum application, while also establishing early warning and asylum crisis management mechanisms. However, the reform did not change the essence of the system itself, leaving the greatest responsibility for processing asylum applications in the hands of the states whose borders form the EU's external borders. The other two documents mainly provided for procedural guarantees and guarantees of rights for applicants for protection (Potyrała, 2016). An additional reinforcement was the launch of the European Asylum Support Office (EASO) in June 2011 to provide and coordinate support to countries whose asylum and refugee systems were under particular pressure.

### **3. THE EU REFUGEE CRISIS IN 2015 AND ITS IMPACT**

Migration flows were boosted in the aftermath of the Arab Spring in 2011. Their number increased year by year, reaching a crisis in 2015–2016 (which can be seen in more detail in Graph 1). First-time asylum applications in the years 2010–2022. Migration flows intensified in the wake of the Arab Spring in 2011. Their number increased year by year, reaching a crisis in 2015–2016 (which can be seen in more detail in chart number 1). However, the situation in many countries in Africa and the Middle East has not stabilized, and prolonged conflicts have ultimately led to a humanitarian crisis in the southern periphery of Europe. However, this was only a prelude to what was to happen in 2015 and 2022, when, as a result of the war in Ukraine, a record number of cases of illegal migration were recorded. Already in 2012, the number of recorded cases of illegally crossing the EU border amounted to over 280,000, and in 2014 year, it almost doubled. However, in 2015,

1,322,850 people applied for asylum in EU countries, which is twice as many as in 2014 and almost four times more than in 2012. The number of Syrians applying for international protection in 2015 it doubled compared to the previous year, reaching 362,800, while the number of Afghans almost quadrupled to 178,200, and among Iraqis it increased by 7,121,500. They represented the three main nationalities of new asylum seekers in the Member States EU in 2015, which accounted for more than half of all asylum seekers. In 2015–2016, the number of asylum applications in the EU was at its highest and then declined. There was an increase of 33.5% in 2020–2021. The highest number of asylum applications were issued in 2017–2018 (+248% compared to 2016 or +300% compared to 2015).



urostat (22.12.2023)

Graph 1. Number of asylum application in 2010–2022

Source: (Eurostat).

The influx of mixed migration flows into Europe since 2015 has strained the asylum systems of EU countries of first arrival. Indeed, numerous reports including Eurostat (see above), EASOS, Court of Justice of the European Union (CJEU) rulings of national courts have highlighted the dysfunctionality of certain provisions of the Dublin system, particularly in light of respect for fundamental rights. These developments forced the Union to take urgent anti-crisis action. The first impetus for action was a series of refugee accidents in the Mediterranean, notably the sinking of a boat with more than 800 refugees from Africa and the Middle East off the coast of Libya in spring 2015. In the aftermath of this tragedy, an extraordinary European Council summit was convened, where heads of state and government called on the European Commission to present a comprehensive migration strategy for the Union. In response to this call, on 13 May 2015. The European Commission presented the European Agenda on Migration. In order to provide a robust framework for migration and asylum policy, the proposed Asylum and Migration Management Regulation introduced Dublin III. Above all, two key elements of the regulation are the expanded definition of family and the recalibration of standards of proof. While these changes apply to all asylum seekers, it is important to examine the implications for vulnerable groups, particularly in relation to the criteria for determining the EU state responsible for an asylum claim.

Among the tasks that the EU was to undertake immediately were: rescuing migrants at sea, combating human smuggling, receiving those seeking refuge through relocation and resettlement programmes, reinvigorating cooperation with countries of origin and transit of migrants, implementing the so-called hotspot approach, and mobilising financial assistance for Member States whose asylum systems were most burdened. In the longer term, it was envisaged to base EU migration policy on four pillars. The first was to be the reduction of incentives for illegal migration to Europe, realised by eliminating the causes of migration (action for peace, poverty reduction or the fight against climate change), combating networks of smugglers and human traffickers and an effective return policy. The second pillar was strengthening the management of the EU's external borders and rescuing migrants undertaking the risky sea crossing. The third area of action became the Common European Asylum System, with a particular focus on the reform of the Dublin system. The fourth pillar of the European migration strategy looked beyond the context of the migration crisis, broadening the perspective to include a holistic policy towards legal migrants. Taking into account the unfavourable demographic trends for Europe, the European Commission announced the facilitation of highly skilled workers from third countries and the promotion of initiatives for better integration of immigrants (More: Oleksiewicz, 2023).

One of the first initiatives of the European Commission as part of its anti-crisis strategy was a proposal to relocate some of the refugees arriving in Member States in southern Europe. The Commission decided to use the emergency procedure provided for in Article 78(3) of the Treaty on the Functioning of the European Union (TFEU), according to which: in the event of one or more Member States being confronted by an emergency situation characterised by a sudden inflow of nationals of third countries, the Council, on a proposal from the Commission, may adopt provisional measures for the benefit of the Member State(s) concerned.

The temporary measure was a scheme to allocate 40 000 asylum seekers arriving in Greece and Italy. Refugee policy is closely linked to the European Union's asylum policy, which was created at a time of economic crisis. It aimed to limit the number of refugees and introduced certain restrictions. The first provision appears in the Single European Act citing the principles of respect for human rights. More precise assumptions of asylum and immigration policy and legal provisions were created only in the Maastricht Treaty.

An important element of international protection was the establishment of fair and effective procedures. The New Asylum Procedure Regulation repealing the Procedures Directive (2013/32/EU) is an amendment to the Regulation proposed in 2016. This was to establish simpler and shorter procedures for processing asylum applications, while guaranteeing the effectiveness of decisions – creating and improving the rights of applicants. On the other hand, one of the amendments of the new Pact that concern vulnerable groups is the establishment of an accelerated border procedure for the processing of asylum applications, which also prepares returns after a negative decision (Article 41). It should be emphasised that accelerated procedures carry the risk of procedural errors and inappropriate processing of asylum claims. Due to strict time constraints, the protection needs of applicants may be overlooked, and their access to legal aid and ability to properly exercise their right to appeal against negative decisions are limited. European Commission presented new pact on migration and asylum 23 September 2020, which marks a new beginning for refugee and migration policy through improved, faster and more effective procedures. The new pact provides for overcoming the conflicts that prevented asylum reform in 2016. Based on the Commission's communication, the new document takes a more 'humanitarian approach', promotes the principle of solidarity

between EU Member States and emphasises the protection of vulnerable groups. At the same time, the European Commission has put forward a Crisis and Force Majeure Regulation, based on Article 78(3) TFEU, to address exceptional situations of mass influx of nationals of non-EU countries arriving illegally, in order to give flexibility to Member States to respond at the moment of crisis and to ensure that the solidarity regime of the Asylum and Migration Management Regulation is adapted to times of crisis (Compare Potyrała, 2016).

In June 2021 the European Commission presented the Schengen strategy, while work continued on the interoperability of large-scale IT systems in the area of freedom, security and justice. Pending further legislative progress on the proposed Return Directive, the European Commission adopted in April 2021 the first EU strategy for voluntary return and reintegration, in which it promotes these solutions as integral elements of a common EU return regime for third-country nationals.

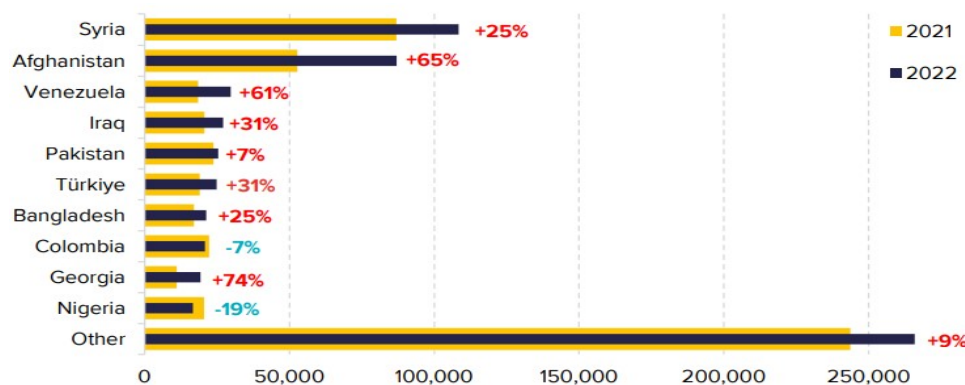
An important development was the entry into force in January 2022 of Regulation of 15<sup>th</sup> December 2021 number 2021/2303 establishing the European Union Asylum Agency (EUAA), which replaced the European Asylum Support Office (EASO) and whose mandate was extended and strengthened.

Refugees accounted for 2,712,477 arrivals in the EU in 2019, of which asylum seekers made up a population of 744,810. The temporary drop in arrivals in 2020 was due to lock down and the COVID-19 pandemic. The Western and Eastern Mediterranean routes had fewer arrivals compared to 2019, while the West African, Central Mediterranean and Western Balkan routes, on the other hand, saw an increase in arrivals. The COVID-19 Pandemia has given a new impetus to accelerate the use of digital asylum technologies. In 2020, Member States implemented new electronic systems in the area of refugee and asylum policy to increase efficiency, for example through online applications or remote interviews. It should be borne in mind that technological advances are always a threat in the form of a cyber attack.

In contrast, in 2021 it was seen a large increase in the number of permits for professional reasons, which rose from 39 per cent to 45 per cent during one year. In 2021, asylum seekers came from around 140 countries. In 2021, 632,405 applications were made in the EU, of which 537,300 were first-time applications. This represents an increase of 34 per cent compared to 2020, but a decrease of 10 per cent compared to 2019, and is in line with 2018 levels before the COVID-19 pandemic. A significant proportion of applicants from visa-free countries entered the EU legally (15 per cent of first-time applicants in 2021, compared to 25 per cent in 2020, primarily due to a decrease in applicants from Latin America).

The increase was largely the result of more applications from Afghans and Syrians, including many applications from Afghans as re-applications. Syrians were the largest group of applicants in 2021, with around 117,000 applications in EU+ countries, followed by Afghans with 102,000 applications. This was followed by nationals of Iraq (30,000 applications), Pakistan and Turkey (25,000 each) and Bangladesh (20,000). In terms of host countries, Germany received by far the largest number of asylum applications (191 000), followed by France (121 000), Spain (65 000) and Italy (53 000).





Graph 2. First instance decisions by Top 10 EU countries of origin given in 2022 compared to 2021

Source: (Eurostat).

In 2021, around 14% (89 000) of all applications were repeat applications from the same EU country, the highest number since 2008. This represents an increase of more than half compared to 2020, when 57 000 repeat applications were submitted. This is probably the result of changes made by the Union in the same year to the so-called fast-track procedure, extending its scope to certain categories of applicants or changing the deadlines.

Regarding the period from January to July, there was an increase in the number of border crossings on the Central Mediterranean routes (+42 per cent), on the Eastern Mediterranean routes (+122 per cent) on the Western Mediterranean routes (+1 per cent, 16,400) in 2022 compared to the same period in 2021. Between January and July 2022, there was a decrease in border crossings on routes across the EU's eastern land border (-21 per cent, 3,300) compared to the same period in 2021. A 33 per cent decrease in maritime fatalities: in 2022, from January to August, there were 1,533 deaths or missing persons on the three main routes, compared to 2,278 for the same period in 2021. At the end of May 2022, the number of pending applications was 774,100, 15 per cent higher than a year earlier (675,200).

#### 4. CONCLUSIONS

Events in 2021 and early 2022 have forcibly displaced millions of people, increasing existing needs for protection solutions around the world. The Taliban's rise to power in Afghanistan has set in motion new cycles of forced displacement within and beyond the country – in a region where displacement was already commonplace. Russia's invasion of Ukraine forced millions of people to leave their homes and seek refuge in neighbouring countries. Meanwhile, people continued to flee displacement hotspots – the Democratic Republic of Congo, Ethiopia, Mozambique, Myanmar, South Sudan, Syria, the Sahel region, Venezuela and Yemen. According to estimates by the United Nations High Commissioner for Refugees (UNHCR), as of June 2021, there were more than 84 million displaced people worldwide. This figure includes 26.6 million UNHCR-mandated refugees, 4.4 million asylum seekers, 48 million internally displaced persons and 3.9 million Venezuelans displaced abroad. In 2022, a record number of people in need of protection arrived in EU+ countries, more on this evidenced by the rapidly growing number

of asylum seekers and over 4 million people displaced from Ukraine applying for temporary protection.

It should not be forgotten that during the migration crisis, most irregular migrants reached Europe either through Italy or Greece. Over time, these two Member States became transit countries where migrants applied for asylum. In countries across the EU, the number of returns actually carried out was significantly lower than the number of return decisions issued. The ECJ identified a number of reasons explaining this, including the long duration of the return procedure and the lack of a procedure for mutual recognition of return decisions between individual EU Member States. The implementation of assisted voluntary return and reintegration measures is adversely affected by the lack of a harmonised EU approach to asylum policy across Member States. The renewed refugee crisis has proven that EU asylum rules need to be reformed, which is why the Eurodac database is intended to help Member States better monitor the situation of asylum seekers and persons with irregular status present in the European Union. The new regulation adopted aims to combat irregular migration and facilitate the return of these persons to their country of origin. In particular, thanks to these provisions, the database will make it possible to ensure better monitoring of asylum seekers, and no longer only of the number of asylum applications, thus enabling better identification of persons making more than one application. The database is also enriched with new biometric data, such as the facial image. The regulation will also make it possible to resolve the issue of data transfer with other European information systems. There is also a special category for identifying persons brought ashore during search and rescue operations at sea. In addition, learning from the solutions introduced in response to the influx of people fleeing the war in Ukraine, the Eurodac Regulation includes an obligation to register persons enjoying temporary protection.

There was increased pressure at the EU's external borders in 2021, with arrivals exceeding pre-pandemic levels. The number of detected irregular border crossings in 2021 was just under 200,000, the highest since 2017. However, data provided by Frontex shows that various migration routes experienced fluctuations in the number of border crossings, with some experiencing a significant increase and other flows remaining relatively stable compared to 2020. As a result of internal political changes in Belarus and the organisation of migrant smuggling by the Belarusian regime under the auspices of the state, detections at the eastern land borders increased more than tenfold.

Following Russia's invasion of Ukraine in February 2022, millions of displaced people sought refuge in the EU – In Hungary, Poland, Romania and Slovakia. These countries responded extremely quickly by opening their borders and allowing entry to their territory. On 4 March 2022, temporary protection was put in place acknowledging the existence of a mass influx of displaced persons from Ukraine thanks to the Justice and Home Affairs Council at the request of the European Commission. It should be noted that Ukraine is listed in Annex II of Regulation 2018/1806, which exempts citizens from visa requirements when crossing the external borders of EU Member States, for stays of up to 90 days within a six-month period. According to Article 2(1) of EU Council Decision 2022/382, the object is to introduce temporary protection for Ukrainian nationals residing in the area and displaced as a result of the outbreak of the Ukrainian-Russian war or after that date as a result of a military invasion by Russian armed forces.

Temporary protection is also granted to third-country nationals displaced on or after 24.02.2022, who prior to that date enjoyed legal protection under Ukrainian law and family members of the persons referred to above.

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## TIKTOK AS A METHOD OF BRANDS' COMMUNICATION WITH GENERATION Z

Consumer behavior has evolved over the years, leading to changes in the perception of consumption and the emergence of trends that help create a profile of the modern consumer. The first two decades of the 21st century brought significant changes in consumer behavior, under the influence of the Internet and social media. The purpose of this paper is to present the profiles of Generation Z consumers, and to see if the TikTok application plays an important role in brands' communication with Generation Z. Virtual communication has become widespread; this poses a challenge for brands, especially among the younger generation. The study shows that as age increases, the time a person has had an account on TikTok decreases, as does the appreciation of this application.

**Keywords:** TikTok, Generation Z, communication, brand

### 1. INTRODUCTION

Since the beginning of the 20th century, the development of new technologies, including the Internet, has been observed. The Internet has become not only a place where one looks for information or makes purchase or sale transactions. With the development of the Internet, social media appeared, where a large part of Internet users' lives, especially these ones, take place from the young generation. The development of new technologies also brought some changes in consumer behavior (Dybka, 2017). Nowadays, customers can make purchases all over the world without leaving home. They also have access to information about the offer and opinions about it, which are available on Internet forums and in widely used social media (Gracz, Ostrowska, 2014). Speaking about consumers who are most affected by these changes, Generation Z should be mentioned.

Generation Z has the ability to roll out enormous improvements in marketing and purchasing propensities in comparison with other generations. Their presence in the virtual world is quite prominent since they have a thirst to always follow the latest trend.

The use of social media by Generation Z continues to arouse interest among researchers, market entities and entrepreneurs (Yadav, Rai). Young consumers are a market segment that undoubtedly poses a challenge for modern marketing.

TikTok is one of these new platforms, which has burst onto the international market with its own logic and language. It is the seventh most used social network in the world

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(Hootsuite, 2021), and it became the first non-Facebook app to reach 3 billion global downloads (Chan, 2021). The interest in TikTok also rests on the young, belonging to the millennial and centennial generations, reaching 24% of those under 35 years old (Newman, 2021). TikTok is associated with a young audience, mainly belonging to gen Z (Pellicer, 2019; Schmidt, 2019). This is the audience that tends to be the most active (Montag et al., 2021), especially teenagers looking to expand their social network, gain fame, self-express themselves, and create an identity (Bucknell et al., 2020). The main reasons for using TikTok are self-presentation, trendiness, nescapist addiction, and novelty (Scherr, Wang, 2021). Brands are the driving force behind the marketing industry. In this context, a brand can best be defined as an intangible marketing or business concept that helps people identify a company, product, or individual. To be successful, brands will need to learn to market to Generation Z, which is quickly gaining power as a consumer group. When building a relationship with members of this generation, "Companies should be attuned to three implications for this generation: consumption as access rather than possession, consumption as an expression of individual identity, and consumption as a matter of ethical concern". According to the author of the article, an important characteristic shared by Generation Z is the search for truth and authenticity (Francis, Hoefel, 2018). The aim of this paper is to present the profile of consumers of Generation Z and check whether the TikTok application plays an important role in brands' communication with Generation Z.

## 2. CHARACTERISTICS OF THE GENERATION Z

The term "generation" is present both in everyday language and in scientific discourse. It was first used in the 19th century by Wilhelm Dilthey who defined a generation as a group of people living at the same time, influenced by the same events, and therefore perceiving reality in a similar way. Each generation develops its own collective personality, which influences the way of life of its members, including their approach to authorities, organizations and participation in it, as well as their expectations towards work and even the ways in which they intend to meet their needs (Kopertyńska, Kmiotek, 2014). R. Waśko points out in his study that when defining the concept of generation, it is assumed that it is "a community with peer characteristics created on the basis of common thoughts and behaviors, which are reactions to various types of historical events". (Waśko, 2016). It is impossible to determine the exact time frame for a given generation. The various critical dates given by the authors only serve to conventionally indicate the period in which a given generation was born. At the end of the 20th century, a new generation appears, called Generation Z. Generation Z is the youngest, most ethnically diverse and largest generation in history (Dadić et al., 2022).

It is assumed that Generation Z are people born after 1994, i.e. in years marked by rapid technological progress (Prensky, 2001). In reference to this young generation, terms such as: Generation M (Multitasking), Generation C (Connected Generation), Net Generation (constantly connected) began to be used (Mladkova, 2011). Generation Z is the first generation born in a world connected to the Internet, and therefore "living and breathing" technology. This also applies to the higher education environment, where Generation Z students rely on computer recordings instead of taking notes, are more inclined to ask questions online, do not like to wait for answers, but demand immediate information and communication (Daukševičute, 2016; Rothman, 2016). The world without the Internet is abstract to them, and the use of it from the computer has become an indispensable part of their home life (Greenfieldet, 2009).

The characteristic features of Generation Z (Żarczyńska-Dobiesz, Chomałowska, 2014; Cilliers, 2017):

- the most technologically savvy generation in history, born in the digital world, familiar and acquainted with new technology,
- more realistic and cautious, materialistic approach to life,
- full of worries about the future,
- self-confident,
- open and accepting of diversity, they themselves as a generation are internally very diverse,
- they become even more involved in the issues of global warming, hunger, wars, etc. honesty and lack of discrimination are more important to them than money, status,
- learning and development in accordance with the principle of "just in time learning", they want to have everything and know immediately, on demand, preferably online,
- they do not like the vision of long-term career building,
- it is important for them to quickly access information,
- professional and private life should constitute a whole in which they want to be themselves and be guided by the same values,
- growing up in the "online mode", social games, they developed various competences valued on the labor market very early,
- they are not afraid of risk and make decisions quickly.

Members of Generation Z boast many skills and benefits that come from living in the modern technological era. They have the ability to multitask, i.e. perform many tasks at the same time – with effective results. They receive and process information quickly, but at the same time require easier access to information. The life of young people from Generation Z takes place in the world of hyperproduction, networking and virtuality. They strive for material, quick earnings, satisfaction and a consumerist lifestyle. They live in an online world that allows them to exchange messages and communicate with the entire world with just one click. The incredible development of technology has opened a window to the entire world for them (White, 2017). For representatives of Generation Z, cyberspace is related to real space, which means that they do not hesitate to enter information about themselves on the Internet (Pandit, 2015). Representatives of Generation Z are connected to the Internet 24 hours a day. New communication devices and techniques are essential in everyday life. Easy access to the Internet allows them to search for information that interests them (Szymczyk, 2016). Even establishing relationships with other people is being replaced by online contacts (Gajda, 2017). Representatives of this generation experience difficulties in functioning outside the Internet, which manifests itself in the loss of contact with the people around them and the inability to concentrate (Stillman, Stillman, 2017). They perceive real reality through the prism of the online world. They most often communicate via social media and instant messengers. People from Generation Z like to travel and do it not only for pleasure, but also for self-development and getting to know other cultures.

### 3. TIKTOK APPLICATION

TikTok is the fastest growing short video app worldwide (Kaye et al., 2021). The TikTok platform was created in 2016. The author is the renowned Chinese company ByteDance in China under the name Douyin (Omar, Dequan, 2020). The global increase in interest in this application can be dated back to 2017, when ByteDance bought the Musical.ly

platform, already popular in the West, for a billion dollars, thus taking over all its users. In August 2018, ByteDance expired the Musical.ly name, and its users received the following message: “Musical.ly has a new name. Welcome to TikTok!” The merger of Musical.ly and Tik-tok turned out to be a success, and the platform quickly gained numerous supporters. These platforms enable interaction between their members and also provide the opportunity to co-create website resources by feeding them with content (Olkowska, 2020). The possibility for TikTok users to take grassroots initiatives makes it a space not only to present their creativity, expression or self-presentation, but also to share their creativity with others. Thus, a social networking site or application can be treated as a separate area around which there is a community focusing on a specific trend, topic, text or person.

The main difference of TikTok is its algorithm and consumption experience. Unlike other platforms, the user does not see as a priority the recent content of the accounts they follow, but instead they are shown the content that the app’s algorithm selects on the For You Page, in a continuous, never-ending succession of videos. TikTok’s algorithm makes it possible for any video from any user – regardless of their number of followers – to be shown on this homepage. Determining factors to achieve this visibility and virality seem to be the use of trending sounds and hashtags, or the number of interactions – likes, comments, shares – achieved by the video in a given time among a reduced group of users (Klug et al., 2021). Particularly interesting videos available on the platform gain popularity in a short time, thus becoming a viral video. Its reputation depends on factors such as: the frequency of sharing, commenting or clicking on the heart icon, through which recipients express their approval of a given film. The viral nature of the video is often perceived by broadcasters as an ennoblement (Cervi, 2021).

An additional phenomenon that can be observed on TikTok are the so-called trends (Negreira, Herrero, Garcia, 2022). They involve repeating activities previously recorded by other users. Thanks to this, TikTok users have the opportunity to present themselves without the need to come up with new, creative content, which is an easy and attractive entertainment tool (Juda, 2021). Trends on TikTok may be shaped top-down by the application's creators, encouraging users to record them in the discovery tab, but it may also be a bottom-up initiative of the Tiktokers themselves. Often, creative strategies and tactics influence the current application content. The platform also allows you to create live shows. This feature allows Tiktokers to develop a closer bond with their followers by answering their questions in real time. Users can also invite other Tiktokers to their live streams, with whom they can create so-called duets (Juda, 2021). Duets are a core part of the TikTok experience: users can take another person’s video and add themselves performing the same action, scene or choreography. Challenges are often community-created trends – even if they can also take the form of sponsored hashtags-, in which many TikTok users will make videos attempting to do the same action/dance/trick (Cervi, Calvo, Marin-Lliadó, 2021). Launched in 2017, TikTok soon grew to be one of the most downloaded apps worldwide (Sensor Tower, 2019). In the U.S., 60% of the TikTok active users are aged 16–24 year olds (Reuters, 2019). In fact, TikTok users in the US open the app eight times a day and spend on average 46 minutes on the app each day (Sloane, Rittenhouse, 2019).

TikTok is the app has grown rapidly in popularity and is continuing a rapid growth rate due to its highly personalized algorithm and addicting content format. TikTok is quickly establishing itself as an essential component of the marketing mix, especially for those wishing to target the newest wave of consumers. Research supports the necessity of successful integration of TikTok content into a brand’s marketing strategy if seeking to



target an audience consisting of members of Generation Z. Also, in relation to other social media platforms, TikTok usage is becoming more popular among this generation. (Fromm, Read, 2018; Grow, Yang, 2018; Priporas et al., 2017). Tik Tok holds a crucial advantage in the marketing mix for those brands who wish to target Generation Z consumers. As media habits and consumer interests evolve, brands must also evolve their marketing strategies. As gen Z kids become gen Z adults with substantial purchasing power, they must be increasingly marketed to in a way that suits their particular media consumption habits, which differ greatly from those of any previous generation. The social media landscape is constantly changing, making Facebook, Twitter, and other more traditional social media advertising platforms virtually irrelevant. The rise in popularity of influencer culture and short video content point marketers towards new platforms, new strategies, and new product placements (Rezek, 2022). Similar to the most user-generated platforms' business model, TikTok's main business strategy is advertising its audience. With billions of users' data on hand, TikTok is able to help its clients find their target audience; and by copying styles of user's content, TikTok produces more authentic TikTok advertisements to publicize client's products that could raise the purchase intentions of the audience. Written on its official web page that addresses the privacy issues, TikTok collects nearly all the data users generated on the platform, which includes users' "profile information", "content and behavior information", "location" and "Information from the third parties" (TikTok-Privacy Policy, 2020). This data is the core and fundamental resource for TikTok to attract businesses globally (Yang, 2020; Azpeitia, 2021; Zhenliang Li, 2022).

The implication TikTok for business means that it is free and effective advertising. Social media can help share and give small business exposure with relative ease and has been faster. Business can create advertisements in hopes of promoting their brands or products for free, with high chance of exposure. People are more inclined to visit a certain destination or buy products on TikTok because of its engagement with the users, and due to psychological effects young people's tendency of doing something that is trending. Video based marketing on TikTok is more enjoyable than regular advertisement due to the nature of TikTok, which is entertainment based. Video based marketing on TikTok has a better chance of earning customer attraction (Baquit, Putra, Farres, Adha, Herlambang, 2021).

#### **4. AN ANALYSIS OF THE ROLE OF TIKTOK IN BRANDS' COMMUNICATION WITH GENERATION Z BASED ON OWN RESEARCH**

The aim of the study was to check whether the TikTok application plays an important role in brand communication with Generation Z. Due to the stated goal of the research process, the following research problems were formulated:

- Q1: Is TikTok an effective tool for brands to communicate with Generation Z?
- Q2: How does gen Z rate brand engagement on TikTok?
- Q3: What is Generation Z's attitude towards the actions taken by brands on TikTok?
- Q4: Does TikTok influence the purchasing decisions of Generation Z (are they more willing to choose products advertised and recommended on TikTok by famous influencers)?

The research group consisted of people aged 18 to 26, students and secondary school students. 321 respondents took part in the study, both women and men. The research was conducted in October–November 2022, using an online survey. The research conducted was a primary, quantitative, sporadic, non-exhaustive study.

Among the respondents, women constituted 77%, and men 23% of the total. The largest group were respondents aged 18–20, i.e. 68% of the total. Definitely less, 25% of the total were people aged 21–32, 7% were respondents aged 24–26. Respondents with a TikTok account constitute 80% of the total.

Table 1. Values of Spearman's rank correlation coefficients

			Age	How long have you had a Tik Tok account?	How many times a day do you use the Tik Tok application?	What is your attitude towards the Tik Tok app?	How do you assess the involvement of brands on Tik Tok?	What is your attitude towards the actions taken by brands on Tik Tok?	How do you assess advertising content in recordings on influencers' profiles?	Are you more likely to buy a product advertised on Tik Tok than one advertised traditionally?	
rho Spearmana	Age	Correlation coefficient	1,000								
		Significance (two-sided)									
		N	258								
	How long have you had a Tik Tok account?	Correlation coefficient	<b>-0,270**</b>	1,000							
		Significance (two-sided)	0,000								
		N	258	258							
	How many times a day do you use the Tik Tok application?	Correlation coefficient	-0,085	<b>0,330**</b>	1,000						
		Significance (two-sided)	0,172	0,000							
		N	258	258	258						
	What is your attitude towards the Tik Tok app?	Correlation coefficient	<b>-0,130*</b>	<b>0,340**</b>	<b>0,452**</b>	1,000					
		Significance (two-sided)	0,038	0,000	0,000						
		N	252	252	252	252					
	How do you assess the involvement of brands on Tik Tok?	Correlation coefficient	0,058	-0,150	0,140	0,104	1,000				
		Significance (two-sided)	0,641	0,225	0,260	0,411					
		N	67	67	67	65	67				
	What is your attitude towards the actions taken by brands on Tik Tok?	Correlation coefficient	-0,088	0,041	0,171	<b>0,389**</b>	0,223	1,000			
		Significance (two-sided)	0,424	0,712	0,119	0,000	0,069				
		N	84	84	84	81	67	84			
	How do you assess advertising content in recordings on influencers' profiles?	Correlation coefficient	0,076	-0,091	0,075	0,215	0,050	<b>0,341**</b>	1,000		
		Significance (two-sided)	0,535	0,459	0,539	0,078	0,717	0,004			
		N	69	69	69	68	55	68	69		
	Are you more likely to buy a product advertised on Tik Tok than one advertised traditionally?	Correlation coefficient	-0,142	<b>0,200**</b>	<b>0,257**</b>	<b>0,346**</b>	-0,045	<b>0,395**</b>	<b>0,496**</b>	1,000	
		Significance (two-sided)	0,053	0,006	0,000	0,000	0,801	0,010	0,002		
		N	187	187	187	183	34	42	36	187	

Source: Author's own studies.

Respondents in the TikTok application value the most: interesting content – 256 indications, watching videos – 230 indications. The most frequently viewed content on TikTok by Generation Z is: trends – 136 responses, tutorials, and dancing and singing – 112 and 98 responses, respectively. Less than 1/3 of respondents follow brand profiles on

TikTok, and 45% of them follow 1 to 5 accounts. Respondents indicated that brand profiles on TikTok should include: presentation of products and their uses, information about promotions, interesting content and opinions of other users. According to respondents, the brand that runs an account on TikTok in an interesting way is Rossmann. More than 1/3 of Generation Z representatives have purchased products from a brand that has a TikTok account. The respondents mainly indicated brands from the cosmetics industry such as: OnlyBio, Rossmann, Garnier and Bielenda. 34% of respondents purchased products from brands promoted on TikTok after seeing advertisements on influencers' profiles. To verify the importance of TikTok as a way of communicating between brands and Generation Z, Spearman's rho correlation index was calculated.

The assumed significance level is  $p=0.05$ . All values of correlation coefficients that are statistically significant are marked in green. A stronger shade of green indicates a higher strength of the relationship. With a positive value of the coefficient, as the value of one variable increases, the values of the other variable increase, while with a negative value of the coefficient, as the value of one variable increases, the values of the other variable decrease.

Taking into account age and individual results of ordinal variables, only two statistically significant correlations were found. As age increases, the duration of having a TikTok account decreases and the appreciation for this application drops. A longer time of having a TikTok account is associated with a greater frequency of daily use of the application, a better attitude towards TikTok and a greater willingness to purchase products advertised using this application. The correlation coefficients are statistically significant, but the strength of the relationship is lower between the duration of having a TikTok account and susceptibility to advertising from this application. Moreover, several statistically significant correlations with clear strengths of relationship were demonstrated. It can be observed that a better attitude towards the TikTok application is associated with a better attitude towards the activities undertaken by brands on TikTok and with a greater willingness to purchase products advertised in the application than those advertised in a traditional way. Subjects with a better attitude towards the activities undertaken by brands on TikTok, they better evaluate the content advertised on Influencers' profiles and are more willing to purchase products advertised on TikTok. A higher rating of the content advertised on Influencers' profiles is associated with a greater willingness to purchase products advertised on TikTok than those advertised in a traditional way.

## 5. DISCUSSION

The study shows that TikTok is not an effective tool for brands to communicate with Generation Z. This is indicated by the number of respondents who follow brand profiles in the application and the number of accounts they follow (45% follow only 1 to 5 accounts). This is an interesting phenomenon that could be the subject of further research. At the same time, the respondents' attitude towards the activities undertaken by brands on TikTok is positive, as is the assessment of their involvement in their profiles. It is also worth emphasizing that young representatives of Generation Z are more inclined to make purchases of products advertised on TikTok than those promoted in a traditional manner. However, they do not choose products promoted and recommended on TikTok by well-known influencers. Businesses and Influencers should understand the wants and needs of customers and post content that engages customers and influences their purchase of products (Sharabati et al., 2022). Respondents who follow brand profiles are more likely

to purchase products advertised and recommended on TikTok by Influencers. Bart et al. indicate that there is a real possibility of using the TikTok application as a channel for Influencer marketing campaigns. This is mainly due to the characteristics of the format and content, as well as great opportunities to directly reach younger users who have important potential as consumers. Moreover, the authors also point out that companies should establish medium- and long-term relationships with TikTok Influencers to take advantage of the economic opportunities of this growing market (Barta et al., 2023). For representatives of Generation Z, interesting content is primarily important both on TikTok and on brand profiles. This may be due to the fact that young people have different media consumption patterns. They are more resistant to traditional advertising in conventional media. (Xu et al., 2021). It should be emphasized that as age increases, the time of having a TikTok account decreases and the appreciation for this application decreases. TikTok is especially popular among teenagers and young adults. The app attracts a younger segment, around 20 years old, with 40% of users being between the ages of 10 and 19 (Haenlein et al., 2020).

## 6. CONCLUSIONS

Generation Z is the first generation to take full advantage of the Internet world and they can easily find their way around it. Social media and the Internet have become an integral element of their communication, entertainment and a source of knowledge. Opportunity for users to take grass-roots initiatives, present their creativity, expression, self-presentation and share their work with others made TikTok popular among Generation Z. Based on the research results, it can be concluded that TikTok is not an effective tool for brands to communicate with Generation Z, but it has marketing potential. This can be confirmed by a positive assessment of the brands' involvement and the actions they take on their profiles. It is also worth noting that a longer time of having a TikTok account is associated with a greater frequency of daily use of the application, a better attitude towards TikTok, and a greater willingness to purchase products advertised using this application. It is also worth emphasizing that young representatives of Generation Z are more willing to purchase products advertised on TikTok than those advertised traditionally.

To sum up, TikTok is a platform that undoubtedly deserves the attention of brands and to try to use the application as a communication medium with Generation Z. To increase interest among Generation Z, brands should focus on product presentations, promotions, interesting content, as well as the opinions of other users.

In terms of future considerations of the TikTok application as a way for brands to communicate with Generation Z, it is recommended to conduct research on a larger, more diverse sample. There are likely other factors that may show a stronger association with Generation Z and brands running accounts on TikTok than those included in our own research. It would be worth considering inviting the alpha Generation to participate in the study. It is very possible that a greater relationship can be demonstrated between the younger Generation and the presence of brands on TikTok.

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## A MODEL OF INTERNAL AUDITORS' MANAGEMENT SYSTEMS ASSESSMENT COMPLIANT WITH ISO 45001

Internal audits are a requirement of point 9.2 of the ISO 45001 standard. They are a very good tool to improve the management system, but also the entire organization. Audits and the auditors conducting them should be improved. Therefore, this article aims to develop a model for evaluating internal auditors of occupational health and safety management systems according to ISO 45001. The model includes both the guidelines of the ISO 19011 standard and expert knowledge resulting from experience in assessing auditors. The following tools are adequately integrated: the SMART(-ER) method, brainstorming (BM), and control sheets. The result is the estimated quality of the auditor's work. Rankings created using this model cannot be used to punish auditors; the model is intended to help chart an improvement path for internal auditors. Due to its nature, the model can be used to assess internal auditors in any management system. It can also be modified according to the original solutions in the field of auditing in a given organization.

**Keywords:** internal audit, ISO 45001, management system, production engineering, ISO 19011.

### 1. INTRODUCTION

Since the beginning of the 1960s, in market economy countries, producers wanting to ensure the reliability of their suppliers and cooperators began to carry out research and assessment of the possibility of maintaining a stable level of supply quality, in accordance with the technical requirements contained in the contract. In this way, the practise of audits.

Also, with the spread of standardised system solutions, mainly in the field of quality, environment and occupational health and safety, the practise of auditing the implemented management systems developed. The need to standardise the audit methodology was then observed. It turned out to be particularly important in relation to audits, which resulted in certification or registration in the so-called list of qualified suppliers. Occupational health and safety audits have been used since the middle of the last century, when the importance of occupational health and safety began to grow. It was also then that a lot of regulations were created in the field of occupational health and safety, which were associated with increasing legal and economic responsibility. The second type of occupational health and

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safety audit was related to occupational risk assessment. Along with the development of formalised management systems, national standards appeared, and then an international standard (ISO 45001) specifying the requirements for occupational health and safety management systems. These systems are audited in the same way as other management systems, e.g. quality or environmental (Pacana, Stadnicka, 2006).

Due to the popularity and importance of audits, the ISO Technical Committees (International Organisation for Standardisation) developed international standards containing guidelines for conducting quality, environmental, and health and safety audits. In 2012, these standards were replaced by one ISO 19011 standard, "Guidelines for auditing management systems", which can be used both in relation to quality and environmental audits as well as occupational health and safety audits. In 2018, this standard was amended and its current edition bears the number: PN-EN ISO 19011:2018-08.

This standard provides guidance on the principles of auditing, the management of audit programmes, the conduct of management system audits, and the competence of management system auditors. This standard is applicable to all organisations that need to conduct internal or external audits of a management system or the management of an audit programme. The application of this standard to other types of audit is in principle possible, provided that particular attention is paid to defining the competencies that the members of the audit team should have in such cases. The guidelines contained in the standard are intended to be flexible. The application of these guidelines may vary depending on the size, nature, and complexity of the organisation as well as the purpose and scope of the audits that will be conducted.

The credibility of the audit process depends on the competence of the people performing the audit. Competence is based on a demonstration of auditors' personality traits and the ability to apply knowledge and skills acquired through education, work experience, auditor training, and auditing experience. The concept of auditors' competencies, according to the ISO 19011 standard, is presented in Figure 1, taking into account the fact that the standard provides guidelines for auditing both quality management systems and environmental management (Balkat, Khaleel, 2021; Karanikas, Weber, Bruschi, Brown, 2022; Pacana, Stadnicka, 2006).

Some of the knowledge and skills are common to the three basic groups of auditors (quality, environment, health and safety), and some are specific to auditors in a given area. Auditors maintain and improve their competence through continuous professional development and regular participation in audits, and their progress should be assessed (Lawlor, Hornyak, 2012).

The PN-EN ISO 19011:2018-08 standard consists of seven chapters. The seventh chapter provides guidelines on the necessary competencies of the auditor and indicates the possibility of evaluating auditors. However, this chapter does not specify the method by which this assessment should be conducted. This fact generates a scientific gap that allows the search for adequate evaluation models of management system auditors. This also applies to the auditors of the occupational health and safety management system. However, your audit work is specific due to its scope. Therefore, the internal auditor evaluation model for this system should be specific.



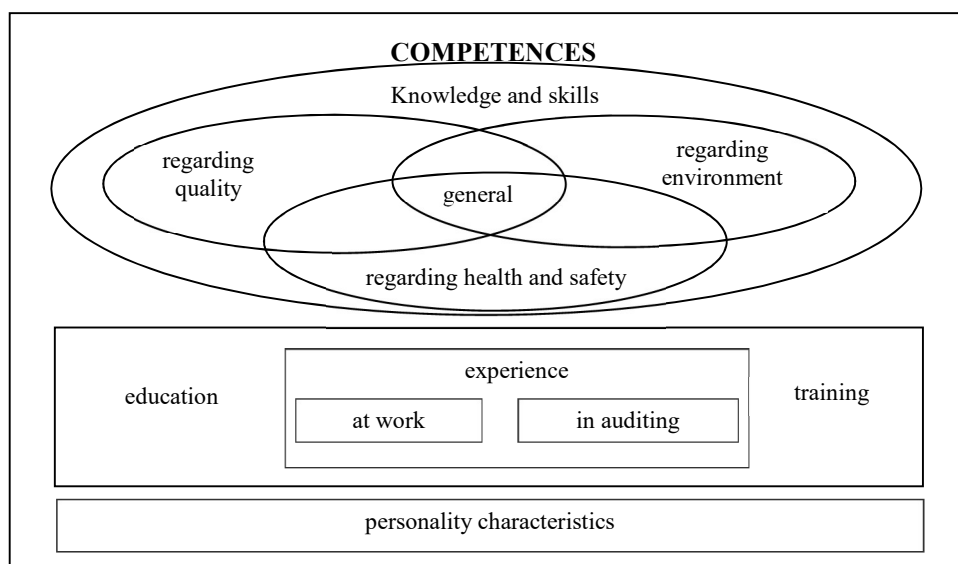


Figure 1. Conception of the internal auditor assessment of the management system on the base 19011 standard

Source (on the base PN-EN ISO 19011:2018-08 (2018); PN-ISO 45001:2018-06 (2018)).

The audit of auditors should be conducted not only to improve OHS auditors, but also to improve the audit process and, consequently, to improve the OHS management system (HSMS). Skilful conduct of this assessment increases the likelihood of benefiting your system. The lack of a standard in this respect means that different organisations can use different methods of evaluating the work of auditors. In this study, we present one of the models that can be used in various organisations.

## 2. ASSESSMENT OF INTERNAL AUDITORS OF ENVIRONMENTAL MANAGEMENT SYSTEMS IN STANDARDS

The requirements for internal auditing are presented in Section 9.2 of ISO 45001. According to this requirement, the organisation shall plan, establish, implement, and maintain an audit program(s) taking into account the importance of the activities considered and the results of previous audits. The organization shall conduct internal audits at scheduled intervals to provide information on whether the OH&S management system complies with its OH&S organization requirements, including the OH&S policy and objectives, with the requirements of this document.

The organisation must also in the area of internal audits:

- a) plan, establish, implement and maintain an audit program(s), including frequency, methods, responsibilities, consultation, planned requirements and reporting, which must take into account the validity of the process concerned and the results of previous audits, as well as:
- b) define the audit criteria and scope for each audit;
- c) select competent auditors to ensure the objectivity and impartiality of the audit process;

- d) ensure that the results of audits are reported to the appropriate management and audit findings are reported to the appropriate employees, or, where appropriate, to employees' representatives, and to relevant stakeholders;
- e) take appropriate action in relation to non-compliance and continuously improve the implementation of the provisions of the health and safety management system;
- f) maintain documented information as evidence of the implementation of the audit programme and audit results (PN-ISO 45001:2018-06 (2018)).

In search of specific information on internal audits of occupational health and safety management systems, the ISO 45001 standard refers to the ISO 19011 standard.

The ISO 45001 standard does not require the development of a procedure/process card for internal audits. It only requires the maintenance of documents from the conducted audits. Nevertheless, from a practical point of view, it is good practise to establish, implement, and maintain an audit procedure(s). This is especially important when the OSH management system is new and the organisation does not have much auditing experience. Such a procedure should then establish, in particular:

- responsibilities and requirements for planning and conducting audits, reporting results, and retaining related records,
- the course of the audit process,
- definition of audit criteria, scope, frequency and methods (PN-EN ISO 19011:2018-08 (2018)).

The selection of auditors and the conduct of audits should ensure the objectivity and impartiality of the audit process. To ensure the correct conduct of audits, it is necessary to skilfully select auditors, i.e., people competent to conduct an audit (point 7.2 of ISO 19011).

To assess the work of auditors, the guidelines contained in points 7.3–7.5 of the ISO 19011 standard can be used. According to these guidelines, the evaluation of internal auditors should be:

- planned,
- implemented
- saved,

in accordance with established procedures to ensure an objective, consistent, fair, and reliable result (PN-EN ISO 19011:2018-08 (2018)).

The evaluation of auditors should take place in the following stages:

- initial assessment of people who want to become auditors;
- assessing the auditor before assigning him to the audit team;
- Continuous evaluation of the auditor's performance to identify the need to maintain and improve his knowledge and skills (PN-EN ISO 19011:2018-08 (2018)).

It seems that this continuous assessment of the auditor's work may have the most significant impact on the improvement of OHS management system audits and the entire management system. ISO 19011 only gives an outline of such a continuous assessment process. It should include four main stages (PN-EN ISO 19011:2018-08 (2018)):

- Step 1 – Identify the personality traits, knowledge, and skills necessary to meet the needs of the audit programme.
- Step 2 – Establishing evaluation criteria.
- Step 3 – Choosing the appropriate assessment method.
- Step 4 – Make an assessment (Balkat, Khaleel, 2021; Pacana, Stadnicka, 2016; PN-ISO 45001:2018-06 (2018)).

The evaluation should be carried out by a person or group of people, according to specific evaluation criteria. Auditor evaluation methods, one or more of which may be used in an organisation are: review of documented information, positive and negative feedback, interview, observation, investigation, post-audit review (PN-EN ISO 19011:2018-08 (2018)). This information is the basis for the building of an evaluation model for internal auditors.

The assessment itself consists of comparing information about the assessed person with the criteria established at an earlier stage. If this person does not meet the criteria, additional training, work experience, and/or auditing experience is required, followed by reassessment (PN-EN ISO 19011:2018-08 (2018)).

When specifying the evaluation criteria, quantitative criteria are indicated:

- number of years of work experience,
- education,
- number of audits carried out,
- number of training hours,

or qualitative:

- personality traits,
- knowledge,
- skills (PN-EN ISO 19011:2018-08 (2018)).

The ISO 19011 standard proposes that when determining what level of knowledge and skills is appropriate, the following should be taken into account.

- the audited organisation (size, nature) and the complexity of its management system;
- objectives and scope of the audit programme;
- certification/registration and accreditation requirements;
- the audit process and its role in the organisation;
- required level of confidence in audits.

As can be concluded from a short review of the ISO 19011 standard guidelines, the application of these guidelines in a small and medium organisation, which has often not conducted audits so far, not to mention improving them or evaluating auditors, seems to be relatively difficult. Therefore, OSH Management Systems Representatives (or persons responsible for the internal audit process) sometimes conduct a simple, but unfortunately unique, assessment of internal auditors. Often this assessment is informal. Therefore, it seems advisable to propose such a model for evaluating internal auditors, thanks to which this assessment would be possible to use with or without modifications in each organisation and would not pose too many difficulties to the person conducting it.

### **3. MODEL**

A universal model of the internal audit process in occupational health and safety management systems has been developed. This model incorporates the expectations of organisations and other stakeholders. The concepts, determinants of the selection of the proposed instruments, assumptions, and characteristics of the model are included in the next part of the study. Figure 2 shows the visualisation of the model.

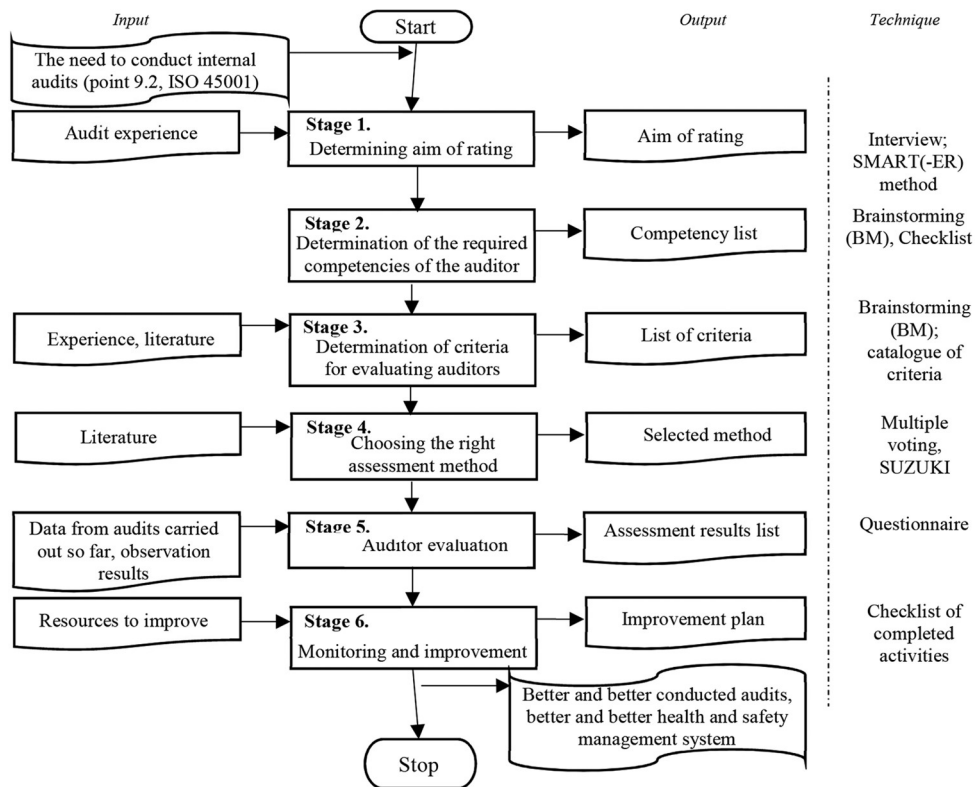


Figure 2. Internal auditor evaluation model

Source: Own study.

The short characteristic of the proposed approach is shown in the next part of the study.

**Stage 1. Determining the objective of the rating.** It has been assumed that the objective is defined by the entity (the Representative, the person responsible for the audits). In the proposed approach, the goal will most often be the adequate selection of the method for evaluating internal auditors in the health and safety management system. To determine the aim, it is preferred to use the SMART(-ER) method (Lawlor, Hornyak, 2012).

**Stage 2. Determination of the required auditor competencies.** When deciding on the necessary competencies, it is recommended, according to ISO 19011, to take into account the following aspects:

- the size, nature, and complexity of the auditee's organisation and processes;
- auditing methods;
- the field of the management system to be audited;
- the complexity and processes of the audited management system;
- type and level of risks and opportunities addressed in the management system;
- objectives and scope of the audit programme;
- uncertainty in achieving audit objectives;

- other requirements, such as those imposed by the audit client or other relevant interested parties,
- if appropriate,
- desirable personal qualities of the auditor (eg ethics, perseverance, perceptiveness). A complete list of features is given in ISO 19011.
- desired auditor knowledge. This applies to general knowledge in the field of conducting audits, but also to knowledge specific to audits of health and safety management systems (e.g. legal requirements).

**Stage 3. Determination of criteria for evaluating auditors.** The first step in creating a concept is to define the evaluation criteria. You can use those listed in ISO 19011, where it is recommended that the criteria be:

- qualitative (such as desirable behaviour, knowledge or skills demonstrated in training or on the job);
- quantitative (such as years of work experience and education, number of audits performed, hours of audit training) (PN-EN ISO 19011:2018-08 (2018); PN-ISO 45001:2018-06 (2018)).

As you can see, the instructions in the standard are not precise. When evaluating, for example, skills, it is impossible not to take into account the criterion of knowledge or personality traits that allow these skills to be demonstrated. The same applies to quantitative criteria. It is hard not to notice their connection and partial penetration with quality criteria. As you can see, these are not unambiguous criteria, but guidelines for evaluation. Therefore, in the proposed model, it is worth using criteria presented differently, which are suggested by the experience of internal auditors' assessment of the health and safety management system. Such criteria include:

- timeliness of the audit,
- timely delivery of documentation after the audit,
- quality of post-audit documentation,
- selective participation of the Representative in selected audits or their parts,
- selective interviews with auditees (Pacana, Stadnicka, 2016).

It is also worth paying attention to the training of internal auditors. Both the participation of internal auditors in internal and external training, as well as training by internal auditors, e.g., employees of the organisation, should be considered. Another such specific criterion is the number of audits mentioned in ISO 19011. The more auditors conduct audits, the more experience they gain. On the other hand, the more audits there are, the more their quality may not be the highest. Therefore, it is worth paying attention to this criterion under specific conditions in a given organisation.

Taking into account the two sources of criteria mentioned above (experience and ISO 19011), the following criteria for evaluating internal auditors of the OSH management system can be proposed for use in the model (as basic):

- A) Personality traits.
- B) Completed trainings.
- C) Knowledge gained during training.
- D) Ability to apply knowledge in the field of audits and OH&SMS.
- E) Number of audits carried out.
- F) Timeliness of the audits performed.
- G) Quality of audit documentation.
- H) Subjective assessment of the auditor's work.

These eight criteria for evaluating the auditor can be modified by the OHSMS Representative depending on the needs of the organisation. They take into account the ISO 19011 guidelines (criteria: A, B, C, D, E) as well as previous experience (criteria F, G, H). Such a number of criteria makes it possible to partially limit the interpenetration of individual criteria. On the other hand, the number of criteria is not so large as to hinder auditor evaluation. Following the authors (Siwec, Pacana, 2021), it was assumed that the number of all criteria should be about 10 criteria. It is necessary to determine a single group of criteria that are characterised by all verified criteria. So, this basic list of criteria can be extended. For this purpose, the model proposes the use of the following methods: Brainstorming (BM); Catalogue of criteria.

The next step in the design of the concept of evaluating internal auditors of the HSHSMS is to determine the classification of the assessment of individual criteria. Based on the literature on the subject, a four-stage classification was found (Abdulkerim, Avvari, Cherkos, 2019; Siwec, Pacana, 2021) to be appropriate. It was assumed that the worst grade would be one point and the best grade would be four points.

**Stage 4. Choosing the right assessment method.** It is recommended that the assessment be made using one or more of the following methods:

- Review of records.
- Feedback.
- Conversation.
- Observation.
- Test.
- Post-audit review.

The proposed model proposes an original approach to the assessment of auditors of the OHS management system. In the first phase, a grouping of the criteria identified in the earlier phase is proposed. In the next phase, it is suggested to determine the importance of the groups of criteria. Based on the literature and experience, it was assumed that personality traits will have a weight of 0.1. The knowledge gained while preparing for the trainings, as well as the knowledge gained during the participation in the trainings, will have a weight of 0.15. The weight of 0.2 was assigned to the total ability of applied knowledge in the field of audits and the health and safety management system. The criterion concerning the number of audits carried out was given a weight of 0.05. Due to the fact that timeliness plays an important role in the auditing process, it was assumed that the weight of the criterion: timeliness of audits will be 0.15. In turn, the quality of post-audit documentation (checklist, number of observations and non-compliances, etc.) is the highest weight – 0.25. This is due to the fact that the OHS management system is being improved on the basis of this documentation. The criterion based on the subjective assessment of the auditor's work received a weight of 0.1. The lowest weight (apart from criterion E) was assigned to criteria that are either not possible to be precisely verified by the representative (or the person responsible for the audits) or his knowledge in this area may be insufficient. In turn, the greatest importance was assigned to the audit documentation, also because the Representative (or the person responsible for the audits) can assess it in the most accurate way.

The following approach has been adopted to assess internal auditors.

$$Q = 0,1 A + 0,15 (B + C) + 0,2 D + 0,05 E + 0,15 F + 0,25 G + 0,1 H \quad (1)$$

where letters from A to H correspond to the criteria as in Table 1.

In the Table 1 presents a sample sheet that is useful in evaluating the internal auditors of the health and safety management system.

Table 1. The form of internal auditor assessment of the safety management system

First and last name of the auditor		.....	.....	.....	.....
Personality traits	(A)				
Completed trainings	(B)				
Knowledge gained during training	(C)				
Ability to apply knowledge in the field of audits and OH&SMS	(D)				
Number of audits carried out	(E)				
Timeliness of performed audits	(F)				
Quality of audit documentation	(G)				
Subjective assessment of the auditor's work	(H)				
Final evaluation of the auditor's work	(Q)				
<p>Note: Values for individual criteria according to the subjective assessment of the OHS Representative should be placed on a scale from 1 (worst) to 4 (best)</p>					
<p>Conclusions after assessment: 0 ÷ 11 – improvement needed                      12 ÷ 21 – correct work (continuous improvement)                      22 ÷ 32 – very good work (continuous improvement)</p> <p>.....</p> <p>date, signature of the OHSMS Representative</p>					

Table 2 introduces some repeatability of the assessments in subsequent assessments of the same auditor, as well as between auditors. Its application will allow drawing conclusions from the analysis and planning the path of development of internal auditors of the environmental management system.

Table 2. The values of the safety management system internal auditors assessment

Points awarded:		1	2	3	4
Personality traits	(A)	No features typical of an auditor	Poorly developed auditory characteristics	Moderately developed features typical of an auditor	Excellent developed features typical of an auditor
Completed trainings	(B)	0	1	2	More than 3
Knowledge gained during training	(C)	0	1	2	More than 3
Ability to apply knowledge in the field of audits and OH&SMS	(D)	Bad conduct of audits	Average auditing	Good auditing	Very good auditing
Number of audits carried out	(E)	0	1-2	2-3	More than 3
Timeliness of performed audits	(F)	Delays over 1 week	Delays up to 1 week	Delays up to 1 day	No delays
Quality of audit documentation	(G)	Numerous comments from the Plenipotentiary	There are comments from the Plenipotentiary	Minor remarks of the Plenipotentiary	No comments from the Representative
Subjective assessment of the auditor's work	(H)	Numerous remarks	There are minor remarks	No comments	There are praises

The quoted Table 2 is preliminary and is a general proposal of the authors, who did not want to expand the auditor evaluation procedure and adopted some simplifications. They can be omitted by introducing modifications to the evaluation of the criteria. These modifications should take into account the specificity of the organisation in which the auditor's evaluation is conducted.

**Stage 5. Auditor evaluation.** It is recommended that the information on the auditor being evaluated is compared with the criteria given in 7.2.3. If the assessed auditor to participate in the audit programme does not meet the criteria, additional training, work experience, or auditing experience and reassessment are recommended.

**Stage 6. Monitoring and improvement.** Auditors and lead auditors should continuously improve their competence. Auditors should maintain their auditing competence through regular participation in management system audits and continuous professional development. This can be achieved through measures such as additional work experience, training, individual learning, coaching, participation in meetings, seminars, conferences, or other appropriate activities. The person(s) managing the audit programme should establish appropriate mechanisms to continuously evaluate the performance of auditors and lead auditors. Continuing professional development activities should include:

- a) changes in the needs of individuals and organisations responsible for conducting the audit;
- b) developing auditing practises including the use of technology;
- c) relevant standards, including guidance/supporting documents and other requirements;
- d) changes in sector or fields.



The presented model, although based on standards, literature, and experience, should be improved in every organisation. This is due to the specificity of the organisation and the changing environment of the organisation.

#### 4. DISCUSSION AND CONCLUSION

Internal audit is an element of the health and safety system that allows you to examine the system and determine the path to improvement. This significant role of audits becomes even more important in the case of health and safety management systems, where the aspect of health and life of the crew appears. Therefore, it is extremely important to conduct internal audits with skill in management systems compliant with ISO 45001. To do this, internal auditors must be educated and then improved. A tool for this can be a repeatable assessment model for these auditors. The results of the assessment should be used to determine the improvement paths of individual auditors, because each of the auditors, despite knowing his company well, should improve the specifics of its operation. Knowledge of the organisation makes it easier for the auditor to assess the observed facts. However, on the other hand, he may be accused of a lack of objectivity due to his personal involvement in the affairs of the organisation, knowledge of the people surveyed. Therefore, the requirement of the ISO 4001 standard is that the audit be performed by a person who is not responsible for the audited area. In a sense, the internal auditor is an instrument of management in the company. Its activity can help to introduce procedures or improve the manufacturing process. As the plant employee who is auditing, he can help determine corrective actions. The proposed evaluation model is intended to help persons responsible for the audit process in evaluating the work of auditors. The assessment made with the use of the proposed model will allow us to show the auditors who work well, those who need to be improved and those who for some reason cannot be or do not want to be good auditors. The assessment can be carried out on the basis of the proposed concept, but it can also be modified. Especially when the already obtained results of the assessment are not satisfactory from the point of view of improving the work of internal auditors of health and safety management systems.

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## WORK SATISFACTION IN SMES: A COMPARATIVE STUDY OF SELECTED COUNTRIES IN CENTRAL AND EASTERN EUROPE

This article is based on empirical research conducted in SMEs in several countries: the Czech Republic, Slovakia, Lithuania, and Poland. The basis for empirical recognition was the assumption that it is possible to develop a positive attitude among employees towards work. The research problem concerned the search for the characteristics of the organizational environments of SMEs in the context of achieving job satisfaction. The research question was, “How and with what mechanisms can the positive attitudes of employees towards their work be strengthened?” To measure employees’ attitudes toward work, quantitative research was carried out using a questionnaire on a sample of 590 respondents. The key dimensions of satisfaction in the workplace were analyzed; these included the quality of management processes, social communication, interpersonal relations, remuneration or self-realization, and fulfillment of competence potential. Summing up the results of the empirical research, it is worth emphasizing that SME employees noticed many different factors affecting, to a greater or lesser extent, their perceptions of professional satisfaction. Among these, they most often mentioned detailed elements of the general context of achieving satisfaction in relation to, for example, individual abilities and skills, interpersonal relationships, communication processes, and reward and motivation systems.

**Keywords:** job satisfaction, workplace, job satisfaction factors, SME, CEE.

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## 1. INTRODUCTION

The issue of job satisfaction is one of the key areas of theoretical and empirical research undertaken by social sciences (Wright, 2015). The broad interest in this subject is based not only on the context of theoretical description, but above all on the practice of creating a friendly organizational environment for business through development of new forms of working, improving social communication and establishing interpersonal relationships, as well as self-realization and using the potential of employees' competences. We are seeing a paradigm shift in understanding development as economic growth and social satisfaction as satisfaction with financial conditions toward economic, environmental, and social sustainability (Manioudis, Meramveliotakis, 2022; Tomislav, 2018). In this context, work satisfaction is considered a key and comprehensive challenge for organization management systems (Aziri, 2011).

Since 1969, there has been an increase in interest in research on job satisfaction. At the same time, it is emphasized that the research effort of theoreticians and practitioners still does not fully translate into a sufficient and satisfactory understanding of this issue from the point of view of business practice, which in turn is justified by the behavior of "correlation without explanation" (Locke, 1969). Undoubtedly, job satisfaction is a multi-faceted topic with many dimensions and meanings. After all, this issue is directly related to the psychological conditions of man, among others. Therefore, research in this area is often ambiguous and it becomes extremely difficult to build generalizations and universal theories (Waltz et al., 2020).

Many organizations choose business sustainability to meet environmental, social, and financial demands to ensure responsible and long-term success (Hellriegel et al., 1995). Corporate sustainability is an important and widely discussed topic of research and consideration in many academic streams and business practices. One approach to sustainability and business balancing is the issue of Environmental, Social and Governance (ESG) framework (Lange, 2009; Tomislav, 2018). Social issues related to job satisfaction are some expressions of the sustainability of business performance, this is important in both corporations and small and medium-sized enterprises. In countries with lower levels of institutional development and governance, socio-environmental sustainability of business especially needs to be responsible in small and medium-sized enterprises. This is also one of the reasons and objective for engaging in the research described in this article, which focuses on selected Eastern European countries and the small and medium-sized enterprise sector. Today's organisations show interest in employee development and job satisfaction (Dhamija et al., 2019; Gross-Gołacka et al., 2022; Soboleva, 2022; Smolarek, Dzieńdziora, 2022). Taking care of job satisfaction is part of this trend. In the global literature, the subject of job satisfaction is still in the center of interest of many theoreticians and practitioners conducting theoretical and empirical research on the recognition of detailed issues related to the functioning of employees in the social world of organizations.

Referring to surveys on the quality of life of EU residents (Quality of life in Europe, 2015), it can be observed that nearly 20% of employees admit to a low level of job satisfaction (19.4%) and less than 25% are highly satisfied (24.8%). By far the highest number of answers reflects an average level of job satisfaction. Taking into account the average rating of job satisfaction, a noticeable decrease in satisfaction was noted in five EU countries – Lithuania, Slovakia, Luxembourg, the Netherlands and Denmark – in 2018 compared to 2013. The highest levels of the indicator in 2018, significantly above the

average for EU countries, were recorded for Austria, Finland, Norway and Switzerland (Quality of life in Europe, 2015).

In the face of numerous theoretical and empirical studies conducted in various scientific fields and disciplines, as well as the results of analyses of job satisfaction in the EU countries, it can be assumed that further detailed exploration of the phenomenon of work transformation as one of the key aspects of human life is still valid and necessary. Job satisfaction surveys in social sciences are conducted, among others, in the area of human resources management, building and managing creative teams, developing unique competences of organizations, and so on. It seems interesting to look for different dimensions not only of the description of the problem of achieving job satisfaction, but above all ways to improve employee satisfaction.

The theoretical and empirical considerations undertaken in the paper were focused on the interpretation of the issue of job satisfaction from the point of view of the analysis of factors reflecting quality of management processes, social communication, interpersonal relationships, remuneration, self-realization, and the use of competence potential. The aim of the study is to identify factors determining the achievement of professional satisfaction with an indication of their importance for driving positive attitudes of employees towards their work. The research was conducted in an international environment, in a group of SMEs (EC definition) in selected countries of Central and Eastern Europe. The selected European countries are characterized by similar levels of economic development but most importantly have very similar cultural capital and historical trajectories (Lange, 2009). The paths of social, environmental, and economic transformation were very similar through a shared history of socialist period, deep transformation, accession to the European Union and current problems of structural adaptation.

Bearing in mind remote work, or digitalization of workspaces, an attempt to identify factors that are most important from the perspective of the level of job satisfaction seems all the more necessary. Currently, working from home is becoming a new research area. The development of teleworking and, thus, the search for opportunities to achieve satisfaction with this form of work, is currently a serious challenge for both the organizational environment and for private lives of employees. The fact is that remote work negatively affects the work-life balance (Bellmann, Hübler, 2020). In addition, another interesting research field is determined by the phenomenon of digitization of workspaces and its impact on achieving job satisfaction (Silic et al., 2020).

## **2. STATE OF THE ART ON JOB SATISFACTION – A LITERATURE REVIEW**

Based on the literature study authors present selected models for the interpretation of job satisfaction. The four examples of models have a cognitive function and each of them presents a different optics on the influence of elements affecting and driving the state and attitude of the employee towards work.

In the coupling model, the employee achieves a state of satisfaction with remuneration for work adequate to the expected level (Table 1). The value of remuneration and awards received is satisfactory and, what is important, fair and appropriate to the effort put into the performance of tasks and duties. The effort is commensurate with the result achieved, which increases the likelihood of professional success.

The perspective of the contextual approach allows you to capture satisfaction as a set of coexisting factors (Table 1):

- The context of work as an intellectual challenge and a source of achieving satisfactory results and a starting point for a satisfactory level of remuneration.
- The context of the objectives with an emphasis on the need to strive for consistency of own and the organization's goals with consent to autonomy in action and maintaining stability of employment.
- The context of physical working conditions satisfying the individual needs of the employee, resulting from the position held, the content of the work performed, etc.
- Interpersonal context where interpersonal relationships based on respect, understanding and negotiation enhance a positive attitude to work.

Table 1. Retrospection of selected models of interpretation of job satisfaction

<b>Model</b>	<b>Detailed interpretation</b>
“Feedback/coupling” model (Vroom, 1964)	<p><b>Work satisfaction as a consequence of:</b></p> <ul style="list-style-type: none"> <li>• The value of the expected and fair reward</li> <li>• The probability of achieving success</li> <li>• Effort commensurate with the result</li> </ul>
“Contextual” model (Vlosky & Aguilar, 2009)	<p><b>Job satisfaction as a resultant of:</b></p> <ul style="list-style-type: none"> <li>• Intellectual challenges and results achieved</li> <li>• Consistency of own goals with general objectives (of the organization)</li> <li>• Physical working conditions in accordance with needs</li> <li>• Fair and adequate remuneration</li> <li>• Degree of autonomy and stability of employment</li> <li>• Working atmosphere: mutual respect and no conflicts</li> <li>• Attitudes of superiors towards achieved results</li> </ul>
“System” model (Lumley et al., 2011)	<p><b>Job satisfaction as a complex and multidimensional construct:</b></p> <ul style="list-style-type: none"> <li>• Satisfaction with the amount of remuneration and the scale of growth</li> <li>• Satisfaction with additional benefits for employees, including awards</li> <li>• Satisfaction with personal development and social status</li> <li>• Satisfaction with social relations in the workplace (formal and informal)</li> <li>• Satisfaction with the applicable internal procedures</li> </ul>
„Socially interactive” model (Davis, 2004; Vladimirova, 2008; Viviers, et al., 2015; Maulabakhsh, 2015; Basma, Fais & Yeoh, 2017; et al.)	<p><b>Satisfaction as an impact of the social work environment:</b></p> <ul style="list-style-type: none"> <li>• Support and proper supervision of management</li> <li>• Identification of objectives, tasks and responsibilities</li> <li>• An unambiguous and fair system: assessment, remuneration and motivation</li> <li>• Training program adequate to the needs and capabilities</li> <li>• An atmosphere conducive to engagement and inclusivity</li> <li>• Participation in decision-making processes</li> <li>• Climate of creation, multiplication and use of knowledge</li> <li>• Culture of strengthening and using the potential of creativity</li> <li>• Culture of personal development and teamwork</li> <li>• Flexible working time</li> <li>• Transparency of rules and stability of employment, etc.</li> </ul>

Source: Own study based on: (Vroom, 1964; Vlosky, Aguilar, 2009; Lumley et al., 2011; Weiss, 2002; Davis, 2004; Jun et al., 2006; Vladimirova, 2008; Raziq, Maulabakhsh, 2015; Viviers et al., 2015, Basma et al., 2017).

Job satisfaction as a complex and multidimensional construct identifies the architecture of the system in which interrelated elements can be distinguished. These elements constitute a whole that achieves the set goal, which is a positive attitude of the employee towards the work performed. Among them, the following stand out: Salary including bonuses and ancillary employee benefits, personal development and social status, social relations in the workplace and internal procedures applicable at the management level, and position held (Table 1). The “socially interactive” model reflects the state of social working conditions for achieving job satisfaction, position, tasks and job responsibilities performed, and career path (Table 1). Particularly noteworthy are: interpersonal capabilities as interpersonal relationships, participation, inclusivity, etc.; organizational capabilities, i.e. a set of goals, division of tasks and responsibilities, remuneration, motivation and evaluation of work; cognitive capabilities, i.e. training, transfer of knowledge and skills, creativity and so on.

Bearing in mind the theoretical considerations undertaken so far, aimed at the interpretation of satisfaction in the workplace, it seems reasonable to present the conclusions of empirical research carried out in the international environment at a later stage. Hence, the study covered key dimensions of satisfaction, such as: quality of management processes, social communication, interpersonal relationships, remuneration, self-fulfillment and use of competence potential.

There are three basic groups among satisfaction factors: organizational, social and personal (Gros, 2012). Organizational factors are directly related to work. These include the type of tasks performed by the employee (e.g. their level of difficulty), pay (it should be adequate to the employee’s obligations and his involvement), promotion prospects, work safety, organization’s functioning policy (taking care of employees and their needs) and policy of organization development (Rzepka et al., 2023). Social factors include determinants that refer to the following: organizational climate (an organization should create a good working climate), mutual respect (no criticism of people, listening to each other, respecting each others’ views), arrangements with superiors and colleagues (there should be a desire to bring help, mutual friendliness) and customer relations. In turn, personal factors involve workers’ individual characteristics that a company has no influence on. These include individual properties, such as age, gender, race, intelligence, use of skills and professional experience at work (Schultz and Schultz, 2008). For SMEs, the importance of a working environment in which employees are part of the overall decision-making process becomes particularly important. Flexible working hours, less workload, the right approach to teamwork and management support have a positive impact on the employee performance. This leads to a high level of employee satisfaction, thanks to which staff can become more involved in the company’s activities, more motivated to work harder and more willing to work more efficiently, which can bring benefits to their enterprises in the long run. Thus, job satisfaction in SMEs has a direct and positive impact on internal entrepreneurship (Schunoe et al., 2015).

### 3. RESEARCH METHODS

**Context of the study.** Empirical studies of job satisfaction were conducted in accordance with the following research procedure: adoption of the research assumption and formulation of the research problem; definition of the purpose of the research and the research question; determination of the test sample and selection of the test method; implementation of the survey and interpretation.

The interview questionnaire was prepared by the authors within the framework of inter-institutional cooperation in the spring of 2022. The purpose was to methodically discuss the design of the interview questionnaire and the procedure for performing surveys to maintain the reliability of the research. The database of companies' (respondents') email addresses was assembled in July-August 2022 through a search by the authors for addresses posted on each company's website. The research was carried out from September to December 2022. A total of 1000 online questionnaire were sent to respondents and 590 valid questionnaire were returned. Therefore, the effectiveness of returning completed questionnaire was 59%. The authors of this article, with institutional support from their universities, were responsible for managing and administration the data as well as organizing the study procedure. All calculations were performed in SPSS Statistics 29.

**Purpose of the study and research question.** The basis for empirical recognition was the following research assumption: it is possible to develop a positive attitude of employees towards work. The research problem concerned the search for the characteristics of the organizational environment of SMEs in the context of achieving job satisfaction.

The aim of the research was to identify the factors to the greatest extent determining the achievement of professional satisfaction. The following research question was asked: "How and with what mechanisms can positive attitudes of employees towards their work be strengthened?"

To measure attitudes of employees to work, quantitative research was carried out using a questionnaire. The choice of the research tool was deliberate, and its legitimacy is expressed primarily by the possibility of conducting general and in-depth comparative analyses, systematizing the list of individual and subjective opinions of respondents and preparing rankings in percentage terms.

The key dimensions of workplace satisfaction were explored in the research process. The analysis covered both general attitudes of employees towards their work, relationships, communication, remuneration systems, motivation and employment in their organizations, as well as detailed elements describing the context of achieving satisfaction in relation to individual abilities and skills, interpersonal relationships, communication processes and reward and motivation systems.

**Research sample.** Empirical research was conducted for an international environment, among employees of SEMs in four countries of Central and Eastern Europe: Czechia, Slovakia, Lithuania and Poland. Detailed characteristics are shown in Table 2.

The selection of countries arose in an attempt to capture certain regularities and differences in geographic and historical areas associated with similar context of development trajectories. Central and Eastern European countries, such as, for example - Poland Czech Republic, Slovakia, and Lithuania, have experienced similar historical phenomena in recent decades. From the struggles for independence and socio-national identity at the beginning of the twentieth century, through the unbearable impact of World War II, the occupation of the Soviet Union (Lithuania was even part of the Soviet Union), to the breakthrough of freedom and joint entry into the European Union (2004).



Table 2. Characteristics of the research sample

<b>research sample = 590 (100%)</b>		
<b>Characteristics describing respondents participating in the survey:</b>		
AGE	up to 25 years old	13.9%
	26–35 years old	11.9%
	36–45 years old	37.8%
	46–55 years old	34.2%
	over 55 years old	2.2%
EDUCATION	Higher	45.6%
	Secondary	38.5%
	Vocational	15.9%
SENIORITY	up to 5 years	11.9%
	5–10 years	27.3%
	11–20 years	32.2%
	21–30 years	18.5%
	over 30 years	10.3%
POSITION HELD	Managerial	7.6%
	Employee	92.4%
Characteristics describing enterprises covered by the survey:		
company size by number of employees	micro-enterprise (0–9)	34.7%
	small enterprise (10–49)	51.0%
	medium enterprise (50–249)	14.2%
country of the company activity	Poland	33.7%
	Lithuania	21.0%
	The Czech Republic	23.1%
	Slovakia	22.2%

Source: Own study based on empirical research.

Therefore, it seems that research aimed at obtaining answers on the topic of similarities and dissimilarities in the perception of job satisfaction is sufficiently justified and contributes to filling the research gap. In addition, it should be mentioned that, like other countries, employment in the sphere of small and medium-sized enterprises (including micro enterprises) is dominant in these countries. At the same time, it should be noted that research on a sample of four (or less) countries and a similar group of interviewees, in the context of job satisfaction is not isolated (Kirkman, Shapiro, 2017; De Witte, Näswall, 2003; Eskildsen et al., 2004; Schlaegel et al., 2022).

#### 4. RESULTS

The empirical research started with asking a question about the general attitude of employees towards their work. The survey shows that nearly 73% of the respondents were satisfied, including almost 6% who gave affirmative answers (and nearly 67% opted for a rather satisfactory attitude). Almost 4% of the respondents did not feel full professional satisfaction.

In the empirical studies there was a relationship between job satisfaction and country of residence. A vast majority of the respondents living in Slovakia considered their work

to be satisfactory (as evidenced by the sum of the percentages obtained for the “yes” and “rather yes” answers: 74.05% and 9.92%, respectively). Against this background, the Lithuanians took the second position. On the other hand, residents of Czechia turned out to be ones the most dissatisfied with their work (Table 3). The results are similar to those of the research carried out in previous years (more in Smolarek, Sułkowski, 2020).

Table 3. Declared attitudes towards work in the surveyed countries of Central and Eastern Europe (CEE)

Declared attitudes towards work	The Czech Republic	Slovakia	Poland	Lithuania	OVERALL
	(data in %)				
Yes	16.9	9.9	7.5	7.3	10.2
Rather yes	48.5	74.0	68.3	71.8	65.8
Rather no	14.0	8.4	9.0	10.5	10.3
No	20.6	7.6	15.1	10.5	13.7
OVERALL	100.0	100.0	100.0	100.0	100.0

Source: own study based on empirical research.

The level of satisfaction of the surveyed employees of enterprises in Slovakia was due to the existing relationships and communication. Not without significance was also the motivation system, where the lowest ratings were given by Slovaks (Table 4). In Lithuania, satisfaction was primarily a result of satisfaction with relationships. The least important factor was satisfaction with the motivation system. In Poland and Czechia, employees reported the highest degree of satisfaction with communication, and the lowest for remuneration.

Table 4. Satisfaction with individual factors driving the level of employee satisfaction in the surveyed countries of Central and Eastern Europe (CEE)

	The Czech Republic		Slovakia		Poland		Lithuania		Overall	
	Yes and rather yes	Rather not and not	Yes and rather yes	Rather not and not	Yes and rather yes	Rather not and not	Yes and rather yes	Rather not and not	Yes and rather yes	Rather not and not
	(data in %)									
Satisfaction with relations	56.6	43.4	80.9	19.1	61.8	38.2	73.4	26.6	67.3	32.7
Satisfaction with communication	60.3	39.7	74.0	26.0	76.4	23.6	55.6	44.4	67.8	32.2
Satisfaction with remuneration systems	38.2	61.8	62.6	37.4	49.2	50.8	58.9	41.1	51.7	48.3
Satisfaction with motivation systems	55.1	44.9	55.0	45.0	56.3	43.7	51.6	48.4	54.7	45.3

Source: Own study based on empirical research.

Analyzing the distribution of the responses in terms of the impact of the individual factors on the level of satisfaction, satisfaction with the relations prevailing in the company

was relatively best rated by Slovaks and worst by Czechs (Table 4). Satisfaction with communication in the organizational environment was most appreciated in Poland and the least by in Lithuania. The highest level of satisfaction with remuneration systems was achieved in Slovakia (and the lowest in Czechia). On the other hand, satisfaction with motivation systems was declared primarily by respondents from Poland.

In Slovakia, professional development (92.4%) and career in the work environment (77.1%) were among the most important factors influencing the level of satisfaction with the possibility of using abilities and skills in the work environment. On the other hand, facilities for participation in various scopes, ways and forms of improving professional qualifications were mentioned the least frequently (Table 5). Employees of Lithuanian SMEs identified knowledge of expectations in the workplace (76.6%) and career development opportunities (75.0%) in the first place. They paid the least attention to the correspondence between their position and their own vision of professional development (42.7%). The most important factors in Poland included clearly and comprehensibly defined responsibilities (76.4%) and professional development (71.4%). In turn, in the opinion of Czech employees, these were the opportunity for development and knowledge of expectations in the workplace (79.4% and 76.5% respectively).

Table 5. Factors influencing satisfaction with the possibility of using abilities and skills at in the surveyed countries of Central and Eastern Europe (CEE)

	The Czech Republic	Slovakia	Poland	Lithuania
	(data in %)			
I know what I am expected to do at work	76.5	68.7	65.8	76.6
My tasks are clearly defined	57.4	70.2	66.3	65.3
My responsibilities are clearly defined	74.3	75.6	76.4	66.1
Professional development is important for me	59.6	92.4	71.4	72.6
My current position is consistent with my career vision	53.7	70.2	61.8	42.7
I know possible career paths in my workplace improvement to its employees	79.4	77.1	71.4	75.0
The company facilitates qualification	33.8	42.7	80.4	62.9
I participate in training financed by the company	40.4	51.1	64.8	45.2
I see my own career opportunities in the perspectives of development of the organization	50.0	59.5	56.8	74.2

Source: Own study based on empirical research.

Satisfaction with relations in the organizational environment of enterprises was most influenced by such factors as trust in the supervisor in Slovakia, the possibility of openly expressing one's own views and opinions in Lithuania and in Czechia, no anxiety about of talking to the supervisor about difficult matters in Poland (Table 6).

Table 6. Factors influencing satisfaction with relations in the organizational environment of enterprises in the surveyed countries of Central and Eastern Europe (CEE)

	The Czech Republic	Slovakia	Poland	Lithuania
	(data in %)			
I like my supervisor's management style	41.2	63.4	61.8	56.5
I trust my supervisor	44.1	71.0	56.8	51.6
I get working support from my supervisor	43.4	58.8	62.8	54.8
My supervisor is open to new suggestions and ideas	49.3	64.9	60.8	54.0
There is a freedom of expressing one's views in the company	56.6	70.2	65.3	59.7
I may always talk to my supervisor about my work problems	51.5	66.4	63.8	43.5
I am not anxious to talk about difficult matters with my supervisor	53.7	64.9	69.8	44.4
My supervisor communicates me criticism without witnesses	45.6	68.7	51.8	57.3

Source: Own study based on empirical research.

The research on employee satisfaction factors in selected European countries applied a four-element model, with a primary focus on the remuneration system in the context of satisfaction as a complex and multidimensional construct.

When analyzing the answers given by the respondents on satisfaction with the remuneration system in enterprises, the answers focused on the following relations to the greatest extent (Table 7): 1. Between qualification level and salary (78.6% and 57.4% in Slovakia and Czechia, respectively). 2. Between performance at work and salary (63.7% and 67.3% in Lithuania and Poland respectively).

Table 7. Factors influencing satisfaction with the remuneration system in enterprises in the surveyed countries of Central and Eastern Europe (CEE)

	The Czech Republic	Slovakia	Poland	Lithuania
	(data in %)			
My remuneration is adequate to my efforts	36.8	70.2	65.8	63.7
My results affect my remuneration	49.3	76.3	67.3	58.9
My qualification improvement is reflected in my remuneration	57.4	78.6	56.8	59.7

Source: Own study based on empirical research.

Not without significance was also the factor describing the employee's effort in the work performed, which had a direct reflection in remuneration. In three countries – Lithuania, Poland and Slovakia – more than 60% of the respondents declared that the remuneration received was commensurate with the effort and commitment. On the other

hand, a worryingly low rating was obtained in Czechia, where only 36.8% of the respondents saw such relationship.

The research confirms that the incentive system in enterprises in many cases satisfies employees of SMEs. The results of the assessment make it possible to identify the factors with the greatest impact. Among them were the following (Table 8):

- The system of praise of employees for the workdone (e.g. in Slovakia).
- Motivation by the immediate supervisor (e.g. in Slovakia).
- Recognizing the effort and commitment of the employee at work and, consequently, the opportunity to receive commendation (e.g. in Lithuania).
- The clearly defined and well-known incentive system completed by informal customs of activating and cheering employees on by their immediate superiors (e.g. in Poland) or giving commendation for the work done (e.g. in Czechia).

Table 8. Factors influencing satisfaction with the incentive system in enterprises in the surveyed countries of Central and Eastern Europe (CEE)

	The Czech Republic	Slovakia	Poland	Lithuania
	(data in %)			
The motivation system is clearly defined	53.7	59.5	77.9	42.7
The motivation system rules are clear	63.2	59.5	75.4	41.9
My superior motivates me to work better	56.6	64.1	80.4	50.8
The company notices what I do	53.7	61.1	71.9	63.7
I am praised for good work	67.6	69.5	76.4	59.7

Source: Own study based on empirical research.

To give an employee satisfaction, work should provide him with the opportunity to develop, i.e. satisfy the need for self-fulfillment. This is an extremely difficult task for managers, as there are individual differences in the understanding of self-fulfillment by employees. However, the point is that work allows employees to use their potential and show initiative.

## 5. DISCUSSION

Satisfaction is an extremely complex topic describing a person's attitude to the work performed. In a sense, it reflects the degree of happiness felt by the employee while fulfilling their professional duties. It is a level of satisfaction that triggers a sense of success and joy in professional development, which in turn reinforces identification and a sense of belonging to the profession and workplace. Achieving satisfaction depends on many factors, such as the possibility of self-development, relations with colleagues and management, communication, remuneration and motivation systems. It is worth emphasizing that achieving satisfaction often determines the possibility of active involvement and real inclusion in the work environment, which in turn implies a positive attitude of the employee towards the position, duties performed, profession and company.

Already in studies conducted in the early 1970s, it turned out that the results regarding job satisfaction among industrial employees were not easy to interpret and, as Form (Form,

1973) notes, sometimes contradicted existing theories. Kirkman et al. (Kirkman, Shapiro, 2017) analyzes in his research the issues of cultural values in job satisfaction, referring to the classic division of cultures by Hofstede (Hofstede, 1980). However, it analyzes different cultural circles in four countries, in the case of this research we are dealing with a similar cultural circle, also in four countries (Central and Eastern Europe), so there are differences in the obtained research results divided into individual countries (Poland, Czech Republic, Slovakia, Lithuania) are not too large. Schlaegel et al. (Schlaegel et al., 2022) examine the links between job satisfaction and emotional intelligence in three countries, the results are inconclusive and indicate that different dimensions of emotional intelligence influence different aspects of job satisfaction. Eskildsen et al. (Eskildsen et al., 2004) report the results of their research in four Nordic countries (Denmark, Sweden, Norway and Finland), which show that Danes are the most satisfied employees among the Nordic countries. At the same time, they point out that the obtained research results (Eskildsen et al., 2004) are not clear, and sometimes even contradictory. This confirms the observation of the authors of this article that very often the results of international job satisfaction surveys are difficult to interpret unambiguously and often defy simple explanations. De Witte and Näswall in their research conducted in four European countries (Belgium, the Netherlands, Italy and Sweden) on temporary work, job satisfaction and organizational commitment also do not obtain clear results (De Witte, Näswall, 2003). Although the results are more clear in terms of the negative aspects of temporary work on job satisfaction, discrepancies can be noticed in the case of other dimensions of job satisfaction in these four countries.

As Borooah notes „there was considerably greater inequality in the distribution of job satisfaction in East European, compared to West European, countries” (Borooah, 2009). Studies of central and eastern European countries indicate that culture and historical heritage and traditional values are somewhat more important in assessing job satisfaction than in western European countries (Fargher et al., 2008). Labor culture in East Central European countries is less entrenched than in stronger and older democracies. This is due to historical conditions involving the revolutionary entry into the liberal market area in the early 1990s. At that time, these countries were dominated by a system based on very Darwinist rules. Of course, since then, the system of work culture in these countries has strongly evolved however, all the time there are significant differences between the work culture of Western and East-Central European countries. One such very characteristic factor is the relatively low degree of interpersonal trust affecting, for example, teamwork and joint achievement of group results. At the same time, these countries are seeing major changes in relation to traditional values such as religion and family. It can be seen especially in Poland, Slovakia, traditionally Catholic societies are changing towards more open societies, which also applies to the perception of work and the ethos of the profession and work as more flexible and mobile.

Exploration of the issues of achieving and influencing the level of employee satisfaction with their work is a serious challenge in social sciences. The subject matter seems extremely interesting, but still, in the context of empirical inference, quite non-obvious and difficult to generalize. Most often, the issue of job satisfaction is addressed either in general, or by sector or profession, such as satisfaction in the hotel industry, construction services, or the work of teachers, medical personnel, etc. (MacIntosh, Doherty, 2010; Lee-Peng et al., 2021; Ghazi, Muzaffar, 2018; Sadeghi et al., 2013), much less are studies covering SMS specifically. The importance of organizational culture in job satisfaction at SMS is often pointed out (Ariani, 2023). This is most likely due to the fact that corporations

have the structural attribute of producing an organizational culture, a corporate culture, while SMS are often associated with a lack of culture or a culture shaped by the business practices (Pimentel, 2018) of the owner of a small or micro enterprise. Despite many limitations, these research results seem to increase the knowledge about the phenomenon of achieving job satisfaction in the countries of Central and Eastern Europe. As noted, Lange (Lange, 2009) research of this type is not widespread enough and new knowledge is constantly needed, especially in the context of changing social, economic and ecological conditions.

## 6. SUMMARY

The job satisfaction surveys were conducted among SME employees in four selected CEE countries: Slovakia, Lithuania, Poland and Czechia. These are not all countries in this part of Europe, but it seems that the test is a good attempt to present new knowledge about job satisfaction in this region (Kirkman, Shapiro, 2017; De Witte, Näswall, 2003; Eskildsen et al., 2004; Schlaegel et al., 2022). The distribution of the research results shows geographic variation. A vast majority of respondents living in Slovakia perceived their work as satisfying. On the other hand, respondents from Czechia expressed their dissatisfaction, relative to other countries, which was reflected in the lowest percentage of professionally satisfied people. The high level of satisfaction in Slovakia was most influenced by satisfactory relations in the organizational environment and efficient and effective communication systems, although not without significance was also the subjective assessment of the forms and practices of principles and rules of motivation. In Lithuania, the high level of professional satisfaction mainly reflected the state of satisfaction with relationships. It was least conditioned by the attitude and by the perception of the incentive system. In the context of the assessment of the individual factors, the highest level of satisfaction with communication was observed in Poland and Czechia. The weakest link in the chain was the remuneration system, which was rated the worst. Despite the limitation of the research sample size ( $n = 590$ ), it seems that the theoretical and empirical diagnosis may contribute to a detailed investigation into the issues of achieving and building professional satisfaction. It is true that observations and conclusions from the research in accordance with the research procedure has measured the levels of satisfaction in only four countries: Slovakia, Lithuania, Poland and Czechia. They may be taken as a kind of background for studying the premises and problems of wellbeing. Because it is hard not to agree that the subject of wellbeing corresponds to achieving a state of satisfaction, i.e. simply feeling satisfaction with the work performed and the effects achieved. However, it is worth emphasizing the significant impact of the environment, including workplace conditions, the atmosphere in the company, employee involvement, active and effective communication, support from leaders or the division of tasks according to qualifications, capabilities and abilities.

Summing up the results of the empirical research, it is worth emphasizing that SME employees notice many different factors affecting to a greater or lesser extent their perceptions of professional satisfaction. Among them, they most often mentioned detailed elements describing the general context of achieving satisfaction in relation to, for example, individual abilities and skills, interpersonal relationships, communication processes and reward and motivation systems. It is important not only to analyze the existing state but, above all, the possibility of improvement, development and reconfiguration as a manifestation of permanent investment in creating more friendly

conditions in the work environment. The basis is, among others, adaptation to the current and future needs of employees, intensification of activation, improvement of professional competences, etc. in response to contemporary characteristics of forms, ways and styles of performing business duties and achieving satisfaction with personal life. It is probably reasonable to assume that research on the issue of job satisfaction will continue in many research streams, especially with the increasing dominance of technology including artificial intelligence and emerging social projects like the basic income guarantee.

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## GAMIFICATION IN MANAGEMENT EDUCATION

Gamification, which uses the mechanisms of games to acquire knowledge and various types of skills to build people's involvement in a specific activity, is playing an increasingly important role. This study aims to emphasize the importance of gamification in the management process, with particular attention to its use in the educational process. It employs a critical literature review, observation, and case studies, containing an analysis of active gamification-based methods used in teaching management (organization and management) and production management. On the basis of the pilot program MANAGER BOB IN, the game used during the production management course, and the experiences of the authors of the study in creating various games, it can be concluded that it is necessary to allocate more time during organizational classes to explain the principles and benefits of participation in gamification, and to extend the time for the implementation of selected challenges. Information feedback is also important, as is the use of various technical solutions that affect the attractiveness of games and the entire educational process.

**Keywords:** gamification, game mechanics, management, education.

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## 1. INTRODUCTION

Gamification has been recognized as one of the greatest, innovative discoveries of modern management due to its interdisciplinary and dynamic features (Wanick, Bui, 2019). Companies increasingly recognize the opportunities offered by gamification. They use them in various areas of management (entrepreneurship management, finance, projects, production, logistics, human resources, risk, etc. – Wanick, Bui, 2019) to motivate, develop cooperation in teams, also check certain skills and competencies of people, to encourage or dissuade them from certain behaviours (Widawska-Stanis, 2017). Despite the proven positive impact of gamification on teaching and learning, and on the attractiveness of classes, there are few studies in the literature on the effectiveness of the use of gamification in the teaching process regarding also management courses. To address this problem, the subject of the study (both theoretical considerations and completed research) is gamification, especially its use in management courses. The article aims to emphasize the effectiveness and attractiveness of gamification for young people studying at the university level. Theoretical considerations were supported by case studies in which positive and negative aspects of the use of games in teaching management (organization and management) and production management were included.

## 2. GAMES AND GAMIFICATION IN THE LEARNING PROCESS

Gamification is the use of game elements in other than game contexts (Herzig, Ameling, Wolf, Schill, 2015; Rosli, Khairudin, Mat Saat, 2019). It means the implementation of the structure and mechanics of games (points, badges, levels, challenges, rewards) into the real world to arouse users' engagement, change their behaviour and solve various types of problems. It is a conscious and deliberate use of mechanisms used in the design of games, loyalty programs and behavioural economics assumptions in business situations to activate, influence the behaviour and motivate a selected group of participants.

Gamification, next to the elements typical for the gaming environment, also includes a specific way of solving problems, taking into account, for example, performing certain activities, taking up challenges, scoring points, etc. Importantly, it uses certain psychological elements that make games so engaging that they have become an integral part of social life. The very idea of gamification is based on the sense of fun that people feel while doing activities related to their work – business, healthcare, sports, education, etc., so those in everyday life seem tedious, monotonous and overwhelming. This change in approach results from the modification of their behaviour and motivation – they want to do this activity because it is attractive to them, and they want to get a prize, beat another gamer, or receive a medal.

Although the application of rewards, loyalty programs and elements of game schemes has been used in business activities for a long time, the gamification method was described and presented in detail in the United States only in 2010 (the term "gamification" appeared a little earlier, it was first used in 2002 by programmer N. Pelling). That's when websites began to appear that introduced elements familiar from games to their sites to diversify and attract an audience. In the same year, G. Zichermann's book *Game-based marketing* was published, thanks to which the author became one of the main experts in the field of

gamification (Kozłowska, 2016)<sup>8</sup>. In Poland, gamification began to be discussed more widely in 2012, when the first publication of P. Tkaczyk in this field – *Gamification. How to apply game mechanisms in business activities* – was published. The author formulated an interesting definition of this concept. In his opinion, gamification is “injecting fun into activities (such as work, getting up in the morning, saving for retirement or studying) that are not normally fun” (Kozłowska, 2016).

Each gamification project comprises three elements: dynamics, meaning a repetitive series of interactions between mechanics and rules of the game (Petrovich, 2017), game mechanics and plot. Gamification should also meet strictly defined criteria (Widawska-Stanisiz, 2017):

- have and achieve a previously set goal – e.g., lead to an increase in product sales or convince drivers to reduce speed on the roads,
- contain emotions – it is to make fun, pleasure and give satisfaction from the designated activities,
- use mechanisms known from games – e.g., rewarding, providing feedback, competing, winning, elements of surprise,
- relate to real-life activities that are not normally related to games,
- increase people's motivation to perform certain activities.

The main didactic goal of universities is the possibility of obtaining education by students. For this purpose, various forms of acquiring knowledge are used, e.g., “giving”, in which the student receives ready-made knowledge provided by the lecturer, e.g. lectures, descriptions or speeches, and “searching”, “heuristic”, i.e. one in which knowledge is gained through self-made work, these are m. among others, discussions, laboratories, exercises (Wiśniewska, 2017). The form of “searching” is gamification, which is also an important tool supporting the work of teachers' and students' learning. First, it gives them greater opportunities to use high-quality educational resources, thanks to a user-friendly interface, adding aspects of social interaction and using motivational gamification mechanisms (Niu, Luo, Niemi, Li, Lu, 2022). Higher education responds to calls for modernised teaching and the need to integrate more practical elements of everyday life into students' learning processes through the use of simulation games (BSG) (Zervas, Kostopoulos, 2023).

When deciding to start education at a university, students pay special attention to the method and manner of conducting classes. In the case of management courses, they focus mainly on whether the classes will provide them with practical knowledge that will enable

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<sup>8</sup> Development of the gamification in business was directly linked to the activities undertaken by companies such as Badge Ville and Bunchball, that have incorporated elements of games into management. One of the first companies to use gamification mechanisms in the recruitment of personnel was French tycoon of the cosmetics industry – L’Oreal. In 2010, the company created the game Reveal L’Oreal, intended for students and graduates of universities of various faculties. Its aim was to help discover the professional profile of each gamer and to choose the right career path. Another interesting idea of recruiting employees was proposed by a personnel consulting company Hays Poland. By means of Facebook game it decided, through a recommendation system, to look for people willing to cooperate in shared service centers. Users whose Hays called recruiters used international forums, thematic blogs and discussion groups to find candidates. The best could use internship or full-time position. The gamers played the role of NASA agents who search for candidates to settle the Earth. The application was supposed to build tension caused by the threat of the entire globe. The recruiter fulfilled subsequent missions and recruited new people, while the candidate filled in an on-line form (Wrona, 2013; Widawska-Stanisiz, 2017).

them to work in the future, e.g., in the profession of a manager. For this reason, it is necessary to constantly modify the didactic process and make the forms of the knowledge transfer process more attractive. Using diverse teaching methods allows for better understanding, memorization of gained content and improvement of student activity within classes (Janecka, Juźwik, 2020; Zatrwarnicka-Madura, 2016). For these reasons, gamification using simulations and augmented reality is becoming more and more popular. They are now almost universally used at all levels of education.

Gamification is an innovative technology (Rosli, Khairudin, Mat Saat, 2019), but also a teaching method based on new educational technologies (Grivokostopolou, Koras, Perikos, 2019), which allows shaping certain behaviours and learning by doing. It increases knowledge, experience, motivation, perseverance and commitment to the tasks carried out, and has a positive effect on self-efficacy (Rosli, Khairudin, Mat Saat, 2019). It changes activities that are difficult or unpleasant into activities that encourage engagement, creating fun out of something that does not resemble it (Złotek, 2019).

Educational games have been developed and are used to improve the teaching and learning process helping both students and teachers achieve their goals (Silva, Rodrigues, Leal, 2019). Game-based education takes two forms: gamification, in which learning is transformed into a game, and Game Based Learning (GBL), by incorporating real play into the learning process (Al-Azawi, Al-Faliti, Al-Blushi, 2016). Social and cultural changes, new technologies and the development of artificial intelligence affect the demand for employees with high competencies, to go beyond the box and perceive reality from different perspectives (Fazlagič, 2019). Gamification gives the freedom to choose a solution to the problem, the system of quick feedback on success or failure used in it increases motivation to learn and allows you to create new ideas and alternative approaches, which help solve problems, encourage the choice of new solutions (Bühler, Jelinek, Nübel, 2022).

Games are effective teaching methods referring to the real world, which are a substitute for real actions and decisions in the real world. For this reason, education may be very effective with the assistance of various business games that simplify economic reality (Gaweł, 2016). You can, for example, become a virtual entrepreneur (learn in practice how to run a business), play managerial roles (Deterding, 2018), and solve problems that an entrepreneur or a manager may encounter when doing business. Research indicates that entrepreneurship education with the use of gamification increases the likelihood of starting their own business for young people (Nowiński, Nowaczyk, Sobczak, Tomczyk, Fabiś, Litawa, 2016). In entrepreneurship education, virtual strategy gamification is very effective. On the one hand, they require gamers to use their existing knowledge, skills and experience – they decide during the gamification, based on already possessed qualifications. On the other hand, commitment is necessary to carry out the gamification, because they are the active actors, discussing, analyzing possible options, making decisions and examining the results of their actions. They ask questions about the most effective market strategy and independently search for answers, which shape their cognitive process (Gaweł, 2016).

Because of its popularity, the use of gamification has been the subject of numerous studies (Yasin and Hafeez, 2018), which highlight its effectiveness in the teaching process.

The results of a systematic literature review show a growing interest in gamification and game-based learning (e.g. Dečman, Rep, Titgemeyer, 2022; Jääskä, Lehtinen, Kauppila, 2022; Kamarudin, Halamy, Mohsin, 2023; Grijalvo, Segura, Núñez, 2022; Bohan, McDowell, Smyth, 2022; Ortiz-Martinez, Santos-Jean, Palacios-Manzano, 2022).

Both forms are increasingly used in various areas of exact and social sciences (Subhash, Cudney, 2018). Progressively, they are used in higher education to teach management<sup>9</sup>. They concern various areas of enterprise management, for example, entrepreneurship of management and employees, managerial skills, and managerial decisions. Computer simulations are often used to prepare for company management, helping to prepare for the future role of managers or entrepreneurs (Silva, Rodrigues, Leal, 2019). Using gamification at universities also results from the fact that it can be very effective, especially with young people who spend a lot of time in virtual reality (e.g., generation Y, Z). Gaming-based education can be attractive to them, arouse more interest, influence engagement, and gain knowledge in this way can be much more effective (Isabelle, 2020). The didactic process, supported by gamification, takes into account and integrates the essential components of this process: cognitive, operational, exercise, and facilitation (Wasyluk et al, 2020) positively affecting the attractiveness and effectiveness of games.

Currently, a big challenge in the didactic process is to support the development of critical thinking and maintaining a constant, high level of attention and focus of students, who often have problems with overstimulation, rapid exposure and exposure to constant distractions. Hence the need to introduce digital technologies into the education process that are attractive and engaging for the recipient and ensure the achievement of educational goals (Boboc, Băutu, Gîrbacia, Popovici N., Popovici D.M., 2022).

Didactic games are aimed at mapping a specific situation, or reality, to enable participants to influence a system. This allows you to create a certain vision so that gamers will experience a specific problem and directly interact with it. Students who have used gamification in the educational process improve academic results than those who have not used them (Ortiz-Martínez, Santos-Jaen, Palacios-Manzano, 2022). This is evident in the situation related to the pandemic and the change in the way of teaching (mainly remote), which has made teaching and learning more tedious and less motivating. In distance learning, the use of gamification can be easily implemented and thus can positively influence the teaching and assessment process of students (Ortiz-Martínez, Santos-Jaen, Palacios-Manzano, 2022). Teachers also see the beneficial consequences of gamification for students, such as increased interest and learning along with an unforgettable learning experience (Jääskä, Aaltonen, 2022).

### **3. GAMIFICATION CASES ANALYSIS APPLIED IN MANAGEMENT AND PRODUCTION MANAGEMENT**

The study focuses on a qualitative approach using observation and case studies. This aims to explore and describe the environment to better understand it (Alotumi, 2022). Examples of those classified as active 'learning by doing' teaching methods using gamification to focus on the learner and acquire industry-specific competencies were used. The study is based on two examples of gamification applied by employees of the Rzeszów University of Technology – the first one is used in management (organization and management) classes, in logistics as well as internal security at the Faculty of Management, the other one in production management classes in management and production engineering at the Faculty of Mechanical Engineering and Aviation.

The effectiveness of the use of gamification in didactics in management sciences and quality has been confirmed by the experience from implementing the author's pilot project

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<sup>9</sup> The first game played in these courses was Monopoly. Over time, more and more of them appeared.

entitled “Program of gamified courses Management/Organization and Management (2022/2023)” (in short *Program*), developed and implemented in the Department of Enterprise Management at the Faculty of Management of the Rzeszów University of Technology in the winter semester of 2022<sup>10</sup>. This offer was addressed to students in the first year of first-cycle studies in two stationary and two non-stationary directions. The gamification, symbolically named MANAGER BOB IN, is based on a canvas from the construction industry, determining the name of the whole gamification. Its essence is summarized in the introduction (INTRO) of the *Program*:

You are a manager focused on personal development, looking for new opportunities and open to inspiring challenges. Your current goal is to build your dream home. To achieve this, you must own currency (B&B), i.e., bobucks. You earn these funds by completing tasks that appear at various stages of the construction process. The dream goal gets closer to implementing subsequent challenges. You can observe your progress actively, experiencing more and more satisfaction from overcoming weaknesses and emerging problems. Complete quests, earn B&B and expand your knowledge in an exciting adventure full of interesting surprises.

The description quoted above fulfils three functions:

- motivates to participate in the gamification by referring to individual motives for studying (methodically diagnosed at the preparatory stage of gamification),
- formulates the goal of the gamification,
- indicates the means and principles of achieving the objective.

The structure of the gamification was subordinated to industry phraseology, defining the so-called construction plan with the following stages:

1. Literature analysis and process coordination.
2. Searching, negotiating and buying your dream plot.
3. Obtaining building conditions for the plot.
4. Purchase of the prettiest house design.
5. Adaptation of the project and land development of the plot.
6. Obtaining a building permit.
7. Building a house.
8. Notification of completion of construction and consent to use the building.

The above positions were organized in a series-parallel system, visualized on the Gantt chart. This gave the opportunity to simultaneously implement selected stages, and completing each of them was tantamount to completing one challenge (task). The gamification included two types of challenges: basic (i.e., obligatory, resulting from the standard study program) and premium (i.e., voluntary, enrolled in the pilot *Program*). Basic tasks were performed and completed during classes by the Gamer (student), playing the role of MANAGER BOB IN, while premium tasks went beyond contact hours. The game schedule specified the time slot (one, two or three weeks) during which premium challenges were active. This meant that their execution, and at the same time the earning of points, was possible at any time, albeit within a strictly defined period, counting from

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<sup>10</sup> The program is available at (<https://bozydarziolkowski.v.prz.edu.pl/materialy-do-pobrania/gamifikacja>).



the moment of making the detailed instruction available until the end of accepting tasks. Due to the optional nature of the gamification, similar personalization concerned the number of challenges undertaken, the so-called “moment of entry into the gamification” and the scope of their implementation. For certain premium challenges, there was a registration requirement. It was conducted at the beginning of a given stage by two employees of the university unit, appointed in the gamification as DESIGNER and CONSTRUCTION MANAGER. This was to provide Gamers with tailored information. The scoring system developed in the game MANAGER BOB IN was based on the currency, which was bobucks (B&B). Gamers won them in three categories, i.e.:

- readiness to join the basic challenge – reflected in the presence at classes (lectures and exercises),
- implementation of the basic challenge,
- Implementation of the premium challenge.

Delay in completing the basic task (i.e., its completion after the exercise) allowed you to get a maximum of 80% of the currency provided for the challenge. Getting 100% of the number of bobucks for all basic tasks entitled the Gamer to obtain a passing grade without taking the colloquium from classes. With above-average implementation of premium challenges, Gamers received additional points, so-called surprises (which are the equivalent of prizes). The aggregate results of all Gamers were published on the gamification page before its completion. The scoring scale used for individual stages together with the results is presented in Table 1.

Table 1. Rules for obtaining currency and scores in MANAGER BOB IN gamification

Percentage of B&B	Total B&B	Stages/challenges/tasks	Scores	
			Exercise	Exam
50%	-	Basic challenges	3,0	-
60%	50% + 10%	BOB IN fieldwork	3,5	-
70%	50% + 20%	BOB IN in the Eisenhower matrix	4,0	-
80%	50% + 30%	BOB IN – pioneers’ stories	4,5	-
90%	50% + 40%	BOB IN evaluation	5,0	3,0
100%	50% + 50%	BOB IN ICAN	5,0	3,5
110%	50% + 60%	BOB IN SPIRATOR	5,0	4,0
120%	50% + 70%	BOB IN - Ishikawa chart	5,0	4,5

Source: own work.

To avoid the impact of objective factors (i.e., affecting the course of gamification of days off from classes) – which randomly differentiated the number of points obtained for basic tasks between individual groups of stationary studies – percentages were used in the above scale.

The last part of the gamification *Program* describes the premium challenges. Its standardized form included: the deadline, distinctive name of the challenge (given in Table 1.), task topic, information about the required registration, information about the type of results of the challenge, detailed instructions for completing the task, inspirations (literature), as well as useful tools (e.g., software, databases).

The results of the pilot gamification *Program* provide the basis for assessing student involvement in terms of three criteria, i.e., the field and form of studies and the type of

challenges. To assess the involvement of the Gamers in the context of the field and form of studies, the calculations presented in Table 2 were made.

Table 2. Participation in MANAGER BOB IN gamification due to the direction and form of study

Field of study	Logistics		Internal security	
	Stationary	Non-stationary	Stationary	Non-stationary
Number of classified persons	110	21	111	31
Number of gamification participants	22	7	33	0
Percentage of Gamers	20	33	30	0

Source: own work.

Involvement in gamification was also assessed based on the type of challenges undertaken, as shown in Table 3.

Table 3. Participation in MANAGER BOB IN gamification due to the type of challenges

Challenge/task name	Percentage of Gamers
BOB IN fieldwork	15
BOB IN in the Eisenhower matrix	87
BOB IN – pioneers' stories	23
BOB IN evaluation	58
BOB IN ICAN	50
BOB IN SPIRATOR	35
BOB IN - Ishikawa chart	52

Source: own work.

Based on the presented results, the analysis of the effects of implementing the MANAGER BOB IN *Program* leads to practical methodological and substantive conclusions. From the point of view of the methodological effects of implementing the *Program*, it was found:

- relatively low interest of students in the presented teaching method – 23% of people expressed their involvement (when considering all university directions),
- significant differentiation of students' involvement due to the field and form of studies, as well as the exercise group,
- the grade of the commitment to the gamification was translated into final results, i.e., the greater the commitment to implementing premium challenges, the greater the number of points (B&B) earned.

However, the assessment of the substantive effects of implementing the *Program* led to the following conclusions:

- the challenge of telephone contact with enterprise managers was taken up by 15% of gamification participants, which shows the high difficulty in the designed task,
- challenges with low difficulty and creativity (to record an individual daily schedule) involved most gamers (87%),

- challenges requiring the acquisition of new competencies (e.g., the use of IT tools or the creation of an original concept) involved fewer Gamers than tasks based on the use of existing knowledge and skills (e.g., in working with text or in preparing a presentation).

Based on the conclusions formulated after the analysis of the results of the pilot MANAGER BOB IN program, it is possible to recommend:

- allocating more time during organizational classes, for students of the first year of each field of study, to explain the principles of implementation and benefits of participation in gamification,
- conducting a student satisfaction survey and presenting its results during organizational classes,
- extending the time of implementation of selected challenges.

Another example of gamification at the Rzeszów University of Technology was introduced into the production management course, based on the learning-by-doing approach in teaching Lean Manufacturing. Its origins date back to 2011, when, because of the implementation of an international project, the Lean Learning Academy Poland was created at the Faculty of Mechanical Engineering and Aviation, which, among other things, develops various types of didactic gamification. In the developed interactive gamification of production management, students – its participants – play different roles, and the behaviour of one person affects the actions of others. They have to achieve a specific goal and achieve the assumed level of efficiency. An attempt was made to recreate as much as possible the real conditions prevailing in the working environment, occurring on the assembly line. In laboratory conditions, this is difficult, so it was necessary to apply several simplifications but tried to reflect as much as possible on what is happening in the enterprise. The gamification is performed at master's degree studies (students already have the title of engineer), because to carry it out it is necessary to have basic engineering (theoretical) knowledge of participants in, for example, production organization, production management, technology design, risk management, quality assurance, signing contracts, training and employee motivation, methods and tools in the field of Lean Management (Stadnicka, 2017).

Students take part in a gamification that is a simulation of a certain part of the company's assembly line, and their job is to assemble pens. It is a very simple construction, which – as it seems – should not create the slightest problems. The implementation of the gamification shows, however, that in the assembly process, students make several mistakes for which they take responsibility, try to solve them and can learn a lot during it. Depending on the recipient's expectations, a decorative element (e.g., a sticker) is also mounted on pens. The gamification makes you aware of how the additional process can hinder the work, and how the addition of a small element can affect the course of the whole process. This is to teach students what ways to use to make the assembly line efficient, but also as flexible as possible according to customer requirements. When creating the gamification, the assembly of a very simple product was deliberately chosen, because its goal is not to teach students how to assemble pens but to organize production (work) when assembling any product. It was also about teaching them what specific tools to use, what methods should be used, and what changes should be introduced to improve the organization of work on the assembly line.

Each participant in the gamification is employed in a specific position depending on the predispositions and abilities assessed by the gamification coordinator. Everyone is

given tasks to do, and their work is assessed and controlled. On the assembly line they work (Stadnicka, 2017):

- operators – who perform assembly tasks following the working documentation with the instructions received; they receive training that provides them with information on how to assemble pens;
- controllers – responsible for the inspection of finished products; at least one controller at the end of the assembly line takes part in the gamification (this was a deliberate action so that students themselves would realize the importance of control at each stage of the assembly so that they would see the importance and effectiveness of self-control);
- warehouse employees – who are responsible for internal logistics, their task is to deliver to the stations' elements necessary for assembly and receive finished products;
- production manager – commissioning production tasks, responsible for the implementation of the assumed number of finished products that meet the customer's requirements, also for achieving a certain level of efficiency;
- process engineers – who observe assembly processes, identify problems, and collect relevant data using tools of their choice; are responsible for the timing of working time, and record activities performed by operators; during the process, they can not interfere in any way in the work of contractors, in the functioning of the production line, they only observe its work.

The gamification is divided into several steps (stages) (Stadnicka, 2017):

- Step 1 – informing everyone what they are responsible for, conducting operator training, starting the assembly process – supervision over the game is taken over by the production manager, who is responsible for the whole; the teacher becomes an observer, and from now on the manager handles the whole, solves emerging problems;
- Step 2 – process engineers become active and summarize what happened on the assembly line; each participant of the gamification (employed in the production process) can comment on what problems have arisen, what bothered him at work, what he had the greatest difficulties with; all reported problems are then collected, grouped, the most important of them (e.g., 3 or 4) are carefully analyzed, and the participants of the gamification are looking for the best way to solve them; for this purpose, teams are created – each of them deals with solving one problem; students create teams themselves, realizing that the criteria for selecting team members should be substantive (and not result, for example, from mutual sympathy) to solve the problem; each team pursues its own goals, but they can be related to the goals of other groups, therefore they must communicate with each other, set priorities, cooperate; teams use familiar Lean Manufacturing tools to help solve the problem; prepare an A3 report for their problem – propose a solution to be implemented to solve the problem, to improve the assembly process;
- Step 3 – the proposals developed by the teams to solve problems arising on the assembly line are then implemented; this is to improve the work of operators on the line; students can change the location of workstations, make corrections in the instructions for performing individual operations, change the flow of materials used for assembly, also the flow of information, eliminate losses, change workload, etc.;

- Step 4 – students organize a new assembly line, taking into account the improvements and corrections they report; new assembly conditions usually bring a huge leap in efficiency, which is to make students aware of the consequences of mistakes made and the effects of the changes introduced;
- Step 5 – evaluation of the introduced changes, summary.

After completion, students focus on other problems that arise in new conditions and evaluate the effectiveness of the changes made. A big surprise for them is a huge (often even 800 or 1000%) increase in the efficiency of the assembly process after implementing the corrections. They realize then that often there is no need for cost changes, large financial investments to improve work, to improve the conditions and organization of production. They know that there are no shortcuts and that every activity must be done correctly and within a specific time if it is to ensure a certain level of efficiency and quality.

The described gamification develops competencies in teamwork, responsibility for decisions, motivation, cooperation and interaction, sharing knowledge and information, identifying problems and searching for ways to solve them (Stadnicka, 2017). The leaders of the gamification each time assess its effectiveness, checking the level of students' knowledge before and after its completion. For this purpose, knowledge tests are used, which show that implementing the game increases the knowledge of students. Average scores are higher each time after the gamification cycle.

#### 4. DISCUSSION

From the perspective of the analysis of the literature on the subject and the experience of the authors of the study during the use of games in the didactic process, it is worth emphasizing that designing an engaging teaching and learning process are equally important aspects that should be taken into account. Based on the analysis of various games, it can be concluded that the attractiveness of the challenges and accompanying components plays a very important role, i.e., the method of developing didactic content and choosing the right medium. It is also necessary to take into account the design features of the challenges such as the level of difficulty and complexity associated with the implementation of the task and time consumption. Also, the scenario of the game, and subsequent challenges, should be adapted to the planned duration of classes, topics and didactic goals. It should contain a sequential network of tasks, in which dependencies between activities determine the order of their execution, engage to take on the next challenge through properly thought-out elements such as:

- division of content into smaller task packages, properly compiled in terms of the scope of knowledge provided and its implications, and thus easier to assimilate by the student, taking into account the time of his highest attention span,
- the use of various forms of transmission of didactic content in a cognitively attractive way,
- taking into account the student's preferences and interests e.g., through the possibility of individualizing the designed tasks, leaving a certain level of freedom of action in choosing the preferred methods of implementation,
- appropriately selected optional challenges, which should support the individual motivations of participants and thus stimulate them to deepen their knowledge.

Another element is the attractiveness of the learning process, which results in the involvement of the student in a way that includes support in new, difficult and ambiguous situations. At the same time, it should be cognitively attractive and engaging to take up and

continue the challenge, regardless of the emerging distractors. This is to introduce the student to a state defined by the concept of *flow*, which is something between satisfaction and euphoria, caused by total dedication to a specific activity. During this state, the participant experiences concentration on the task, active control accompanied by a combination of action and awareness, loss of self-awareness, and distortion of the experience of time. The implementation of the task becomes the only necessary justification for its continuation (Mihaly Csikszentmihalyi, 2008).

A very important element is communication, i.e., the way of establishing contact, receiving feedback or providing support by the lecturers, considered in the aspect of synchronicity and asynchronicity. The traditionally accepted form of asynchronous communication should be assessed as a potential inhibitor of engagement. Consideration should be given to introducing solutions using a synchronous form of communication, i.e., one that always provides appropriate feedback at the right time, giving a sense of its adequacy to the effort put in. In a similar aspect, the availability of further challenges for students should be assessed, which may affect the disruption of the *flow* state, a key element of the engagement-building process.

In the game design process, the interaction and communication between students should be properly thought out and designed, which further reinforces the feedback loop and thus maintains engagement at the appropriate level. To improve this process, it is recommended to shorten the waiting time for the opportunity to take on the next challenge and, if possible, automate this process. Bearing in mind the availability of various tools, it is worth taking into account the preparation of a course or its part on an LMS (Learning Management System) platform, e.g., Moodle and using, for example, quizzes as a form of assessing the acquired knowledge.

Based on the diverse experience of the authors of the study (also referring to the creation of various games), observations and case studies described in the literature, it can be concluded that gamification is a complex process and should not be limited only to superficial elements, such as the implementation of points, badges and scoretables. Based on data obtained during the evaluation of courses and many years of experience in game design of one of the co-authors of this study, the following factors building students' involvement in the learning process were identified:

- ludic experience – which is built by introducing such elements as, m.in. plot or balancing the degree of difficulty of the game,
- the possibility of satisfying socialization needs through various forms of cooperation and interaction in the group,
- cognitive competence of the process – through appropriately developed didactic materials that will be cognitively attractive and will respond to the needs related to assimilation, learning and searching for new knowledge,
- psychological aspects that keep the student in a state of flow, giving a sense of agency, as well as feedback and gratification, which directly affects the sense of effectiveness.

The above elements are used in the process of designing games to provide the recipient with specific emotions associated with a certain type of activity (Wesołowski, 2016). The potential of games can therefore be successfully used in the education process, supporting taking up the "challenge" by emphasizing the flow state, properly balancing the difficulty of the game concerning the student's skills and introducing such elements as choices, puzzles, missions, narrative development and interactivity. Games activate the

development and improvement of cognitive competencies, which include a wide range of skills, such as: cognitive flexibility, critical thinking, creativity and logical reasoning, as well as solving complex problems (Karwańska, 2022; Guo, Li, Guo, 2021).

The experience of game design practitioners allows us to formulate conclusions regarding the effective implementation of the gamification method in the teaching and learning process. Therefore, it is necessary to distinguish certain stages in the process of designing a gamified course, which leads from setting didactic goals and the corresponding scope of knowledge, through designing the game, to effectively integrating subsequent mechanisms of the game into the didactic process. The first related to the implementation of didactic goals relates to the scope of knowledge that the student should master with the format of its presentation. Didactic purposes should be accompanied by dedicated content (multimedia) or other supplementary materials. The result is a cohesive educational solution that tailors game complexity and challenges to a given context.

The next stage is to choose the form of the game and the right tools. Linking in-game activities to learning objectives and real-life situations is provided by a well-designed plot and narrative, context and events that enable you to understand the real implications, and practical relationships of knowledge with the context of its application. The key element is to achieve and maintain a state of *flow*, which should be supported by the selection of a systematized game design methodology. To gamify the course, one of the frameworks can be used, in particular: MDA (Hunicke, LeBlanc, Zubek, 2004), GSF Application Model (Klapztein, Cipolla, 2016), Octalysis (Yu-kai Chou 2015). One of the commonly used is the MDA (*Mechanics, Dynamics, Aesthetics*) framework, which distinguishes the following components: rules, system and play, and establishes their design counterparts i.e., mechanics, dynamics and aesthetics. Dynamics describes individual components at the level of processed content and the mechanisms behind it, dynamics describes the reaction of mechanics to the interaction of the participant during the game, and aesthetics describes the desired emotional reactions such as: following, challenging, fabricating, expressing, narrating, discovering, sensation and bonding, evoked in the player when interacting with the game system (Hunicke, LeBlanc, Zubek, 2004). The gamified course should be based on a gameplay loop, creating feedback loops between Goal – Challenge – Reward. At the same time, the goal should be formulated by the SMART principle, the challenge should be balanced and diverse, and the reward should give satisfaction exceeding the effort put in and be meaningful to the participant.

A well-designed game supports the learning process and in this sense is an effective method to support motivation, increasing the student's involvement in the learning process through persuasive, emotional and cognitive elements. When designing gamification, it is worth taking into account, among others, such elements as a gratification system, selection of appropriate forms of engagement including an engaging plot and an interestingly conducted narrative, building habits, varied challenges, embedding the game in an interesting universe, leaving space for freedom of action or self-expression by participants, inspiring to deepen knowledge in a given area and optional areas. Equally important are the elements that provide various types of aesthetic experiences.

## 5. CONCLUSIONS

Gamification has great potential, and the use of the game mechanism is very effective, especially with young people who are more willing to engage in tasks using game rules – it is an interesting, much more attractive form for them. Interest in gamification is growing,

which is undoubtedly influenced by the development of techniques and technology. Gamification and games are increasingly used at different levels of education.

Based on the analysis of the literature on the subject and based on the experience of people using games in the education process, it can be concluded that: they affect the level of involvement of participants (which was also confirmed by research by Thomas and Baral (Thomas, Baral, 2023); support the learning process; shape social interactions.

For centuries, the education system has been focused more on conveying ready-made messages than on shaping openness to change and innovation. Such a concept is useless in a changing and dynamic environment, in which adaptation and development consist not in the application of ready-made knowledge, but in solving constantly emerging new problems and anticipating problem situations (Sikorska-Wolak, 2010).

The article contains the most significant information on the importance of gamification in the education process. It was based on examples of gamification used in management (organization and management) courses and production management classes with students of the Rzeszow University of Technology. The main motives for their implementation were the desire to make classes more attractive, as well as to increase interest in the taught topic, and to arouse greater motivation and involvement of students in the tasks carried out. The analysis of the effects discussed in the development of gamification leads to the following conclusions:

- some of the tasks designed in the gamification were difficult, which resulted in less interest and involvement of Gamers,
- low-difficulty challenges and creativity involved most Gamers,
- challenges requiring the acquisition of new competencies (e.g., the use of IT tools or the creation of an original concept) involved a smaller number of Gamers than tasks based on the use of existing knowledge and skills (e.g. when working with text or preparing a presentation),
- significant differentiation in students' involvement was noticed due to the field of study and form of studies, as well as the exercise group,
- the degree of involvement in gamification translated into the final results of the gamers, i.e., the greater the involvement in the implementation of premium challenges, the greater the number of points earned,
- implementing the production management gamification contributed to better results obtained in the final tests,
- gamification makes you aware of the problems that may arise even with simple activities, but they teach you to be responsible for mistakes.

The implementation of the gamification programs discussed in the study in practice indicates the need to introduce some modifications that will certainly make them more attractive in the next cycle of classes. This includes, for example, the inclusion in the gratification system not only of rewards directly related to the activity but also a deferred "bonus" meaning additional pools of points e.g., for helping another student, which additionally stimulates interaction between participants and pro-social activities shaping transformative competencies. In addition to currency, it is also worth introducing other prizes, for example, unique digital artefacts, which are a reflection of the results achieved during the implementation of tasks (e.g., in the case of the discussed MANAGER BOB IN course, these could be varied house graphics, which are a representation of previously made decisions, as a consequence of commitment during the course – from a crumbling ruin in case of the weak grade, to an exclusive residence for the excellent grade). The diversity of



rewards, combined with various types of activities related to the didactic goals set, allows you to additionally shape skills such as: cooperation, creativity, teamwork, and entrepreneurship.

Each course should be accompanied by appropriate instructions, which before taking up the challenge explain the rules of the gamification to the student in the form of e.g., a presentation, a demonstration film or other interactive introduction, allowing them to learn the rules of the gamification. Learning the rules and mechanics of gamification requires extra effort from students, which can be felt as a burden. Therefore, the ideal solution, independent of having instructions in the form of a compendium, will be to weave it into the content of the course.

The gamification process is complemented by feedback, which fulfils important functions strengthening the learning process, such as assessing the progress related to mastering new knowledge, providing information about the success or, on the contrary, mistakes made along with their explanation. As part of the whole process, it introduces a coupling between effort and satisfaction, as well as the activation of knowledge and its supplementation. If feedback is given immediately after the end of the action, then it leads to the strongest link between the action and its effect. If there is a significant discrepancy between the action and the result, the player may not understand how his action affected the result obtained. At the same time, you should eliminate any unnecessary information that may distract your concentration. Feedback should be linked to the reward system. It is necessary to minimize those aspects of the game that affect the competition because, on the one hand, they can be a demotivational factor for some students, and on the other hand, they may not stimulate the development of cooperation skills. Each course should also be accompanied by dedicated evaluation tools, which allow for gradually improving the course in all its aspects.

Bearing in mind the preferred way of learning for digitally active young people, it is also worth emphasizing that every didactic process (not only the one using gamification) should absorb new technological solutions, which can be conventionally divided into two groups: supporting the teaching process and enriching the learning experience. The first one is aimed at engaging students in the didactic process, and their activation, such as gamification and accompanying solutions. The second one is to strengthen the motivation to learn also outside the time of classes. Technologies enriching the educational experience include those related to the immersive and interactive form of content presentation such as VR (*Virtual Reality*), AR (*Augmented Reality*), MR (*Mixed Reality*). The potential associated with the use of virtual worlds is based on an alternative format of perception and experience. In addition, the ability to enter the role of the hero (avatar), according to the scheme of J. Campbell's monomyth, allows you to go through a series of changes, finish the gamification with the identification of strengths and weaknesses and see the practical implications of knowledge in the real world. Augmented reality enriches the way of exploration by introducing elements of interactivity based on descriptive knowledge, visualization of application cases, and additional sensory stimuli. The current trend related to the use of digital learning environments, additionally supported by large language models (*Large Language Models* – LLM), should be emphasized. The basic functionality of the LLM, in the context of gamification of the course, can be used as a virtual assistant that provides the student with answers to questions in real-time, as well as helps in structuring knowledge or supports the teacher in preparing feedback for the student, after its prior verification.

The results of the analysis show that the use of active methods, including games and gamification, may bring benefits in learning management and production management subjects because they enable the use of tools consistent with real scenarios observed in companies. The results of the study encourage new research to further explore the use of gamification in education.

The examples in this study refer only to management courses, which may be a kind of limitation and the fact that, due to the small research sample, it is impossible to generalize conclusions. Despite the proven positive impact of gamification on teaching and learning, and on the attractiveness of classes, there are few studies in the literature on the effectiveness of the use of gamification in the teaching process and presenting students' expectations in this area. For this reason, there is a need for further qualitative research in this field using the experience of game designers.

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## THE ABUSE OF LAW CLAUSE WITH RESPECT TO VAT

This article presents a problem of the abuse of law clause with respect to VAT that gives rise to numerous disputes between tax authorities and taxpayers. It aims at comprehensively discussing this problem, in the context of the source literature as well as national and EU legislation and case law. The issue presented in this article is important for the operations of enterprises. A principal conclusion is that in each case, tax authorities and administrative courts must examine the transaction and all its aspects in their entirety in terms of their actual nature and objective. This boils down to investigating whether the only objective of a given transaction is to obtain an undue tax advantage, or whether such an advantage is merely gained by an entity “along the way”.

**Keywords:** VAT, abuse of law, administrative judicature, tax authorities, Court of Justice of the European Union.

### 1. INTRODUCTION

As mentioned above, the term “abuse of law” is a broad one and actions covered by this term also include VAT carousel fraud. However, it cannot be determined whether tax fraud constitutes an abuse of law (tax abuse) although, importantly, the abuse of law will not always take the form of a tax fraud or carousel fraud (Mudrecki, 2018).

It needs to be indicated that the abuse of law clause was introduced to the VAT Act, with effect from 15 July 2016, by way of an Act of 13 May 2016 amending the act – Tax Code and other acts (Ustawa..., 2016), through adding paragraphs 4 and 5 to Article 5 of the VAT Act (Ustawa..., 2004). In accordance with this regulation, the tax abuse includes such activities as: supply of goods against payment and provision of services on the national territory for consideration; export of goods; import of goods on the national territory; intra-Community purchase of goods against payment on the national territory; intra-Community supply of goods as part of transactions whose objective, despite having met formal conditions established in the provisions of the Act, was fundamentally to achieve tax advantages the granting of which would be contrary to the purpose served by

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the said regulation. In the event an abuse has been established, the activities performed only bring about such fiscal effects that would emerge in the case of recreating a situation that would take place in the absence of activities constituting the abuse of law. Therefore, the activities that account for the abuse of law are lawful, i.e. compliant with the law, only that they are performed for the purpose contrary to the objectives of the tax law.

What is more, it should be mentioned that these regulations were introduced parallel to the general clause on combatting tax evasion in the field of direct taxes, a clause that was included in the Tax Code Act (Gajewski, 2018).

We need to underline that a thorough analysis of problems related to the abuse of law pertaining to VAT requires a comprehensive view of the issue, i.e. not only from the angle of actions undertaken by payers of this tax and decisions of tax authorities, but also in terms of the stance of the doctrine and case-law of administrative courts and CJEU. Although one should agree with a proposition that “profitability of relations with clients is of key importance for conducting and continuing business activity” (Lew, 2016), the relationship between an entrepreneur and tax authorities is no less relevant. Beyond doubt, “every analysis of an actual status conducted in order to determine fiscal effects should also take account of examining the civil and legal effects of the activity put under scrutiny” (Każmierczyk, 2011). The main aim of the article was, therefore, to analyze the extent to which the standards shaping the issue of abuse of law in VAT are clear and understandable for entrepreneurs in terms of the correct fulfillment of tax obligations. When analyzing the issues covered by this article, the authors used the source analysis method, which made it possible to present the regulations shaping these issues in national and EU legislation. It was also necessary to use the dogmatic method, taking into account the views of the doctrine, the jurisprudence of administrative courts and interpretations issued by tax authorities.

## 2. THE ABUSE OF LAW CLAUSE IN THE SOURCE LITERATURE

The discussed issue has become a subject of numerous developments of the doctrine. J. Zubrzycki states (while analysing the decision in the “Halifax” case) that “if an abuse has been defined, then the transactions carried out should be redefined in a manner that allows recreating a situation which would take place if a transaction that constitutes an abuse had not been carried out”. At the same time, he claims that “the decision in the Halifax case is groundbreaking as CJEU for the first time explicitly applied the concept of the abuse of the subjective right in the field of VAT” (Zubrzycki, 2018).

It seems that B. Rogowska-Rajda and T. Tratkiewicz conducted a comprehensive analysis of the question of abuse of law in the context of VAT. They claim that the prohibition of practices that represent an abuse or an abuse of law has been applied by the Court of Justice from the 1970s in several areas and in a manner that has been untypical for these areas (Rogowska-Rajda, Tratkiewicz, 2018). However, the analysis of the Court of Justice’s case-law shows diverse approaches to the prohibition of abuse of law depending on a domain.

According to the authors, there is certainly a conflict between the principle of prohibition of abuse of law and the principle of legality and legal certainty. Based on the decisions of CJEU, they determine that “combatting fraud, tax evasion and potential abuses is on the one hand an objective that is recognised and supported by the Community law, but on the other hand, that law should be precise and its application should be predictable for business entities” (Rogowska-Rajda, Tratkiewicz, 2018). Furthermore, “if a taxpayer

has the right to choose between two transactions, the directive does not impose on them an obligation to choose a transaction that entails the payment of the highest VAT amount. Quite the contrary, the taxpayer has the right to choose a form of their activity that will limit their tax liability. However, the freedom of choice may not legalise solutions representing the abuse of law” (Rogowska-Rajda, Tratkiewicz, 2018). Further in their considerations, the authors argue that “in order to establish the existence of an abuse, a tax authority of a Member State is required to prove the occurrence of two conditions. First of all, certain transactions, despite having met formal requirements established by relevant provisions of the directive and national laws that transpose this directive, have triggered the effect of gaining a financial advantage the granting of which would be contrary to the purpose served by these regulations (an objective condition). Secondly, it should result from all objective factors that the only or principal objective of disputed transactions is to gain a tax advantage (a subjective condition)” (Zubrzycki, 2018).

When analysing the decisions of regional administrative courts from recent years, we need to note that they too make use of the stance derived from the source literature. A frequently quoted opinion of Dominik J. Gajewski, a judge of the Supreme Administrative Court, provides that “it shall not suffice to prove that a given transaction gives rise to a tax advantage or aims at gaining such an advantage, as such an assumption would prejudice the freedom of activity of an entrepreneur. It is therefore necessary to establish that such an advantage is contrary to the objective of Directive 2006/112/EC or the national implementing legislation. In other words, the fact that economic objectives other than gaining a tax advantage are completely a matter of chance is of no relevance to the transaction and fails to provide an appropriate justification. Thus, gaining a tax advantage should constitute an overarching objective of the activities, at the same time excluding or marginalising other economic objectives. A given activity cannot therefore be qualified as an abuse of law, if relevant justification of a given organisational and legal form of an activity or individual activities of an entrepreneur other than gaining a tax advantage is available. A different position would mean endowing tax authorities with excessive discretion as to which objective of a transaction should be determined as dominating and, at the same time, would yield a high level of uncertainty as to the possible selection of business activities made by an entrepreneur” (Gajewski, 2016).

Summing up, from the normative point of view, the principle of abuse of tax law is a situation in which a taxpayer undertakes actions aimed at shaping legal relations, while fundamentally remaining in concert with the literal wording of the VAT Act, in such a manner that enables them to gain beneficial tax effects that would however stand in contradiction with the economic, financial or social objectives resulting from the VAT Act (Drozdek, Machalica-Drozdek, 2018).

### **3. ABUSE OF LAW CLAUSE IN THE CASE-LAW OF ADMINISTRATIVE COURTS**

The principle of prohibition to deduct VAT due to the abuse of law clause in the case-law of administrative courts is based on Article 88(3a)(4)(c) of the VAT Act. However, in its decisions the Supreme Administrative Court additionally pleads that the prohibition on deduction results directly from Article 86(1) in situations where the only objective of a given economic transaction is to gain a tax advantage and where such an activity does not have any other economic justification. Provided, obviously, that such fact has been proven indisputably.

When considering the question of abuse of law in the light of Article 88(3a)(4)(c) of the VAT Act, it is necessary to address the issue that appears in nearly every related decision of the Supreme Administrative Court. Namely, in line with the established case-law of the Supreme Administrative Court, tax authorities cannot declare invalidity of a given legal act. However, they can decide that for the purpose of Article 88(3a)(4)(c) of the VAT Act, Article 58 and/or Article 83 of the Civil Code (Ustawa..., 1964), shall apply, which obviously is subject to the assessment of the administrative court. This is not contrary to the fact that the provisions on VAT essentially focus on the economic effects of legal acts and events and derive tax liability (or lack of such liability) from them, and they are largely autonomous from the civil law (Baçal, Dominik, Militz, Baçal, 2013).

A ruling that bound these two articles, thus challenging the right to deduct the tax charged, was a decision of the Supreme Administrative Court of 6 July 2011 (I FSK 950/10). In this decision the Court determined that “if it has been established based on objective circumstances that the challenged sale was carried out for a taxpayer who had known or should have known that by purchasing a product they participated in a transaction used to perpetrate fraud with respect to VAT, determination of the inability to exercise the right to deduct a tax results from Article 86(1) of the VAT Act, obviously if it has been indisputably established that the challenged transactions were not carried out as part of regular commercial transactions, but only for the purpose of misusing advantages resulting from that provision, i.e. gaining a financial advantage the granting of which would be contrary to the purpose served by this regulation. The provision of Article 86(1) of the VAT Act should in fact be interpreted as objecting to the taxpayer’s right to deduct VAT charged as part of an invoice, which on the one hand meets formal conditions established by the national legislation, but on the other hand documents a transaction constituting an abuse, i.e. if it has been indisputably demonstrated that gaining a tax advantage represents an principal objective of a given activity instead of if its economic legitimacy (profitability)” (Judgment of the Supreme Administrative..., 2011, I FSK 950/10).

The decision mentioned above is obviously one of the many that address the issue of abuse of law pertaining to VAT, with an ever-increasing case-law body that raises more and more questions included in this domain (The judgments of the Supreme Administrative Court: 2015, I FSK 2/15; 2017, I FSK 2254/15; 2017, I FSK 1669/15; 2019, I SA/Sz 792/18 and others).

As provided in the case-law of the administrative courts, the concept of abuse of law applies to situations where transactions carried out as part of concluded contracts were of a genuine nature, although the authority reconstructs the actual status that is alternative to the existing one and determines fiscal consequences in relation to it.

#### **4. ABUSE OF LAW WITH RESPECT TO VAT IN THE VIEW OF THE COURT OF JUSTICE OF THE EUROPEAN UNION**

It needs to be indicated here that the concept of “abuse of law” was elaborated (defined) in the case-law of the Court of Justice of the European Union (hereinafter CJEU) in the decision issued on 21 February 2006 on Halifax, C-255/02 CJEU.

In the discussed case, Halifax, being a banking enterprise, conducted business activity that was mostly exempt from VAT. The company concluded several agreements with its counterparties related to an investment providing for the construction of “call centres”. The counterparties were Halifax’s subsidiaries. The call centres were supposed to be created in several cities and the mechanism applied by Halifax was similar for all investments.



Halifax concluded contracts for developing a call centre with an independent developer and construction company, while its rights and obligations were assumed by a subsidiary through an annex. Mutual financial flows took place between the companies as well as new contracts were concluded between them. Those contracts were related to loans, assignments, lease, sublease or investment progress. In the opinion of a court submitting a question for a preliminary ruling to the CJEU, all these agreements were aimed at gaining tax advantages. Therefore, the court formulated questions to be decided upon by CJEU, one of which asked whether transactions carried out by each participant only to gain a tax advantage, in the absence of any independent economic objective, are eligible to VAT as supplies made by or for participants as part of their business activity. Moreover, the question was whether, in line with the abuse of law doctrine elaborated by CJEU, the requests made by applicants to recover the tax charged as a result of given transactions should be rejected. The position communicated by companies in question claimed that the transactions carried out were of a genuine nature. Not only the services provided by independent contractors, but also by entities participating in agreements, had served commercial purposes. Moreover, the companies raised an argument that within the Sixth Directive (Sixth Council Directive..., 1997) system, transactions carried out only for the purpose of gaining a tax advantage and having no other economic objective, account for supplies or services provided by or for participants as part of their business activity, within the meaning of the VAT concept. However, governments of countries interested in the decision argued on the contrary that the transactions which, first, were carried out by each participant only to gain a tax advantage and, second, did not have any other economic objective, did not account for supplies or services provided by participants as part of their business activity.

In examining the abovementioned issues, CJEU determined that the Sixth Directive on the harmonisation of the laws of the Member States relating to turnover taxes, replaced by Directive 2006/112/EC, should be interpreted as objecting to the right of a taxpayer to deduct VAT if transactions that the right derives from constitute an abuse. To be able to establish the existence of an abuse, it is required that given transactions, regardless of the fact that they meet formal conditions provided for in relevant provisions of the Sixth Directive and national legislation transposing that directive, resulted in gaining a tax advantage the granting of which would be contrary to the purpose served by these provisions. Secondly, it should also result from all objective circumstances that the overarching objective of these transactions is to gain a tax advantage.

Following the decision in the Halifax case, CJEU put taxpayer practices in terms of the abuse of law under scrutiny multiple times (CJEU judgment: 2016, C-223/03; 2014, C-589/12; 2014, C-337/13; 2017 C-251/15). However, CJEU had conducted such assessments even before the decision in the Halifax case. One of the decisions dealing with the abuse of law (prior to the Halifax case) was a ruling in the C-63/04 case. The opinion of the Advocate General in the discussed case is particularly interesting. A company constituted under private law erected a building for a university which later became a subject of numerous transactions between the university and other (either directly or indirectly) affiliated entities. The Advocate General determined that those transactions only aimed at deducting tax paid as part of conducting the investment by the university. It was related to the fact that the university essentially performs activities that are exempt from VAT. And, in the words of the Advocate General, although such transactions give an impression of being phony and aimed only at enabling the university to deduct VAT, the investment will nevertheless be covered by the obligation to adjust the deductions made

(for using it for purposes exempt from VAT). Taking that into account, the event of tax exemption that stands in contradiction to the objectives of the Sixth Directive and would have to be adjusted through invoking unwritten rules, such as the prohibition of abuse of law, is not present here. Therefore, it results from the Advocate General's interpretation that the prohibition of abuse of law applies only as a last resort, when the objective assumed by the directive cannot be fulfilled through a relevant interpretation of its provisions.

When analysing the abovementioned decisions of CJEU, we need to remember that Member States, in accordance with the principle of proportionality, must apply measures that enable them to efficiently fulfil an objective consisting in protecting their financial interests, but at the same time these measures must represent the smallest possible threat to the objectives and principles resulting from relevant Community regulations (Mudrecki, 2018).

## 5. CONCLUSIONS

Conclusions that we can draw from this article can be analysed in two ways. Beyond doubt, competences of tax authorities with respect to determining actual substance and significance of transactions carried out by a taxpayer, in particular to determining whether it can be inferred from objective circumstances that the overarching objective of the undertaken actions was to gain tax advantages, derive from the case-law of both national administrative courts and CJEU. To this end, tax authorities may take account of both the nature of such transactions and legal, economic and personal links between entities entering into transactions. If, as a result of the analysis, a conclusion is made that the transactions entered into are phony and aim only (or mostly) to gain a tax advantage, then such legal acts may be deemed an abuse of law. However, as indicated above, a given act cannot be qualified as abuse of law if a different material justification of a given activity or individual activities of an entrepreneur is possible.

The content of this publication is only the private opinion of the Authors.

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## POLISH WOMEN ON THE BANKING SERVICES MARKET: AN EMPIRICAL ANALYSIS OF POLISH WOMEN'S ATTITUDES TOWARDS BANKING FOR WOMEN

This article presents an analysis of the behavior of Polish women in the banking services market. The empirical material is the results of surveys conducted among 1217 randomly selected Polish women. Using the collected and organized empirical material, developed in a descriptive, tabular, and graphical form, through the method of comparative analysis, the article estimates Polish women's level of interest in basic banking products, and their preferred forms of payment. It determines the level of customer satisfaction with the current banking service (the product portfolio offered, service quality, and bank employees' approaches to serving women). In addition, it examines the attitudes of Polish women to the need to create an offer dedicated to women and a bank that would serve only women. This confirms the research hypothesis that Polish women do not see the need to create a special bank for women, but they expect more interest from banks in providing them with an offer specially dedicated to women. The results presented in the article expand the state of knowledge about the behavior of Polish women in the banking services market.

**Keywords:** banking services, banking, women.

### 1. INTRODUCTION

Banks are one of the basic pillars of the functioning of every state. Both individual and institutional clients use their services on a large scale. The bank's success is measured primarily by the size of its annual profit. However, the basis of this success is his relationships with clients. Therefore, banks must pay special attention to dynamically changing customer expectations. On the one hand, that each product offered and the method of service provision must be accepted by potential customers. On the other hand, the fact that their potential customers are not a homogeneous group that has the same expectations as to the scope and manner of banking services. Therefore, banks carry out activities aimed at segmenting customers into smaller homogeneous groups whose members have similar characteristics and needs. This allows banks to develop personalised offers for individual customer groups.

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For hundreds of years, the activities of banks focused on meeting the needs of customers who were men. The offer of banks was developed to meet their needs, they were served by exclusively male staff, and even the decor of the banking units was adapted to their taste. This was due to the applicable legal regulations, which did not allow women to independently decide about their finances, including using the services of banks.

Such discrimination occurred not only in less developed countries or countries where the dominant religion put women on the margins of economic life, but also in countries considered highly developed, whose socio-legal systems were a role model for other countries. For example, in Germany, until 1962, a married woman could not open her own bank account (*Die erste Frau...*) without her husband's consent. In the United States, the right to have a bank account (without the consent of the husband) was granted to married women in the 1960s, in Canada in 1964, and in Great Britain in 1975 (*Women's...*, 2014; *Canadian...*). Also in 1975, Spanish married women obtained the right to own property (*BBVA: a history of banking...*). The French obtained the right to open bank accounts in 1965. From 1881, they were allowed to open savings accounts, and from 1895 to make deposits and withdrawals (*Histoire...*, 2013; *L'émancipation...*). At this point, it should be noted that in Poland already in 1921, the March Constitution rejected the possibility of discrimination on grounds of sex. In addition, it repealed the possibility of restricting the exercise of legal acts by married women.

Women were also discriminated against in their employment in banks. Practically until the 1920s, women in banks were very rarely employed (usually as typists or telephone operators, not customer service employees). During this period, absurd reasons were given as reasons for not employing women in banks: „the office air was harmful to women's health, they were not efficient and intelligent enough, they had no ambition” and the „terrible smell of violets” in offices disturbed men's work (*Frauen...*, 2004). As late as 1915, the Association of Banking Officers in Germany expressed the position that the employment of female bankers should always be combated. For example, in German banks in 1878, only four apprentices were employed. In 1912, the number of women employed in these banks was 2,408. However, it should be noted that most women performed auxiliary work (*Frauen...*, 2004).

The situation was no better in other countries. In 1894, the first women were employed at the Bank of England. Twenty years later, this bank had only 64 women out of 1,004 employees (*Women in the Bank*). However, the only exception in English banking should be pointed out, when in the second half of the 19th century a woman held a managerial position in a bank – it was Fanny Hopkins, who headed the Hawkhurst agency in London & County Bank from 1859 to 1905 ([www.natwestgroup.com](http://www.natwestgroup.com)).

In turn, in Royal Bank Canada, the first woman was employed in 1902, she became a branch manager only in 1968, and a member of the Board of Directors in 1976. It should be noted that since 1947 women accounted for over 50% of employees of this bank (*Women at Royal Bank*).

The situation was even worse in Spain, until 1969 women were practically not employed in banks (*BBVA: a history of banking...*).

In turn, the Ottoman Bank operating in the Ottoman Empire/Turkey in the years 1910–1930 employed 226 women out of 6,000 employees. It is interesting that Catholic women dominated among them (33%). They were followed by Muslim (24%), Jewish (17%), and Orthodox (16%) women. 76% of the Ottoman Bank were virgins (*Baruh*, 2016). This bank allowed the employment of married women, which was prohibited in the case of banks in most European countries. Employees should quit their jobs after getting married. For

example, it was only in 1950 that the National Provincial Bank was the first British bank to remove the ban on marriage, which in practice meant that women employed in it could continue to work in the bank after marriage ([www.natwestgroup.com](http://www.natwestgroup.com)).

In the twentieth century, there were initiatives that were supposed to lead to changes in the banking services market. On the one hand, to provide women with free access to these services, on the other hand, to enable them to take up work in institutions of the financial sector.

The first bank established to serve women inclusively was Die Genossenschaftsbank selbständiger Frauen (also called Frauenbank), founded in 1910 in Berlin. The Management Board and its Supervisory Board consisted exclusively of women. In addition to standard banking activities, the bank also carried out activities aimed at women's financial education. The bank ceased operations in 1916. Its failure was due, among others, to legal conditions that limited women's ability to use the services of banks (Henninger [ed.], 1999).

In 1919, First Woman's Bank of Tennessee was founded in Clarksville, Tennessee. The founder of this bank was Brenda Vineyard Runyon. The bank had all female staff and management. In 1926, it was acquired by The First Trust and Savings Bank of Clarksville. (Women's..., 2014).

In 1921, Bank of America in San Francisco opened a Women's Banking Department. The bank only employed women. Provided women with access to their own accounts, with the ability to manage their finances without involving their spouses. In addition, it offered counseling services and financial education to help women make the best decisions about their finances. Another branch was opened in 1923 in Los Angeles. In 1927, both branches operated over 20,000 customer accounts (Every woman's bank).

In 1964, the National Commercial Bank of Scotland experimented with serving female customers and opened the UK's first 'women's branch' in Edinburgh. This branch employed and served only women. This branch provided women with the opportunity to use banking services through other women ([www.natwestgroup.com](http://www.natwestgroup.com)). The idea of operating such a branch could have been related to women's complaints about the quality of their service by men - treating them as customers of the „inferior kind”.

In 1973, the Spanish bank Banco de Bilbao created a special service, The Woman's Bank, which provided women with banking advice and assistance in setting up bank accounts and developing credit applications ([www.bbva.com](http://www.bbva.com)).

In 1975, First Women's Bank was established in New York. The purpose of establishing this bank was less feminist than business. The founders of the bank noticed the potential in the segment of high-income American women. The launch of this bank became an impulse to establish similar institutions in other states. For example, a year later, a group of businesswomen founded First Women's Bank of California in Los Angeles. The purpose of the bank was to help women save money and take loans. This bank focused on helping women manage their money, especially after divorce. The bank's clients included then-screen stars Jane Fonda, Loretta Swit, Phyllis Diller, Farrah Fawcett, and Anne Bancroft.

It should be noted that although in the 20th century the situation of women has changed, they have won a number of rights, including „equality” in the banking services market, one can still notice the worse situation of women in this market, especially in countries where culture and religion place them in the background of social life (Sołtysiak, Suraj, 2017). To counteract this, mainly in Islamic countries, banks aimed exclusively at women have been launched. Examples of such banks are Pratibha Women Cooperative Bank from India,

Grammen Bank from Bangladesh, First Women Bank from Pakistan, Tanzania Women's Bank sp. z o.o. from Tanzania, Women Microfinance Bank from Kenya and Enat Bank from Ethiopia.

The need to launch such institutions, not for religious reasons, but for the desire to meet the needs and expectations of women, was also noticed on the American continent, where Citigroup's Women & Co. was established in the United States, Women Entrepreneurs in The Royal Bank of Canada, in Canada and the Venezuelan National Bank for Development in Venezuela. Women (Spanish: Banco Nacional de la Mujer or Banmujer). In 2020, conditional approval from Federal Deposit Insurance Corp. First Women's Bank, which is set to become Chicago's first banking start-up, was given a start-up. The bank will focus its activities on granting loans to women-owned enterprises.

European banks also pointed out differences in the approach to finance and in the way representatives of different genders use banking services. An example of this is the bank launched for women in the Austrian resort of Gastein by Raiffeisen Bank. In turn, Bulgarian banks have created programs dedicated to women – Fibank the Smart Lady program and UniCredit Bulbank the Donna programme. The idea behind these programs was to „meet the needs of the modern woman”.

On the other hand, there are currently no products dedicated exclusively to women on the Polish market of banking services. Banks believe that banking products do not have a „gender”, so there is no need to create a separate offer for men and women. This is not a fully correct statement, especially considering the fact that in Poland the number of women using banking services is systematically increasing year by year. As a result, the predominance of men among bank customers has been obliterated. This is confirmed by the fact that the percentage of women with a bank account is higher than the level of banking among men. It should also be noted that women have been the majority in the adult population of Poles for decades. Currently, the number of women living in Poland is higher by 1,244.9 thousand. from the number of men (Rocznik Demograficzny, 2018). As a result, banks should approach servicing this customer segment with greater care. The more so that the conducted surveys showed that 46.27% of representatives of the young generation of Polish women report the need to create such an offer dedicated to them, and as many as 55.81% expressed their willingness to use the services of a bank for women. It should be emphasised that it is important for women that the bank, as part of a service dedicated to them, assigns them a personal advisor (46.06%) who will provide financial information (31.74%) and will have an individual approach to the client (21.58%). They also believe that such an offer should be accompanied by additional benefits, such as: programs with retail chains (40.04%) and cosmetics companies (32.78%), insurance (26.97%) and helpful packages: home (21.16%), car (20.33%), health (16.6%) (Sołtysiak, Suraj, 2019).

Despite the fact that, although banks recognise the differences between the needs of women and men in the field of banking services, they do not take actions aimed at personalising the offer for particular genders. Bank managers are of the opinion that there is no such need in Poland. And the offer for women should primarily be created in countries where women are discriminated against in access to banking services. It should be emphasised that not only bankers think so, a similar opinion is expressed by the majority of society. This is probably related to the fact that the majority of Polish society believes that Poland has a relatively low level of financial exclusion (Sołtysiak, 2019; Sołtysiak, 2020a). On the other hand, analyses of research reports on customer behaviour in various segments of the Polish financial market indicate that it is usually not analysed due to the



gender of the respondents, but primarily their age, income, education, or place of residence (Maison, 2017; Zasobność..., 2017; Morawski, Wieczorek, 2018). That is why there is a lack of studies that could be used to compare with the results of the conducted research presented in the next part of the article.

## **2. PURPOSE, EMPIRICAL MATERIAL AND RESEARCH METHODS**

Empirical research on the behaviour of Polish women on the market for banking services was of the nature of primary research. They were conducted in the form of a direct survey. The non-random sampling method was used to select the research group. The analysed research group included 1217 respondents living in South-East Poland. The study participants were divided into six age segments (18–25 years old – 20.46%, 26–35 years old – 19.15%, 36–45 years old – 16.19%, 46–55 years old – 15.12% %, 56–65 years old – 15.04%, over 65 years old – 14.05%), into five groups by place of residence (rural area – 16.43%, city with up to 25,000 inhabitants – 22.51%, city of 25–50 thousand inhabitants – 18.32%, city of 50–100 thousand inhabitants – 17.17%, city of over 100 thousand inhabitants – 25.55%), and into three groups according to education (primary/middle school – 10.6%, secondary – 56.37%, higher – 33.03%).

The main objective of the conducted research was an attempt to determine the preferences of Polish women representatives in the use of banking products and forms of payment. Determining the level of satisfaction with the product portfolio offered, the quality of service, and the approach of the bank's employees to serving women. In addition, examining the level of interest in the introduction of an offer dedicated exclusively to women by banks and the establishment of banks for women.

## **3. WOMEN'S BANKING PRODUCT PORTFOLIO**

Contemporary Polish women are aware of how important it is for the quality of everyday life to be able to provide banking services and to have a bank account. In the analysed group, over 98% of the respondents declared that they use banking services and almost 90% of the respondents said that they had a bank account. The level of banking among the study participants was higher by 2 pp from the average level of banking among women in Poland (The Little, 2018). The highest level of banking use (Figure 1) was found among female respondents aged 26–35 (95.71%), and the lowest among those aged over 65 (81.29%). It should be emphasised that among senior women, a very high level of banking coverage was recorded, higher by 24 pp from the average level of banking coverage of Polish women in this age group (Raport InfoSenior, 2018). The largest percentage of respondents with a bank account were residents of cities of 50–100 thousand (94.26%) and the lowest percentage of rural residents (84%). It should also be noted that the level of banking use of the study participants increased with the increase in their level of education; among respondents with primary/middle school it was 78.29%, with secondary education – 87.32% and with higher education – 98.26%.

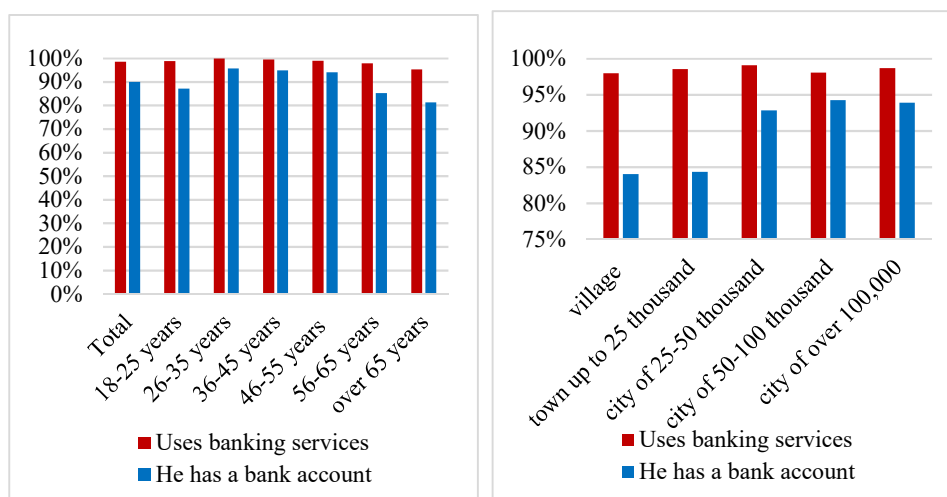


Figure 1. The level of banking by female respondents

Source: Study based on own research.

The study participants willingly use the bank cards attached to the current account (Figure 2). More than 86% of the respondents declared having debit cards. It should be emphasised that almost 93% of the respondents aged 26 to 55 years were of this kind. The results obtained were similar to the results obtained in the study „Poles' attitudes towards non-cash transactions” (Maison, 2017).

The percentage of respondents with debit cards increased in direct proportion to the size of the town they live in and the level of education. Among the inhabitants of rural areas, 82.48% of the respondents declared having a debit card, and among the inhabitants of cities of over 100,000 as many as 91.96% of the respondents.

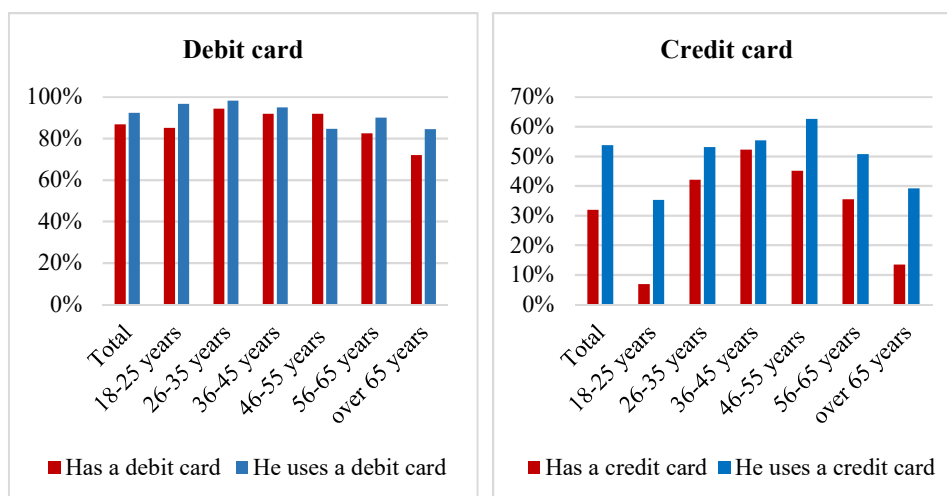


Figure 2. Percentage of female respondents who have and use bank cards

Source: Study based on own research.

It should be noted that the Polish women participating in the research were not only passive holders of bank cards. More than 92% of respondents who have a debit card declared that they make payments using it. As the main reasons for using this financial instrument, they indicated convenience, time savings, a greater sense of security associated with having a card than cash, the ability to pay for electronic services, and shopping on the Internet. Most often, debit card operations were performed by female respondents aged 26–35 years (98.18%), respondents living in cities with more than 100,000 inhabitants (95.10%) and respondents with higher education (96.44%). This is due to the fact that young women willingly use modern technologies and believe that the use of these technologies is safe. Respondents in the oldest age group over 65 years of age carried out the least frequent debit card operations. It should be emphasised that in this segment only 71.93% of respondents had a debit card and 84.55% of their holders declared that they used it. This is mainly due to the fact that this age group is dominated by the „cult of cash” and the fear of using modern payment instruments. However, in the analysed group, the percentage of users using debit cards was 9 pp higher than the value obtained in the study conducted in December 2018, commissioned by the Polish Bank Association, on the socioeconomic situation of the elderly in Poland. (Raport InfoSenior, 2019).

Every third research participant had a credit card in addition to a debit card. Most often it was declared by respondents from the age group of 36–45 (52.28%), inhabitants of cities with more than 100,000 inhabitants (38.91%), and respondents with higher education (34.33%). However, it should be noted that the level of education of the respondents had little impact on having a credit card. It was possessed by 31.01% of the respondents with primary/ middle school, 30.76% with secondary education and 34.33% with higher education.

In contrast to debit cards, which were used by the vast majority of their holders, only every second holder of credit cards used them. This may be due to the fact that in Polish society, there is a belief that using a loan to finance everyday payments should be a last resort. Therefore, respondents willingly use debit cards, which at the right time may signal a lack of funds in the account, rather than credit cards under which the granted limit can be used, which must be repaid from future proceeds.

Most often, women aged 46–55 (62.65%), residents of cities with up to 25,000 inhabitants (58.33%), respondents with primary/lower secondary education (57.5%) declared payments using credit cards. It is interesting that the percentage of those using credit cards decreased with the increase in the level of education of the respondents and amounted to 57.5% for respondents with primary/ middle school, 56.4% with secondary education and 48.55% with higher education, respectively.

Analysing the level of interest in using the two basic types of banking products, deposits and loans (Figure 3), we find that among Polish women there is definitely more interest in using savings products than loans. Almost 60% of the respondents declare that they use savings products, while only 26.38% of the respondents stated that they took loans. This may indirectly result in less interest in making payments with credit cards, the very name of which is associated with taking out a loan.

It should be noted that the greatest interest in using both savings and credit products was among the respondents from the 46–55 age group and the lowest from the 18–25 age group. This may be due to the fact that respondents from the 46–55 age group have a stable professional position, and their income allows them to use savings products. In turn, the use of credit products may involve the need to repay long-term loans taken out years ago to finance expenses related to creating appropriate living conditions for their families (e.g.

mortgage loans). In the case of the youngest age group, less interest in saving may result from the lack of funds that could be allocated for this purpose and the low interest in credit products due to the lack of creditworthiness.

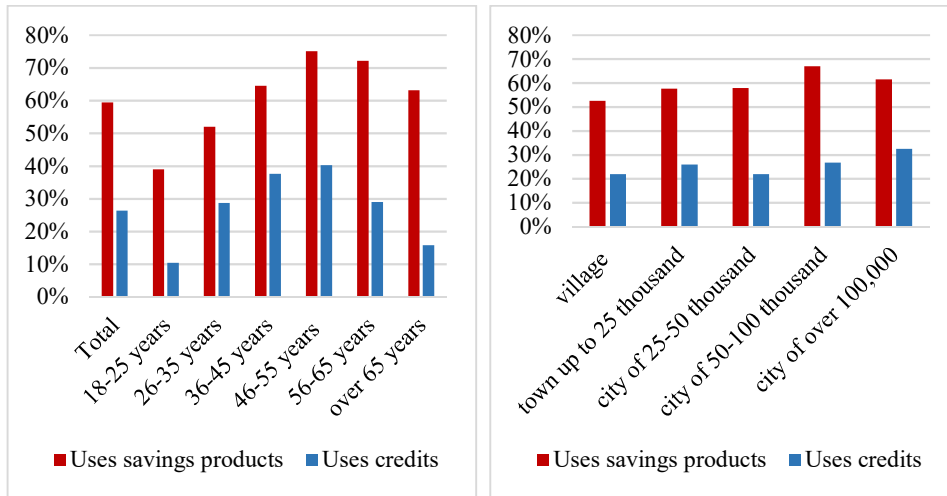


Figure 3. Percentage of female respondents using savings and credit products

Source: Study based on own research.

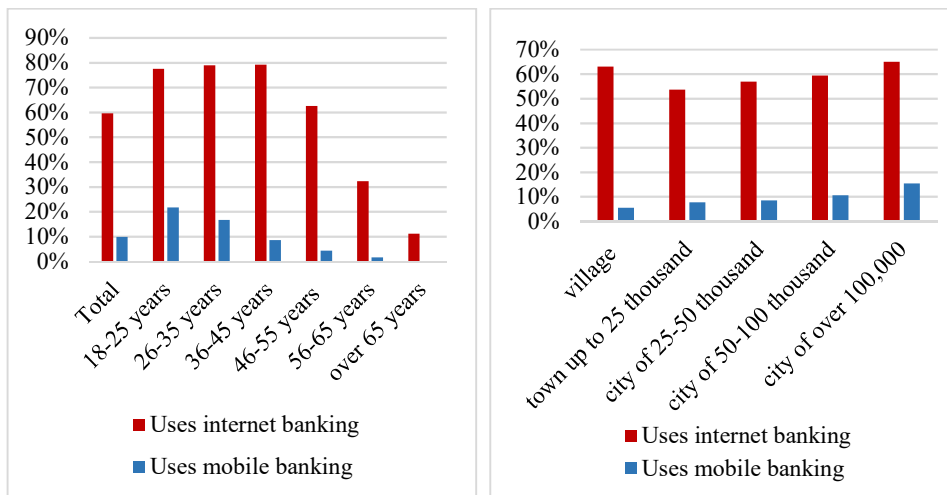


Figure 4. Percentage of female respondents using online and mobile banking

Source: Study based on own research.

Representatives of Polish women participating in the research indicated that they are also familiar with the use of modern banking products and their distribution channels. Almost 60% of the respondents declared that they use online banking. The increased

interest in this form of banking services is undoubtedly related to the changes that have taken place in both the private and professional lives of Polish women. Nowadays, it is practically impossible to be active on the labour market without using information technology on a daily basis. The same is true in private life. Polish women are very eager to buy goods online, use various types of information services or contact their relatives (this form of contact has become extremely valuable during the COVID-19 pandemic). One can be tempted to say that research conducted after the COVID-19 pandemic will show a significant increase in the percentage of Polish women using online banking.

In the study conducted, respondents from the 36–45 age group (79.19%), women living in rural areas (63%) and cities with more than 100,000 inhabitants (64.95%), respondents with higher education (68.16%) most often declared the use of online banking services (Figure 4).

On the other hand, every tenth participant in the study used mobile banking services. This form of banking services was most preferred by women respondents belonging to the youngest age groups: 18–25 years of age (21.69%) and 26–35 years of age (16.74%), respondents living in large cities: 50–100 thousand inhabitants (10.53%) and more than 100,000 inhabitants (15.43%), respondents with higher education (12.69%). The fact that mainly representatives of the youngest age groups use mobile banking to provide banking services is due to the fact that they use modern devices on a daily basis with which it is possible to provide these services. However, respondents from older age groups usually indicate difficulties related to the use of these types of devices and fear of the possibility of fraud.

#### 4. PREFERRED FORM OF PAYMENT

Respondents participating in the research, declaring the preferred form of payment (Figure 5), divided into two groups of similar size (51.43% were in favour of cash payments and 48.57% were in favour of non-cash payments). The analysis based on the age criterion allowed indicating a clear division of the research group between the generation of the cashless era and the generation of the cash era. Among the respondents, the division line was in the age group of 46–55 years. In this group, 52.18% of the respondents declared card payment as their preferred form, and 47.83% of the respondents declared cash payment. Younger respondents mostly declared that they more often make non-cash payments (63.92% of respondents aged 18–45 preferred card payments) and older respondents in cash (82.77% of respondents aged over 55 preferred cash payments). Such a division may result from the fact that the young generation prefers to make payments using tablets, smartphones, watches, etc. Devices and does not use cash, for which they would have to go to a bank or ATM. In turn, the older generation is more attached to cash, lacks skills in implementing modern forms of non-cash payments and lacks confidence in most of these forms of payment.

However, using the criterion of place of residence for the analysis, it was found that a higher percentage of respondents who preferred cash payments lived in rural areas (68%) and cities with 25–50 thousand inhabitants (54.7%) and a higher percentage of respondents preferring card payments in cities up to 25 thousand inhabitants (52.19%) and in cities with more than 100,000 inhabitants (52.09%). In turn, using the criterion of education, it was determined that cash payments were used most often by female respondents with primary/middle school (68.99%) and bank card payments by respondents with higher education (67.91%).

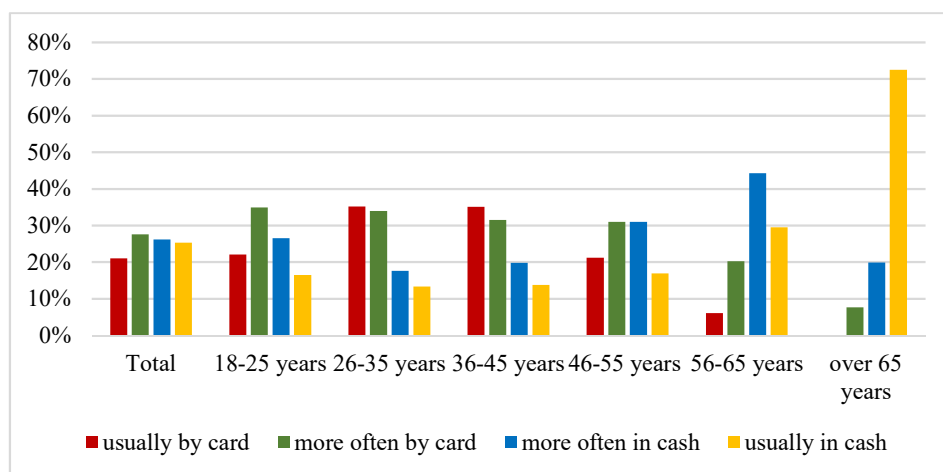


Figure 5. Preferred form of payment by the respondents

Source: Study based on own research.

## 5. THE LEVEL OF SATISFACTION WITH THE PORTFOLIO OF BANKING SERVICES AND SERVICE QUALITY

Based on the conducted research, the level of satisfaction with the product portfolio offered by banks, the quality of service and the approach of the bank's employees to serving women was estimated.

When analysing the level of satisfaction of the respondents with the product portfolio offered by the banks, it was found (Figure 6) that it was rated the highest by female respondents of the age group over 65 (34.5%) and the age group 18–25 (28.52%). It should also be noted that in the 18–25 age group there was the smallest number of female respondents who assessed it as low or very low (10.44%). On the other hand, the highest number of survey participants unhappy with the product portfolio offered by banks, who evaluated their level of satisfaction as low or very low, were in the 46–55 age group (33.7%).

This may be due to the fact that representatives of the oldest age group have very low expectations as to the offer of banking products – most of them use the services of only one bank not more than once a month, only every third of them use deposit products and every from credit products (Sołtysiak, 2020b). In addition, they prefer the traditional form of banking service and do not expect banks to introduce any innovations they do not trust. On the other hand, representatives of the younger generation use mainly the services of banks that offer the most modern forms of banking services on the market. However, they do not pay much attention to the deposit and credit products offered by these banks, which in turn are very important for clients belonging to the 46–55 age group.



Figure 6. The level of female respondents' satisfaction with the product portfolio offered by the banks

Source: Study based on own research.

However, when analyzing the level of satisfaction with the offered product portfolio with respect to the criterion of the place of residence of the respondents, it was found that it was at a similar level among residents of rural areas and cities, the number of inhabitants of which does not exceed 100,000. It was city highest among the inhabitants up to 25,000 (31.75%) and the lowest among the inhabitants of cities over 100,000 (22.83%).

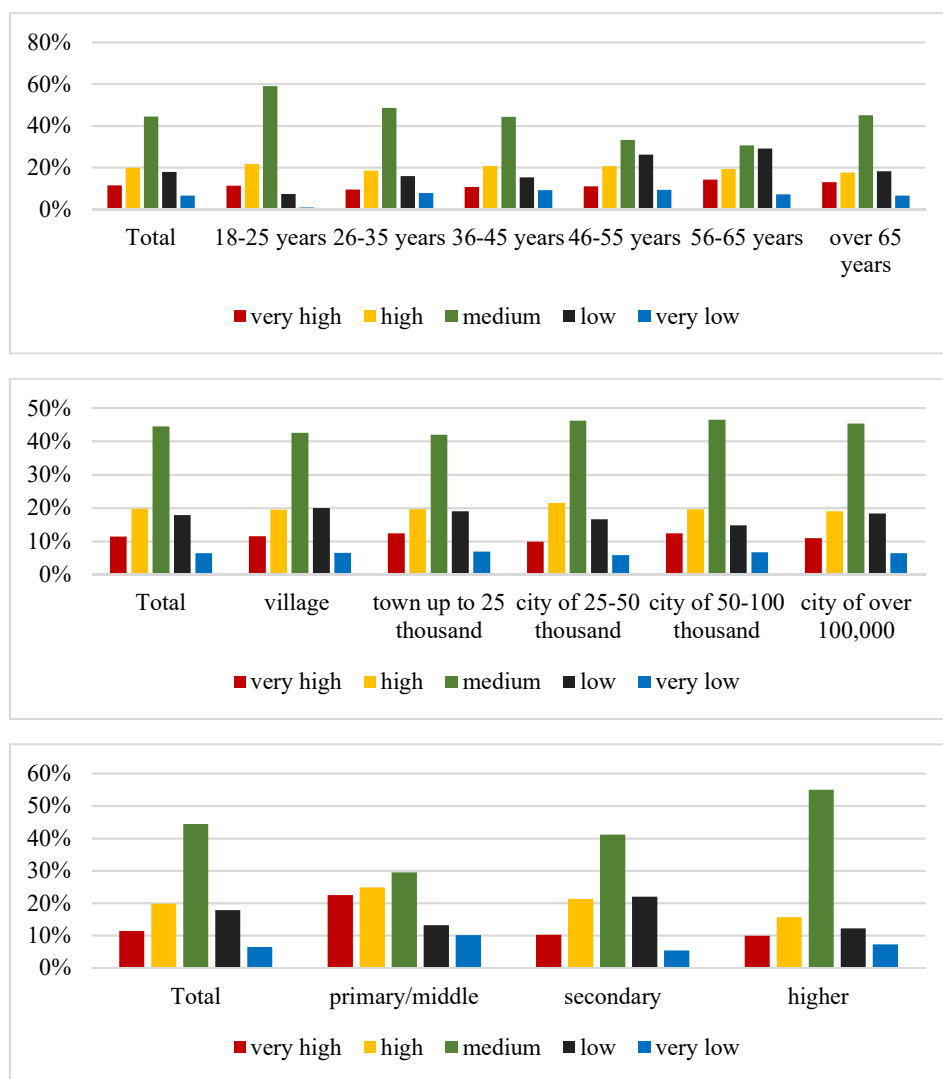


Figure 7. The level of female respondents' satisfaction with the quality of service

Source: Study based on own research

However, the analysis based on the criterion of education of the respondents indicated that the level of satisfaction with the product portfolio offered by the banks decreased with increasing level of education of the respondents. It was, respectively, 37.21% among the respondents with primary/middle school, 30.76% among the respondents with secondary education and only 19.65% among the respondents with higher education. This is due to the fact that educated Polish women with higher incomes are not satisfied with an „offer for everyone”, but expect banks to create offers dedicated to them, „tailor-made”, i.e. fully satisfying the needs of a modern woman in this respect.



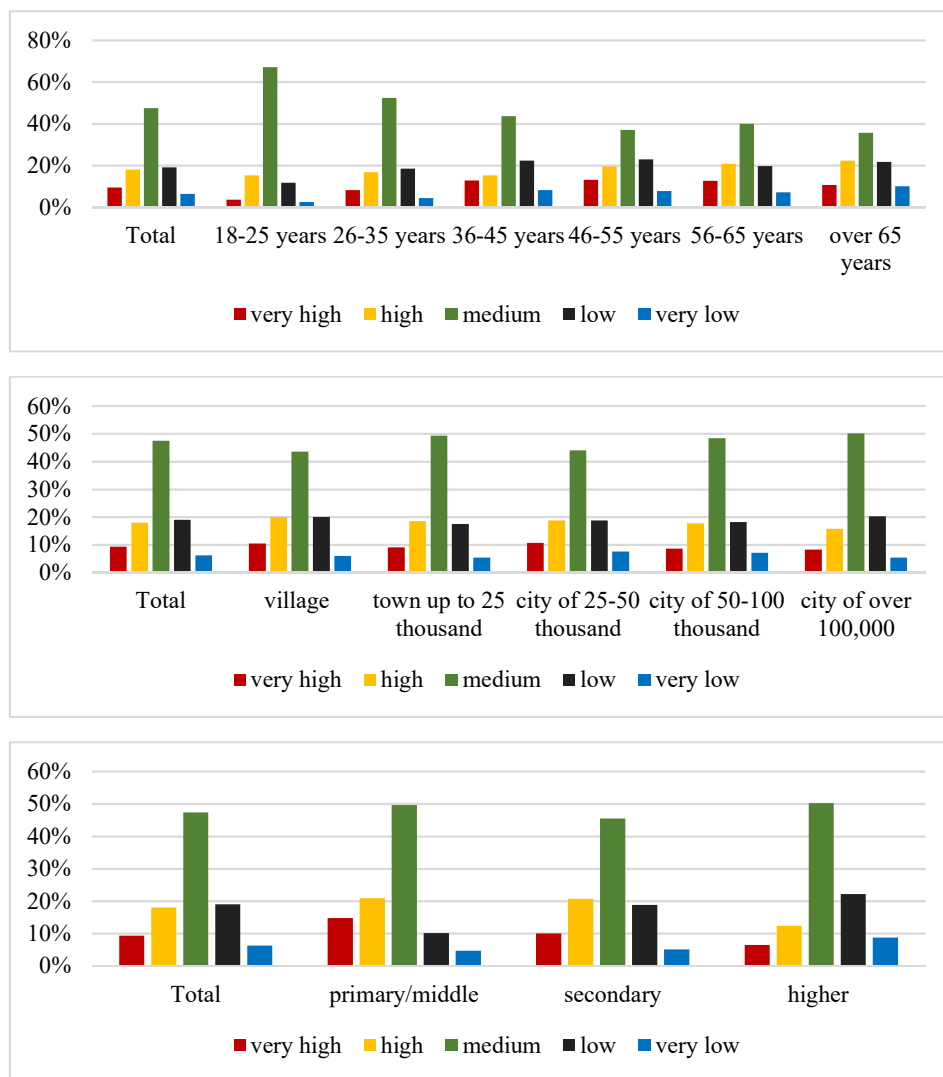


Figure 8. The level of satisfaction with the approach of the bank's employees to serving women

Source: Study based on own research.

The analysis of the assessment of the level of customer service quality (Figure 7) showed that every third participant in the study was satisfied with the level of this service, indicating a high (19.8%) or very high (11.42%) answer. On the other hand, every fourth respondent believed that the level of this service is low (17.83%) or very low (6.49%). It should be noted that this level was rated the highest by respondents belonging to the age group 56–65 (33.34%), women living in cities with up to 25,000 inhabitants (32.12%) and respondents with primary education (47.29%). On the other hand, the lowest percentage was recorded by female participants aged 26–35 (27.89%), respondents living in cities with

more than 100,000 inhabitants (29.9%) and female respondents with higher education (25.62%).

However, when analyzing the level of satisfaction of female respondents with the approach of bank employees to serving women (Figure 8), it was found that the percentage of respondents satisfied with this service (27.37%) was similar to the percentage of respondents who assessed the quality of this service negatively (25.22%). This level was rated the highest by respondents from the age group (33.34%), respondents living in rural areas (30.5%), and respondents with primary/ middle school (35.66%). On the other hand, the least satisfied with the attitude of bank employees toward their service were women respondents belonging to the age group over 65 years (31.58%), residents of cities with 25–50 thousand inhabitants (26.46%), respondents with higher education (30.85%).

## 6. BANKING FOR WOMEN

When segmenting customers, banks attach more importance to creating an offer for customers due to their income (most banks offer accounts for mass customers and VIP customers) or their stage of life (e.g., accounts dedicated to teenagers aged 13 to 18 years of age, young people aged 18–26 (30 years old) or seniors) than by the gender of the potential customer. Only a few banks made unsuccessful attempts to introduce to their portfolio products that would be intended only for representatives of one sex, e.g., women (Konto na Obcasach offered by BZ WBK or credit cards: Impresja offered by Bank Millennium and Citibank-Elle offered by Citi Handlowy Bank or MasterCard „Mała Czarna” debit card offered by Alior Bank). mBank even conducted an advertising campaign under the name „mBank is a woman”. However, it did not become the basis for creating a separate bank or an offer dedicated to women.

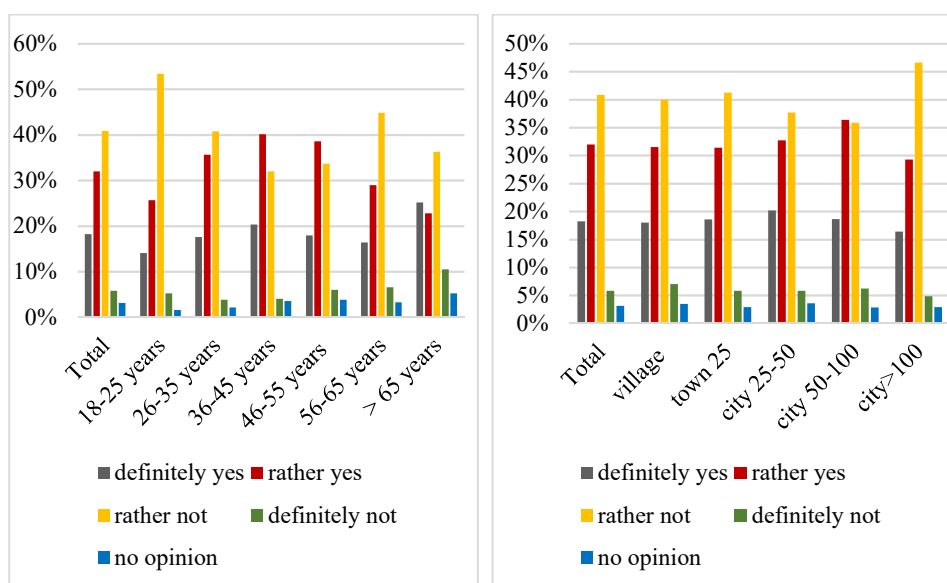


Figure 9. Opinion of female respondents on the introduction of an offer dedicated only to women

Source: Study based on own research.

This is probably why only 2.22% of the respondents declared that they had already had the opportunity to use the offer dedicated exclusively to women. And 4.27% of the respondents stated that they had heard of the existence of such an offer. The knowledge of the offer exclusively for women was most often declared by respondents in the age group of 46–55 (5.98%), respondents living in cities with 50–100 thousand inhabitants (7.66%), respondents with higher education (6.97%). However, this offer was most often used by female respondents of the age groups 36–45 (3.55%) and 46–55 (3.8%). Respondents living in cities with 50–100,000 inhabitants (3.35%) and cities with over 100,000 inhabitants (3.22%). Respondents with higher education (4.73%). It should also be noted that in the analysed research group, none of the respondents with primary education and 18–25 years used the offer for women.

Half of the women who participated in the survey (50.2%) expressed the opinion that Polish banks should introduce an offer dedicated exclusively to women (Figure 9). This opinion was most often expressed by female respondents from the age groups 36–45 (60.4%) and 46–55 (56.52%), respondents living in cities with 50–100,000 inhabitants (55.02%), and respondents with higher (60.7%). On the other hand, the lack of such a need was most often indicated by respondents from the youngest age group of 18–25 years (58.63%), women living in cities with more than 100,000 inhabitants (51.44%) and respondents with primary education (60.47%).

A different attitude is presented by the participants of the study in relation to the proposal to establish a bank for women in Poland (Figure 10). This action is supported by only 27.28% of the respondents. On the other hand, up to 64.83% of the respondents are of the opposite opinion. The highest percentage for enthusiasts of the establishment of such an institution in Poland was among respondents in the age groups 36–45 (30.45%) and 46–55 (30.44%), respondents living in cities with 50–100 thousand inhabitants (32.53%), of respondents with primary/middle school education (33.34%). In turn, the largest group

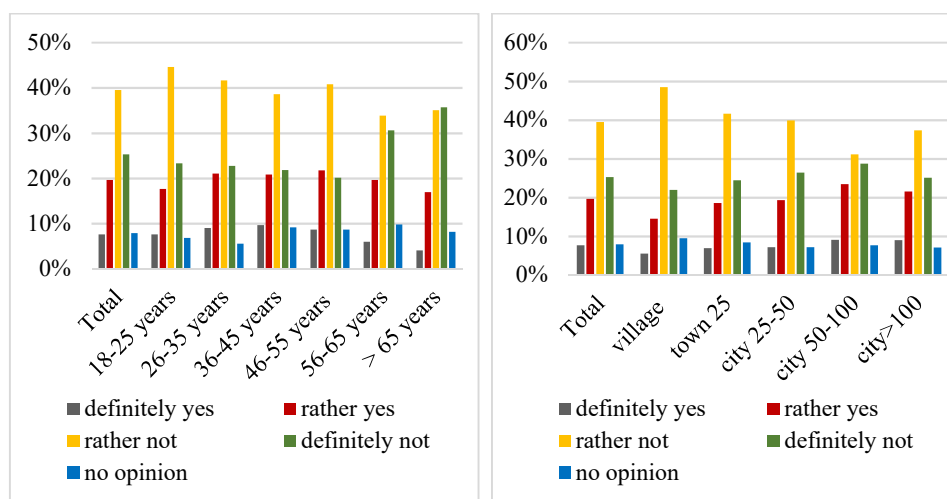


Figure 10. Opinion of the respondents on the bank for women

Source: Study based on own research.

of opponents of the creation of such an institution was among respondents aged over 65 (70.76%), respondents living in rural areas (70.5%), and respondents with higher education (69.15%).

However, it should be noted that as many as 48.48% of the respondents declared their willingness to use the services of a bank for women. The largest percentage of respondents who expressed their willingness to use the services of such a bank was among those in the age groups 46–55 (53.26%) and 18–25 (53.06%). On the other hand, the least willing were among representatives of older age groups: 56–65 years (34.43%) and over 65 years (33.92%). Using the criterion of education for the analysis, it was found that interest in servicing women by the bank increased with the increase in the level of education of the respondents and amounted to: 35.66% among respondents with primary/middle school education, 43.44% with secondary education and 61.2% with higher education.

Among the main factors affecting the intention to use the bank's services for women, the respondents mentioned (Figure 11) waiting for the offer of services for women (36.78%), dissatisfaction with the product portfolio offered (28.98%) and dissatisfaction with from previous service (20.34%).

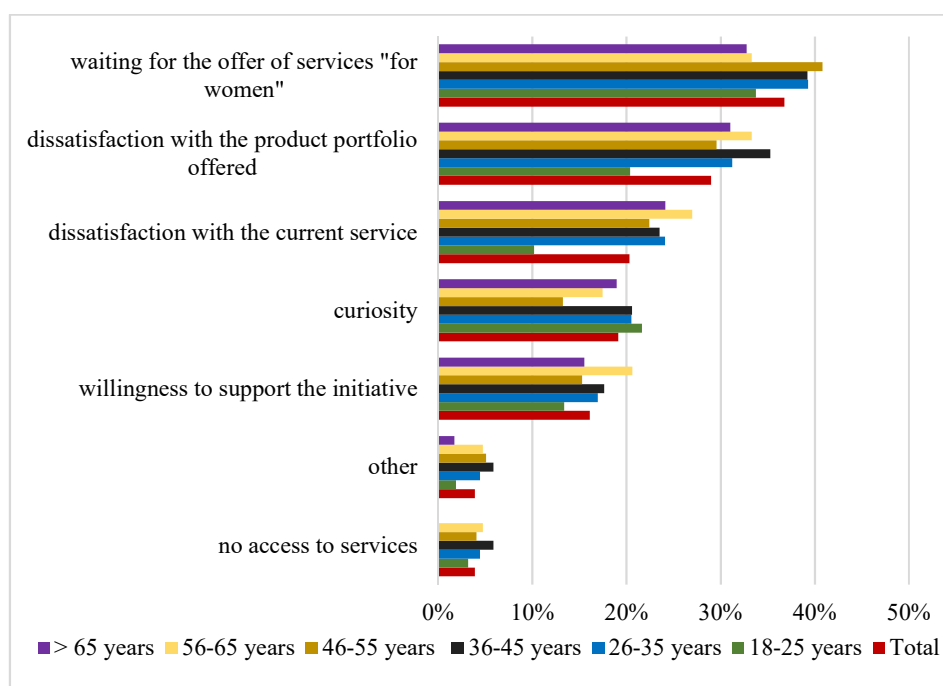


Figure 11. Reasons for the intention to use the bank's offer for women

Source: Study based on own research.

Every fifth respondent stated that the reason would be curiosity about how such an institution functions. Most often, respondents who belong to younger age groups indicated 'curiosity' as a reason for using the services of a bank for women: 18–25 years (21.66%), 26–35 years (20.54%), 36–45 years (20.54%), 59%). Respondents living in large cities:

50–100,000 inhabitants (21.82%) and 100,000 inhabitants (20.25%). Respondents with primary education (30.43%).

On the other hand, every sixth respondent wanted to support the operation of such an institution by using the services of a bank for women. The willingness to support such an initiative was most often indicated by respondents with higher education (17.07%), respondents living in cities with 50–100 thousand inhabitants (17.27%), respondents belonging to the 56–65 age group (20.63%).

## 7. CONCLUSIONS

Polish women are active participants in the banking services market. According to the World Bank, their level of banking coverage is 88% and is higher than the level of banking coverage of Polish residents, which is 86.7% (The Little, 2018). The research conducted showed that the phenomenon of financial exclusion is concerning to a small extent. Among them, as many as 89.98% had a bank account and 98.5% declared the use of banking services. Most of the study participants also have the option of making non-cash payments using debit cards (86.77%) and credit cards (31.96%). Almost 60% of the respondents declared the use of savings products and over 26% of credit products. However, it should be noted that the level of their satisfaction with the activities of the banks was moderate. Only 27.73% of the respondents assessed the level of satisfaction with the product portfolio offered by the banks as high or very high. However, such levels of satisfaction in service case of the quality of service and the approach of bank employees to serving women, respectively.

These opinions indicate that banks should thoroughly analyse these issues and pay more attention to the basic challenges that have always faced them over the years, i.e., to adapt the product portfolio and methods of offering services to the expectations of potential homogeneous customer groups. It should be taken into account that individual homogeneous groups of customers may have different needs and expectations in this regard. In most cases, banks do not divide their offer based on the gender criterion. This is mainly due to the fact that for centuries the offer of banks was addressed primarily to men. Currently, many bankers are of the opinion that the difference between a female client and a male client has been blurred. However, at the same time, they see the need to use a different form of „packaging” for some banking products (e.g. different images of bank cards). The Polish women participating in the research are also divided on the need to introduce women's banking. Half of the respondents (50.2%) see the need for banks to create an offer specifically dedicated to women. However, only one in four respondents (27.28%) were of the opinion that a women's bank should be established in Poland. It is interesting, however, that up to 48.48% of respondents would like to use the services of such a bank, and the main reason for this is „waiting for an offer of services for women” (36.78%).

Analysing the situation on the Polish banking market, one can agree with the opinion of the research participants that there is currently no need to create a bank that would serve only women. Such a bank would probably have limited chances for dynamic development in the Polish reality. However, its creation would have an impact on changing the attitude of banks operating on the Polish market to date regarding services for women. These banks would probably be more willing to take into account the demands made by the participants in the research regarding the creation of an offer dedicated to them.

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## UNDERSTANDING SPACE SECURITY CULTURE AS A NEW EXPLORED HUMAN ENVIRONMENT

This article focuses on systematizing the artificial environments that humans produce in the course of conscious activity. With dynamic technological progress, these, in turn, evolve and become separate entities. Here, the authors attempt to “extend” the artificial human environment to include the space environment. Whether it should be treated as a separate entity from well-known environments such as the rural, urban, industrial, military, and cyberspace will be the subject of the authors’ interest and scientific inquiry. As human activity in space increases, including satellite launches, exploration missions, and potential economic ventures, the creation of a robust space security culture becomes a necessity. Anthropocene man (Sommer, Zakrzewski 2017b) expands on the planet Earth, which is why he looks so eagerly towards Space. The kind of safety culture that will be brought to the newly explored environment will be the subject of piecemeal research. The central problem is formulated as follows: *Should humanity learn about and explore Space?* Undoubtedly, the decision to explore space is complex and requires consideration of the potential benefits against the associated costs and ethical considerations.

**Keywords:** Space, ecosystem, security culture.

### 1. INSTEAD OF AN INTRODUCTION

Since the dawn of mankind, primitive man has always looked at the sky and asked himself what secrets the universe holds<sup>3</sup>. Today, due to its exploration, the word “Space” is used more often. These terms mean the same thing – that is, everything that is outside the Earth and it is:

the arrangement of all astronomical objects, scattered matter and physical fields together with the space-time they fill”. It is space together with the matter in it

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<sup>3</sup> Latin “universum” was created almost 14 billion years ago as a result of the Big Bang. Throughout this time, it constantly spread and changed to achieve its current size and appearance [Access: 21.09.2023]. Access on the internet: <https://zpe.gov.pl/a/jak-urzadzony-jest-wszechswiat/D14tUpAYP>.

(stars, planets and other even smaller celestial bodies, their clusters – galaxies, clusters of galaxies, intergalactic matter and other objects), which in any way can affect us (or we affect it) in the past, present or future (See more: *PWN Encyclopedia*).

Until the Middle Ages, through ancient times and regardless of the type of religion practised, the axiom was that the Universe was created in the act of creation and the Earth occupies a central place in it, as the habitat of man. The mechanics of the sky were not understood by man and often threatening (lunar eclipse); they were interpreted as the works of the gods, which is why mythologies were created. Space is, after all, an element of any theology. The work of Nicolaus Copernicus<sup>4</sup>, published in Nuremberg in 1543, changed the understanding of the Universe. Mankind was unable to come to terms with this revolutionary theory and, for historical justice, it should be said that the work was put on the index of banned books, from where it was only withdrawn in 1757<sup>5</sup>. As a result of the development of science, the theory of N. Copernicus was modified, among others, by scholars: Johannes Kepler discovered that the motion of the Earth and planets follows an elliptical trajectory with the Sun at one of the foci in the early 17th century and a few decades later Isaac Newton formulated the law of universal gravitation and in the 1920s Albert Einstein, Nobel Prize winner, created the special and general theory of relativity. Even as late as the fourth quarter of the twentieth century, the Cosmos, in the average mass audience culture, was perceived as the space that hosts science fiction and fantasy novels and films. Almost simultaneously, intensive research on the military and economic use of Cosmos was carried out in scientific centers.

## 2. EXTENSION OF THE HUMAN ENVIRONMENT

Homo Sapiens, since he began to make the Earth subject to himself, began to create artificial environments one by one (Sommer, Zakrzewski, 2023b). The division supplemented by the space environment is shown in Figure 2. H. Sommer, G. Zakrzewski in their article *Determining the level of awareness of the use of selected components of the artificial environment (Określenie poziomu świadomości korzystania z wybranych składowych sztucznego środowiska naturalnego)* (Sommer, Zakrzewski, 2017a), signaled the need to place the space environment and placed it within the artificial military environment.

On the basis of the analysed literature on the subject, the authors propose to supplement the artificial environment with the space environment in a basic division. Compared to its predecessors, it is the most technicalised and closest to the cyber environment.

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<sup>4</sup> Nicholas Copernicus, born on 19 II 1473, Toruń, died 24 V 1543, Frombork, Polish astronomer, mathematician, physician, lawyer and economist; creator of the heliocentric theory.

<sup>5</sup> In 1999, the manuscript of the work was entered on the UNESCO Memory of the World list. [Access: 22.09.2023]. Access on the internet: <https://encyklopedia.pwn.pl/haslo/kopernik-mikolaj;3925575.html>.

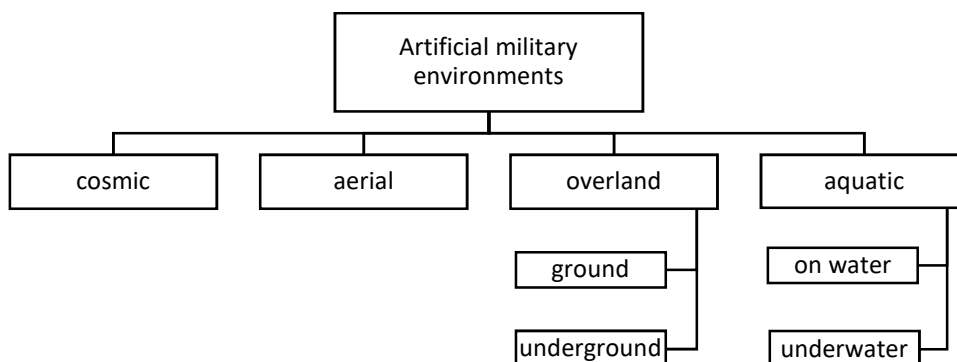


Figure 1. Division of artificial military environment  
 Source: (Sommer, Zakrzewski, 2017a).

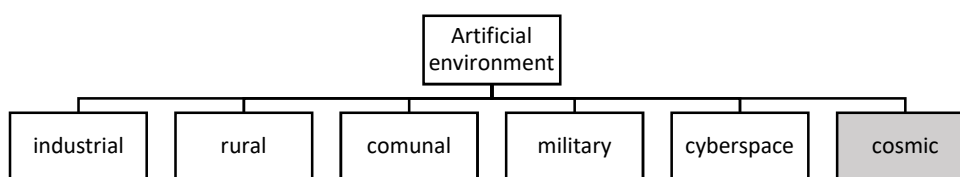


Figure 2. Division of artificial environment  
 Based on own research: (Sommer, Zakrzewski, 2023b).

In the remaining artificial environments (rural, industrial, communal and military), human presence is obligatory. In the cyberspace and space environment, humans are not 'present' all the time. The criteria used to characterize the natural human environment can be used to describe the space of the new artificial environments, where the essential bonding element is the relationship between the biocenosis and the habitat, which is part of the flow of energy and matter. H. Sommer, G. Zakrzewski state:

- An ecosystem is an area of relatively homogeneous abiotic conditions (biotope), occupied by a corresponding set of species linked by trophic and paratrophic relationships, through which a stream of energy and matter flows. According to this definition, an ecosystem consists of two closely related components:
- inanimate (biotope, also called habitat), which consists of soil, water and air with their physicochemical properties and climate that exists independently of biocenosis;
  - animated (biocenosis), composed of a combination of species specific to a given biotope under given geographical conditions (Sommer, Zakrzewski, 2023a). From the classical definition of a habitat, one can easily derive the definition of a technicised habitat, i.e. one that is the product of human thought and engineering achievements, which is inhabited by humans.
- Extreme cases of a technically developed ecosystem include an orbital station or a nuclear-powered submarine (Sommer H., Sommer H., Zakrzewski, 2018b).

The latest two artificial environments will be of the greatest interest to the scientific world as well as to decision-makers as an important attribute of the social life of the earth's inhabitants in this century.

### 3. THE MEANING OF SPACE

The development of space exploration and the technical means to explore it after the Second World War was significantly influenced by German scientists who built the space powers: USA's Wernher von Braun<sup>6</sup>, and his right hand Helmut Gröttrup<sup>7</sup> the might of the USSR. The last decade, after years of downtime, the “new” exploration of space is once again gaining momentum. One of the factors of this specific acceleration is the inclusion of the private business sector in the implementation of extraterrestrial exploration. New states and the EU are striving for sustainable space exploration in order to accept not only the huge costs of the project, but also the public acceptance of space projects. A new policy is emerging before our eyes – the space policy to support the development of modern and secure satellite systems used to improve life on Earth. As assured by those in power, the systems being exploited and designed are civilian in nature, including those on the civil-military frontier such as humanitarian overseas operations and crisis management, with military circles looking on with the greatest interest from the outset. It is no secret that before any new invention sees the light of day it is first given a close look by the military (Sommer, Zakrzewski, 2017a).

### 4. METHODOLOGY AND RESULTS OF THE RESEARCH

Research methods are a certain general system of rules that deal with the organization of a given research activity, namely, various cognitive and practical operations, the order of their application, and activities oriented towards the established research goal. In this study, the research will be conducted centred around the following question:

*Should humankind learn about and explore outer space?*

An effectively conducted study, in addition to formulating a research question, requires the formulation of a hypothesis. The following hypothesis can be formulated in response to the main question:

It can be assumed that the responders' level of knowledge of outer space depends on the acquired and learned behaviour.

The research was carried out in July 2023 in the city most closely associated with the aerospace industry in Poland (See more: Aviation Valley.PL). A total of 159 people took part in the study. The research was conducted using a survey with 9 questions. Random individuals who agreed to participate were surveyed. The only criterium for participants was living in one of the areas marked in Figure 3. They were not involved in the research issues. The respondents came from different counties of the Subcarpathian Voivodeship (33% from each area marked in Figure 3). Figure 3, for the purpose of the article, divides the Subcarpathian Voivodeship into three zones. The first zone (A) covers an area with a developed technical culture. It was in this area, among others, that the Central Industrial District, which was the largest economic investment of interwar Poland, developed

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<sup>6</sup> Operation Paperclip (Allies / USA) – the Allies imported thousands of Hitler's scientists from Germany.

<sup>7</sup> Operation Osoaviachim (USSR) – a Soviet operation that had analogies with Allied operations.

intensively. This is where not only the economic strength of the Second Polish Republic was created, but also technologies that were modern at the time were implemented and what is nowadays referred to as innovations were created. The Central Industrial District permanently changed the face of these areas. The second zone (B) is well developed agriculturally. Fertile soils and a favourable climate are conducive to its development. On the other hand, the third zone (C) has no potential for dynamic development due to the terrain. This is an area from which a large percentage of residents have emigrated (See more: Sommer, H., Sommer, H., Zakrzewski 2018a) due to poor transportation system or the lack of well-paid jobs. Educated young people are leaving to larger cities. These are serious problems for the region. This is an area in need of strategic investment due to low socio-economic development.

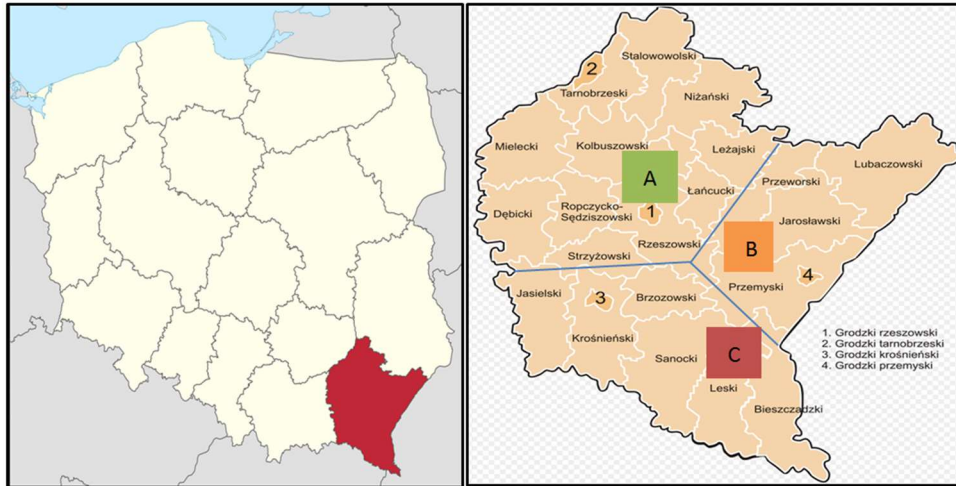


Figure 3. Scientific research area by zone

Source: based on own research: [https://pl.wikivoyage.org/wiki/Wojew%C3%B3dztwo\\_podkarpackie#](https://pl.wikivoyage.org/wiki/Wojew%C3%B3dztwo_podkarpackie#).

The results of the conducted research are illustrated with 9 graphs.

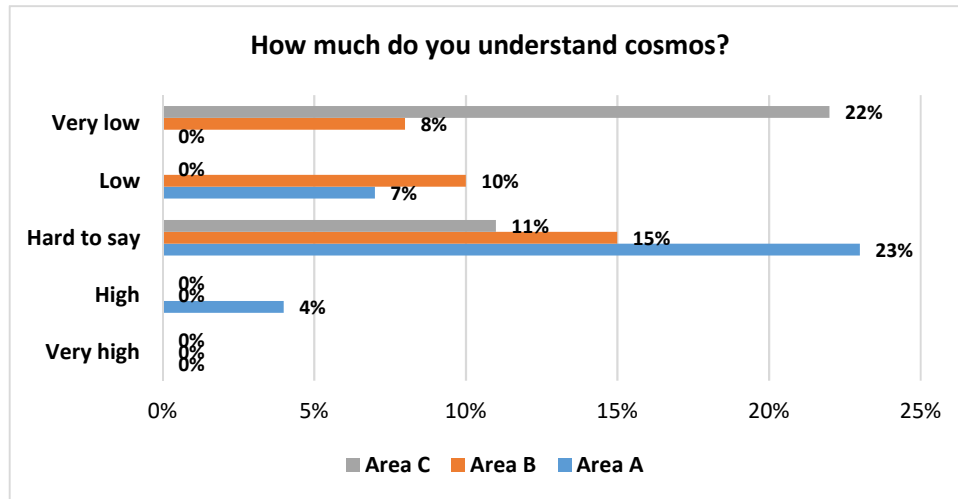


Chart 1. Level of cosmos understanding

Source: authors' own research.

Understanding the universe is a vast and complex endeavor. The results of the conducted research confirm this. The most common answer chosen by respondents – difficult to say, was chosen by as many as 23% from zone A, 15% from zone B and 11% from zone C. Their knowledge of outer space was rated as limited or very limited by respondents living in zone A (7%, 0%), B (10%, 8%), and C (0%, 22%), respectively. Only 4% of respondents from zone A felt that they had a high level of knowledge of this subject. However, no one indicated a very high level of understanding of the space environment. Scientists from various fields are constantly collaborating to find answers to complex questions and gain a more comprehensive understanding of outer space.

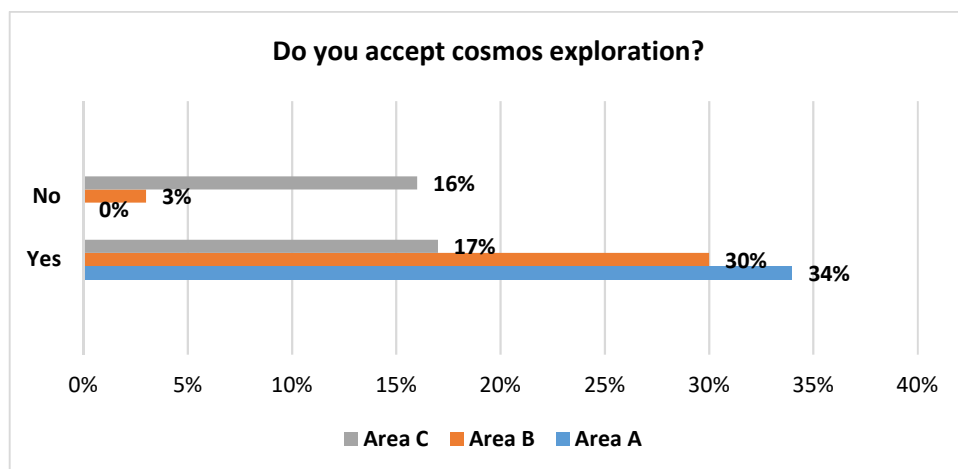


Chart 2. Acceptation of cosmos exploration

Source: authors' own research.

Space exploration often stimulates the human imagination and inspires dreams of possibilities beyond Earth. Many people see space exploration as a driving force behind scientific and technological progress. This is reflected in the survey results. The vast majority of respondents (81%) from all areas of research are in favour of space exploration, A (34%), B (30%), and C (17%), respectively. Only 3% of respondents from zone B and 16% from zone C do not approve of space exploration. Although there is a generally positive attitude towards exploring outer space, public opinions can vary and depend on several factors (e.g. education, individual perspectives). In the research presented, it can be seen that the residents of the socioeconomically least developed area are reluctant when it comes to these efforts.

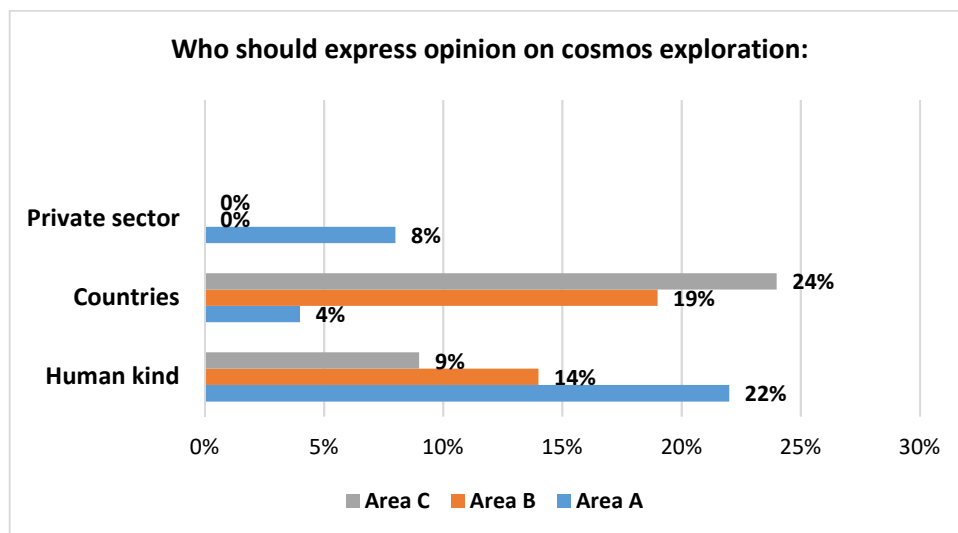


Chart 3. Who should express opinion on cosmos exploration?

Source: authors' own research.

The discussion on space exploration involves different parties, each with their own perspective and interests. The respondents of the survey do not have a definitive opinion. 45% of respondents support the human species, respectively A (22%), B (14%) and C (9%). Entrusting this decision to the states was approved by 47% of respondents, A (4%), B (19%), and C (24%), respectively. Only 8% of respondents from a well-developed technical culture believed that the assessment of space exploration should be left to commercial entities.

The concept of space security culture recognises the interconnectedness of space activities and the need for collective commitment to responsible behaviour in order to maintain the security and sustainability of outer space. This concept refers to the development and promotion of practices, standards and behaviours aimed at the responsible use of space. More than half of the respondents (58%) said that they were not familiar with the concept of a space security culture, A (6%), B (22%), and C (30%), respectively. A rather large percentage of them (36%) are not sure whether they know this

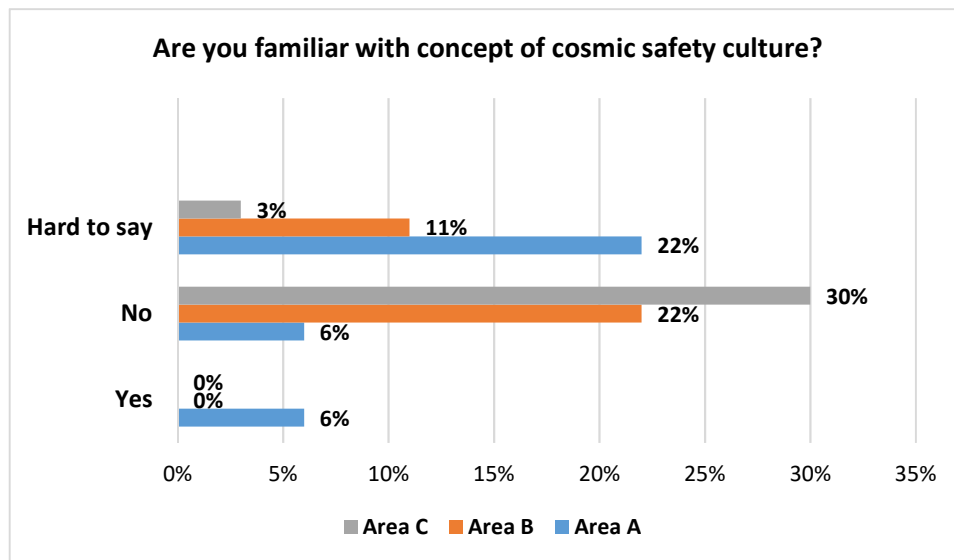


Chart 4. Knowledge of cosmic safety culture

Source: authors' own research.

concept, respectively A (22%), B (11%), and C (3%). Only 6% of respondents from the highly developed zone believe that they know what the concept of a space security culture is, and that its application should be beneficial for all humanity.

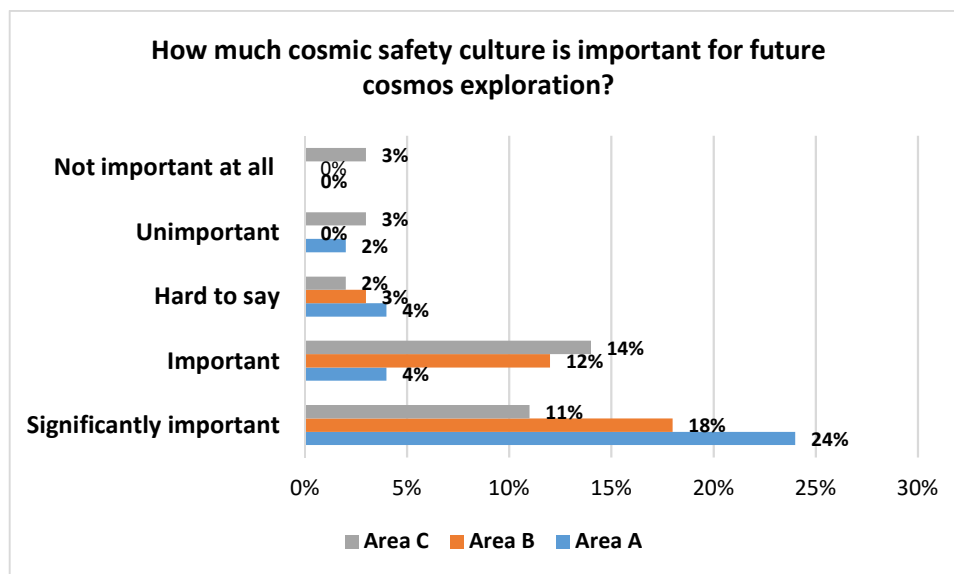


Chart 5. Importance of cosmic safety culture for future cosmos exploration

Source: authors' own research.



Despite the fact that in question 4 such a large percentage of respondents did not know or were not sure that they knew the concept of a space security culture, after learning about this concept, the results regarding its rating are interesting. As many as 53% considered it to be extremely important – A (24%), B (18%), C (11%); 30% thought it was important – A (4%), B (12%), C (14%); 9% could not rate it – A (4%), B (3%), C (2%); 5% rated it as not very important – A (2%), C (3%) and 3% of respondents from the area with less developed technical culture considered it to be not important at all.

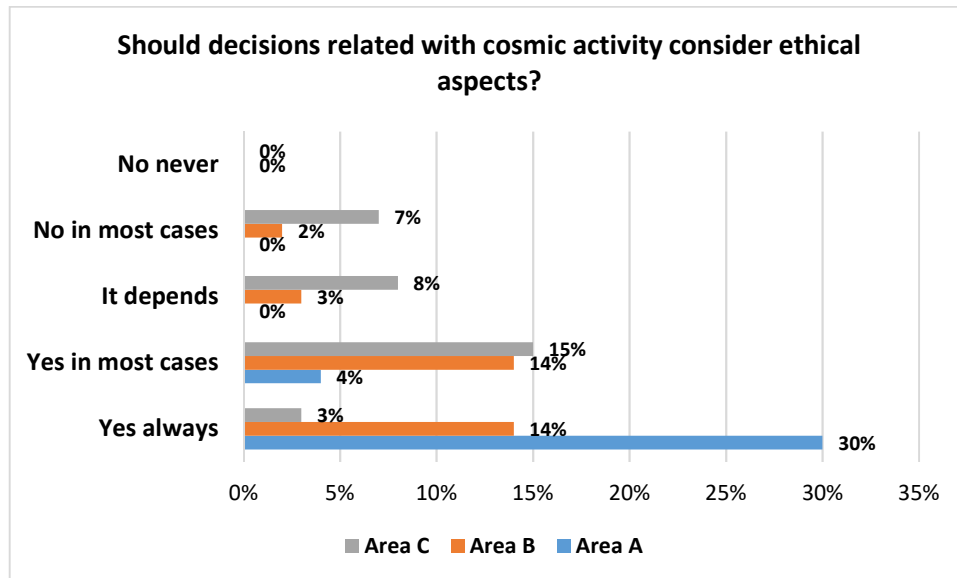


Chart 6. Ethical aspects in decisions related with cosmic activity

Source: authors' own research.

When making decisions about the use of space resources and the environmental effects, the interests of future generations must be taken into account. Including ethical considerations in decision-making processes can contribute to the responsible and sustainable development of space activities, in accordance with principles that prioritize the best interest of individuals, communities and the environment, both on Earth and in outer space. This approach is supported by as many as 47% of respondents – A (30%), B (14%), C (3%). A large percentage (33%) believe it to be true in most cases – A (4%), B (14%), C (15%). There are also those (11%) from less economically developed areas who make it dependent on various issues – B (3%), C (7%). However, all respondents disagree that ethical aspects are never important.

It can be said that there is unanimity among the respondents on minimising space debris. As many as 41% (A – 26%; B – 12%; C – 3%) strongly support actions to do so, and 50% (A – 8%; B – 19%; C – 23%) agree with this approach. Only 4% (B – 2%; C – 2%) of respondents are unable to take a position on this issue, and 5% (C) considered that there was no need to take any action in this area.

Solving the problem of orbital debris is crucial to the sustainability of space activities and ensuring the long-term viability of space exploration. Continued efforts in research,

technology development and international cooperation are indispensable to effectively manage the challenges posed by space debris.

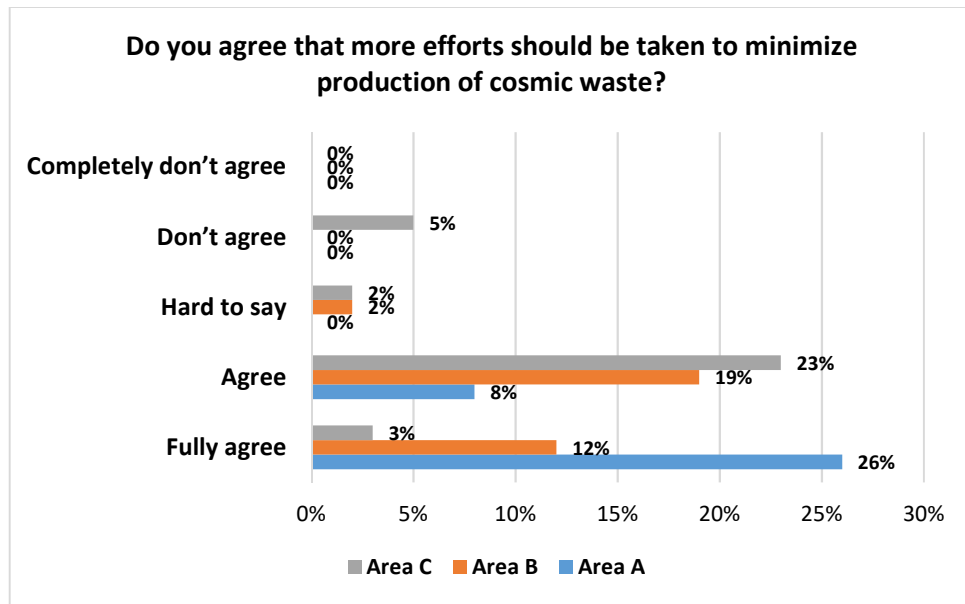


Chart 7. Can taking more effort help minimize production of cosmic waste?

Source: authors' own research.

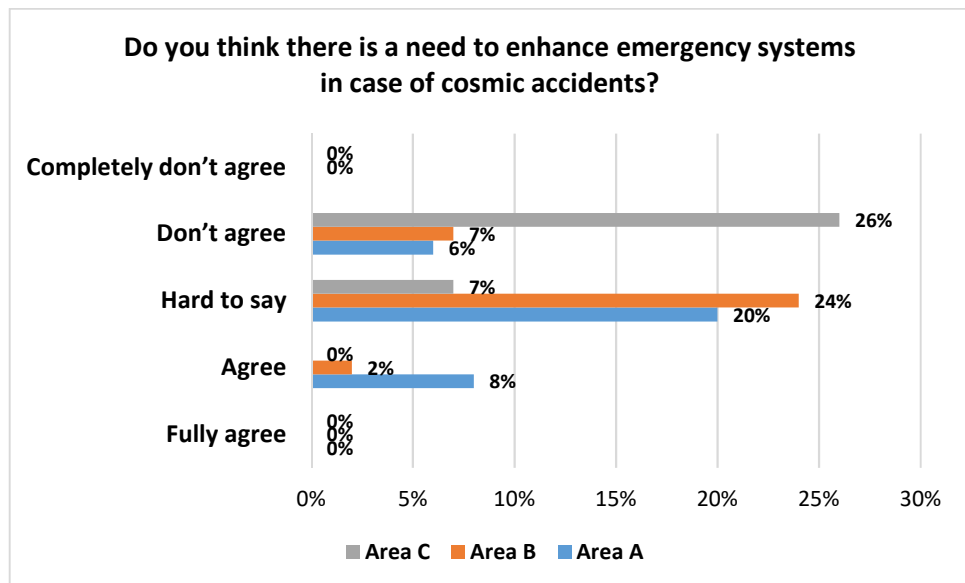


Chart 8. A need to enhance emergency systems in case of cosmic accidents.

Source: authors' own research.

Regarding the improvement of crisis response mechanisms in the area of space events, the answers have been narrowed down to three categories, I agree or disagree and it is difficult to say. Most often, 51% (A – 20%; B – 24%; C – 7%) did not take a position on this issue. A slightly smaller percentage do not see the need for such actions 39% (A – 6%; B – 7%; C – 26%). However, only 10% believe that efforts should be made to ameliorate crisis response mechanisms in space events.

Although space activity has become an integral part of various aspects of modern life, emergency situations in or related to space can have significant consequences. It seems that the respondents did not fully understand the question posed. Their answers may indicate this.

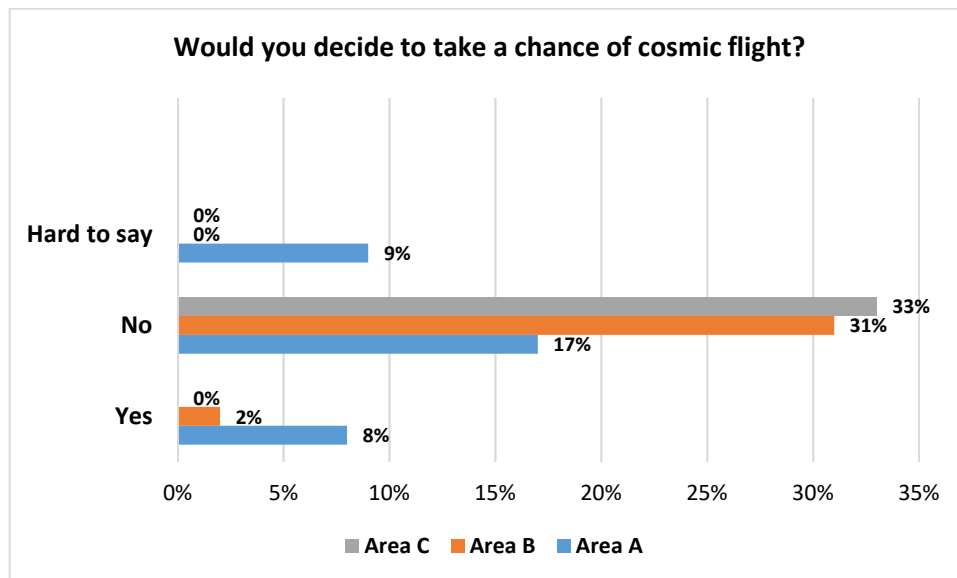


Chart 9. Declaration of cosmic flight.

Source: authors' own research.

Graph 9 presents the results regarding the flight into space. It is astonishing that as many as 81% (A – 17%; B – 31%; C – 33%) of the respondents do not want to go to space. Only 10% (A – 8%; B – 2%) of the respondents are of the opposite opinion. On the other hand, 9% of highly developed areas were unable to take a position on the analyzed issue.

For some people, the lack of control over their surroundings and the reliance on technology and systems that they may not fully understand can be anxiety-inducing. As space technology evolves and becomes more commonplace, it's possible that these fears may diminish for some individuals.

However, it is observed that in recent years there has been a significant development of the commercial space industry, driven by technological progress, increased private investment and growing interest in space tourism.

Our understanding of the Universe is constantly evolving as we make new observations and refine or replace theories. However, summarizing the results of the conducted research, it should be stated that a significant part of the respondents could not determine their degree

of knowledge of the Space. The largest percentage of them comes from a separate, highly developed area. Others assessed this knowledge at a low level, and the largest percentage came from areas with a low level of socio-economic development. The respondents are generally in favor of space exploration, but a large percentage of area C is opposed to such activities. Countries or human species should speak out about the subject of space exploration. Only a few from area A indicated commercial entities. The vast majority of participants from all areas surveyed are unfamiliar with the concept of space safety culture or cannot identify themselves. Only single people from areas with a high degree of development recognized that they knew this concept. However, after familiarizing the respondents with the issue of space security culture, the vast majority of respondents, coming from all areas, considered it necessary for the future of space exploration. Ethical considerations in making decisions related to space activities are of great importance due to the potential impact of these activities on various stakeholders and the long-term sustainability of space exploration. This is also the position of the vast majority of respondents. Over 90% of respondents supported the fight against space debris. Proactive approach to space debris mitigation shows responsibility and care for our planet. More than half of the respondents did not take a position on the need to improve crisis response mechanisms in the event of space events, and the others most often did not see such a need. Only a few in area A are in favour of improving crisis response mechanisms that help to minimise the economic impact and facilitate faster recovery from setbacks. Surprising results concern the declaration of a desire to fly into Space, where over 80% of respondents do not want to experience such an adventure. The commercial space industry faces challenges such as regulatory hurdles, safety concerns, and sustainability issues, including the management of space debris. As the industry continues to evolve, regulatory frameworks, safety standards and international cooperation will be essential. The research goal has been achieved. However, it requires further research to precisely describe the need of space exploration and perceive it as an exciting boundary of humanity's progress.

## 5. INSTEAD OF A CONCLUSION

By the end of the 18th century, many scientists argued about the quantitative issues of elements on Earth. During the formation of the industrial environment, the exploiters wondered whether intensive exploitation of resources would eventually determine the end of their activities. Their doubts were dispelled, independently of each other, by the Russian Mikhail Lomonosov and the Frenchman Antoine Lavoisier, who in 1756 and 1785, respectively, based on the mass preservation during chemical reactions, stated and formulated the law of mass preservation in chemistry. According to this law, in a closed system (where the products of the reaction do not leave the system), the total weight of the substrates is equal to the total weight of the chemical reaction products. It means that an equal mass of products is produced from the mass of substrates used in the reaction. Thus, during the chemical transformation, the total mass of the substances involved does not change.

“Nothing in nature is lost” – this saying refers to the basic principle governing changes in our world. The precursor of this statement can be considered the ancient Greek scholar Empedocles of Akragas, the creator of the concept of the four elements, who stated: “Nothing arises in nature that can die; there is no complete annihilation; nothing happens except changes and disintegration of what is connected”. As humanity, we are aware of

two basic things – in order to change the existing system, we must export or import something from Earth, speaking economic language.

That is why there is so much interest in Space. Not everyone is aware that a cosmic environment is being created before our eyes, into which *Homo sapiens* is already entering, often not yet defining the rules of living there. The conducted fragmentary research showed that we want to have a monopoly on the exploitation of space, but we have not established the rules that we want to “follow” there. Will the people of the old continent repeat the mistakes similar to those made during the period of discovering the continent of the new world? The fragmentary research undertaken is to draw attention to the importance of a safety culture in the space environment, so that the alien civilization does not think of us as barbarians.

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## THE POWER STATUS OF ASIAN AND PACIFIC REGION STATES ON THE BASIS OF SYNTHETIC POWER MEASURES FROM 1992 TO 2022

This paper presents power status in Asia and the Pacific region states – an issue that has a major impact on the international security of countries. To illustrate this, the study takes the period after the end of the Cold War, from 1992 to 2022. The purpose of the paper is to characterize the power status of the Asian and Pacific region countries based on synthetic power measures, adopting the powermetrics model of Professor Miroslaw Sulek to calculate the power of states. The analysis proves that the most important role in international security is played by the countries known as superpowers and world powers, whose power enables the implementation of relevant strategic goals, especially in such an important region as Asia and the Pacific. In the coming decades, there is a high probability that China will gain the status of a superpower, while the US must fight to maintain its global position among the rapidly developing countries of the Asia-Pacific region, which in the game for power may take away some of Washington's current advantage.

**Keywords:** security, power status, powermetrics, Asia and the Pacific.

### 1. INTRODUCTION

Around the Pacific and in Asia, countries located there are currently in a constant fight for power and resources in order to be able to influence other political entities to an even greater extent and become richer. The 21<sup>st</sup> century is to belong to Asia, especially China and India. The first symptoms of this can already be seen in the field of economic power or the broadly understood economy. The United States still retains its great position, although its power has been diminished in recent decades. Strong countries strive to become different types of powers, and this path culminates in becoming a superpower in a unipolar system of forces, which currently seems to be a very difficult task. The shift in focus from the Atlantic to the Pacific and Southeast Asia has accelerated the arms race in the region, and increased competition and the potential for conflict. Apart from Europe, Brazil, the Middle East and some African countries, the largest and very powerful countries

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in the world are located in Asia and the Pacific: the USA, China, Russia, India, Japan, and Indonesia. Other countries also aspire to the role of active participants in international relations in this area due to their economic, military or geopolitical strength (Singapore, South Korea, Canada). India, although it does not border the Pacific, has a great influence on the policy in this area. The term Pacific region appeared in Poland for the first time thanks to Edward Haliżak in an article from 1985: “The Pacific region in international relations” (Jarczewska, Zajączkowski [red. nauk.] 2016), and replaced the term “Far East”, which had pejorative colonial associations.

The purpose of the paper is to characterize the superpower status of Asia-Pacific countries based on synthetic power measures from 1992 to 2022. The subject of the research covered the currently most important region of the world, i.e. the Pacific countries lying on both sides of it, along with India, which also have great aspirations and are connected to this region.

The article consists of four parts: the first concerns the concept of the power status; the second and third shows the model of synthetic power measures used by Professor Sułek and the calculation of power measures of the countries of Asia and the Pacific region; the last part focuses on the characteristics of the power status of the countries and its changes in the post-Cold War period in 1992–2022. The article also includes an introduction and the summary.

## **2. THE CONCEPT OF POWER STATUS AND ITS IMPORTANCE IN CONTEMPORARY INTERNATIONAL RELATIONS**

From the beginning of the existence of states, the concept of power status in the form of hegemony or empire was known. Despite the passage of thousands of years in science, this concept has not yet been properly defined. Currently, it is recognized that the main players in the world are the superpowers, among all participants in international relations. Colloquially, it is believed that superpowers are large and strong states, although these criteria of the power status have changed over the centuries. Science grades this term into great powers, superpowers or hyperpowers. The criteria of great power include, among others, economic, military, cultural, political, population, geographical, and psychological factors. They are called sectoral power bases (Bógdał-Brzezińska, 2010; Sułek, 2013).

Power status determines the actions of states playing a dominant role in the international environment. According to Ron Böhler, a superpower is a sovereign state that is recognized as having the ability and expertise to exert influence on a global scale (Böhler, 2017). Historically, the status of superpowers was recognized during the Congress of Vienna of 1814–1815 and in the post-Napoleonic era, when the most important states known as the “Concert of Europe<sup>3</sup>” claimed the right to jointly enforce post-war treaties. John Mearsheimer defines great powers as those that “have sufficient military resources to mount a serious fight in a conventional war against the most powerful state in the world” (Mearsheimer, 2001). In the 20th century, Kenneth Waltz, as a representative of neorealists, recognized the scale of the real influence exerted on the international system. The criteria of great power were also expanded to include economic foundations and soft power. Military power and its influence on superpower status slowly began to lose importance (Waltz, 1979). Thanks to Joseph Nye, after the collapse of the bipolar system

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<sup>3</sup> After first use in 1856 after the Peace of Paris.



after 1991, soft power was recognized as the main factor influencing the modern power status (Nye, 2007).

The power of the state and international recognition have a significant impact on the characteristics of the power status. However, in each era there are relative and qualitative changes in the powers, which are not predictable to a greater extent. According to Danielski, power relations in the last two hundred years have always emerged after great wars, mainly on the basis of winning coalitions (Danielski, 1983). There are two levels of power: actual and formal. In the second sense, a state is recognized by others, gaining an appropriate status. This is mainly done by granting specific powers in significant international organizations (UN, G7). The actual fact is that a country can win a great war, although there are also countries that could not win a great war, and their influence on other countries is significant. Related to these assumptions is the issue of hegemonic wars. Harold Sprout and Margaret Sprout also believed that a state's ability to win a great war confirmed its power status (Sprout, M., Sprout, H., 1966). However, the loss of the power status does not deprive a given country of its actual power. This status is manifested in the actions of the state, i.e. in foreign policy, which covers the entire world for the superpowers.

### 3. POWERMETRICS MODEL BY M. SUŁEK

Power and business connections play a decisive role in international relations. Quantitative methods of analyzing the power of actors in international relations are beginning to play an increasingly important role. The science dealing with such measurement is called powermetrics. As an auxiliary discipline of geopolitics, powermetrics not only measures power, but also serves to model and simulate the international balance of power (Sułek, 2001; Sułek, 2013). A synthetic assessment of the balance of power in quantitative terms shows two categories of power: general and military, and economic (general) power consists of economic results (gross domestic product), demographic factors (population) and spatial components (territory area). Military power consists of military-economic factors (military expenditure, which is part of GDP), demographic-military factors (number of active service soldiers) and spatial factors (territory area). Geopolitical power is calculated as the arithmetic mean of economic power (overall) and double military power (the role of the military factor in shaping the current balance of power was appreciated). We divide the obtained data regarding the factors indicated above by the appropriate global values, and enter the obtained fractional values into the formula. After performing the operation, we will receive the power of countries as a fraction of the world power. In international relations, the most important feature is the balance of power, according to the main thesis of Raymond Aron (Aron, 1995). Also important in this discipline is Bertrand Russell's thesis that "the fundamental concept of social science is power, in the same sense that energy is the fundamental concept of physics" (Russell, 2001). The struggle for power is characterized by a zero-sum game, which means that the increase in power of some countries can only take place at the expense of other countries. Estimating the power of states by measuring indicators allows for the assessment of the international balance of power in the Asia-Pacific region.

- $P_e = PKB^{0,652} \times L^{0,217} \times a^{0,109}$
- $P_w = W^{0,652} \times S^{0,217} \times a^{0,109}$
- $P_g = \frac{P_e + (2 \cdot P_w)}{3}$

Symbols:  $P_e$  – economic power (general),  
 $P_w$  – military power,  
 $P_g$  – geopolitical power,  
 $PKB$  – gross domestic product,  
 $L$  – population,  
 $a$  – territory,  
 $W$  – military expenditure,  
 $S$  – number of soldiers in active service.

We can multiply the obtained results by any numbers, if we multiply them by 100, we will get the results as a percentage of the world's power (then the world's power = 100). In our case, it will be more convenient to multiply them by 1000 (then the power of the world = 1000), millimirs (abbreviation mM), i.e. thousandths of the world power. The statistical base of the article is based on data from the World Bank and The Military Balance. The monetary components in the formulas are based on current prices in US dollars.

#### 4. DYNAMICS OF CHANGES IN POWER INDICATORS IN ASIA AND THE PACIFIC REGION

In the last thirty years, after the Cold War, great geopolitical changes have taken place in the world related to the collapse of the bipolar system and the USSR, as well as the acceleration of globalization on an unimaginable scale. Countries in Asia and the Pacific region especially benefited from the latter. First Japan after 1953, then South Korea, Taiwan, Singapore, India and, most of all, China. They joined the old powers and rich countries such as the USA, Canada, Australia and New Zealand. In the 21st century, other countries around the Pacific have also significantly improved their economic status: Indonesia, Thailand, Vietnam, Mexico and the Philippines, trying to benefit from the economic transformations of the modern world. Only Russia is experiencing a decline in economic importance due to its war in Ukraine from February 2022, just as it happened after 1991 during President Yeltsin's term. During the period under study, there were major shifts in the regional balance of power. East Asia and the Pacific came first at the expense of Europe and Central Asia. North America as a whole remained in third place. South Asia is also growing stronger at the expense of Africa and the Middle East.

Calculations of overall, military and geopolitical power for Asia and the Pacific region are presented in Table 1–3 (Surowiec, 2023).

The economic/general power of the countries in the Asia-Pacific region presented in Table 1 mostly indicates increases from 1992 to 2022 (Sulek, 2016). Japan, however, recorded a spectacular decline from 68.53 mM in 1992 to 28.33 mM in 2022 in the world share. However, the greatest increase in absolute and percentage power was recorded by China, from 37.35 mM in 1992 to 167.93 in 2022, i.e. its power increased 4.5 times, while in terms of percentages the increase was 350%! India also strengthened its position in the world, its power increased by 97% from 24.4 mM in 1992 to 46.10 mM in 2022. Russia's overall power at that time changed its shares quite significantly, falling since 1992 from level 26.74 to 17.40 mM. This was the lowest share of Moscow's power in the period under study, from then on it increased – to the peak in 2012 (34.31 mM). However, in the following years, Russia's power decreased to the level of 21.31 mM in 2022 (Białoskórski, 2018). The level of US power ranged during the period under study from 180.72 mM

Table 1. The general (economic) power of the countries of the Asia-Pacific region in mM, i.e. world = 1000

State	1992	1997	2002	2007	2012	2017	2022
<b>Australia</b>	12.29	12.83	11.28	13.14	16.74	14.48	14.12
<b>China</b>	37.35	54.78	67.33	85.04	126.44	152.14	167.93
<b>Philippines</b>	3.83	4.47	3.94	4.24	5.05	5.60	5.67
<b>India</b>	24.40	26.98	29.20	36.80	40.70	49.26	46.10
<b>Indonesia</b>	9.62	11.72	10.32	12.39	17.16	17.52	16.21
<b>Japan</b>	68.53	64.14	56.70	42.53	43.58	34.97	28.33
<b>Canada</b>	20.76	19.12	19.68	21.57	21.03	18.69	16.92
<b>South Korea</b>	9.90	11.60	11.51	12.25	10.93	12.04	10.86
<b>Mexico</b>	16.12	17.25	21.48	18.82	17.43	16.24	14.70
<b>New Zealand</b>	1.58	1.85	1.73	1.99	1.97	2.10	1.88
<b>Russia</b>	26.74	20.96	17.40	29.03	34.31	25.85	21.31
<b>Singapore</b>	0.44	0.60	0.54	0.60	0.71	0.75	1.46
<b>Thailand</b>	5.90	6.18	5.35	5.91	6.50	6.72	5.78
<b>Taiwan</b>	5.56	5.85	5.50	4.68	4.46	4.71	4.80
<b>The USA</b>	159.63	165.00	180.72	154.53	140.34	150.19	154.52
<b>Vietnam</b>	1.21	2.02	2.25	2.69	3.50	4.43	5.09
<b>world</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>

Source: own research.

(18% of world power) in 2002 to 140.34 mM (14%) in 2012, which was influenced by the effects of the 2008 crisis. In 2022 The total power of the USA was 154.52 mM. In 2022, the overall powers of the US and China together accounted for one-third of the world's power. The emerging new balance of power is characterized by the US losing global leadership to China (Allison, 2018), and the increasing power of Eastern countries. China's power is currently based on its demographic and spatial potential (Stevens, 2021), while the US's is based on its economic and military potential. In the Asia-Pacific region, based on calculations, we are dealing with a US-China bipolar system. On a global scale, the EU as a whole is also considered to be a great economic power, hence with this assumption we are dealing with a tripolar system (Sulek, 2014).

Table 2 shows the military power of the countries of Asia and the Pacific region.

The USA was ranked first among the surveyed countries in Asia and the Pacific region. Their military power from 1992 until now has exceeded one-fifth of the world's share. In 1992, the USA recorded its largest share, as much as 255 mM, or 25.5%. This is a huge advantage over other countries. Only China, by strengthening its military potential, in 2022 had a military power half that of the United States. Despite this, since 1992 their military strength has increased 3.4 times. India also more than doubled its position in this regard, from 18.62 mM in 1992 to 41.60 mM in 2020. Among most other countries in the Asia-Pacific region, there have been uneven and slight increases in military power, in particular in Australia, the Philippines, Indonesia, South Korea, Mexico, New Zealand, Singapore and Vietnam. Japan, on the other hand, lost 36% of its power in the analyzed range from 27.19 mM in 1992 to 17.85 mM in 2022, the decline also affected Canada, Thailand and

Table 2. Military power of the countries of Asia and the Pacific region in mM, i.e. world = 1000

State	1992	1997	2002	2007	2012	2017	2022
<b>Australia</b>	9.74	9.96	9.07	11.31	12.22	13.03	14.51
<b>China</b>	33.43	39.06	56.54	63.23	90.59	115.20	115.22
<b>Philippines</b>	2.26	3.01	2.35	2.42	2.58	3.25	3.754
<b>India</b>	18.62	25.46	28.50	32.83	36.54	48.66	41.15
<b>Indonesia</b>	4.91	7.54	4.05	5.58	7.28	9.03	7.95
<b>Japan</b>	27.19	28.49	26.20	19.64	21.07	17.95	17.85
<b>Canada</b>	14.003	10.78	10.17	12.13	11.08	12.19	12.40
<b>South Korea</b>	14.38	15.91	14.46	16.67	14.80	17.10	17.12
<b>Mexico</b>	4.33	4.82	5.80	5.58	5.74	5.43	5.19
<b>New Zealand</b>	1.18	1.36	1.02	1.18	1.10	1.20	1.48
<b>Russia</b>	68.64	38.54	29.27	46.16	55.83	50.84	47.16
<b>Singapore</b>	0.79	1.50	1.37	1.31	1.30	1.25	2.58
<b>Thailand</b>	5.70	6.08	4.06	4.65	5.17	5.79	5.25
<b>Taiwan</b>	11.37	11.52	9.14	6.38	5.42	5.14	6.25
<b>The USA</b>	255.18	218.83	239.52	240.39	222.94	206.71	225.22
<b>Vietnam</b>	1.66	2.97	0.77	2.95	3.69	4.92	5.25
<b>world</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>

Source: own research.

Taiwan. Russia is also a country that has experienced a significant decline in military power (Sulek, Białoskórski, 2018). In 1992, its global share was 68.64 mM, it was the highest indicator in the period under study, later it decreased to the lowest level in 2002 – 29.27 mM. However, in the following years there was a rebound of the trend and further increases, which were stopped after another peak in 2012 (55.83 mM). In 2022, Russia's share in world power was 47.16 mM (4.7%). On the basis of military power, a unipolar system was created in the studied region of the world, with the USA having a great advantage over other countries, including China.

Geopolitical power combines the general and military power of states, providing even more objective data on the real position of a given state in the balance of power. Without a developed military power, it is impossible to build a strong geopolitical power. Table 3 presents the power of the countries in the Asia-Pacific region from 1992 to 2022.

The strongest geopolitical power in the years 1992–2022 was the USA, from 223.33 mM to 201.65 mM (a decrease of 22%). However, they did not maintain a constant trend in this respect; years of increasing power were separated by years of decline. The second country that significantly improved its results and ranks second in the Asia-Pacific region is China. Their geopolitical power increased by 3.8 times, from 34.74 mM in 1992 to 132.79 mM in 2022. India also strengthened its position in this respect, its power increase was 100% between 1992 and 2022. Spectacular Japan recorded a decline from 40.97 mM to 21.34 mM in 2020. The situation is similar with Russia, which lost 16.1 mM, or 29.5% of its geopolitical power. from 1992 to 2022. The balance of power in the Asia-Pacific

Table 3. Geopolitical power of countries in the Asia-Pacific region in mM, i.e. world = 1000

State	1992	1997	2002	2007	2012	2017	2022
<b>Australia</b>	10.59	10.92	9.81	11.92	13.73	13.51	14.38
<b>China</b>	34.74	44.30	60.13	70.50	102.54	127.51	132.79
<b>Philippines</b>	2.78	3.50	2.88	3.03	3.41	4.02	4.39
<b>India</b>	20.54	25.97	28.74	34.15	37.93	48.86	42.80
<b>Indonesia</b>	6.480	8.93	6.14	7.85	10.58	11.86	10.70
<b>Japan</b>	40.97	40.38	36.37	27.27	28.57	23.62	21.34
<b>Canada</b>	16.25	13.56	13.34	15.27	14.40	14.35	13.91
<b>South Korea</b>	12.88	14.47	13.47	15.20	13.51	15.41	15.03
<b>Mexico</b>	8.26	8.96	11.03	9.99	9.63	9.03	8.36
<b>New Zealand</b>	1.32	1.52	1.26	1.45	1.39	1.50	1.61
<b>Russia</b>	54.67	32.68	25.31	40.45	48.66	42.51	38.54
<b>Singapore</b>	0.68	1.20	1.10	1.07	1.11	1.08	2.21
<b>Thailand</b>	5.77	6.11	4.50	5.07	5.61	6.10	5.43
<b>Taiwan<sup>1</sup></b>	9.43	9.63	7.92	5.81	5.10	5.00	5.77
<b>The USA</b>	223.33	200.88	219.92	211.77	195.41	187.87	201.65
<b>Vietnam</b>	1.51	2.65	1.26	2.86	3.63	4.76	5.20
<b>world</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>	<b>1000</b>

Source: own research

region in terms of geopolitical power is characterized by a significant advantage of the USA over other entities, including China. Other countries do not play a major role in this respect.

## 5. POWER STATUS OF THE STATES OF THE ASIA-PACIFIC REGION ACCORDING TO PROFESSOR SUŁEK'S CRITERIA

The adoption of synthetic power measures allows ranking countries according to the adopted ranges marking the classification of powers. The advantage of this is the use of qualitative and quantitative factors. Unfortunately, there is no common division of countries according to their power; the article uses the classification created by Professor Sułek, according to which: the SM superpower (has over 18% of the world's power), the World's world power MŚ (12–18% of the world's power), the great power of the WM (7–12% of world power), regional power MR (3–7% of world power), local power ML (1–3% of world power), small power MM (0.1–1% of world power), microstate (less than 0,1% of the world's power) (Białoskórski, Kiczma, Sułek, 2018). The power status of states of Asia and the Pacific region are presented in tables 7, 8 and 9.

Table 7 presents power status based on the general power; only the USA met the superpower criterion in the analyzed period in 2002. In the remaining five-year years, being a world power. In the case of China, the observed results show the growing power of this country, from a regional power to a great power and, since 2012, a global power, just like the USA. Therefore, international relations in the Asia-Pacific region can be described as bipolar, taking into account overall power. Among the remaining countries, only Japan and, since 2012, India have met the criteria of a regional power. Russia played the same role only in 2012.

The criteria of the power status based on military power (Table 8) indicate the hegemonic position of the USA as a superpower, which has never fallen below this level in the period under study. Only China has managed to achieve great power status since 2012, and in 2020 it became a world power. Among other countries, Russia and India have gained the status of a regional power due to their expanded military potential.

Power status based on military power is associated with the so-called militarization rates. They were also calculated on the basis of synthetic power measures of Professor Sułek's model. Three types of militarization of countries in Asia and the Pacific region are presented in tables 4, 5 and 6.

In addition to the basic measures of state power, there are derived measures that describe a given country to an even greater extent and place it in a specific place in the international hierarchy. Such measures include, among others: parameter of militarization of states. Defined as  $q$  – a dimensionless quantity, it is the ratio of military power to economic/general power:

$$q = \frac{P_w}{P_e}$$

It also determines the mobilization of funds that have been allocated for military purposes. In this case, the values for the world are equal to 1. Countries with militarization greater than 1 are above the world average, and those with less than 1 are below the average.

We count militarization in three forms: economic militarization –  $m_e$  (general) as the share of military power in the economic (general) power), militarization of GDP as the share of military expenditure in GDP in and demographic militarization as the share of the number of active-duty soldiers in the general population (with appropriate power exponents – according to the model). We treat countries with militarization greater than 1 as highly militarized, and countries with a militarization score below 1 as weakly militarized (Białoskórski, Kiczma, Sułek, 2019).

The high level of GDP militarization relative to demographic militarization indicates that the state maintains small and professional armed forces, but at a high level of equipment and training. In the opposite situation, we usually deal with a large army, mainly conscripted, less equipped and trained.

Table 4 presents the economic militarization rates (ME) of countries in Asia and the Pacific region in 1992, 2007 and 2022.

Economic militarization indicators ( $m_e$ ) (Table 4) of the countries of Asia and the Pacific region indicate that the first four places in 1992 were: Russia – as many as 2,567, Taiwan, Singapore, the USA (all others above 1.5); in 2007 – Singapore 2,192, Russia, the USA, Taiwan; in 2022 – Russia 2,213, Singapore, South Korea, the USA. The lowest rates at this time were achieved by Mexico, Indonesia, Japan and the Philippines. The high level of militarization in the case of Russia and the USA indicated the active foreign and military policy pursued by these countries in the world, including interventions in other countries. In the case of Taiwan, Singapore and South Korea. high militarization indicates threats to these countries from others and the need to have armed forces adequate to the threat.

Table 4. Indicators of militarization of the economy ( $m_e$ ) Asia and the Pacific countries in 1992, 2007 and 2022

State/ $m_e$	1992	State/ $m_e$	2007	State/ $m_e$	2022
Russia	2.567	Singapore	1.454	Russia	2.213
Taiwan	2.044	Russia	1.341	Singapore	1.772
Singapore	1.786	The USA	1.279	South Korea	1.576
The USA	1.599	Taiwan	1.036	The USA	1.458
South Korea	1.452	South Korea	1.021	Taiwan	1.302
Vietnam	1.373	Vietnam	1.005	Vietnam	1.032
Thailand	0.967	India	1.001	Australia	1.027
China	0.895	Australia	0.930	Thailand	0.909
Australia	0.793	Thailand	0.838	India	0.893
India	0.763	China	0.703	New Zealand	0.783
New Zealand	0.750	New Zealand	0.686	Canada	0.733
Canada	0.675	Philippines	0.671	China	0.686
Philippines	0.590	Canada	0.650	Philippines	0.663
Indonesia	0.511	Japan	0.537	Japan	0.630
Japan	0.397	Indonesia	0.490	Indonesia	0.490
Mexico	0.269	Mexico	0.321	Mexico	0.353

Source: own research.

Table 5 presents the GDP militarization rates of countries in Asia and the Pacific in 1992, 2007 and 2022.

Table 5. Indicators of militarization GDP ( $m_{GDP}$ ) of countries in the Asia-Pacific region in 1992, 2007 and 2022

State/ $m_{PKB}$	1992	State/ $m_{PKB}$	2007	State/ $m_{PKB}$	2022
Russia	2.046	The USA	1.454	Russia	1.726
Taiwan	1.526	Singapore	1.341	Singapore	1.356
The USA	1.432	Russia	1.279	The USA	1.320
Singapore	1.333	Taiwan	1.036	South Korea	1.161
Vietnam	1.108	South Korea	1.021	India	1.093
South Korea	1.087	India	1.005	Australia	1.057
China	0.998	Vietnam	1.001	Taiwan	1.050
India	0.984	Australia	0.930	Vietnam	0.902
Thailand	0.950	China	0.838	New Zealand	0.855
Australia	0.818	Thailand	0.703	Canada	0.804
New Zealand	0.812	Philippines	0.686	Thailand	0.790
Canada	0.742	New Zealand	0.671	China	0.782
Philippines	0.734	Canada	0.650	Philippines	0.778
Indonesia	0.647	Japan	0.537	Japan	0.671
Japan	0.476	Indonesia	0.490	Indonesia	0.559
Mexico	0.320	Mexico	0.321	Mexico	0.389

Source: own research.

The militarization indicators of GDP (mGDP) (Table 5) of the countries in the study region show that the highest positions were achieved in 1992 – Russia 2,046, Taiwan, USA, Singapore; in 2007 – the USA 1,454, Singapore, Russia, Taiwan; in 2022 – Russia 1,726, Singapore, the USA, South Korea. Mexico, Indonesia and Japan again achieved the lowest GDP militarization.

Table 6 presents the rates of demographic militarization of countries in Asia and the Pacific region in 1992, 2007 and 2022.

Table 6. Demogr. militarization indicators. (ma) countries in the Asia-Pacific region in 1992, 2007 and 2022

State/ma	1992	State/ma	2007	State/ma	2022
<b>Singapore</b>	1.340	<b>Singapore</b>	1.634	<b>South Korea</b>	1.357
<b>Taiwan</b>	1.339	<b>South Korea</b>	1.333	<b>Singapore</b>	1.307
<b>South Korea</b>	1.337	<b>Taiwan</b>	1.315	<b>Russia</b>	1.283
<b>Russia</b>	1.254	<b>Roussia</b>	1.243	<b>Taiwan</b>	1.239
<b>Vietnam</b>	1.239	<b>Thailand</b>	1.119	<b>Thailand</b>	1.151
<b>The USA</b>	1.117	<b>Vietnam</b>	1.097	<b>Vietnam</b>	1.147
<b>Tailand</b>	1.018	<b>The USA</b>	1.070	<b>The USA</b>	1.105
<b>Australia</b>	0.969	<b>Australia</b>	0.925	<b>Australia</b>	0.972
<b>New Zealand</b>	0.923	<b>Mexico</b>	0.923	<b>Japan</b>	0.939
<b>Canada</b>	0.908	<b>Indonesia</b>	0.914	<b>New Zealand</b>	0.916
<b>China</b>	0.897	<b>China</b>	0.888	<b>Canada</b>	0.912
<b>Mexico</b>	0.839	<b>India</b>	0.887	<b>Mexico</b>	0.909
<b>Japna</b>	0.834	<b>New Zealand</b>	0.883	<b>China</b>	0.877
<b>Philippines</b>	0.804	<b>Canada</b>	0.866	<b>Indonezsia</b>	0.877
<b>Indonesia</b>	0.789	<b>Japan</b>	0.860	<b>Philippines</b>	0.851
<b>India</b>	0.776	<b>Philippines</b>	0.834	<b>India</b>	0.817

Source: own research.

Demographic militarization indicators (md) of countries in Asia and the Pacific region (Table 6) show that the highest among the surveyed countries in 1992 were: Singapore 1,340, Taiwan, South Korea, Russia; in 2007: Singapore 1,634, South Korea, Taiwan and Russia; in 2022 South Korea 1,357, Singapore, Russia, Taiwan.

The power status of the countries of the Asia-Pacific region based on geopolitical power is presented in table 9. Similarly to the basis of military power, only the USA has an unshakable position as a superpower. Among the remaining countries, only China has the status of a world power, and India and Russia, due to their great military power, maintain the level of a regional power according to the adopted criteria. Table 9 also shows the decline in the importance of Japan in recent decades, as a result of which the country lost its position as a regional power in favor of a local one.

The presented results make us aware of the possibility of China gaining the status of a superpower in the coming decades, while the US must fight to maintain its global position, with the rapidly developing countries of the Asia-Pacific region, which in the game for power may take away some of Washington's current advantage.



## 6. CONCLUSIONS

The purpose of the paper was to characterize the power status of Asia-Pacific countries based on synthetic power measures based on Professor Sułek's model. Synthetic criteria of great power allow one to classify countries based on power measures into appropriate ranges. Based on its economic power in the period under study, the USA had the status of a world power in the years 1992–2001 and from 2012 to 2022. Only in the years 2002–2006 did it achieve the status of a superpower. The main competitor of the USA in the Pacific region - China, achieved the status of a world power in 2012, having previously been a great power and a regional power. It was only in 2007 that India became a regional power. Russia, however, had the status of a regional power only in the years 2012–2016, and was a local power between those years.

Based on its military power, the USA was a superpower throughout the entire period, which only confirmed the leading role of this country in guaranteeing international security. None of the other countries in the Pacific region achieved such status or the role of a world power during the period under study. Only China has had the status of a great power in this respect since 2012. India and Russia also have a strong position in this respect, which we can describe as regional powers since 2007 in terms of superpowers based on military power.

In terms of measures of geopolitical power, the USA has had the status of a superpower throughout the period, while China has become a world power since 2017. Among the remaining countries, only India and Russia have had the status of regional powers in this respect since 2007.

Research on the power status and the position of states allows us to achieve not only cognitive goals, but also contribute to making better decisions, for example in the field of security strategies of individual states.

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## ATTACHMENT

Table 7. Power status of countries in the Asia-Pacific region based on the general power

State	1992	1997	2002	2007	2012	2017	2022
Australia	ML	ML	ML	ML	ML	ML	ML
China	MR	MR	MR	WM	MŚ	MŚ	MŚ
Philippines	MM	MM	MM	MM	MM	MM	MM
India	ML	ML	ML	MR	MR	MR	MR
Indonesia	MM	ML	ML	ML	ML	ML	ML
Japan	MR	MR	MR	MR	MR	MR	ML
Canada	ML	ML	ML	ML	ML	ML	ML
South Korea	MM	ML	ML	ML	ML	ML	ML
Mexico	ML	ML	ML	ML	ML	ML	ML
New Zealand	MM	MM	MM	MM	MM	MM	MM
Russia	ML	ML	ML	ML	MR	ML	ML
Singapore	-	-	-	-	-	-	MM
Thailand	MM	MM	MM	MM	MM	MM	MM
Taiwan	MM	MM	MM	MM	MM	MM	MM
The USA	MŚ	MŚ	SM	MŚ	MŚ	MŚ	MŚ
Vietnam	MM	MM	MM	MM	MM	MM	MM

Source: own research.

Table 8. Power status of countries in the Asia-Pacific region based on the military power

State	1992	1997	2002	2007	2012	2017	2022
Australia	MM	MM	MM	ML	ML	ML	ML
China	MR	MR	MR	MR	WM	WM	WM
Philippines	MM	MM	MM	MM	MM	MM	MM
India	ML	ML	ML	MR	MR	MR	MR
Indonesia	MM	MM	MM	MM	MM	MM	MM
Japan	ML	ML	ML	ML	ML	ML	ML
Canada	ML	ML	ML	ML	ML	ML	ML
South Korea	ML	ML	ML	ML	ML	ML	ML
Mexico	MM	MM	MM	MM	MM	MM	MM
New Zealand	MM	MM	MM	MM	MM	MM	MM
Russia	MR	MR	ML	MR	MR	MR	MR
Singapore	-	MM	MM	MM	MM	MM	MM
Thailand	MM	MM	MM	MM	MM	MM	MM
Taiwan	ML	ML	MM	MM	MM	MM	MM
The USA	SM	SM	SM	SM	SM	SM	SM
Vietnam	MM	MM	-	MM	MM	MM	MM

Source: own research.

Table 9. Power status of countries in the Asia-Pacific region based on the geopolitical power

State	1992	1997	2002	2007	2012	2017	2022
Australia	ML	ML	MM	ML	ML	ML	ML
China	MR	MR	MR	WM	WM	MŚ	MŚ
Philippines	MM	MM	MM	MM	MM	MM	MM
India	ML	ML	ML	MR	MR	MR	MR
Indonesia	MM	MM	MM	MM	ML	ML	ML
Japan	MR	MR	MR	ML	ML	ML	ML
Canada	ML	ML	ML	ML	ML	ML	ML
South Korea	ML	ML	ML	ML	ML	ML	ML
Mexico	MM	MM	ML	MM	MM	MM	MM
New Zealand	MM	MM	MM	MM	MM	MM	MM
Russia	MR	MR	ML	MR	MR	MR	MR
Singapore	-	MM	MM	MM	MM	MM	MM
Tajlandia	MM	MM	MM	MM	MM	MM	MM
Tajwan	MM	MM	MM	MM	MM	MM	MM
USA	SM	SM	SM	SM	SM	SM	SM
Wietnam	MM	MM	MM	MM	MM	MM	MM

Source: own research.



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## THE DETERMINANTS OF ELECTRIC SCOOTER ACCEPTANCE AMONG STUDENTS AS A MANIFESTATION OF ADAPTING TO THE REQUIREMENTS OF E-MOBILITY, USING THE TECHNOLOGY ACCEPTANCE MODEL

One of the biggest challenges for modern metropolises is the problem of public transportation. Barriers to the development of urban transport, the expansion of private vehicles, congestion of beehives, traffic jams, parking problems, and the negative impacts of transport on the environment are causing an increase in interest in shared micromobility. Electric scooters are one of these innovative solutions. This article aims to construct a model for the acceptance of electric scooters among students. The authors employed the technology acceptance model, and used the SmartPLS 4. Program to reconstruct the model. The basis of the model was a CAWI survey on a sample of 442 students. On this basis, the study verified the hypotheses on the relationships between the factors influencing the acceptance of electric scooters: demographic characteristics, perceived usefulness, ease of use, attitudes towards this solution, and behavioral intentions.

**Keywords:** micromobility, e-mobility, shared mobility, e-scooter, environmentally friendly technologies, Technology Acceptance Model (TAM).

### 1. INTRODUCTION

The functioning of modern metropolitan cities poses great challenges in many areas. One of them is the problem of developing urban transportation means (United Nations, 2017; Mavlutova et al., 2023; Barreto, Neto, Carazza 2021; Cloud, Heß, Kasinger, 2023).

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With the development of civilization, increasing urbanization, growing urban population, and emerging barriers to public transportation due to the dynamic intensification of urban traffic, there has arisen a need for new means of transport that would relieve the road infrastructure from excessive congestion while providing the ability to travel short distances without the need to use public transport. The resolution to this issue has been the implementation of a shared mobility system, i.e. movement by means of transportation used by multiple users (cars, bicycles or electric scooters) rented for a specified period of time (Mering, Wachnicka, 2021) in the form of collaborative consumption (sharing economy), which is viewed as an essential element of sustainable development (Dąbrowska, Janoś-Kresło, 2018).

In addition, the escalating issue of environmental pollution, including greenhouse gas emissions has drawn attention to the need to seek environmentally friendly transportation means, resulting in the development of e-mobility. The introduction of innovative mobility solutions that utilize collaborative consumption has a positive impact on the environment (Lienkamp 2012; Baptista, Melo, Rolim, 2014; Severengiz, Finke, Schelte, Forrister, 2020). Promoting these solutions can bring tangible results in reducing air pollution and noise (European Commission, 2018).

Electric mobility (e-Mobility) is a term related to the development of electric-powered vehicles. Responding to the increasing need for sustainable transportation, electric vehicles emerge as a compelling choice for both businesses and individuals. They serve as either an initial investment in cleaner transport or a strategy for partially or wholly converting existing fleets from dependence on fossil fuel, thereby reducing greenhouse gas emissions (GHG).

The newest means of transportation that fulfils both the criteria of collaborative consumption and e-mobility are electric scooters. Electric scooters are gaining increasing popularity and are becoming more readily available (Foissaud, Gioldasis, Tamura, Christoforou, Farhi, 2022) and used primarily for short (up to 10 km) distances (Yang et al., 2020). Their development dates back to the last few years - worldwide, between 2018 and mid-2022, more than \$5 billion was invested in the development of services enabling shared electric scooters (Heineke, Kloss, Scurtu, 2020).

In Poland, the e-mobility market is characterized by high dynamics (Kubik, 2022). According to data from September 2023, nearly five years after the introduction of the first electric scooters, there are almost 93,000 electric scooters available for rent through apps in nearly 210 localities (*Between euphoria...*).

The phenomenon of the perception and acceptance of electric scooters as new and environmentally friendly means of public transportation, especially those rented via applications, has not been thoroughly examined in academic literature. The available publications - both in Poland and in other countries - generally refer to aspects of their use in the context of solving traffic problems (Smith, Schwieterman, 2018), environmental pollution (Moreau et al., 2020), the lack or inadequacy of existing regulations (traffic laws) regarding driving or parking (Mering, Wachnicka 2021; Allem, Majmundar, 2019; Ajao, 2019) or the safety or risk of scooter use related to accidents and injuries (Mering, Wachnicka 2021; Yang et al., 2020; Badeau et al., 2019; James, Swiderski, Hicks, Teoman, Buehler, 2019; Sikka, Vila, Stratton, Ghassemi, Pourmand, 2019; Trivedi, 2019; Blomberg, Rosenkrantz, Lippert, Christensen, 2019; Yang, 2010; Namiri et al., 2020; Stigson, Malakuti, Klingegard, 2021). In contrast, the issue related to factors influencing the acceptance, or lack thereof, of such transportation solutions among potential users has

received relatively little attention. In this context, the authors felt it appropriate to undertake such a research problem.

This article aims to construct an acceptance model for electric scooters among Warsaw university students. For this purpose, the authors used the technology acceptance model proposed by Davis, Bagozzi, Warshaw (1989). As a tool for reconstructing the model, the authors applied the SmartPLS 4. program by Ringle, Wende, Becker (2022).

This article consists of several sections. In the first section, the authors present the theoretical framework of the problems addressed in the study. The second section describes the methodology of the research. The third section presents the results obtained. The fourth section contains a discussion of the findings, while the fifth section includes a summary, conclusions, limitations and directions for further research.

## 2. THEORETICAL FRAMEWORK

### 2.1. Electric scooters as a means of urban transportation

In recent years, cities worldwide have witnessed the emergence of new mobility alternatives, including micromobility. The concept of micromobility, as exemplified by electric scooters, finds its origins in the development of the new mobility paradigm (Sheller, 2011; Fortunati, Taipale, 2017; Brunner, Hirz, Hirschberg, Fallast, 2018). While the term is becoming more prevalent in literature on transportation (e.g. Anderson-Hall, Bordenkircher, O'Neil, Scott, 2019; Clewlow, 2018; McKenzie, 2019), it often lacks a precise and universally accepted definition. Broadly speaking, micromobility encompasses short-distance personal transportation using lightweight vehicles or small-size devices, especially powered two-wheelers (Eccarius, Lu, 2020). The growing interest in micromobility is firmly grounded in the broader notion of fostering sustainable and eco-friendly consumption practices. We can cite numerous studies that underscore the significance of this trend across diverse regions worldwide and in Poland (Zhao et al., 2020; Yao, Guo, Wang, Jiang, 2022; Hasterok et al., 2021; Sobczyk, Sobczyk, 2021; Witek, Kuźniar, 2021; Lundheim, Pellegrini-Masini, Klöckner, Geiss, 2022).

Micromobility, as a concept, highlights several primary advantages within the area of transportation. Potential benefits encompass a reduced carbon footprint and a decrease in road space occupancy. In addition, a shared micromobility service can improve access to motorized personal transportation for economically or socially disadvantaged groups that cannot afford a private vehicle.

This paper focuses on the introduction of electric scooters, often referred to as "e-scooters", which represent a relatively new form of micromobility experiencing growing adoption rates globally (Yang, 2010; Clewlow, 2018; McKenzie, 2019; Reck, Guidon, Haitao, Axhausen, 2021; Sandt, 2019; Seebauer, 2015) in both urban and suburban landscapes (Aartsma, 2020; Aguilera-García, Gomez, Sobrino, 2020; Tyrinopoulos, Antoniou, 2020).

In contemporary urban settings, electric scooters have emerged as the primary mode of shared transportation. In the US, for example, the number of trips already exceeded the number of rides on shared bikes without docking stations in 2018 – one year after the access system was launched (James, Swiderski, Hicks, Teoman, Buehler, 2019; *National Association...*). In most systems, electric scooters can be parked anywhere in the service area. As a flexible mode of transportation, electric scooters can play a key role in solving the first- and last-mile problem by bridging the gap between a cyclist's home or destination

and public transportation stops. Electric scooters can be part of car-free mobility, along with bicycles, public transportation and walking (Ajao, 2019).

The use of electric scooters has many advantages, benefiting both individual users and society as a whole. Due to their increasing availability, electric scooters are seen as an increasingly common and convenient means of transportation (Shaheen, Cohen, 2019; Guidon, Becker, Dediu, Axhausen, 2019). Their advantages also include small size and weight (Matyja, Kubik, Stanik, 2022), making travel more attractive, reducing travel time, allowing its users to avoid urban traffic jams (Kijewska, Iwan, 2019), alleviating traffic problems by reducing road congestion (traffic jams), lowering the number of traffic accidents (Shaheen, Cohen, 2019; Gössling, 2020; Abduljabbar, Liyanage, Dia, 2021; Astegiano, Fermi, Martino, 2019; Sperling, Pike, Chase, 2018; Qiu, He, 2018; Bieliński, Ważna, 2020), and reducing greenhouse gas emissions and noise (Leuenberger, Frischknecht, 2010; Bishop, Doucette, Robinson, Mills, McCulloch, 2011; Sheng, Zhou, Zhou, 2016; Hsieh, Chang, Yu, Wu, 2018). In this context, electric scooters are seen as vehicles which are environmentally friendly (Moreau et al., 2020). The common characteristic of all e-scooter providers is that they position e-scooters as a “green” solution for mobility. Considering different modes of transportation, electric scooters are among the most energy-efficient – apart from walking and cycling, where energy consumption does not occur at all. E-scooters are also seen as the most efficient means of transportation (energy use per meter per person is only 20 joules, while, for example: subway – 30 joules, electric bus – 87, car – 380) (*Tier The 7 Myths...*). However, some authors point out the short life cycle of electric vehicles and the high energy intensity of their production (Elliot, McLaren, Sims, 2018).

Still, the negative effects of the development of this mode of travel are also recognized. They are primarily related to the safety of road users due to the lack of or failure to comply with appropriate regulations pertaining to electric scooter usage such as the age of users, speed, the arteries of traffic (such as sidewalks) used, the allocation of right-of-way in relation to pedestrians, bicycles or cars, safety related to the abandonment of vehicles in public spaces, in a way that impedes other users (James, Swiderski, Hicks, Teoman, Buehler, 2019; Hollingsworth, Copeland, Johnson, 2019; Sanders, Branion-Calles, Nelson, 2020). The discussion of safety risks associated with electric scooters is also related to the relatively high number of injuries from electric scooter-related accidents (Choron, Sakran, 2019).

There are also some limitations related to access to equipment and docking stations, as well as long charging times for the scooters. There is also no clear evidence that the use of electric scooters is beneficial to the development of the urban mobility model (Kos, Krawczyk, Tomanek, 2020). This is because the use of electric scooters necessitates the use of a digital media platform, often a mobile application (“app”) provided by the electric scooter company on a smart device (Ratan et al., 2021).

Multiple studies point to the increasing popularity of electric scooters, revealing variations in the acceptance of e-mobility solutions based on demographic characteristics (Akar, Fischer, Namgung, 2013; Murphy, Usher, 2015). It emerges that these are primarily modes of transportation used by young people (Hardt, Bogenberger, 2019).

Studies on shared e-mobility indicate that the main users are young people, usually between the ages of 21 and 45, well-educated, with medium to high incomes, living in urban areas (Kubik, 2022; Lin, Liu, Yang, Lin, 2021). The special characteristics of the young generation of consumers, especially those belonging to Generation Z, include the fact that they are confident, open-minded, accepting of diversity and innovation in many



areas (which also applies to movement and transport), expecting immediate satisfaction of their needs, living and functioning according to the principle of just in time, oriented toward convenience in the use of goods and services, combining work and private life, socially oriented and deeply committed to social responsibility, including alleviating the issue of global warming and pollution, wanting to be seen as caring for the environment without, however, incurring substantial expenses in the process (Kim, McInerney, Rüdiger Smith, Yamakawa, 2022; Wielki, 2020).

Motivations regarding scooter use and perceptions are multidimensional. They are influenced by whether the respondent has already used them or not (James, Swiderski, Hicks, Teoman, Buehler, 2019; Kopplin, Brand, Reichenberger, 2021), situational context (Choi, Kwak, Yang, Lim, Woo, 2022; Jiao, Bai, 2020) concern for the environment (Seebauer, 2015; Gössling, 2020; Zhang, Chang, 2023) or the demographic characteristics of a given respondent (Laa, Leth, 2020; Lee, Baek, Chung, Kim, 2021; Mitra, Hess, 2021; Reck, Axhausen, 2021).

Badia and Jenelius (2023) distinguished between six types of purposes for using e-scooters: work (commuting, work-related trips and school), public transport (connection to stops/stations), social/entertainment (restaurants, visits to friends, etc.), fun/recreation (exercise or tourism among others), shopping/errands (e.g. health appointments), and other. McKenzie (2019) and Sanders et al. (2020) note, in turn, that electric scooters are used differently, either as a means of transportation for commuting to work/school or for recreation. In doing so, some studies show that electric scooters are used more often for commuting to work or school than for recreation (Gebhardt, Ehrenberger, Wolf, Cyganski, 2022), while others indicate that they are used more often for tourist and recreational trips (McKenzie, 2019).

## 2.2. Legal regulations concerning the use of electric scooters in Poland

One of the key aspects of using electric scooters is the issue of ensuring the safety of all traffic participants. Given that electric scooters represent a relatively new phenomenon, a comprehensive regulatory framework is still in development. This lack of established regulations leads to a certain degree of freedom of use and consequently carries risks for both e-scooter users and other road traffic participants (Sanders, Branion-Calles, Nelson, 2020). In many European countries or the USA, attempts are being made to regulate this phenomenon. They primarily concern the minimum age of the user, maximum speed, the need to ride on the roadway or bike path and the prohibition of riding on sidewalks, treating electric scooters similarly to bicycles (Mering, Wachnicka, 2021).

In Poland, the first regulations on electric scooters (*Road Traffic...*) came into force on May 20, 2021. Previously, scooters were included in road regulations, which led to conflicts between pedestrians and scooter riders and resulted in dangerous situations on the roads. The new regulations have introduced a definition of an electric scooter as “an electrically-powered, two-axle vehicle, with a steering wheel, without a seat or pedals, structurally designed to be driven solely by the driver on the vehicle” (*A guide before...*), and categories of assistive mobility devices (UWR, *urządzenie wspomagające ruch*) and personal transportation devices (UTO, *urządzenie transportu osobistego*), which included electric scooters, rollerblades, skateboards, etc. (*Electric scooters...*).

Drivers of electric scooters must use bicycle paths or bike lanes, if available (*Regulation of the..., 2021*), and the maximum speed effective from November 2, 2021 is 20 km/h on bike paths and roadways (*New rules from...*). Riding on sidewalks is allowed only in special cases, at a speed close to that of a walking pedestrian.

Adults do not need a driver's license to use an electric scooter, but minors (10–18 years old) must have a bicycle card or a driving license in category AM, A1, B1, or T. (*E-scooters...*). Children under the age of 10 can ride a scooter only under the supervision of an adult in a residential zone.

These vehicles are not subject to technical inspection (*On November...*) but the regulations specify the size and technical parameters and mandatory equipment of the electric scooter (*The Minister has...*). The scooter needs to be equipped with appropriate lights, brakes, reflectors and a bell or horn. Using a phone while riding is prohibited, as is transporting other people, animals or cargo/load. According to regulations, parking a scooter is only allowed in designated areas (*Electric scooters...*), and leaving it on the sidewalk requires compliance with certain rules.

Violating these regulations can result in fines and, in cases of parking violations, the scooter may be removed from the road at the owner's expense. The introduction of new regulations was aimed at regulating the use of electric scooters, ensuring the safety of users and other road users, and adapting the law to the new realities of electric personal transportation devices.

### 2.3. Development of Hypotheses

The use of electric scooters is significantly conditioned by demographic variables, among which young age plays a primary role (Mitra, Hess, 2021). Laa and Leth (2020) emphasize that electric scooters are most commonly used by young, educated males. Reck and Axhausen (2021) add to these three variables the additional factors of not having a family and being employed. The factors influencing the use of electric scooters are perceived somewhat differently by Lee et al. (2021), who do not focus on demographic characteristics, but rather on users having a higher income and being dissatisfied with public transportation. Costs associated with the use of an electric scooter are also an important factor – sometimes regarded as a decisive factor (Glavić, Milenković, Trifunović, Jokanović, Komarica, 2023).

H<sub>1</sub> – There is a relation between the age of respondents and the perceived usefulness of electric scooters.

H<sub>2</sub> – There is a relation between the size of the respondent's place of residence and the perceived usefulness of electric scooters.

H<sub>3</sub> – There is a relation between the financial situation of respondents and the perceived usefulness of electric scooters.

According to research conducted by Li, Sinniah, Li. (2022) the perceived ease of use of e-bikes has a positive effect regarding the perceived usefulness. The availability of electric scooters often presents a significant challenge. E-scooters are associated with barriers related to being able to find working equipment when needed (Sanders, Branion-Calles, Nelson, 2020).

H<sub>4</sub> – There is a relation between the perceived ease of use of electric scooters and their perceived usefulness.

Research conducted among Asian consumers shows that the ease of use of electric motorcycles perceived by people positively influences their attitudes toward using electric motorcycles (Mitra, Hess, 2021).

H<sub>5</sub> – There is a relation between the perceived usefulness of electric scooters and attitudes toward this device (Attitude towards technology).

H<sub>6</sub> – There is a relation between attitudes toward electric scooters (Attitude toward technology) and behavioural intentions to use them.

Research conducted among Asian consumers shows that people's attitudes toward using electric motorcycles positively influence their behavioural intentions toward electric motorcycles (Zhang, Chang, 2023). This is especially true for a comfortable way to travel, especially on hot days and compared to walking (Hollingsworth, Copeland, Johnson, 2019). However, negative aspects of using electric scooters are also recognized, with safety concerns coming to the forefront. Studies indicate that e-scooters are also associated with concerns about traffic safety (Sanders, Branion-Calles, Nelson, 2020).

H<sub>7</sub> – There is a relation between the perceived usefulness of electric scooters and behavioural intentions toward using them.

The study of Kopplin et al. (2021) shows that the intention to use e-scooters impacts their actual usage.

H<sub>8</sub> – There is a relation between behavioural intentions to use electric scooters and their actual usage.

H<sub>9</sub> – The relation between perceived usefulness associated with the use of e-scooters and behavioural intentions to use e-scooters is mediated by attitudes toward e-scooter technology.

### 3. METHODS

The aim of the article is to answer the question of which variables affect the intensity of the use of electric scooters among students. For this purpose, the authors used the technology acceptance model proposed by (Davis, Bagozzi, Warshaw, 1989) customizing it to suit the requirements of the technology acceptance concerning electric scooters. The survey was conducted in April 2023 on a sample of 442 students at the University of Warsaw. It is a public university located in the capital of Poland, Warsaw. To invite students to participate in the study, the system administrator sent them an email containing information about the research and a link to the online survey. Table 1 shows the characteristics of the survey sample. Among the respondents, more than 60% were women. The majority of respondents were individuals in the age group up to 24 years old. The average age of the respondents was 22. Nearly 60% of the respondents were individuals residing in cities with a population exceeding 200,000 residents. The overwhelming majority of respondents rated their financial situation as good and very good.

Table 1. Characteristics of the research sample

	Specification	N	%
Total		442	100.0
Gender	Male	160	36.2
	Female	282	63.8
Age	Under 24	393	88.9
	25–34	36	8.1
	35–55	13	2.9
Size of place of residence	Village	76	17.2
	Town up to 20 thousand residents	25	5.7
	Town 21–50 thousand residents	37	8.4
	City 51–200 thousand residents	44	10.0
	City of more than 200 thousand residents	260	58.8

Table 1 (cont.). Characteristics of the research sample

Specification		N	%
Perceived financial situation	Bad (I have barely enough for basic products and services)	2	0.5
	Sufficient (I can still make ends meet)	26	5.9
	Average (I have enough to live frugally)	72	16.3
	Good (I am not complaining, but it could be better)	248	56.1
	Very good (I have enough for everything, with some savings)	94	21.3

Source: own studies.

We adopted the variables proposed by Davis et. (1989) in the Technology Acceptance Model as variables affecting the intensity of electric scooter use and adapted them for the needs of this study. These variables include: perceived usefulness of using electric scooters (PU), ease of using electric scooters (PEOU), attitude toward electric scooters (ATT), behavioural intention related to using electric scooters (BI), and current use of electric scooters (AU). In addition, the model included variables such as the age of students (AGE), size of residence of students (POR) and financial situation of students (FS). Variables such as PU, PEOU, ATT, BI and AU are latent variables, composed of their respective loadings. Each loading was rated by respondents on a 5-point Likert scale, where 1 meant completely disagree with a given statement, 2 – disagree, 3 – neither disagree nor agree, 4 – agree, 5 – completely agree. Table 2 lists the statements/loadings describing the above latent variables.

Table 2. Description of the latent variables used in the model

Perceived usefulness of electric scooters (PU)	
PU1	Electric scooters are useful for commuting to work/university
PU2	Electric scooters are useful for running daily errands (shopping, picking up packages from parcel machines, etc.)
PU3	Electric scooters are useful for riding for pleasure
PU4	Bad weather conditions discourage me from using electric scooters
PU5	Using an electric scooter, I can charge my cell phone
PU6	Using electric scooters available for minute rentals allows for reducing costs of transportation (e.g., fuel costs, bus tickets, etc.).
PU7	The offer of electric scooters available for minute rentals is cost-effective
PU8	Using electric scooters available for minute rentals saves time
PU9	Electric scooters available for minute rentals are useful because they allow people to avoid infection by not having to use public transportation

Table 2 (cont.). Description of the latent variables used in the model

<b>Perceived ease of use of electric scooters (PEOU)</b>	
PEUO1	Riding an electric scooter is very simple / easy
PEUO2	Riding an electric scooter allows you to get virtually anywhere you want to go
PEUO3	The quality of the wheels on electric scooters enables a comfortable ride on uneven or poorly laid sidewalks.
PEUO4	While riding an electric scooter, overcoming unevenness on the road, e.g., holes in sidewalks, curbs are not a challenge
PEUO5	The technical capabilities of electric scooters enable reaching an adequate/satisfactory speed
PEUO6	There is a large number of electric scooters available for minute rentals near my location.
PEUO7	The application or applications enabling the use of electric scooters available for minute rentals are very user-friendly.
PEUO8	Electric scooters available for minute rentals are technically efficient.
PEUO9	Electric scooters available for minute rentals have a sufficient range
PEUO10	Operators provide transparent access to information about the pricing of electric scooters available for minute rentals.
PEUO11	Electric scooters available for minute rentals have high-quality brakes that enable comfortable riding.
PEUO12	Electric scooters available for minute rentals have high-quality suspension that allows for comfortable riding.
<b>Attitude towards technology like electric scooters (ATT)</b>	
ATT1	Riding an electric scooter is safe for users
ATT2	Riding an electric scooter is safe for the environment/other road users such as pedestrians
ATT3	Electric scooters provide entertainment associated with riding them
ATT4	Using electric scooters reduces noise pollution
ATT5	Riding an electric scooter improves physical fitness
ATT6	The use of electric scooters reduces congestion on roads
ATT7	Popularization of electric scooters contributes to reducing greenhouse gas emissions
ATT8	The popularization of electric scooters for minute rentals can make life difficult for other users because they are left / abandoned anywhere.
<b>Behavioural intentions regarding the use of electric scooters (BI)</b>	
BI1	In the future, I will be using the services of operators offering the option to rent electric scooters available for minute rentals
BI2	In the future, I intend to buy my own electric scooter
BI3	I will recommend others to use electric scooters available for minute rentals
BI4	I will recommend others to buy their own electric scooter

Source: own studies.

The age variable was described on a quantitative scale. Based on the year of birth given by the respondents, age was assigned to each of them. The variable size of residence was described on a five-point rank scale, where 1 – indicated a village, 2 – a town of up to 20,000 residents, 3 – a town of 21,000 – 51,000 residents, 4 – a city of 51,000 – 200,000

residents, 5 – a city above 200,000 residents. Perceived own financial situation was also described on a five-point rank scale, where: 1 means bad financial situation (barely enough for basic products and services), 2 sufficient (I still can make ends meet), 3 average (enough to live frugally), 4 good (I'm not complaining, but it could be better), 5 very good (I can afford everything and I can save some money). We used Partial Least Square Structural Equation Modelling (PLS-SEM) technique with SmartPLS software to verify the relations between the analysed variables (Wielki, 2020). Figure 1 shows our proposed conceptual model for the acceptance of electric scooters.

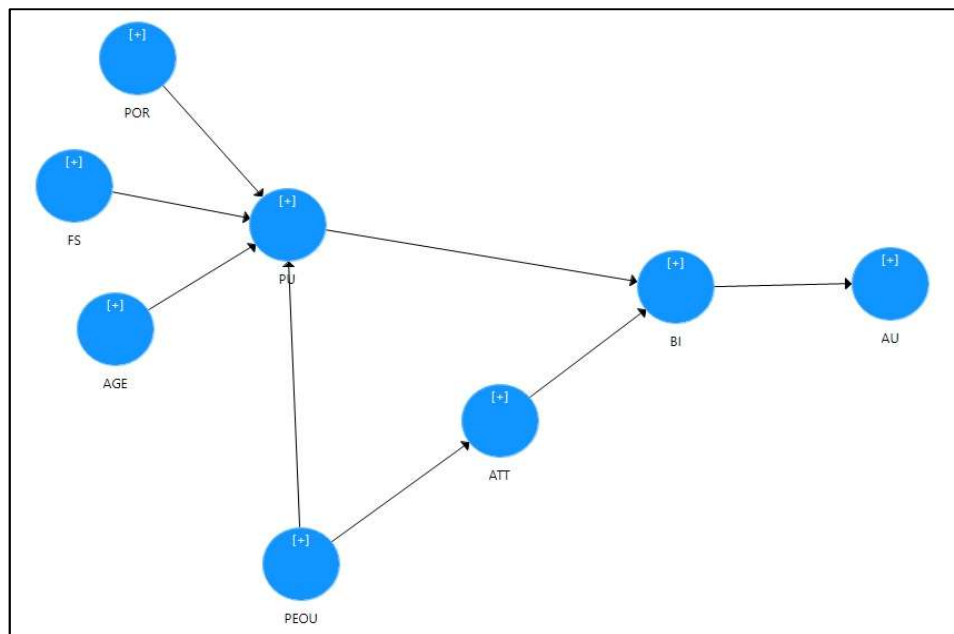


Figure 1. Conceptual model

Source: own studies.

## 4. RESULTS

### 4.1. Quality assessment of the proposed model

Using the aforementioned SmartPLS software (Wielki, 2020) we tested the reliability of the variance using Cronbach's alpha and Composite Reliability (CR). The reliability can be defined as the degree to which "measurements of individuals on different occasions, or by different observers, or by similar or parallel tests, produce the same or similar results" (Streiner, 2003). Cronbach Alpha measures the internal consistency of a test or scale; it is expressed as a number between 0 and 1. Internal consistency describes the extent to which all the items in a test measure the same concept or construct (Tavakol, Dennick, 2011). As Streiner (2023) points out, the minimum alpha value depends on the context. 0.50 to 0.60 for early stages of research, 0.80 for basic research tools and 0.90 for clinical trials. On the other hand, Hair, Ringle, Sarstedt (2011) propose the minimum acceptable value as 0.7. In Table 3, we see that for three variables, alpha is above 0.7. On the other hand, for the ATT

variable, it takes a value just below 0.7. On the other hand, Composite reliability for all latent variables analysed is above 0.7. Hair et al. [100] state that Composite reliability should be higher than 0.70 (in exploratory research, 0.60 to 0.70 is considered acceptable). In turn, the average variance extracted (AVE) should be higher than 0.50 (Hair, Ringle, Sarstedt, 2011; Chin, 2010). An AVE value of 0.50 and higher indicates a sufficient degree of convergent validity, meaning that the latent variable explains more than half of its indicators' variance (Hair, Ringle, Sarstedt, 2011). The first column refers to factor loadings. All items having factor loadings smaller than 0.6 were discarded and were not taken into account in further analysis. As stated by Hair, Ringle, Sarstedt (2011), indicators with loadings below 0.7 should be deleted. Factors loadings between 0.40 and 0.70 should only be considered for removal from the scale if deleting this indicator leads to an increase in composite reliability above the suggested threshold value. Another consideration in the decision to delete indicators is the extent to which their removal affects validity. Weaker indicators are sometimes retained on the basis of their contribution to content validity. Indicators that exhibit very low loadings of 0.40 and lower should, however, always be eliminated from reflective scales. In our case, further removal of items no longer increased validity and reliability.

Table 3. Items loadings, reliability and validity

	$\lambda$	Alpha	CR	AVE
ATT1	0.797	0.689	0.811	0.520
ATT2	0.727			
ATT3	0.719			
ATT4	0.631			
BI1	0.871	0.766	0.866	0.686
BI2	0.694			
BI3	0.905			
PEOU1	0.725	0.833	0.875	0.501
PEOU7	0.752			
PEOU8	0.776			
PEOU9	0.622			
PEOU10	0.679			
PEOU11	0.750			
PEOU12	0.636			
PU1	0.867	0.784	0.861	0.609
PU2	0.765			
PU3	0.757			
PU8	0.726			

Source: own studies.

The structural model in PLS can be evaluated using a coefficient of determination  $R^2$ . It measures the variance, which is explained in each of the endogenous constructs, and is therefore a measure of the model's explanatory power. The  $R^2$  ranges from 0 to 1, with higher values indicating a greater explanatory power (Hair, Risher, Sarstedt, Ringle, 2019). For the perceived usefulness of e-scooters  $R^2 = 0.376$ .

It means that variables such as POR, FS, AGE, and PEOU explain 37.6% of the variance in perceived usefulness. In the case of actual usage of electric scooters,  $R^2 = 0.310$ , for attitude toward e-scooters  $R^2 = 0.429$  and for behavioural intention  $R^2 = 0.342$ .

Table 4. Discriminant validity – cross loadings

	<b>ATT</b>	<b>BI</b>	<b>PEOU</b>	<b>PU</b>
ATT1	<b>0.797</b>	0.429	0.504	0.417
ATT2	<b>0.727</b>	0.455	0.393	0.276
ATT3	<b>0.719</b>	0.316	0.572	0.559
ATT4	<b>0.631</b>	0.332	0.406	0.430
BI1	0.490	<b>0.871</b>	0.538	0.460
BI2	0.310	<b>0.694</b>	0.323	0.309
BI3	0.498	<b>0.905</b>	0.499	0.475
PEOU1	0.557	0.472	<b>0.725</b>	0.553
PEOU7	0.435	0.443	<b>0.752</b>	0.501
PEOU8	0.506	0.395	<b>0.776</b>	0.434
PEOU9	0.379	0.333	<b>0.622</b>	0.319
PEOU10	0.432	0.298	<b>0.679</b>	0.348
PEOU11	0.495	0.416	<b>0.750</b>	0.425
PEOU12	0.405	0.365	<b>0.636</b>	0.338
PU1	0.490	0.442	0.507	<b>0.867</b>
PU2	0.411	0.400	0.392	<b>0.765</b>
PU3	0.473	0.401	0.464	<b>0.757</b>
PU8	0.446	0.339	0.510	<b>0.726</b>

Source: own studies.

In turn, Table 5 shows Discriminant validity using the Heterotrait-Monotrait Method (HTMT) developed by Henseler et al. (2015). The HTMT is defined as the mean value of the item relations across constructs (i.e., the heterotrait-heteromethod relations) relative to the (geometric) mean of the average relations for the items measuring the same construct (i.e., the monotrait-heteromethod relations) (Hair, Risher, Sarstedt, Ringle, 2019). There are two approaches to the HTMT threshold, helping to verify that discriminant validity has been established between each two constructs. Some authors suggest a threshold of 0.85, whereas others propose a value of 0.90 (Henseler, Ringle, Sarstedt, 2015). In our analyses, almost all pairs of latent variables fall within the stricter approach – the HTMT value does not exceed 0.85. For only one pair of latent variables, the HTMT value is 0.851. Table 6 presents descriptive statistics of the variables included in the analyses: mean, standard deviation and median.

Table 5. Discriminant validity using the Heterotrait-Monotrait Method (HTMT)

	<b>ATT</b>	<b>BI</b>	<b>PEOU</b>	<b>PU</b>
<b>ATT</b>				
<b>BI</b>	0.724			
<b>PEOU</b>	0.851	0.680		
<b>PU</b>	0.794	0.648	0.729	

Source: own studies.



Table 6. Descriptive statistics

	Mean	Median	Std. Dev.
ATT1	3.000	3.000	1.053
ATT2	2.529	2.000	1.087
ATT3	4.097	4.000	0.852
ATT4	3.844	4.000	0.932
BI1	3.210	3.000	1.242
BI2	2.265	2.000	1.287
BI3	2.817	3.000	1.179
PEOU1	3.869	4.000	1.051
PEOU7	3.876	4.000	0.947
PEOU8	3.548	4.000	0.861
PEOU9	3.489	4.000	0.893
PEOU10	3.559	4.000	0.921
PEOU11	3.362	3.000	0.890
PEOU12	3.172	3.000	0.857
PU1	3.964	4.000	0.997
PU2	3.658	4.000	1.131
PU3	4.161	4.000	0.967
PU8	3.898	4.000	0.878

Source: own studies.

#### 4.2. Verification of the hypotheses

Table 7 shows the verified hypotheses on the direct relations between the analysed variables. Hypothesis H<sub>1</sub> on stochastic independence between age and perceived usefulness of e-scooters: AGE → PU ( $\beta = -0.100$ ,  $t = 2.703$ ,  $p = 0.007$ ) was supported. The size of the respondents' place of residence and their financial situation did not affect the perception of the usefulness of electric scooters: POR → PU ( $\beta = -0.046$ ,  $t = 1.253$ ,  $p = 0.211$ ), FS → PU ( $\beta = -0.002$ ,  $t = 0.041$ ,  $p = 0.967$ ). Thus, hypotheses H<sub>2</sub> and H<sub>3</sub> were not supported. Perceived ease of use of e-scooters affects the perceived usefulness of this mode of transport and attitude toward e-scooters: PEOU → PU ( $\beta = 0.597$ ,  $t = 14.607$ ,  $p < 0.001$ ), PEOU → ATT ( $\beta = 0.655$ ,  $t = 21.634$ ,  $p < 0.001$ ). Thus, hypotheses H<sub>4</sub> and H<sub>5</sub> were supported. Behavioural intention of use of e-scooters is affected by the attitude towards e-scooters and perceived usefulness of this mode of transport: ATT → BI ( $\beta = 0.356$ ,  $t = 7.097$ ,  $p < 0.001$ ), PU → BI ( $\beta = 0.299$ ,  $t = 6.646$ ,  $p < 0.001$ ). Thus, hypotheses H<sub>6</sub> and H<sub>7</sub> were supported. The H<sub>10</sub> hypothesis was also confirmed. Behavioural intention to use of e-scooters affects the actual usage of e-scooters. BI → AU: ( $\beta = 0.558$ ,  $t = 18.015$ ,  $p < 0.001$ ). The last hypothesis concerned the mediating role of attitude toward e-scooters between perceived ease of use and behavioural intentions regarding the use of e-scooters: PEOU → ATT → BI ( $\beta = 0.233$ ,  $t = 6.499$ ,  $p < 0.001$ ). Hypothesis H<sub>9</sub> was supported. Attitude toward e-scooters is a mediator of perceived ease of use and behavioural intentions regarding the use of e-scooters.

After confirming the above relations, we assessed the effect size of the predictor construct using  $f^2$ . The effect size is a measure used to assess the relevant impact of a predictor construct on an endogenous construct. According to Cohen (1899), the  $f^2$  value of 0.02 or more is defined as a small effect, the value of 0.15 is seen as a medium effect, and the value of 0.35 or more is described as having a large effect. In the case of the

relationship between the variables age and perceived usefulness, the effect size just negligible, i.e.,  $f^2 = 0.016$ . In the case of the relationship between perceived ease of use and perceived usefulness, perceived ease of use and attitude towards e-scooters, behavioural intention and actual usage of e-scooters there was a large effect size: PEOU  $\rightarrow$  PU ( $f^2 = 0.569$ ), PEOU  $\rightarrow$  ATT ( $f^2 = 0.752$ ), BI  $\rightarrow$  AU ( $f^2 = 0.449$ ). In contrast, there was a small effect size for the relationship between attitude toward e-scooters and behavioural intention, with:  $f^2 = 0.127$ .

Table 7. Summary of verified hypotheses

	<b>B</b>	<b>t</b>	<b>p</b>
AGE $\rightarrow$ PU	-0.100	2.703	0.007
POR $\rightarrow$ PU	-0.046	1.253	0.211
FS $\rightarrow$ PU	-0.002	0.041	0.967
PEOU $\rightarrow$ PU	0.597	14.607	0.000
PEOU $\rightarrow$ ATT	0.655	21.634	0.000
ATT $\rightarrow$ BI	0.356	7.097	0.000
PU $\rightarrow$ BI	0.299	6.646	0.000
BI $\rightarrow$ AU	0.558	18.015	0.000
PEOU $\rightarrow$ ATT $\rightarrow$ BI	0.233	6.499	0.000

Source: own studies.

## 5. DISCUSSION

Transportation difficulties have become one of the main problems for residents of large cities in Poland today (Dorocki, Wantuch-Matla, 2021; Płaziak, Szymańska, 2019). The increase in the number of vehicles and the need for ever – increasing mobility in commuting to work and school, especially from developing suburban areas, have contributed to the growing inconvenience of travel (Dorocki, 2022). These factors have simultaneously become the driving force behind the development of micromobility-based transport.

The 2020 survey found that most people used electric scooters for the first time to try out this innovative solution. The next most common motivation for the respondents was to use it purely for fun. The next less frequently selected responses were using an electric scooter as a cheaper or faster alternative, a more accessible solution or being encouraged to use it by family and friends. There were also isolated responses given by the respondents, such as an offer to purchase a scooter at an attractive price or a conscious choice of this mode of transport (Mering, Wachnicka, 2021). The results show that 45.9 per cent of people ride a unicycle with a maximum frequency being twice a week, while the remaining share, over 50 per cent, do so three or more times a week. Although many users use the scooter occasionally and mainly treat it as an attraction, the majority use it much more often for a specific purpose. The analysis of the responses revealed that 36% of respondents undertake journeys lasting between 10 and 20 minutes, 29.4% of respondents prefer journeys of up to 10 minutes, and 17.8% opt for commutes lasting between 20 and 30 minutes. The least frequently selected answer was an average journey time of more than 30 minutes, which was declared by only 16.8% of respondents. Determining the average travel time made it possible to determine the average length of the unicycle trips. The

average speed of an electric scooter is taken as 25 km/h. Thus, users usually travel a distance of between 4 and 8 km by electric scooter.

Research by Eccarius and Lu (2018) found that among users of the shared e-scooter system; when commuting, the majority usually walked, cycled or used public transport. This is supported by research by James et al. (2019) which indicates that electric scooters are more likely to replace walking than other modes of transport, such as cars, bicycles, buses or taxis.

Previous experience with electric scooters is an important factor in increasing the propensity to use electric scooters. During a study of the Seoul metropolitan area in South Korea, Hong et al. (2023) discovered that people who have used an electric scooter at least once are more likely to travel by electric scooter. Based on the study findings, the authors suggest encouraging people to experience using an electric scooter by offering a free trial ride for first-time users.

Although the results show that e-scooters generate benefits, they also contribute to numerous safety problems (Félix, Orozco-Fontalvo, Moura, 2023). In their study, James et al. (2019) collected divergent responses regarding perceptions of safety and blocking of sidewalks by those using and not using electric scooters. As Gössling (2020) noted, it is important for urban planners to introduce policies in cities regarding maximum speeds, mandatory use of cycling infrastructure and dedicated parking. Also, it would also be necessary to limit the number of licensed operators.

According to studies published by McQueen and Clifton (2022) and Nikiforiadis et al. (2023), the acceptance of electric scooters increases when it is possible to use combined transport modes (e.g. e-scooter and a train or e-scooter and a car), but only if there is a clear reduction in travel time or convenient parking locations are available.

The crucial aspect in this context is the relationship between the availability of an electric scooter and the desire to combine it with another mode of travel. Those living in the central part of the city have greater access to electric scooters and are more likely to use them as part of their choice of transportation. For residents in suburban areas, electric scooters offer a convenient solution for travel, especially when public transportation options are limited in frequency and reach. Higher population density, number of residents, shorter distance to the city centre, and better street connectivity are correlated with more intensive use of e-scooters (Jiao, Bai, 2020).

Kroesen (2017) indicates that owning an electric scooter significantly decreases reliance on traditional vehicles, but also, to a lesser extent, reduces the use of cars and public transportation. Secondly, e-scooter owners reduce their car and public transport use more than those who own standard bicycles. And thirdly, on the level of vehicle ownership, the e-bike functions as an alternative to the conventional bicycle and does not act as a substitute for the car.

As shown by research conducted by Kopplin et al. (2021), e-scooter owners and non-owners differ in terms of their perception of the benefits connected with using e-scooters. More than half of e-scooter owners see them as a solution to the problem of air pollution, traffic jams and the low quality of public transport. Non-owners agree on the positive impact of e-scooters on noise reduction, but at the same time point to a high accident risk.

Some studies show that the development of electric, shared transport modes (scooters and electric bicycles) does not always have positive effects. Some studies (Hollingsworth, Copeland, Johnson, 2019) indicate that the intensification of the use of electric scooters may have a negative impact on the environment – results suggest that while electric

scooters may be an effective solution to urban congestion, they do not necessarily reduce the negative environmental impact related to this mode of transport.

Another issue is the need to use specific applications to rent electric scooters. The user experience of mobile apps varies considerably from one electric scooter operator to another, as user interfaces are developed by entirely separate teams. While the usability of mobile applications is largely similar across companies, as they all provide essentially the same basic functionality (i.e. unlocking the scooter), they differ in their ease of use (Ratan et al., 2021).

When examining the issue of the development and acceptance of electric scooters, it is also important to consider the social context of the phenomena. Nowadays, the success of any new solution relies on its widespread dissemination through mass communication channels. Contemporary consumers not only seek and share information online, but they also actively create it. Moreover, they show a keen interest in content shared by influencers (Zatwarnicka-Madura, Nowacki, Wojciechowska, 2022). The communication of eWOM means that micromobility providers firstly need to be present on social media so that consumers can get to know them better, and secondly, they need to consciously shape the image of this form of urban transport in line with the expectations of their customers (Czarnecka, Kinelski, Stefańska, Grzesiak, Budka, 2022). At present, not only are social media users increasingly interested in environmental issues, but they also elicit more reactions to posts related to sustainability topics. Social networks provide a context in which users both reinforce their beliefs and values and try to replicate the behaviour of other users, which promotes the acceptance of new technological solutions (Domalewska, 2021).

## 6. CONCLUSION

This research represents one of the first studies into the acceptance of electric scooters as a manifestation of micromobility in Poland. Summarising the discussion, it can be concluded that micromobility is an important alternative to car transport in cities. Electric scooters offer great potential for the development of e-mobility and contribute to the reduction of car traffic congestion in cities, thus providing an important solution in terms of reducing urban traffic problems. However, local policy should consider the needs and circumstances of all road users as well as pedestrians using sidewalks. Indeed, the misuse of electric scooters can present significant risks. The challenge is to introduce appropriate regulations governing the use of electric scooters and an adequate system for monitoring their compliance. The introduction of legislation in numerous countries and cities is merely an initial step towards the comprehensive regulatory framework of this phenomenon.

In order to increase the level of acceptance of electric scooters and increase the frequency of their use, it is also necessary to develop measures that could promote or encourage sustainable mobility via trips that integrate public transport with electric scooters. This could be achieved by ensuring the availability of electric scooters near the main public transport hubs, making the combined journey more appealing and convenient, i.e. eliminating the need to find a rented electric scooter. This entails creating designated parking areas for e-scooters at strategic locations near public transport stations. Another benefit of designated e-scooter parking areas is the reduction of accidental scooter parking, a problem often associated with dockless systems.

## 7. LIMITATIONS AND DIRECTIONS FOR FURTHER RESEARCH

The study focuses only on university students in Warsaw, which may cause some limitations to the overall representativeness of the results. The extent to which electric scooters are used and the approach to this solution may be conditioned by demographic, sociocultural and economic variables as well as the place where the survey has been conducted, the availability of scooters, the availability of parking spaces, the condition of roads and the urban layout. It would therefore be reasonable to extend such surveys and include respondents with other demographic characteristics, living in both large agglomerations and smaller towns. This implies the need to carry out research covering a larger and more diverse population.

The present survey provides insights into current student behaviour, but it does not consider possible changes in the future. For example, developing public transport infrastructure or changes in legislation may affect the use of e-scooters. It would be worth conducting a cyclical survey covering this topic. A future survey may include factors such as the availability of cycling paths, the availability of parking spaces for scooters and other aspects of urban infrastructure affecting scooter use presented in the analysis.

Future studies on perceptions of electric scooters should also examine the issues related to the impact of pricing dynamics and promotional strategies. This might help to address the question of how promotions, discounts and changes in scooter rental prices affect students' decisions.

It may also be interesting to analyse how the use of scooters affects students' travel patterns, for example, whether it reduces the use of public transport or personal vehicles, how it shapes the habits and routines associated with the use of scooters, for example, where they are most often used, what routes are preferred and why, what factors influence travel time (e.g. distance, specific time or traffic).

It is also important to focus on the limitations of the original TAM model used. The model has continuously evolved, leading to the emergence of newer and increasingly complex versions (Venkatesh, Davis, 2000; Venkatesh, Morris, Davis, Davis, 2003). However, the application of any version of the model does not guarantee that all variables of interest in these models have been considered, which means that some important variables may have been omitted. Therefore, researchers should examine other potential options and models to examine the issue of technology adoption or application that have not been discussed in this paper.

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## ASSESSMENT OF LONG-TERM TASTE AND SMELL COLOR BLINDNESS AS A RESULT OF COVID-19 DISEASE

Among the effects of COVID-19 are taste and smell disorders, which have occurred in a significant number of sick people. It is believed that the impairment of these senses may be long term. The aim of our research was to investigate the impact of COVID-19 disease on the ability to recognize tastes among students at the Rzeszów University of Technology. The research was conducted on a sample of students who declared that they had or had not suffered from COVID-19. The assessment of the ability to recognize flavors – that is, taste color blindness – was carried out based on the methodology recommended by the Polish Committee for Standardization [PN ISO3972]. The research, which involved 68 women and 74 men, was carried out in a laboratory adapted for this purpose, meeting the requirements specified in the standard [PN ISO 8589]. The tests took place in the morning (9 a.m.–12 p.m.). Taste recognition ability was assessed using a set of aqueous solutions of citric acid (0.43 g/L), sucrose (5.76 g/L), sodium chloride (1.19 g/L) and caffeine (0.195 g/L). The collected questionnaires were based on a standard approach to food quality analysis, and the data obtained were analyzed in the Statistica 13.3 program. It was observed that, in the studied group of students, the percentage of people who declared COVID-19 disease was high (69%). In this group, the majority of respondents (51%) described the course of the disease as mild. Among the respondents, 63.3% indicated a loss of taste, while slightly more (69.4%) declared a loss of smell. The analysis of data regarding the ability to correctly recognize individual tastes indicates that gender influenced the ability to recognize sweet and bitter tastes. Statistically, significantly more men misidentified these flavors. The impact of

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COVID-19 infection on the ability to identify the analyzed flavors was moderate and was confirmed only for salty and bitter tastes. Therefore, the ability to perceive important qualitative factors of food products was impaired.

**Keywords:** students at the Rzeszow University of Technology, COVID-19, life quality, smell loss, taste loss, taste daltonism.

## 1. INTRODUCTION

The virus responsible for COVID-19 disease, SARS-CoV-2, was first time detected as a novel member of the coronavirus family in China in 2019. The contagious disease rapidly became a pandemic on the world encompassing scale. It is known that this virus can cause severe respiratory failure and even death in infected patients (Al-Swiahb et al., 2021, Saraf et al., 2023, Song et al., 2021).

The most common symptoms of COVID-19 are fever, cough, and fatigue. Other common symptoms include shortness of breath, body aches, sore throat, headache, chills, and nasal congestion. In some cases, people with COVID-19 may also experience diarrhoea, nausea, or vomiting. In addition, ear, nose, and throat symptoms, including loss of sense of smell and/or loss of sense of taste have been reported as symptoms caused by this virus (Coelho et al., 2021; Klopfenstein et al., 2020; Męczykowska et al., 2020). In the peer-reviewed medical literature, it has been reported that infection with SARS-CoV-2 in cases of some patients may cause smell and/or loss of sense of taste without nasal discharge and, unlike other viruses that infect the upper respiratory tract. It is important to note that not everyone with COVID-19 will experience symptoms, and some people may have mild or no symptoms at all. There is a number of contrary behaviour of SARS-CoV-2 between various patients (Barón-Sánchez et al., 2020; Klinger et al., 2020; Sakalli et al., 2020). The loss of smell and taste, also known as anosmia (Loss of sense of smell) and ageusia (loss of sense of taste), respectively, occurs in a significant proportion of COVID-19-19 patients, even in those cases where patients show no other symptoms (Klinger et al., 2020). The loss of smell and taste is thought to be caused by the virus damaging the olfactory nerve and its associated cells, which are responsible for detecting smells (Butowt et al., 2023; Karamali et al., 2022; Xydakis et al., 2021).

Studies are underway to investigate the biological mechanisms behind COVID-19-related anosmia and to uncover treatments to address post-COVID-19 smell dysfunction (Dolgin 2022; Husain et al., 2021), but it is believed to involve the disruption of neural pathways and the impairment of the cells responsible for detecting and transmitting smells and tastes (Scotto et al., 2022). Congestion and swelling of the nasal passages due to the infection can interfere with the detection of smells (Xu et al., 2022). While the loss of smell and taste is generally temporary and resolves within a few weeks in most cases, some patients may experience long-term or even permanent changes in their ability to taste and smell (Kumar et al., 2021). In addition, the loss of smell and taste can have a significant impact on a person's quality of life, affecting their ability to enjoy food and beverages, detect dangerous odours, and identify spoiled or contaminated food.

In this manuscript a statistic assay was utilized in order to analyse the percentage of cases of smell and taste losses as a result of COVID-19 infections among students of Rzeszów University of Technology. The conducted research aimed the determination of adverse effects of the infection on smell and taste senses and therefore the quality life determined by the lack or presence of features of consumed food products.



## 2. MATERIALS AND METHODS

The current study was conducted in the spring of 2023 in Rzeszów, involving 142 students from the Faculty of Management at Rzeszów University of Technology. All participants agreed upon to report and completed a survey providing information regarding, among other things: gender (male, female), place of residence (village, city up to 100,000 inhabitants, city over 100,000 inhabitants), financial situation (average, good, very good), eating habits (proper, improper, unsure), COVID-19 infection, course of the disease, and whether the disease was accompanied by a loss of taste and/or smell. A specially prepared questionnaire also allowed for the evaluation of the healthy dietary habits of the study participants. The assessment of taste recognition ability and taste colour blindness was conducted based on the methodology recommended by the Polish Committee for Standardization PN ISO3972. The study, in which 68 women and 74 men participated, was carried out in a laboratory adapted for this purpose, aiming to provide conditions as prescribed by the standard methodology PN ISO 8589. The research took place in the morning hours (9–12). Based on declarations, the participants abstained from alcohol and strongly flavoured or aromatic foods on the day before the study. On the day of the study, they consumed a light meal, and 90 minutes before the study, they refrained from eating, drinking, and smoking. The taste recognition ability was assessed using a set of aqueous solutions of citric acid (0.43 g/L), sucrose (5.76 g/L), sodium chloride (1.19 g/L), and caffeine (0.195 g/L). The taste samples, at a temperature of approximately 20°C, were served in 40 ml labelled glass containers. The taste samples were examined unhurriedly, with approximately 20 ml of the solution taken into the mouth at a time. Before each sample, the oral cavity was rinsed with water at approximately 20°C. The test results were recorded in sheets. The obtained results underwent statistical analysis using the Statistica 13.3 software. All dependencies and correlations were verified using the chi-square independence test, with a significance level set at  $\alpha = 0.05$ .

The research was based on the questionnaires filled by the students as part of food industry technology course with additional questions about the COVID-19 related observations. Therefore the analysis of flavours and smells took place as part of classes on sensory analysis of food as part of the mandatory food industry technology course in the field of logistics studies. As such it was obligatory to utilize well known methods for determination of food parameters. The utilized substances, that played the role of the taste and smell determinants were not of hazardous nature. Therefore the authors did not seek an opinion of ethics committee on the research on humans. The research participants agreed on the studies conditions, and the research was introduced as a part of standard course with the students agreed upon as a part of their study.

## 3. RESULTS AND DISCUSSION

In the Table 1 the Socio-demographic characteristics of the respondents in the group of students of Rzeszow University of Technology was provided. In the table 1 various characteristics such as gender and economic status and nutrition habits of students that took part in the research.

Within the experiment a slightly higher amount of male respondents took part (52,1% of respondents). Close to equal distribution of gender of respondents can be considered as an important argument with positive impact on the creditability of conducted research. In particular the even distribution of gender factor allows for statistically significant results of the conducted scientific investigation.

This corresponds with distribution of human species gender in nature which is in general close to even. As a conclusion drawn from the analysis of the earlier results of other researchers in some cases the distribution of gender of respondents was often uneven. Such observation were reported mainly based on the research by Zborowski and Mikulec (Zborowski et al., 2021). In their research the majority of respondents were females who were responsible for 74% of results based on the investigated population. Female students were also more likely to participate in long-term studies of veterinary students, constituting over 60% of the study population. Undoubtedly, in the case of the gender structure in research conducted with students, the profile of the university and the field of study of the respondents are important.

The data concerning characteristics of the group of students asked about the loss of smell and taste as a result of the infection with the COVID-19 disease are presented in Table 1.

Table 1. Socio-demographic characteristics of study participants

Factor	Factor category	n	%
Gender	Man	74	52.1
	Woman	68	47.9
Place of living	Village	82	57.7
	City up to 100,000	40	28.2
	City over 100 thousand	20	14.1
Economic status	Average	24	16.9
	good	100	70.4
	Very good	18	12.7
Nutrition	proper	82	57.7
	Improper	30	21.1
	unsure	28	19.7
Number of meals eaten	1	10	7.0
	2	40	28.2
	3	68	47.9
	4	22	15.5

Source: authors' own research.

Most source studies show that surveyed students and young people most often declare eating 3 or 4 meals a day, while the share of people who eat a larger number of meals concerns 5–15% of respondents. Similarly, in our own research, most research participants declared that they ate 3 meals a day. The share of these people in the study group is 47.9% (Table 1). A relatively large number of people, 28.2%, declared that they ate only 2 meals a day. At the same time, it should be noted that, according to other authors, the outbreak of the COVID-19 pandemic, and especially the period of quarantine and isolation, caused isolated people to tend to eat more meals.

In the authors' own research, respondents were asked to provide information regarding the incidence and course of COVID-19 disease. The survey results were summarized in Table 2.

Table 2. Infections, course of illness, symptoms of COVID-19 infection of study participants

Factor	Factor category	n	%
Was sick	No	44	31.0
	Yes	98	69.0
Test confirmation	No	62	63.3
	Yes	36	36.7
Course of illness	Mild	50	51.0
	Moderate	42	42.9
	Sever	6	6.1
Loss of taste	No	36	36.7
	Yes	62	63.3
Loss of smell	No	30	30.6
	Yes	68	69.4

Source: authors' own research.

The answers to the question about the incidence of COVID-19 show that a total of up to 69% of the surveyed students were ill. The infection rate determined in our own research was much higher compared to the results obtained by (Zborowski et al., 2021), in which approximately 20% indicated the risk of Covid-19, while the share of people answering "I don't know" in these studies was approximately 37% (Mikulec et al., 2022).

Further analysis of the course of COVID-19 infection shows that relatively few people confirmed the disease by performing an appropriate test. This means that the majority (63.3%) of respondents identified COVID-19 infection only with the occurrence of somatic symptoms typical of this disease (Table 2). At the same time, only 6.1% of the surveyed respondents declared that the disease was severe.

According to (Zawilska et al., 2021), approximately 72% of people infected with SARS-CoV-2 have asymptomatic or minimally symptomatic disease, 8% have mild symptoms, and approximately 14% of patients have severe symptoms requiring hospitalization.

The main aim of the presented research was the assessment of the taste blindness of students of the Rzeszów University of Technology. The research results are based on the correct identification of four basic tastes and were prepared in accordance with the guidelines provided in Polish standards and by (Masłowska et al., 2010).

Tables 3–6 provides information on statistically analysed answers for questionnaires filled by respondents from the group of students of Rzeszów University of Technology. Each table provides insight into the structure of correct and incorrect identification of salty, sweet, acidic and bitter tastes depending on gender, the infections and course of COVID-19 of study participants.

All dependencies and interdependencies were verified using the chi-square test of independence, with a predetermined significance level  $\alpha = 0.05$ . The decision to reject the null hypothesis was based on the test probability level ( $p$ ). The null hypothesis was rejected when the test probability level was lower than or equal to 0.05. Statistica 13.3 software package was used for the analysis.

The analysis of the results regarding the influence of gender on the correct identification of the tested tastes did not reveal any statistically significant impact of this factor on the recognition of salty, sweet and sour tastes (Tables 3–5).

Table 3. The structure of false and correct identification of salty taste by group of respondents depending of gender, infection and course of COVID-19 illness of research participants

Factor	Factor category	Salty Taste		p-value
		Percentage of identifications		
		False	Correct	
Sex	Man	45.95%	54.05%	0,352
	Woman	38.24%	61.76%	
Was sick	No	40.91%	59.09%	0,828
	Yes	42.86%	57.14%	
Loss of taste	No	44.44%	55.56%	0,809
	Yes	41.94%	58.06%	
Loss of smell	No	33.33%	66.67%	<b>0,048</b>
	Yes	<b>49.06%</b>	50.94%	
Course of the sickness	Mild	32.00%	68.00%	<b>0,027</b>
	Moderate/sever	54.17%	45.83%	

Source: authors' own research.

Table 3 presents the results regarding the structure of salty taste identification by research participants. The analysis of the data contained in the table shows that people who declared a loss of smell made statistically significantly more incorrect identifications of salty taste (Table 3). It was also shown that the ability to identify this taste depended on the course of the disease. People with moderate and severe COVID-19 incorrectly identified salty taste in over 50% of cases, while the share of people with mild COVID-19 was 32%. (Table 3).

Table 4. The structure of false and correct identification of sweet taste by group of respondents depending of gender, infection and course of COVID-19 illness of research participants

Factor	Factor category	Sweet Taste		p-value
		Percentage of identifications		
		False	Correct	
Sex	Man	<b>45.95%</b>	54.05%	<b>0,042</b>
	Woman	28.35%	71.65%	
Was sick	No	31.82%	68.18%	0,213
	Yes	42.86%	57.14%	
Loss of taste	No	38.89%	61.11%	0,545
	Yes	45.16%	54.84%	
Loss of smell	No	40.00%	60.00%	0,704
	Yes	44.12%	55.88%	
Course of the sickness	Mild	44.00%	56.00%	0,816
	Moderate/sever	41.67%	58.33%	

Source: authors' own research.

Analysis of the data summarized in Table 4 showed that men made a statistically significantly higher percentage of incorrect answers. It is worth emphasizing that the share of those giving incorrect answers regarding the identification of sweet taste was almost twice as high compared to the share of women (Table 4). It was also established that the course of the disease and the loss of the senses of taste and smell did not significantly affect the perception of sweet taste by the study participants.

In turn, according to research carried out by (Gomółka-Pawlicka et al., 2018), women recognized individual tastes better than men, and particularly clear differences concerned the recognition of salty and sour tastes. Women's predisposition to correctly identify sour taste was also confirmed in our own research (Table 5). It was found that over 91% of the surveyed women correctly identified this stimulus, while the percentage of men who correctly identified the sour taste was 83.78%. It is also worth noting that the incidence of COVID-19 did not significantly affect the ability to identify sour taste. The percentage of respondents who correctly identified themselves was almost the same in the group of people who had and did not suffer from COVID-19.

Table 5. The structure of false and correct identification of acidic taste by group of respondents depending of gender, infection and course of COVID-19 illness of research participants

Factor	Factor category	Acidic Taste		p-value
		Percentage of identifications		
		False	Correct	
Sex	Man	16.22%	83.78%	0,186
	Woman	8.82%	91.18%	
Was sick	No	13.64%	86.36%	0,818
	Yes	12.24%	87.76%	
Loss of taste	No	16.67%	83.33%	0,309
	Yes	9.68%	90.32%	
Loss of smell	No	<b>13.33%</b>	86.67%	0,287
	Yes	2.94%	97.06%	
Course of the sickness	Mild	16.00%	84.00%	0,247
	Moderate/sever	8.33%	91.67%	

Source: authors' own research.

Only gender differentiated the ability to identify bitter taste (Table 6). It was also found that statistically significantly more women (67.71%) correctly identified this sensory stimulus, while only 48.66% of men correctly indicated this taste, which is almost 20% less than in the case of women.

In the case of sweet and bitter taste the man showed a statistical significant higher percentage of false identification of taste than woman. In the case of COVID-19 disease as the result of infection the false result of taste identification occurred at the statistical significant level only in case of bitter taste, (salty, sweet and acidic taste were characterized by to low statistical significance. Next the share of incorrect indications of the assessed tastes depending on the impact of the taste loss symptom in the subjects was summarized. The observed differences were not statistical significant. Another observation was that in

case of salty and bitter taste the percentage of incorrect identifications of taste was dependent on the reported loss of sense of smell. During the course of COVID-19 infection in case of mild symptoms of disease it was revealed that the illness had no result on the increase of false identification of all from the chosen taste cases. However as a result of moderate or severe symptoms the illness resulted in the statistical significant loss of salty taste. In the case of gender susceptibility to taste loss it was observed that woman showed higher resistance to the negative result of the COVID-19 illness in the case of taste loss. Over 41% of woman were able to identify all four of the investigated tastes. In the group of male respondents only a quarter of students identified correctly all four tastes. In the case of people questioned about the taste loss in the course of COVID-19 illness it was revealed that the majority of students did not correctly identified all four tastes. The course of COVID-19 disease had no impact on the number of correct identification of tastes.

Table 6. The structure of false and correct identification of bitter taste by group of respondents depending of gender, infection and course of COVID-19 illness of research participants

Factor	Factor category	Bitter Taste		p-value
		Percentage of identifications		
		False	Correct	
Sex	Man	<b>51.35%</b>	48.65%	<b>0,033</b>
	Woman	32.29%	67.71%	
Was sick	No	31.82%	68.18%	<b>0,048</b>
	Yes	<b>48.98%</b>	51.02%	
Loss of taste	No	38.89%	61.11%	0,128
	Yes	54.84%	45.16%	
Loss of smell	No	30.00%	70.00%	<b>0,037</b>
	Yes	<b>52.94%</b>	47.06%	
Course of the sickness	Mild	48.00%	52.00%	0,843
	Moderate/sever	50.00%	50.00%	

Source: authors' own research.

To sum up, the results of the questionnaire of the students of Rzeszow University of Technology, revealed following data; test probability values lower than the adopted significance level indicate statistically significant dependencies on: gender (a higher percentage of men correctly identified at most one taste type; a higher percentage of women correctly identified all four taste types). Past illness (a higher percentage of individuals with an illness correctly identified at most one taste type; a higher percentage of individuals without an illness correctly identified all four taste types). Loss of taste (a higher percentage of those who have lost their sense of taste correctly identified only two taste types; a higher percentage of those who have not lost their sense of taste correctly identified three or four taste types) (Tables 3–6). Loss of sense of smell (a higher percentage of those who have lost their sense of smell correctly identified only two taste types; a higher percentage of those who have not lost their sense of smell correctly identified four taste types). In general in the case of bitter taste – the impact of gender was statistical significant and the higher percentage of incorrect identifications were in the group of men. Also in case of bitter taste

– there was a statistical significant impact of illness. There the higher percentage of incorrect identifications in the group of individuals with a history of illness was recorded. Moreover in the case of bitter taste the loss of sense of smell was also identified as a factor with impact on other sense (higher percentage of incorrect taste identifications in the group of people who have lost their sense of smell).

In the remaining cases (course of illness), no statistically significant dependency was found ( $p > 0.05$ ) (Tables 3–6).

According to earlier related research by (Szczawiński et al. 2017), The students of Warsaw university were tested on smell and taste identification. The results were subjected to statistical analysis. There it was shown that female students were more likely to correctly identify the investigated features of food products (Tables 3–6). Furthermore as the time passed new generation of students were identified to be more accurate in determining the food features such as smell and taste. This trend can be stopped by the long-time effects of COVID-19 illness.

In general the patients infected with SARS-CoV-2 exhibited various and wide range of symptoms. In Asia, 85.6% of patients had fever, 68.7% had cough, and 39.4% had fatigue as the main symptoms determined at the treatment stage. Furthermore nasal congestion, and sore throat may be, an additional problems reported by patients infected with SARS-CoV-2. Meanwhile in Europe in particular in Italy, the most common symptoms were fever (55.9%), cough (60.4%), and fatigue (68.3%) (Sakalli et al., 2020).

Based on the data obtained with the COVID-19 Anosmia Reporting Tool developed in USA it was indicated that 73% of 237 SARS-CoV-2-positive patients had experienced loss of sense of smell at admission to hospital. In other study that was conducted in 417 SARS-CoV-2-positive patients with mild or moderate symptoms, 85.6% of patients described loss of sense of smell, 88.8% described loss of taste, and 79.6% of those with loss of sense of smell had anosmia and 78.4% reported that they had ageusia. Based on this and other data, the loss of smell was agreed upon to be referenced as a valid marker of COVID-19 disease (Marchese-Ragona et al., 2020).

Some of the reviewed manuscripts contain research on the topic of the prevalence and mechanisms of olfactory and gustatory dysfunction (OGD) in COVID-19 patients. Anosmia and OGD have been reported as distinguishing symptoms of COVID-19, with a high prevalence observed in patients. These symptoms have been included in official lists of COVID-19 symptoms (Shahzaib et al., 2022). Although the importance of the various symptoms for identification of ongoing illness was more important in the past, the long term results of the infection are of interest since the disease show some long lasting effects affecting the quality of life (Coelho et al., 2021).

Both the central and peripheral nervous systems are believed to be impacted by the virus, with evidence of neuroinvasion, expression of ACE-2 receptors in neurons and glial cells, and the presence of the virus in cerebrospinal fluid. Sialic acid receptors, involved in taste perception, may also be bound by the virus, potentially increasing the gustatory threshold. OGD may occur simultaneously without one symptom dominating, and taste disorders are unlikely to exist in isolation (Scotto et al., 2022).

The immune response and subsequent inflammation in patients with robust immune systems may lead to degeneration of olfactory neurons, causing smell dysfunction, while weaker immune responses spare the nasal mucosa. Although objective and subjective assessment of OGD could be utilized in order to help in primary screening, considering the constraints of PCR testing on medical resources, the aim of authors research was to estimate the long term effect of COVID-19 disease on the quality of life related to loss of

smell and taste senses. From long-term research conducted by (Szczawiński et al. 2017), conclusions can be drawn that approximately 34% of veterinary students may have some difficulties with the recognition of tastes and smells, which, according to the authors, may be a limitation in the employment of food assessment inspectors. Also this results in negative effect on the life quality of infected people. Furthermore as a result of COVID-19 it was observed that in the group of sick people the respondents tend to eat more and drink more alcohol which caused increase of body weight (Mikulec et al., 2022; Sidor et al., 2020).

#### 4. CONCLUSION

1. In the surveyed group of students, the share of people who declared Covid-19 disease was high and amounted to 69%. Within this group, the majority of respondents (51%) declared the course of the disease to be mild.
2. Among the respondents, 63.3% of the participants indicated a loss of taste, while slightly more 69.4% of the participants declared a loss of smell.
3. The analysis of data regarding the ability to correctly identify individual tastes shows that gender influenced the ability to identify sweet and bitter tastes. Statistically, significantly more men incorrectly identified these flavors.
4. The impact of the infection and course of COVID-19 on the ability to identify the analyzed flavors was moderate and was only marked by a higher share of people incorrectly identifying the bitter taste. Subjects who lost their sense of smell were statistically significantly more likely to incorrectly identify salty and bitter tastes.
5. Based on conducted research it was observed that as a result of COVID-19 illness the quality of life expressed as taste and/or smell loss which occurred in the group of students that were exposed to COVID-19 decreased.

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*Founding source: The research was conducted based on own resources of Rzeszow University of Technology.*

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## EXPLORING THE EFFECTS OF OIL PRICES ON ROAD FREIGHT IN POLAND AMIDST COVID-19 AND RUSSO-UKRAINIAN WAR

Destructive market forces are multiplying as the world faces the worst global energy crisis in history. The continuing economic downturn and fluctuating oil prices, triggered by OPEC+'s plan to reduce supply, are slowing down global oil demand. In this respect, the situation in the transport services market is changing. Changes in the price of oil are indirectly influencing the formation of wholesale diesel prices; consequently, road freight should also change. However, are these changes correlative and do oil price fluctuations directly affect freight rate changes? This article aims to investigate the correlation between fluctuations in oil prices on world markets and their impact on wholesale diesel prices and, thus, the development of net road freight in Poland. In the study, the authors developed a model called "fuel adjustment," containing the fluctuations in wholesale diesel prices, which were taken into account in determining the average deviation in the road freight level over the analyzed period. In this way, it became possible to determine the amount of road freight and its fluctuations depending on the development of oil prices on world markets. The results of the study confirm that there is a strong and positive relationship between the analyzed variables. When the prices of crude oil on world markets fall, this should be followed by reductions in diesel prices in individual countries, including Poland. Consequently, the amount of road freight should also have a downward trend. Will this happen?

**Keywords:** crude oil, economics, fuel model, fuel prices, pandemic, road freight, transport.

### 1. INTRODUCTION

In recent years, crisis situations such as natural disasters, pandemics, economic crises, migration crises, political conflicts or terrorist attacks have had a significant impact on the

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economic policy-making of countries around the world. This has brought one of the main economic motors of each country, i.e. transport in its broadest sense and the accompanying transport services, to the centre of turmoil. This is also the case in Europe, where the transport market is evolving intensively towards liberalisation and efficiency of access, harmonisation of economic, financial, technical and social relations, increased interoperability and uniform rules of intra-industry and inter-industry competition (Liberadzki, Mindur, 2008).

Fluctuations in the volume of transport services are not without an impact on the social environment. This is because the main consumer product of transport underwent significant changes in the years of 2021 and 2022. The global markets have seen rapid fluctuations in oil prices (Silvennoinen, Thorp, 2013; Galinis et al., 2020; Llamosas, Sovacool, 2021; Sheng et al., 2020), which have had a significant impact on the environment, energy efficiency, the economy, the financial markets and, above all, the level of inflation worldwide and in Europe in particular (Kilian, 2009; Kilian, 2010; Shah et al., 2020; Sun et al., 2021; Ahmadi et al., 2022; Song et al., 2022;). The last year clearly demonstrated how the dynamic fluctuations in oil prices are becoming a major premise for the rising social cost of living levels across Europe.

The price of the crude oil from which diesel is produced is a key element influencing transport costs. Undoubtedly, changes in oil prices on world markets, indirectly influencing global inflation, are also changing the face of the transport services market. The situation is similar in Poland, which has some of the most important transport channels in Europe. Transit channels from Western Europe to Eastern Europe and Asia, as well as transport channels from Northern Europe to the Mediterranean, all cross in Poland. Therefore, transport is of key importance not only for Poland's development, but above all for the stable life of its citizens (Sadowski et al., 2021).

Until now, little scientific research has covered and analysed the period of the armed conflict in Ukraine and the period of the COVID-19 pandemic in Central and Eastern Europe in the context of the impact of oil prices on the situation of the transport branch in Europe. Few scientific studies analysing the relationship between oil price fluctuations and the amount of road freight in a specific European country have been published. Mostly studies on terrorism and its impact on the operation of oil producers and oil transport appear in the literature (Frey, Kucher, 2000; Frey, Kucher, 2001; Abadie, Gardeazabal, 2003; Amichud, Wohl, 2004; Bird et al., 2008; Drakos, 2010; Kollias et al., 2013; Pchan et al., 2021; Nabin et al., 2022). There are also papers that describe the so-called 'trade war' between the US and China, or formerly Saudi Arabia and Russia, as another element strongly affecting fuel prices (Kilian, 2009; Kilian, 2010; Kilian, 2019; Aastveit et al., 2015; Baumeister, Kilian, 2016; Kamber, Wong, 2020; Ma et al., 2021; Zhnag, 2022; Carlomagno, Albagli, 2022). In the literature, one can find studies on for example, the long-term impact of oil price changes on the price of refined petroleum products in European markets using the Johansen multivariate test (Asche et al., 2023). Borenstein et al. described an asymmetric error correction model and confirmed an asymmetric relationship between oil prices and fuel prices (Borenstein et al., 1997). Borenstein and Shepard's study also identified significant lags between fluctuations in world oil prices and wholesale fuel prices in different countries (Borenstein, Shepard, 2002). Chouinard and Perloff examined the impact of various factors on retail and wholesale fuel prices in the USA and found that fluctuations in oil prices were the dominant driver of their fluctuations (Chouinard, Perloff, 2007). However, there is a lack of studies presenting the relationship between fluctuations in crude oil and diesel prices and their impact on the formation of road freight in a European

country such as Poland. Therefore, there is a research gap that needs to be filled in order to answer the question of how oil price fluctuations affect the price of diesel and whether there is a relationship (and if so, what kind of relationship) between oil prices and road freight.

The article therefore adopts two working hypotheses:

**H1: Oil price fluctuations influence the change in diesel prices in Poland.**

**H2: Oil price fluctuations affect road freight rates in Poland.**

The aim of this article is to examine the relationship between fluctuations in crude oil prices on world markets and their impact on wholesale diesel prices and thus the development of net road freight in Poland. The basis in the deduction process was a review of international literature and websites dedicated to the subject, as well as analyses of correlations using primary and secondary data.

Primary data was obtained from an in-house survey conducted among a group of private transport companies belonging to the small and medium-sized enterprises (SMEs) sector operating in Poland. The data concerned the amount of road freight in September 2021 as a basis for further research.

The considerations, analysis and conclusions of the study, which constitute its value, may contribute to the illustration of the situation of Polish road freight transport, its conditions and profitability as key factors affecting the development and competitiveness of enterprises on the transport, shipping and logistics (TSL) market. In addition, the obtained results of the analysis will indicate whether there is a relationship between the fluctuation of oil prices on the market and the amount of road freight, how strong it is and what type of relationship it is. The sample selection for the study was purposive. The study, based on primary data, was conducted in October and November 2022. It used the desk research method of statistical data analysis, the comparative analysis method and the method of critical analysis of the available literature. The study used Pearson's correlation analysis, the aim of which was to examine the relationship and significance between fluctuations in the average prices of diesel oil in Poland and the net amount of road freight, as well as the impact of changes in the price of BRENT and WTI crude oil on the average net price of diesel oil in Poland.

## 2. LITERATURE REVIEW

The political situation in Central and Eastern Europe caused by the COVID-19 coronavirus pandemic and the war in Ukraine, which was started by Russia, has led to historic geopolitical changes in global oil markets. As a result, economic relations between many countries practically around the world have changed. Countries such as China, Serbia, Hungary and India, which have not fully acceded to the economic sanctions imposed by most European countries and the US to withdraw from the purchase of fossil fuels from Russia, benefit by sourcing cheap Russian oil. These countries, through the following of such a purchasing policy, contribute to the financing of Russia's war activities. The opponent of such a strategy is Europe, which is diversifying its purchases of fossil fuels by minimising or completely cutting supplies from Russia. The sharp shift away from Russian oil is raising fuel prices in Europe, which directly affect the price of transport services. In turn, transport costs affect the prices of products, materials, goods or services. It seems that countries that now benefit from cheap Russian oil will pay the costs of their inadequate political decisions in the future, by losing the confidence of coalition countries and thus reducing the exchange of goods in these countries.

The literature often refers to oil as the 'blood' of any country's economy (Long, Zhang, 2022). When analysing the oil market, it can be seen that oil consumption is steadily increasing. In December 2022, global consumption of this crude was around 99 million barrels per day (MMbbl/d) and, according to the International Energy Agency (IEA), will increase to 101.5 MMbbl/d in Q1 2023. Global oil demand is projected to grow to around 1.7 MMbbl/d in 2023 due to the transition of the electric power industry to oil fuel, especially in Europe, due to high natural gas prices (Oil Market Report, 2022).

The United States accounted for the largest share of global oil production in 2021 and its influence on the level of global oil prices in financial markets, with the United States accounting for 16.6 MMbbl/d, Saudi Arabia 10.9 MMbbl/d and Russia 10.5 MMbbl/d (Amoros, 2022). This also confirms the worrying trend regarding Russia's share and its influence on crude prices. However, after Russia's military aggression against Ukraine in February 2022, due to sanctions imposed by Western countries, the price of Russian oil dropped significantly, and this country currently does not play a significant role in shaping oil prices on world markets. The phenomenon of relationality between oil producers and their influence on oil price formation has already been the subject of academic research (Ansari, 2017; Behar, Ritz, 2017; Bessembinder, 2018; Bradshaw, van de Graaf, 2019; Parnes, 2019; Plante, 2019).

The war in Ukraine and the existing COVID-19 pandemic have caused considerable market turbulence with regard to global oil price levels. Changes in oil prices negatively affect the economic situation of individual countries, including Poland. In order to cope with the existing social challenges, more attention needs to be paid to sustainable development (Trojanowski, Kazibudzki, 2021). Unfortunately, the BRISC summit<sup>5</sup> that took place in June 2022 indicated that Europe may have major problems related to rising inflation, which can currently be seen in Poland. The problems with curbing inflation are largely due to the fluctuation of oil prices on world markets. This is confirmed by international studies that clearly show a high dependence of inflation on oil price fluctuations, as well as on the occurrence of the COVID-19 pandemic (Apergis, Apergis, 2020; Gil-Alana, Monge, 2020; Xun-Zhang et al., 2022; Li et al., 2022). For example, studies by Kamber and Wong or Long and Zhang show that energy commodity prices have a very strong impact on global inflation (Aastveit et al., 2015; Baumeister, Kilian, 2016; Long, Zhang, 2022; Carlomagno, Albagli, 2022), while Hamilton's research revealed for the first time a close correlation between oil price shocks and macroeconomic results (Hamilton, 1983). Thus, numerous studies confirm that global oil price fluctuations affect macroeconomic variables to varying degrees (Lord et al., 2009; Katircioglu, 2015; Zulfugarov, Neuenkirch, 2020).

Worldwide, one can observe the efforts of individual countries in the search for suppliers of cheap oil. If information is additionally taken into account that in China the economy is beginning to recover from the lockdown after the COVID-19 epidemic, it should be assumed that the price of this raw material will grow dynamically (Song et al., 2022). Although, in the case of China, as the largest oil beneficiary in the world, the alliance with Russia provides the country with a low purchase price for this commodity. Thus, it seems that China will not significantly participate in the purchase of oil on European markets and, consequently, the price of this raw material in Europe should relatively

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<sup>5</sup> BRISC summit is the summit of the group of developing countries: Brazil, Russia, India, China and since 2011 South Africa.

stabilise. However, before this happens, it will mean enormous problems for the world, including European countries, and a massive increase in inflation rates.

On the other hand, the latest global oil production figures confirm that OPEC countries and its allies have agreed to cut oil production limits in order to raise prices, which have fallen in fear of an economic slowdown (E-petrol, 2022). OPEC's actions and China's economic slowdown due to the ever-present COVID-19 pandemic, as well as the relatively stable oil supply situation in Europe, are driving oil prices down. How long this process will be and what consequences it will have for the European economy will become clear in the near future.

### 3. RESEARCH METHODOLOGY

The main objective of the study was an attempt to identify the relationship between fluctuations in the price of Brent crude oil (which is the reference unit for Europe) and West Texas Intermediate (WTI), and the development of the wholesale price of diesel and its impact on road freight in Poland.

In order to verify the hypotheses, an analysis was conducted of the relationship between Brent and WTI crude oil price fluctuations and the wholesale diesel oil price, and then its impact on the development of road freight in Poland was examined. In the paper, a model called 'fuel correction' was developed, containing fluctuations of wholesale diesel oil prices on the basis of which average deviations of the road freight level were determined in the analysed period. The study used primary and secondary data obtained from a critical analysis of the available literature, as well as from reports of leading analytical agencies, including: IRU, Upply and TI. The monthly average price of Brent and WTI crude oil was determined on the basis of data published in BM Reflex agency reports on daily oil price quotations on world markets.

Subsequently, on the basis of data obtained from the leading fuel producer in Poland, PKN Orlen, data presenting the development of daily wholesale diesel prices were obtained. Based on these, as in the case of oil prices, monthly harmonic averages were calculated for the variable in question. The data obtained for the study covered the period from September 2021 to August 2022. Based on the collected statistical material, graphs were constructed showing the analysed variables along with their dynamics. In addition, an analysis of the relationship between selected variables characterising the wholesale diesel fuel price market and the amount of road freight in Poland was conducted. This study was carried out using Pearson's linear correlation coefficient with its significance test. Linear regression equations were also determined for individual pairs of variables characterising the study area. Correlation and regression analysis was conducted using the IBM SPSS statistics programme.

In the article, the authors assumed that the determinant of the amount of road freight in the analysed period is the deviation from the average freight rate that was in operation in September 2021 by the difference in the wholesale purchase price of diesel in Poland. This was due to the fact that it is practically impossible to determine specific freight rates in individual months of the research period, as their level depends on a great number of factors, including: the size of the company, the scope and quality of services provided, the length of the route, the means of transport, the type of cargo. Therefore, a model of the so-called 'fuel correction' was developed, which in the analysed months showed the amount of road freight calculated as the adjusted value of the average base freight amount by 40% of the net purchase price of diesel. The average base road freight amount was determined

on the basis of the primary survey conducted covering domestic Full Truck Load (FTL) transport. The transport unit was a standard neutral general cargo – non-unitised.

The sample selection for the study was purposive. On the basis of data obtained from public administration sources available on websites (Ranking of TSL companies, 2021), 10 randomly selected private transport enterprises belonging to the SME sector were identified, regardless of their capital and period of operation on the market. On the basis of the information obtained from the companies regarding the amount of road freight expressed as PLN rate per loaded kilometre and PLN rate per kilometre of mileage, a harmonic average was calculated for each form of transport in September 2021. Then, the obtained results of the average freight amounts for the individual forms of transport were averaged, determining the average base road freight amount falling in September 2021. Once the relevant data had been entered into the 'fuel correction' model, road freight heights were calculated for the individual months of the study period. In the developed 'fuel correction' model, a 40% share of the wholesale purchase price of diesel fuel in the total freight amount was assumed. This percentage was assumed on the basis of information obtained from the companies surveyed and data published in transport magazines. The data showed that, depending on the size of the company, its financial condition, the quality of its rolling stock and other factors, this share varies between 30% and 60%. On this basis, a harmonic mean of 40% was calculated.

The study, based on primary data, was conducted in October and November 2022. It used the desk research method of statistical data analysis, the comparative analysis method and the method of critical analysis of the available literature. Computer-Assisted Telephone Interviewing (CATI) and Computer Aided Personal Interview (CAPI) techniques were used to obtain primary data.

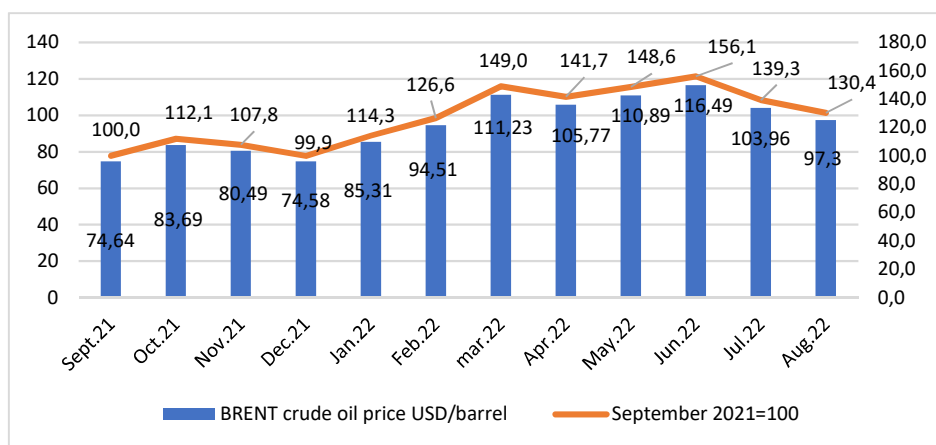
However, it should be noted that the determination of the real amount of road freight is possible only on selected relations and with the adoption of certain parameters. Thus, the presented results of the study concerning its amount are based on the forecast model of 'fuel correction' as the only criterion of their changes. Therefore, they may not fully reflect the real amount of freight for the entire transport market in Poland (Gońka, Wiśnicki, 2010).

#### 4. RESULTS

The first stage of the research analysis was to determine the average prices of Brent and WTI crude oil on the basis of stock market indices and to indicate the dynamics of change of these indices expressed in percentage terms during the period under study.

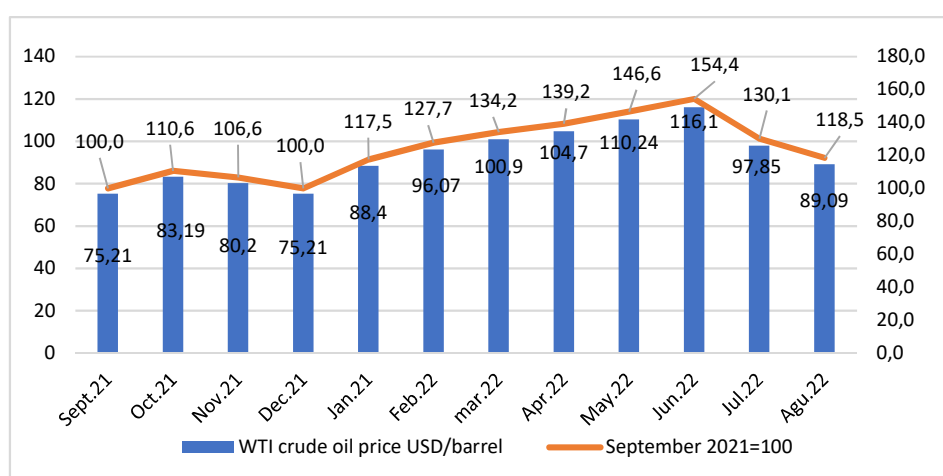
From September 2021 to February 2022, the average price of Brent crude oil as well as WTI crude oil on the world's stock exchanges remained at similar levels. From February 2022 there was a dynamic increase in the price of oil on the exchanges, which lasted until June 2022, where there was the largest increase of more than 56% for Brent oil and more than 54% for WTI oil compared to the base period. This was caused by the imposition of economic sanctions on Russia as a consequence of the war with Ukraine. This was followed by systematic declines in both Brent and WTI crude oil prices in subsequent periods, which reached USD 97.3/barrel for Brent and USD 89/barrel for WTI crude at the end of August 2022.





Graph 1. Average Brent crude oil price USD/barrel along with the dynamics of change

Source: own elaboration based on: <https://www.reflex.com.pl/ceny-brent>.

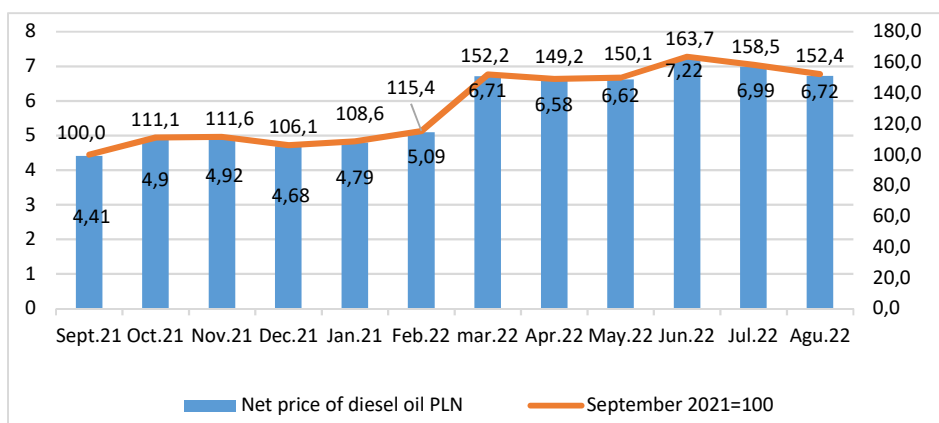


Graph 2. Average WTI crude oil price USD/barrel along with the dynamics of change

Source: own elaboration based on: <https://www.reflex.com.pl/ceny-brent> (28.10.2022).

Taking into account fluctuations in the average prices of Brent and WTI crude oil on world markets, an analysis was made of the impact of these prices on the wholesale price of diesel in Poland, as an element significantly influencing the amount of road freight.

From September 2021 to February 2022, the average wholesale price of diesel in Poland remained at a similar level. Its sharp increase was observed in March 2022 by more than 50% compared to the base period. In the last analysed period, i.e. August 2022, the average monthly net price of diesel amounted to PLN 6.72 and was 52.4% higher than in September 2021.



Graph 3. Average wholesale price of diesel oil PLN/L in Poland along with the dynamics of change

Source: own elaboration based on: <https://www.orlen.pl/pl/dla-biznesu/hurtowe-ceny-paliw#paliwa-archive> (05.11.2022).

In the further part of the research process, due to the fluctuation of wholesale diesel prices in Poland, as well as taking into account the percentage impact of diesel prices on the amount of road freight, which averages 40%, a so-called 'fuel correction' model was developed, which took into account the fluctuation of the amount of car freight in individual months as an adjusted value of the base price by the value resulting from the fluctuation of diesel purchases in net prices.

Table 1. 'Fuel correction' model showing average net road freight

Period	Average net diesel price PLN/L (base)	Variance to base	Difference %	Road freight adjustment	Month-to-month adjustment of road freight (%)	The average net road freight rate PLN/km
Sept.21	4.41	100.00	0.00%	0.00%	0.00%	<b>3.37</b>
Oct.21	4.9	111.11	11.11%	4.44%	4.44%	<b>3.52</b>
Nov.21	4.92	111.56	11.56%	4.63%	0.18%	<b>3.53</b>
Dec.21	4.68	106.12	6.12%	2.45%	-2.18%	<b>3.45</b>
Jan.22	4.79	108.62	8.62%	3.45%	1.00%	<b>3.48</b>
Feb.22	5.09	115.42	15.42%	6.17%	2.72%	<b>3.58</b>
Mar.22	6.71	152.15	52.15%	20.86%	14.69%	<b>4.10</b>
Apr.22	6.58	149.21	49.21%	19.68%	-1.18%	<b>4.06</b>
May.22	6.62	150.11	50.11%	20.05%	0.36%	<b>4.07</b>
June.22	7.22	163.72	63.72%	25.49%	5.44%	<b>4.29</b>
July.22	6.99	158.50	58.50%	23.40%	-2.09%	<b>4.20</b>
Aug.22	6.72	152.38	52.38%	20.95%	-2.45%	<b>4.10</b>

Source: own elaboration.

On the basis of the achieved results, it can be noted that in the period from September 2021 to February 2022, the amount of road freight was at a similar level, i.e. approx. PLN 3.50 per kilometre. This level of freight was recorded practically from the beginning of 2021. A dynamic change occurred in March 2022, where the amount of freight increased by almost 21% in relation to the base period, which was September 2021. This increase was primarily dictated by large fluctuations in oil prices on the global markets resulting in higher wholesale diesel prices. These increases were undoubtedly a consequence of the reduction in Russian oil imports due to the sanctions imposed on Russia. The largest increase in the amount of freight occurred in June 2022, up 25.5% compared to the base period and amounted to PLN 4.30 net per kilometre.

The first stage of the analysis related to the influence of chosen factors on the amount of road freight was to examine the relationship between the average wholesale price of diesel (PLN/L) and the net amount of road freight in the period from September 2021 to August 2022. As a consequence of changes that occurred in the area of oil and diesel price fluctuations, an analysis of correlations between variables characterising the fuel market situation and their impact on changes in the amount of road freight in Poland was conducted.

Table 1 presents the results of Pearson's linear correlation coefficients for the four analysed variables. The analysis confirmed that there is a strong and positive relationship between the analysed variables. Moreover, all the correlations proved statistically significant at  $\alpha = 0.01$ . The highest value of the correlation coefficient ( $r_{yx} = 1$ ;  $p = 0.000$ ) was recorded in the case of the study of the relationship between the average wholesale price of diesel (PLN/L) and the amount of road freight (PLN/km), which indicates a functional relationship. On the other hand, the lowest value ( $r_{yx} = 0.834$ ;  $p = 0.001$ ) was recorded for the price of WTI crude oil and average wholesale diesel prices.

Table 2. Matrix of Pearson's linear correlation coefficients

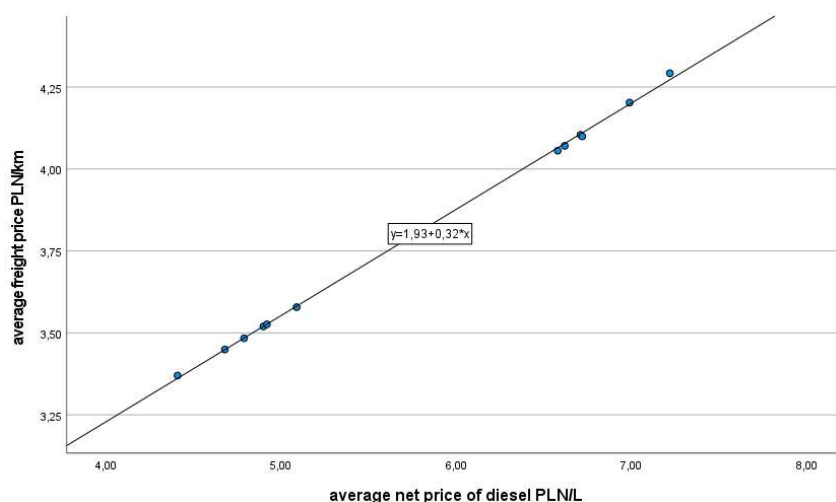
	Average wholesale diesel oil price PLN/L	Average BRENT oil price USD/barrel	Average WTI crude oil price USD/barrel	Road freight price PLN/km
Average wholesale diesel oil price PLN/L	1	,930**	,834**	1,000**
		0,000	0,001	0,000
	12	12	12	12
Average BRENT oil price USD/barrel	,930**	1	,963**	,930**
	0,000		0,000	0,000
	12	12	12	12
Average WTI crude oil price USD/barrel	,834**	,963**	1	,836**
	0,001	0,000		0,001
	12	12	12	12
Road freight price PLN/km	1,000**	,930**	,836**	1
	0,000	0,000	0,001	
	12	12	12	12

\*\* Correlation significant at 0.01 level (two-sided)

Source: own elaboration.

As a consequence of the presence of a bilaterally significant correlation, a simple regression analysis was performed for selected pairs of variables characterising the study area.

Based on the data included in diagram 4, it can be concluded that the relationship between the analysed variables is linear. Therefore, it was justified to determine the Pearson linear correlation coefficient. On the basis of the estimated regression equation, it can be concluded that an increase in the average wholesale price of diesel by 1.00 PLN generally results in a net increase in road freight by 0.32 PLN/km. The fit of the estimated regression equation to the empirical data is 99% ( $R^2 = 0.999$ ). The analysis showed that 99% of the variation in net freight depends on the variation in the average wholesale price of diesel.

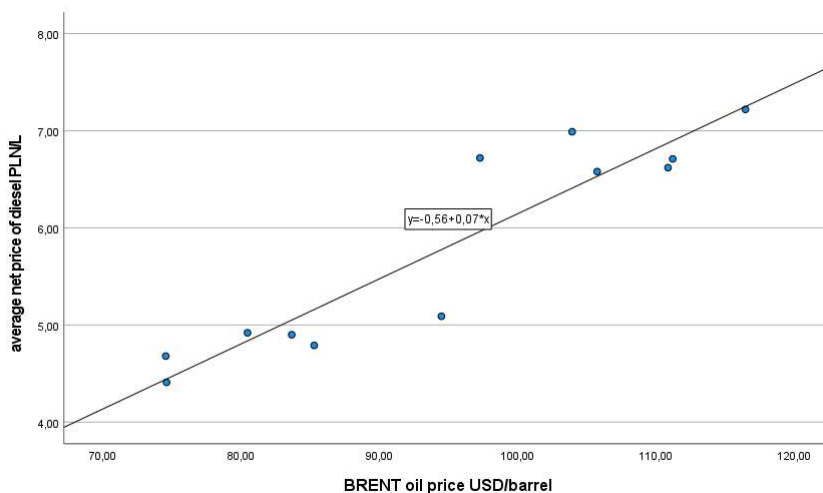


Graph 4. Scatter diagram for the average wholesale price of diesel and the amount of road freight in Poland

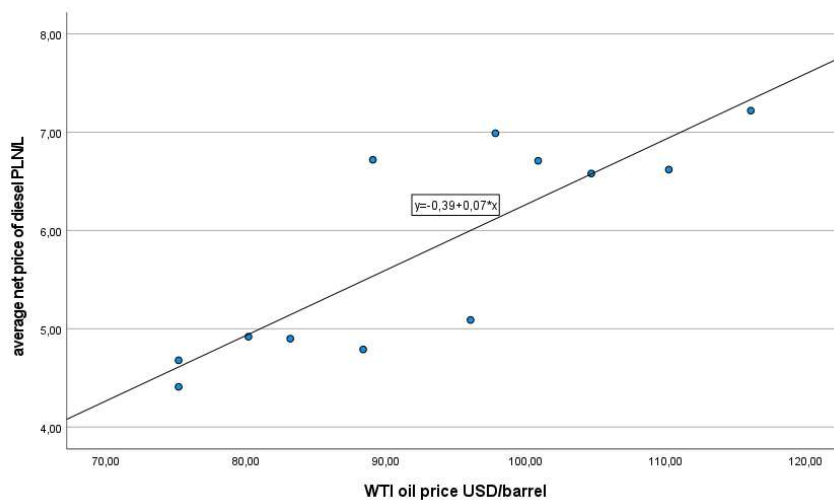
Source: own elaboration.

Another cause-and-effect relationship analysed was the study of the impact of BRENT and WTI crude oil price changes on the average level of the net price of diesel in Poland.

Based on the data presented in the scatter diagrams for the analysed variables (cf. Graph 5 and Graph 6), it can be concluded that the relationship is linear and the estimated regression equation is of the form:  $\hat{y}_i = 0.56 + 0.07 * x_i$ . The fit of the estimated regression equation to the empirical data is quite good at 87%. A USD 1 increase in the BRENT oil price results in a net increase in the diesel price of 0.07 PLN/L on average (cf. Figure 5). Similarly to the WTI crude oil price, its increase by 1 USD generally causes an increase in the average net price of diesel by 0.07 PLN/L, with a determination coefficient for the estimated regression function of nearly 70%.

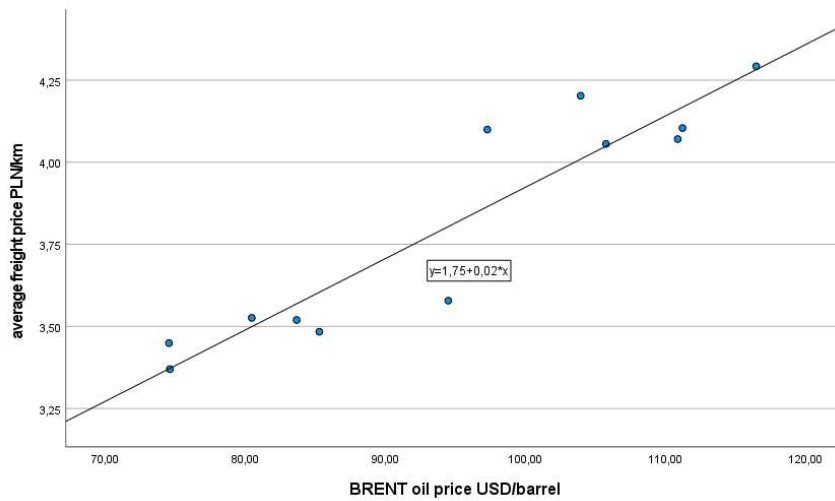


Graph 5. Scatter diagram for BRENT oil price and average net diesel price  
Source: own elaboration.

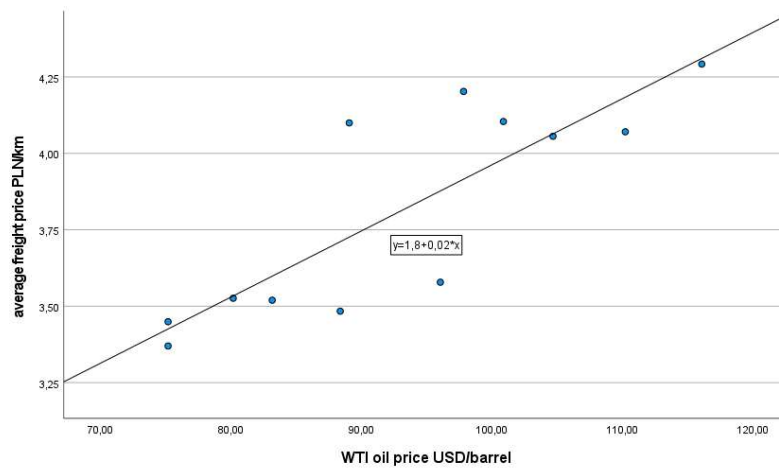


Graph 6. Scatter diagram for WTI oil price and average net diesel price  
Source: own elaboration.

The final stage of the research analysis conducted was to analyse the impact of BRENT and WTI oil prices on the net amount of road freight in Poland.



Graph 7. Scatter diagram for Brent crude oil price and net amount of road freight  
Source: own elaboration.



Graph 8 Scatter diagram for the WTI oil price and the net amount of road freight  
Source: own elaboration.

In the case of both analysed variables, the effect of Brent and WTI crude oil prices on the net amount of road freight in Poland happened to be positive. An increase in crude oil prices by 1 USD results in an average increase of 0.02 PLN/km. The estimated regression equation for the variables in question is fairly well fitted to the empirical data. In the case of the WTI oil price, the coefficient of determination reached ( $R^2 = 0.699$ ), while for the BRENT oil price variable, the coefficient in question reached ( $R^2 = 0.866$ ).

## 5. DISCUSSION

The growth rate of prices recorded by stock exchanges after the outbreak of the war in Ukraine has reduced and has been recording a slow decline in recent months. Such a trend will continue to minimum level of crude oil production. Undoubtedly, this is related to the constantly deteriorating world economic situation, and the temporary higher prices caused by the OPEC countries' plan to reduce oil supply are slowing down global demand for oil. As a result of the analyses, based on the estimation of Pearson's linear correlation coefficients for the analysed variables, it was found that there is a strong and positive relationship between all the analysed variables. Furthermore, all of these correlations were found to be statistically significant at  $\alpha = 0.01$ .

According to the CSO report, in 2020, 2331.8 million tonnes of freight were transported by road, 21.4% more than in 2019, and transport work in tonne-kilometres was 16.8% higher. Commercial transport accounted for 59.2% of total freight, while economic transport accounted for 40.8% (Transport, 2022). Further growth in the volume of transport services is also expected in the coming years (Sustainable, 2022). This is due to the fact that the war in Ukraine has caused a change in political courses of most countries and, consequently, the formation of new coalitions of economic cooperation, e.g: Russia, China and Brazil. Unfortunately, the Arab countries are also benefit from cooperating with Russia. Furthermore it is still unclear whether it will be possible to supply oil from Iran to Europe, although this seems unlikely given the increasing cooperation between Iran and Russia in the military area. The news channels reporting on Iranian arms deliveries to Russia could lead to a blockade of this direction in oil deliveries to Europe. OPEC-affiliated countries, on the other hand, are not interested in lowering the oil price, despite suggestions from the US. An alternative for Europe and the world could be oil from Venezuela.

Poland's main fuel producer PKN Orlen expects Brent crude oil prices in the range of USD 90-110/barrel and expects a temporary increase in refining margins on European markets in the coming quarters. Such expectations stem from the fact that global demand for oil is declining as a result of the economic slowdown caused primarily by lower economic activity in China. Additionally, the release of strategic oil reserves by the US and a strong dollar with OPEC+ declaring lower production by two million barrels per day deteriorate this situation (PKN Orlen's Q3, 2022).

Considering recent months, average Brent crude oil prices ranged from USD 75.64 per barrel in September 2021 to USD 97.30 in August 2022 (Average oil prices, 2022). In contrast, in Poland, the wholesale purchase price of diesel (ecodiesel) from a leading producer such as PKN Orlen in September 2021 averaged 4411.36 PLN/1000 L. Average prices for August 2022 are 6720.02 PLN/1000L. Converting the average price of a barrel of Brent crude oil (which is the reference unit for Europe) into the Polish zloty, in September 2021 it cost PLN 288.9, while in August 2022 a barrel of oil cost PLN 453.4. Thus, over the analysed period, the price of a barrel of Brent crude oil expressed in PLN increased by 57%, while diesel oil in the same period at the Polish producer rose by 52.4%. This shows that wholesale diesel prices over the period increased to a much lesser extent than crude oil.

However, this situation is not as obvious as it might seem. As the data presented in the graphs show, the difference between the scale of the increase in wholesale diesel and oil prices appeared sharply at the end of January 2022. At that time, there was no war in Ukraine yet, and oil was getting more expensive. Undoubtedly, this resulted in an increase in wholesale diesel prices across Europe, but in Poland the upward trend was mitigated.

Diesel prices began to fall in relation to European prices. At that time, a difference in price between Brent crude oil and the wholesale price of diesel was created, which remains at a more or less similar level. This difference, to a large extent, is the effect of the anti-inflation shield introduced in Poland through the government's reduction of VAT on fuel from February 2022. Therefore, paradoxically, diesel became more expensive to a lesser extent than oil on world exchanges during the period under review, thanks to the actions of the Polish government, which took protective measures.

Such activities in Poland have had a real impact on the amount of road freight. This is mainly due to the share of diesel purchase costs, which are one of the largest variable costs that a transport company has to bear. It is estimated that fuel purchase costs can account for approximately 30-60% of all expenses incurred for transport operations (Transport Orders.pl., 2022). In contrast, the price of diesel, in addition to various refining costs, margins and taxes, is primarily driven by the purchase price of a barrel of crude oil on world markets and is directly linked to the US dollar exchange rate. An increase in the price of a barrel of crude oil or the US dollar exchange rate can significantly reduce the profitability of transport services. So it is a fact that fluctuations in oil prices on world markets are significantly affecting the net amount of road freight not only in Poland, but worldwide. According to the IRU World Road Transport Organisation, transport rates increased by 6.1% during the quarter to a record 121%. This is an increase of 13.1% on Q2 2021 after four consecutive quarters of rate increases. The freight market index almost doubled, up 11.8% on Q1 2022 and 20.1% on Q2 2021 (IRU Annual Report 2021, 2022). Data from the CNR shows that in the European Union, the cost of diesel accounted on average for more than 25% of the total cost of operating a truck in 2019. (Comité National Routier, 2022).

In 2019, the average price of diesel in Europe was around €1.33 per litre. A price increase in early 2022 to €1.9 per litre suggests that fuel will now account for around 40%-60% of total operating costs (The Q2 2022 European Road Freight Rate Benchmark, 2022). In Poland, the increases on domestic routes for FTL transport were not much smaller. In March 2022, the average net freight rate was PLN 4.10, 11.4% higher than in the previous month and 11.7% higher than in January 2022. The year-on-year increase was 32.4% (Trans for Forwarders, 2022). The outbreak of war in Ukraine led to a dynamic increase in oil prices and, consequently, fuel prices at fuel stations. As a result, the fuel price reductions resulting from the anti-inflation shield were quickly consumed.

## 6. CONCLUSIONS

Oil is the most widely used resource in the world. According to the IEA, it accounts for more than 31% of the world's primary energy, at the same time being the most widely used resource for transport. Many wars have been fought over this so-called 'black gold'. The price of oil is being closely monitored by everyone - especially since the coronavirus crisis and now the war in Ukraine. Since the early months of 2022, the price of oil on the world's stock exchanges has risen by 97%. Meanwhile, history teaches that when the price of oil rises by 100% in a year, there is always a recession (Machalica, 2022).

Consumers around the world are affected by higher prices as the protracted COVID-19 pandemic and the war in Ukraine cause oil prices and natural gas prices to rise. Nusair and Olson suggest that oil price shocks have an asymmetric impact on the rates of return of several Asian countries, but do not consider China. Such a situation undoubtedly affects the economic situation of individual European countries, where transport is mainly



dominated by one industry, road transport (Nusair, Olson, 2019), which is described as the main carrier in the market (Apergies, Apergies, 2020). In freight transport, its steadily but consistently increasing share now reaches about 84% of all land transport calculated in tonnes of freight transported, due to the fact that oil will continue to play an important role in the global economy over the next few decades (Xunzhanga et al., 2017).

The huge reduction in OPEC+ oil supply increases the risks in terms of global energy security. Even taking into account lower demand expectations, this will significantly reduce the much-needed increase in oil stocks in the 2023. (Oil Market Report, 2022). Thus, in the post-pandemic era, the growth rate of global oil demand will gradually decline after slight increases, but this will allow supply capacity to be maintained and the international oil price to remain medium to low USD 60-70/barrel between 2023 and 2025 (CNPC 2021, 2022). Looking ahead to the next few years, the coronavirus pandemic and OPEC's production policy will remain the two main factors influencing the supply and price of oil on the world market.

As the results show, there is a strong and positive relationship between the analysed variables. Therefore, when crude oil prices on world markets fall, and forecasts for this raw material indicate such a tendency in the nearest future in connection with the slowdown of world economies and the spectre of their recession, this should be followed by reductions in diesel prices in individual countries, including Poland. Therefore, the amount of road freight should also have a downward trend, being strongly correlated with the price of Brent or WTI crude oil, which is the main determinant of diesel prices. However, according to experts, this will not happen. These experts predict the situation will be just the opposite. Due to the expiry of the anti-inflation shield introduced by the Polish government from the first of January 2023 which will result in an increase in fuel prices. In addition, the existing global inflation associated with the COVID-19 pandemic and the war in Ukraine causing sharp price increases for transport services and thus products of all kinds, will contribute to maintaining this trend in the future. The uncertain situation in the Middle East and economic fluctuations in China will intensify fluctuations in oil prices on global markets. Therefore, the price of diesel used in transport will not decrease but will actually increase in the long term. This, in turn, will contribute to systematic increases in the amount of road freight not only in Poland, but also throughout Europe. The year 2023 showed that the conducted research analyses confirm market trends regarding the impact of average wholesale diesel prices on road freight prices. Fluctuations in oil prices on global markets are within the adopted forecasts, and road freight prices remain at a similar level as in 2022. However, the very difficult and unstable political situation in the world makes it very difficult to indicate the direction in which the policy will be shaped. pricing of freight transport.

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## GREEN MARKETING: PERCEIVED GREEN PURCHASE CONTROL AND ITS ROLE IN EXPLAINING GREEN PURCHASE INTENTIONS: THE EMERGING MARKET PERSPECTIVE

Sustainable development is becoming a subject of global discussion. Behaviors towards the purchase of eco-friendly products may help protect the environment and reduce the adverse effects of consumption. This article aims to provide a deeper understanding of the predictors of green purchase behavior, and, in particular, to explain the role of perceived green purchase control in shaping the intention to purchase a green product. The theoretical approach is based on the Theory of Planned Behavior. An empirical study was carried out among 650 Polish purchasers of green products; data were collected using an online survey. The research clarifies how perceived green purchase control affects the intention to purchase a green product. Intentions are positively and strongly correlated with attitudes and subjective norms. On the other hand, the relationship with perceived green purchase control is relatively weak, yet statistically significant. This study provides valuable knowledge on the factors clarifying purchasers' behavior towards green products. It aids understanding of the importance of barriers to green product purchases and the formulation of marketing strategies to narrow the gap between positive attitudes and behavior, and trigger the effect of switching to green versions of products.

**Keywords:** green consumer, green marketing, green product, Theory of Planned Behaviour, perceived green purchase control.

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## 1. INTRODUCTION

The concept of sustainable development is becoming a subject of a global discussion, which results from the growing awareness of negative consequences ensuing from environmental degradation (Korombel, Ławińska, 2019). Consumers voice their concern over the environment and the future of the globe, nevertheless, their purchase behaviour does not demonstrate that they care about the environment (Tudu, Mishra, 2021; Kreczmańska-Gigol, Gigol, 2022; Witek, Kuźniar, 2020). Positive attitudes towards care for the environment and green products do not translate into green purchase behaviour (Witek, 2019a; Nguyen, H.V., Nguyen, C.H., Hoang, 2018; Joshi, Rahman, 2015). Consequently, the market share of green products is still modest, and this problem relates not only to developing, but also developed countries. A consumer may take a positive attitude towards a green product, however, he or she may have no intention to purchase it, especially, when there are difficulties. Hence, the relationship between an attitude towards green product purchase and purchase intention should be verified in consideration of the degree of how easy or difficult it is to make a green purchase. Although results of many studies (f.e. Dilotsotlhe, 2021; Zuang, Luo, Riaz, 2021; Paul, Modi, Patel, 2016; Kautish, Paul, Sharma, 2019) point to a relationship between perceived behavioural control and green product intention, there are some pieces of research which demonstrate that such a link is weak or there is no link whatsoever (Barbarossa, De Pelsmacker, 2016; Sparks, Shepherd, 1992).

This study aims to thoroughly investigate the aspects associated with the shaping of green purchase intentions, and specifically, to examine the relations between perceived green purchase control and green purchase intention, as well as between perceived green purchase control and attitudes towards green purchase and subjective norms. The present research allows for a better understanding of green purchase behaviour, and particularly, of the barriers due to which positive attitudes towards green purchase do not always translate into green purchase behaviour.

This research provides organisations, and particularly, marketing managers, with bases for green marketing strategies. The results give valuable guidance about the predictors affecting green purchase behaviour. They are of key relevance to manufacturers and retailers, showing how to overcome barriers, concerns and objections of consumers relating to green purchase, as well as how to apply effective marketing strategies. Understanding the role of perceived green purchase control in the shaping of purchase intentions may help stimulate in the future consumers' behaviour towards environmentally and socially responsible purchasing processes.

## 2. PERCEIVED GREEN PURCHASE CONTROL FROM THEORETICAL PERSPECTIVE

The purchase of a green product will be likely if a consumer adopts a positive attitude towards such a product and if that sort of behaviour of that person is expected by other people around him or her. Furthermore, consumers must perceive themselves as being capable of fulfilling their intentions, and the consumer environment cannot be influenced by any external restrictions. One of the most recognised theoretical approaches explaining consumer eco-friendly behaviours is the Theory of Planned Behaviour (Alzubaidi, Slade, Dwivedi, 2021). It was also considered a useful model for predicting green purchase behaviour (Bhardwaj, Sreen, Das, Chitnis, Kumar, 2023; Setyawan, Noermijati, Sunaryo, Aisjah, 2018; Paul, Modi, Patel, 2016).



The main construct of that model is behavioural intention, which was accepted to be the best available predictive factor of behaviour (Ajzen, 1991). Many studies acknowledge that intention is fit to explain and predict behaviour. Furthermore, powerful impact is exerted by attitudes towards behaviour and subjective norms of behaviour (Ajzen, Fishbein, 2005). Nonetheless, incorporating perceived behavioural control into the model effectively verifies behavioural intention, and consequently, behaviour. Behaviour is hence is a function of intention which is based on attitudes, subjective norms and perceived control (Ajzen, 2002). Perceived behavioural control has a direct bearing on intentions (Ajzen, 2002). It is a measure that makes it possible to determine the degree to which consumers have the opportunity and capacity to behave in a particular way. The TPB allows for the assessment of intention and purchase behaviour towards products or brands (Ajzen, 2015).

Attitudes, subjective norms and perceived control behaviour form a comprehensive framework for predicting intentions and real behaviours of purchasers towards green products. Although the results of some studies (Padel, Foster, 2005) stress the higher value of attitudes than other variables, if the purchaser has seen any difficulties, he or she will not behave in a specific way, even when a positive attitude towards green purchase is adopted. Limitations, such as: perceived social pressure and perceived difficulty of specific behaviour, weaken the relation between attitudes and behaviour (Wallace, Paulson, Lord, Bond, 2005). Hence, a positive link between an attitude and intention should be verified through the degree of perceived behavioural control. Consumers perceive difficulties in purchasing products, which has a negative impact on the intention to purchase them. It is very unlikely that consumers will engage in purchasing green products if they believe that making a purchase is difficult or effort related to the purchase of such a product does not bring any benefits to the purchaser and the environment.

Therefore, perceived behavioural control reflects a judgement as to how easy or difficult it is to bring about the effect of a given type of behaviour (Eagly, Chaiken, 1993). That construct takes into consideration perceived difficulties, obstacles and barriers which can be experienced by the purchaser in connection with a given behaviour. It is linked to the consumer's perception of external factors and his or her ability to make a purchase (Ajzen, 1991). Perceived behavioural control includes the factors of internal control (one's own effectiveness), external control (perceived barriers) and objective difficulties, e.g. product availability (Armitage, Conner, 2001). The consumer's conviction about his or her opportunities and difficulties in relation to purchase can either facilitate or limit the behaviour of such a consumer.

Perceived green purchase control reflects individual perception as to whether it is easy or difficult to purchase a green product. It can be associated with situational factors, such as economic costs, time, convenience, the availability of information about the product, and the product availability or visibility (Barbarossa, De Pelsmacker, 2016). As regards the Polish market, price and availability are behavioural control factors that are particularly perceived, as they have the potential to limit purchases (Bryła, 2016). Rejection of higher prices is the greatest barrier to purchasing green products (Connell, 2010; Gleim, Lawson, 2014). The effect of high prices is exacerbated by limited financial resources of purchasers (Chekima et.al 2016). Many studies (Joshi, Rahman 2005; Olsen, 2015) demonstrate that a high price has a negative impact on purchase intentions and purchase behaviour towards green products.

Purchasers' acceptance of higher prices is hindered by reduced efficiency of distribution and low effectiveness of promotional activities. Purchasers perceive limited

availability of green products as a barrier preventing their purchase (Buder, Feldmann, Hamm, 2014). The availability of green products refers to how easy it is for a consumer to localise and purchase a green product for consumption. The availability of green products is relevant to purchasers, affecting both their purchase intention and purchase (Tarkiainen, Sundqvist, 2005). Research showed that limited availability of green products was negatively correlated with purchase intention and thus with its purchase (Young, Hwang, McDonald, Oates, 2010). Where availability limits the purchase of a green product, consumers do not have full control over its purchase. Jarczok-Guzy (2018) points to a narrow range of promotional activities. Bryła (2016) identified, as major barriers to the purchase of green food, not only scarce availability, but also short use-by dates and poor visibility in a shop (Barber, Kuo, Bishop, Goodman 2012).

A critical barrier to purchase is insufficient awareness and scant knowledge of purchasers (Wang, Ma, Bai, 2019). A low level of knowledge about production, characteristics and eco-labelling reduces an interest in green products. This may lead to a lack of trust for green products. Such a situation can hinder the acceptance of higher prices and preclude the purchase of green products, despite a positive attitude towards them.

Other factors controlling green purchase include a sense of one's own effectiveness, convenience, a lack of economic restrictions, a lack of visibility of a product on a shelf (Witek, 2019b). When the purchaser finds that he or she has no control over the purchase of a green product or that his or her control is very weak due to such restrictions as, e.g. the unavailability of products, limited time for searching or limited economic resources, then behavioural intentions will be weaker or this may constrain the behaviour itself or even a person can decide not to purchase a green product. Low perceived behavioural control or its lack may also lead to switching to versions of conventional products (Henryks, 2014).

Many studies indicate that perceived behavioural control has a direct effect on the intention to purchase a green product (Han, Kim, 2010; Tan, 2013; Karatu, Mat, 2015). The greater perceived behavioural control is, the stronger the intentions to purchase a green product are (Mancha, Yoder, 2015; Karatu, Mat, 2015). Furthermore, many pieces of research conducted on the green food market showed a positive relationship between consumer behavioural control and purchase intention (Yin, Du, Chen, 2010; Tseng, Chang, 2015). Perceived behavioural control positively affects the intention to purchase eco-friendly cosmetics (Askadilla, Krisjanti, 2017). Similar contribution were presented in the context of green hotels (Chang et al., 2014) and recycling (Liu, Yang, Clarks, Shelly, 2022). The greater perceived control is, the higher likelihood that there will be stronger behavioural intentions is seen (Tan, 2013; Kim, Chung, 2011). Dowd and Burke (2013) found that the relationship between perceived behavioural control and purchase intention is equal to 0.5. Some pieces of research reveal that perceived behavioural control has no significance for the explanation of these sorts of behaviour (Onel, 2017) and that the relationship between perceived behavioural control, on the one hand, and intention and behaviour, on the other, is irrelevant (Yazdanpanah, Forouzani, 2015; Ng, Paladino, 2013).

### **3. RESEARCH METHODOLOGY**

The empirical research aimed to investigate the relationships between perceived green purchase control, on the one hand, and attitudes towards green product purchase and subjective norms regarding the purchase of a green product, on the other, as well as

between perceived behavioural control and the intentions to purchase a green product. The measurement is focused on green product purchase. The main constructs of the model include a dependent variable – green purchase intentions, and the following independent variables: attitudes towards green purchase, subjective norms and perceived green purchase control. The Theory of Planned Behaviour was employed to form the factors explaining purchase intentions and served as the basis for the identification of factors explaining green purchase intentions. Items were prepared based on literature sources (Table 1). These items were evaluated by respondents on a seven-point Likert scale, where 1=strongly disagree and 7= strongly agree.

Table 1. Constructs and Measurement Items in the Research Model

Constructs	Items	Cronbach's Alpha	Sources
Attitude towards green purchase (AGP)	Green purchase protects the natural environment. When I purchase green product, I help protect my health. When I purchase green product I help protect my security. When I purchase green product I am sure that I buy product of higher quality.	0.90	Wang et al., 2019; Tan, 2011; Paul et al.2016; Maichum et al., 2016; Kim, Han, 2010; Yadav, Pathak, 2017
Subjective norms (SN)	My family members purchase green products. My friends think that, I should choose green products.	0.77	Mhlophe, 2016; Taufique, Vaithianathan, 2018; Paul et al., 2016; Maichum et al. 2016; Chan, Lau, 2002; Yadav, Pathak, 2017
Perceived green purchase control (PGPC)	I purchase green product even if with higher price. I have the competence to search for green products among others available in the store. I have time to search and purchase green products. My current habits do not prevent me from purchasing green products. PCB5. I have the income to buy green food products.	0.73	Mancha, Yoder, 2015; Paul et al., 2016; Maichum et al., 2016; Yadav, Pathak, 2017; Kim, Han, 2010
Intention green purchases (IGP)	I plan to purchase green products in the next 3 months. I will purchase a green product when I go shopping next time. I am willing to pay a higher price for green product. I am willing to switch to the green version of the product, but if the price and quality are similar.	0.73	Taufique, Vaithianathan, 2018; Mancha, Yoder, 2015; Paul et al., 2016; Maichum et al., 2016; Wu, Chen, 2014

Source: own study.

The following measures were developed, which referred to: attitudes towards green purchase, subjective norms, perceived green purchase control. They were used as independent variables, whereas intentions to green purchases were assumed to be a dependent variable (Figure 1).

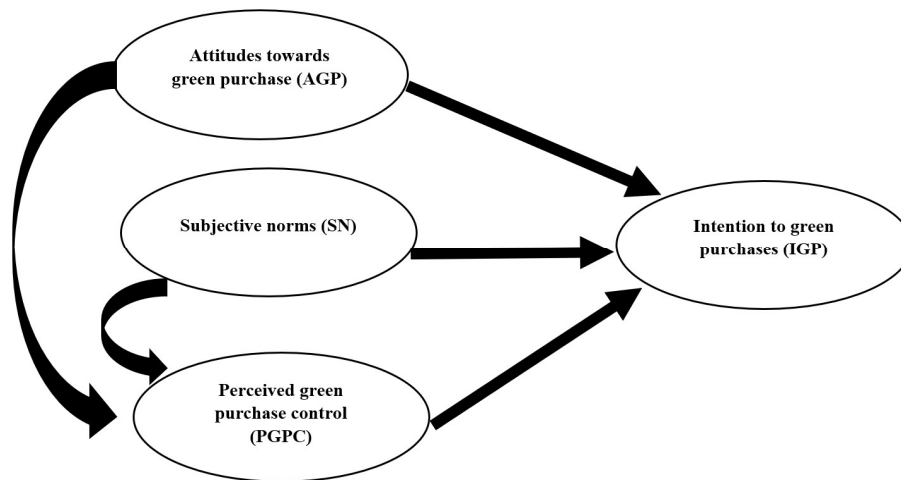


Figure 1. Conceptual Model of Green Purchase Intention

Source: own study.

The variable attitude towards green purchase (AGP) encompasses attitudes towards the purchase of a green product and its benefits. It incorporates environmental and consumer benefits relating to health, safety and high quality. Whereas the construct subjective norms (SN) includes a family and friends as the most important referents towards green purchase and their influence on purchasing decisions. The variable perceived green purchase control (PGPC) was assessed using the following factors: perceived consumer effectiveness, income, time, green product price, availability and habits. The reliability of the measurement for the scales used was tested with Cronbach's alpha. The recommended value should equal at least 0.7 as a sufficient measure of reliability or an instrument of internal consistency (Taber, 2018). A scale reliability analysis showed that the Cronbach's alpha for individual domains ranged between 0.63 and 0.9 and therefore, one statement specifying subjective norms and two statements specifying perceived green purchase control were rejected. Due to that rejection, the scales are characterised by high reliability, which is proved by high Cronbach's alpha values. The scale used for attitudes towards green purchase demonstrated the highest reliability, with Cronbach's alpha being equal to 0.9. The other components had equally satisfactory values for the said coefficient. The acceptable values of alpha, ranging are from 0.73 to 0.77.

On the basis of the above discussed literature and the TPB assumptions the following hypotheses were proposed:

Hypothesis 1 (H1): Intention to green purchases (IGP) is correlated, to the biggest extent, with perceived green purchase control (PGPC).

Hypothesis 2 (H2): The relationship between intention to green purchases (IGP) and perceived green purchase control (PGPC) is positive.

**Hypothesis 3 (H3):** Attitudes towards green purchase (AGP) are positively correlated with perceived green purchase control (PGPC).

**Hypothesis 4 (H4):** Subjective norms of green product purchase (SN) are positively correlated with perceived green purchase control (PGPC).

**Hypothesis 5 (H5):** Perceived green purchase control (PGPC) explains, to the biggest degree, intention to green purchases (IGP).

The research was carried out within one month and finished in January 2019. The online survey method was employed. To eliminate errors and improve the measurement instrument, a pilot study was conducted among 30 consumers. The final analysis covered 650 correctly completed questionnaires, which also met the research sample selection criteria. The empirical data of the results was analyzed using the IBM SPSS Statistics 27.0 computer software. Controlled variables for the sample included the place of living, age and gender of respondents (Table 2).

Table 2. Characteristics of Respondents

Characteristics	Items	Percentage
Age	18–24	13%
	25–35	30%
	36–45	28%
	46–55	17%
	55 and more	12%
Gender	Male	30%
	Female	70%
Place of living	Village	31%
	Town to 40 thousand	19%
	Town from 40 thousand to 100 thousand	13%
	City from 100 thousand to 500 thousand	12%
	City above 500 thousand inhabitants	25%

Source: own study.

#### 4. RESULTS

The analysis of the Pearson's correlation coefficient, which shows the relationship between the features, reveals that the measures selected for the research are linearly interrelated with each other, which is reflected by correlation coefficients (Table 3). The variable intention to green purchases (IGP) is to the biggest extent correlated with the variable concerning attitudes (AGP). The Pearson's coefficient equals 0.60. The relationship is positive and directly proportional, meaning that as the AGP variable goes up, the IGP variable also rises. Hence, hypothesis 1 has been rejected. Intentions are positively and strongly correlated also with subjective norms (0.50). On the other hand, the relationship with perceived behavioural control is relatively weak, yet statistically significant (0.21). Hence, hypothesis 2 has been supported. Attitudes are strongly correlated with subjective norms, however, the correlation with perceived green purchase control is weak. The relationship between attitudes and perceived green purchase control is positive, hence, hypothesis 3 has been supported. Perceived green purchase control is

positively correlated with subjective norms, although that relationship is weak. Hence, hypothesis 4 has been supported.

The more favourable attitude towards green products the purchaser displayed, the greater his or her willingness to purchase them in the future was declared. Perceived green purchase control also had a bearing on purchase intentions, however, to a lesser extent than attitudes. The opinions of people around a person were significant for his or her purchase, although also to a lesser degree than attitudes. In conclusion, Pearson correlation matrix between the model elements in the whole sample showed that attitudes towards the purchase of green products and subjective norms are positively correlated with perceived behaviour control. Perceived green purchase control has a positive impact on the intentions of purchasing green products from consumers who buy green products. The research showed that consumers had more control over the purchase (hence the more problem-free the purchase was and the more it was feasible), the more willingly he or she expressed the desire to buy.

A regression analysis performed for the model describing intentions to green purchase of all those surveyed led to the conclusion that all the variables incorporated into the model, namely, attitude towards green purchase, subjective norms and perceived green purchase control, had a statistically significant and positive impact on purchase intentions.

The forward stepwise regression method was employed to determine which variables, and in which order, enter the model and describe the "intentions to green purchase" variable to the biggest extent. The first variable to enter the model was AGP ( $R^2=0.36$ ). Another variable entering the model was SN ( $R^2=0.43$ ), followed by PPC ( $R^2=0.45$ ). The results of the estimation of model parameters are shown in Table 4.

It was found, using the forward stepwise regression method, that AGP, SN and PGPC, which describe intentions to green purchase, enter the model in this particular order as variables. Intentions to green purchase were described to the greatest extent by attitudes towards green purchase. The results revealed that the proposed model explains 45% of the variance in intentions to green purchase. It is characterised by a normal distribution of residuals, hence, it has been constructed correctly ( $p=0.25545$ ). Hence, hypothesis 5 has been rejected.

Table 3. Pearson Correlation Matrix between TPB Elements

<b>Variables</b>	<b>Attitudes towards Green Purchase</b>	<b>Subjective Norms</b>	<b>Perceived Green Purchase Control</b>	<b>Intention to Green Purchase</b>
Attitudes towards Green Purchase	1.00	0.45	0.05	0.60
Subjective Norms	0.45	1.00	0.15	0.50
Perceived Green Purchase Control	0.05	0.15	1.00	0.21
Intention to Green Purchase	0.60	0.50	0.21	1.00

Note: Intention – a dependent variable. All correlation coefficients are statistically significant ( $p < .01$ ).

Source: own study.

Table 4. Regression results for "Intention towards green purchase" dependent variable model

Specification	b*	Std. Err. b*	b	Std. Err. b	t	p-Value
Intercept			0.587	0865	0.678	0.497989
Attitude towards Green Purchase	0.477	0.033	0.519	0.036	14.607	0.000000***
Subjective Norms	0.266	0.033	0.484	0.060	8.071	0.000000***
Perceived Green Purchase Control	0.141	0.030	0.113	0.024	4.782	0.000002***

\*\*\*  $p < 0.001$  – there is a very highly statistically significant relationship.

Source: own study.

## 5. DISCUSSION AND CONCLUSIONS

The green product market is growing dynamically. In particular, green foodstuffs and cosmetics represent the most promising business sectors. Poland is a post-socialist country with the developing green sector, but the share of these products in the household budget is negligible. The present research attempted to understand the role of perceived green purchase control in the green purchase behaviour taking place or not, despite positive attitudes towards green purchase. This research demonstrated that the more problem-free the purchase of a green product for the purchaser was, the greater feasibility of that purchase could be seen. The purchaser having greater control over the purchase was more eager to make that purchase. A lack of perceived control over one's own behaviour may lead to the limitation of green product purchase. A huge number of barriers on the Polish market which hamper the purchase of green products not only create a gap between positive attitudes and behaviour, but also result in switching to a non-green version of products. Perceived factors of green behaviour control are, in particular, the price and availability of a green product. Difficulties in the purchase of green products, which are perceived by purchasers, affect their purchase intentions adversely. Behavioural intentions will be weaker, if the purchaser faces barriers preventing him or her from purchasing (Witek, 2019b). This is different on mature markets, where purchasers display greater sensitivity over sustainable activities performed by companies, and the purchaser does not concentrate on a price in the purchasing process (Ławińska, Korombel, 2023b). On the Polish market, the prevailing trend is still to look for cost-savings at the level of price of goods (Jerzyk, 2015).

The intention to green purchase has been predicted with the use of the direct measures of the main determinants (attitude, subjective norms, perceived behaviour control) that account for 45% of variance in the consumers' intention. The results of this research are concurrent with results of other studies on the green product market. In the study investigating Czech consumers, Zagata (2012) obtained the multiple square coefficient of intention and perceived green purchase control, amounting on average to  $R=0.52$ .

This study explores the fact that attitudes are strongly linked to green purchase intentions, which is in line with other research results. The research showed, however, a weak impact of perceived behavioural control on behavioural intentions, which corresponds to Klöckner's (2013) findings. These results demonstrated that attitudes, perceived behavioural control and social norms explained 55% of variance in intentions. The research revealed that perceived behavioural control had a relatively weak impact on

behaviour. This may be an indication that green products, and specifically green food and cosmetics, are more and more available to wider social groups owing to their sale in conventional retail networks (Zagata, 2012). The research revealed that perceived green purchase control is not a powerful indicator, which, to the greatest extent, explains purchase behaviours towards green products.

Having deeper knowledge of variables affecting the purchaser's behaviour towards green products motivates companies to assume greater responsibility for the effects of their operations and to be more committed to environmental protection. These achievements have an impact on green marketing, as perceived behavioural control has been considered a good indicator of green product purchase intentions. It allows for developing marketing strategies which are in line with the principles ensuring respect for the environment. Informed purchasers who bought green products regularly displayed the greatest willingness to pay higher prices. Purchasers will be prone to pay more for green production methods, on condition that they have been given clear, fair and complete information about that (Ławińska, Korombel, 2023a; Gam, Cao, Farr, Kang, 2010).

The interrelations identified in this research can help formulate practical guidelines for developing marketing instruments, and in particular, an appropriate price policy, creating the effect of visibility and availability. A lack of knowledge and trust is a considerable barrier. When purchasers gain knowledge and competences relating to the identification of a green product, this may help overcome barriers and lead to a purchase.

As indicated by the research, perceived difficulties in purchasing a green product are not that significant, as assumed. However, even if purchasers take a positive attitude towards green products, they do not display actual purchase behaviour. Hence, it is relevant to examine and seek in the future factors that are responsible for green purchase gap. A refusal to accept higher prices may stem from a lack of knowledge about the labour-intensive methods used for green production and benefits from green purchase. Furthermore, when one has no past experiences with green products, this may contribute to a lack of trust. Therefore, these two constructs must be incorporated into future research. In addition, as a consequence of mistakes made by traditional shops, where green products are not properly exhibited and are not conspicuous enough, it can happen that these products will not be able to attract purchasers' attention. Thus, the research implies that additional variables should be incorporated into the model to enhance the explanatory and predictive capacity of that model. Future research may concentrate on selected green products and attempt to clarify perceived green purchase control for different types of green products.

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## IT SUPPORT FOR DANGEROUS GOODS WAREHOUSE OPERATIONS IN RETAIL

This article describes basic IT support for dangerous goods inventory management in retail stores to ensure safe work. Retail network managers are often confronted with problems arising from the consequences of their chosen assortment choices. Time pressures related to seasonal assortment require the support of the IT system. For operators of regionally distributed shops, the central management aspect is of particular importance. Under such a requirement, the rapid and easy implementation of organizational and system design for a distributed business structure is key to achieving the expected result. A properly prepared system can significantly help in the process of implementing the idea of selling this type of material.

**Keywords:** ERP Systems, RMS Systems, dangerous goods, warehouse logistics.

### 1. DANGEROUS GOODS. PROBLEMS AND CHALLENGES

Managers of product ranges for stores could be faced with additional restrictions and legal aspects related to a specific group of goods. This type of product are dangerous goods, which additionally, as in the case of fireworks, also may be a seasonal offering. Providing management support for this type of product is a challenge. Dangerous goods are materials which have chemical, physical or biological properties that can cause damage or material injury or even death when improperly handled. The storage of dangerous goods is associated, among other things, with the possibility of serious health effects or even risk to life for people in the storage space and its environment. To avoid this type of situation, it is essential to apply the rules and regulations relating to the storage of this type of material. Enterprises that intend to expand their business in this area must be fully prepared for such situations. Therefore, compliance with obligations and tasks is important for warehouse managers and employees as well. For a company intending to trade with dangerous goods,

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maintaining complete and reliable control over storage processes ensures safety and avoids the occurrence of harmful situations (Janczak, 2014). Dangerous goods are regulated or completely prohibited for transport. Such goods need to be properly labelled, packaged transported and stored to be allowed into the market (Grzegorzczak, Buchcar, 2019). Regulations on this subject can be found already in the international convention concerning the carriage of dangerous goods by road, concluded in Geneva on 30 September 1957 (Polish Journal of laws, 2021, pos. 874). Under the general health and safety at work regulations, dangerous goods are classified as hazardous, in accordance with the regulations of the Chemical Substances and Mixtures Act, and materials containing harmful biological factors classified in hazard group 3 or 4 in accordance with the regulations on harmful biological factors for health at work and the protection of the health of workers professionally exposed to such factors (Żabiński, 2018). Based on known hazards, dangerous goods can be divided into 13 classes (Kwaśniewski, Kulczyk, Kierzkowski, Józwiak, 2014). Apart from the predominant hazard, which corresponds to the class name, a dangerous good may be characterised by an additional hazard. This additional hazard is determined on the basis of the class-specific criteria of the predominant character (Kopczewski, Nowacki, 2018):

- Class 1 – explosives materials and objects
  - mass explosion,
  - scatter, excluding mass explosion,
  - fire, with low risk of explosion, or scatter excluding mass explosion,
  - spontaneous ignition,
  - low probability of mass explosion or spontaneous combustion,
  - extremely insensitive with no mass explosion hazard.
- Class 2 – Gases
  - flammable gases,
  - non-flammable, non-poisonous gases,
  - poisonous gases.
- Class 3 – Flammable liquid
- Class 4 – Flammable solids
  - self-igniting materials,
  - materials generating flammable gases in contact with water.
- Class 5 – Oxidising materials
  - organic peroxides.
- Class 6 – Poisonous materials
  - infectious materials.
- Class 7 – Radioactive materials
- Class 8 – Corrosive materials
- Class 9 – Miscellaneous hazardous materials and objects.

An essential element that should be present with every dangerous good is the Material Safety Data Sheet. This document should contain basic physical and chemical details and describes the hazards that the material may cause. Such a card is intended to inform about potential hazards and the procedures that should be carried out in the event of an emergency (Polish Journal of laws, 2011, No. 63). In the case of retail stores, hazardous materials refer mainly to chemicals and pyrotechnics, which have the potential to cause problems if stored inappropriately (Prasula, Mazur, Czerwinska, Cieślak, 2023).

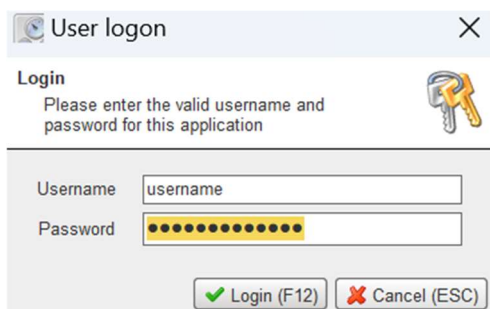
## 2. BASIC IT SUPPORT FOR DANGEROUS GOODS WAREHOUSE OPERATIONS IN RETAIL STORES

Retailers do their business at the end of the product distribution channel, and their customers are mainly consumers. The transactions usually cover sales in relatively small quantities, and the customers are private persons who, therefore, gain access to the products and services offered by the producers. The sale of stored goods is an essential function for running this type of business, which has a direct impact on its performance and market position. Retail trade is therefore an activity that takes place in shops, ensuring direct, physical access of consumers to different types of products, including dangerous goods. In order to improve the protection of the interests of both the seller and the buyer, various types of norms and legislation regulating trade-related issues have appeared since ancient times (Stepień, 2000). In Poland, a turning point in the development of the retail sector was Poland's accession to the European Union in 2004. This provided domestic companies with easier access to European markets and capital, including a wide range of products, but at the same time forced them to adapt to EU regulations.

Dangerous (hazardous) goods are substances, preparations (mixtures), and articles (solid, liquid, or gaseous) which have one or more hazardous characteristics and can therefore cause danger to human or animal life or health, harm the environment or damage property. Therefore, dangerous goods warehouses must be planned, constructed and operated in a way that minimises risks to people, environment and property (Beutler et al., 2018). Structural preventive measures for the storage of dangerous goods are of primary importance, but the possibilities to improve and support organisational preventive measures are not less important. Preventive organisational measures are an important extension of structural measures and are designed to protect workers, the public, and the environment. They limit the occurrence of risk by optimising the handling within the warehouse of dangerous goods. The employer has full legal responsibility for protecting the health and safety of its employees, customers, and the environment. Appropriate training must be provided and rules for working with hazardous materials must be strictly enforced. Dangerous goods should not be stored in the warehouse without proper packaging, labelling, or having a safety data sheet. Another important aspect is the requirement to comply with maximum storage system loads, maximum permissible quantities, or stacking rules. Furthermore, once the expiration date is exceeded, the risk of hazardous waste arises, making it necessary to carry out stock management on a FIFO (First In – First Out) basis at the very least (EU-OSHA, 2023).

A properly prepared IT system can help make all the responsibilities more manageable. Basic IT support for dangerous goods storage processes is related to securing safe work organisation and secure internal logistics. In this context, a few issues that can be relatively easily supported by a warehouse IT system seem to be the most important. Detailed access control and verification of handling with dangerous goods can be ensured. These include ensuring detailed access control and verification of personnel working with dangerous goods, the definition, and control of the separate storage area, including the identification of the shelf allowed for dangerous goods, as well as the definition and control of the weight of the stored product that is allowed in the storage location. The rules defined in this way help to prevent the storage of dangerous goods in places not approved for this purpose and by persons not authorised for such activities, such as people who have not completed the required training. This also protects against the storage of too many goods at a location with a defined maximum load capacity. System control starts when a specific user attempts

to log into the system and protects against unauthorised access. The proper definition of users and their rights makes it impossible to use the system or any part of it without knowing the user name and password. Furthermore, each user, after logging in, has a set of rights and options defined by the administrator, which allows his or her work to be continuously monitored by the IT system (Figure 1).

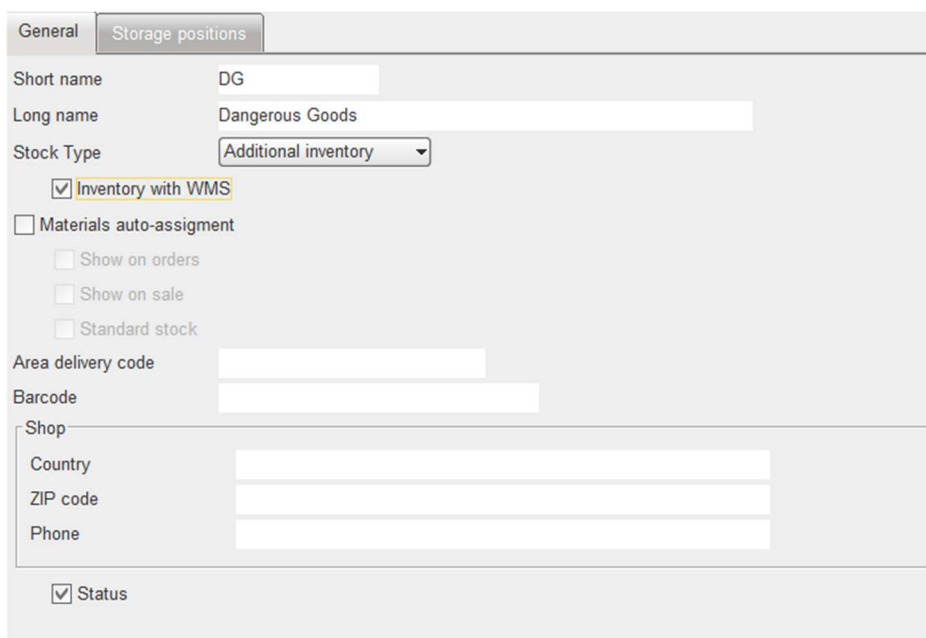


The image shows a 'User login' dialog box with a title bar containing a clock icon and a close button. Below the title bar, the word 'Login' is displayed in bold, followed by the instruction 'Please enter the valid username and password for this application' and a key icon. The dialog contains two input fields: 'Username' with the text 'username' and 'Password' with a masked password of ten dots. At the bottom, there are two buttons: 'Login (F12)' with a green checkmark and 'Cancel (ESC)' with a red X.

Figure 1. User login

Source: own research.

The first step to take to introduce dangerous goods into warehouse management is the definition of a new stock (Figure 2).



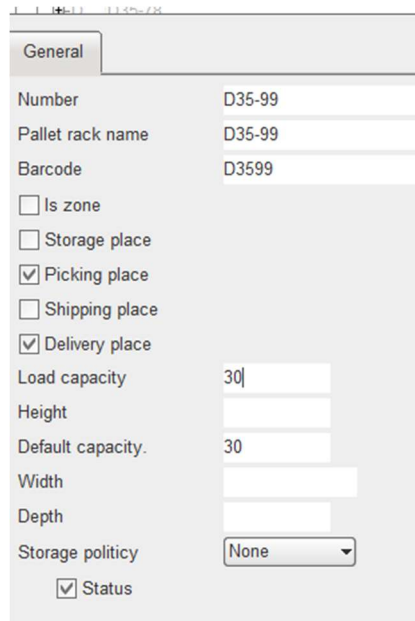
The image shows a software interface for defining a new stock. It has two tabs: 'General' and 'Storage positions'. The 'General' tab is active. The form contains the following fields and options: 'Short name' (DG), 'Long name' (Dangerous Goods), 'Stock Type' (Additional inventory), a checked checkbox for 'Inventory with WMS', an unchecked checkbox for 'Materials auto-assignment', and three unchecked checkboxes for 'Show on orders', 'Show on sale', and 'Standard stock'. There are also input fields for 'Area delivery code', 'Barcode', 'Country', 'ZIP code', and 'Phone'. At the bottom, there is a checked checkbox for 'Status'.

Figure 2. Definition of new stock for dangerous goods operations

Source: own research.



In the next step, storage locations must be allowed for the previously defined stock. This is particularly important to determine the permitted weight of the goods that can be stored at this new location. This will allow the system, while the employee is performing the task, to control the allowed filling of a specific shelf (Figure 3).



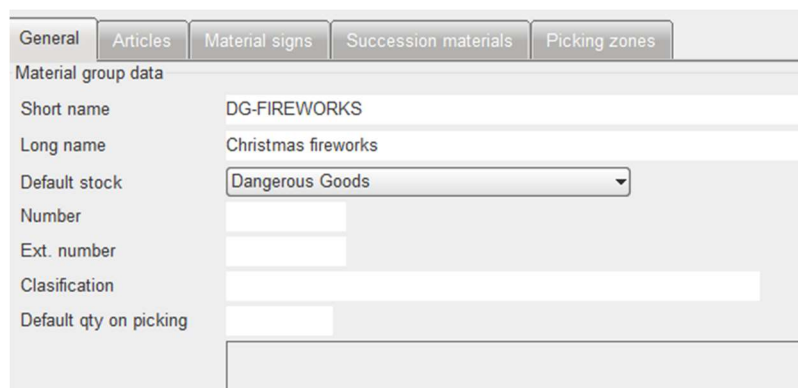
The screenshot shows a 'General' tab in a software application. The form contains the following fields and options:

Number	D35-99
Pallet rack name	D35-99
Barcode	D3599
<input type="checkbox"/> Is zone	
<input type="checkbox"/> Storage place	
<input checked="" type="checkbox"/> Picking place	
<input type="checkbox"/> Shipping place	
<input checked="" type="checkbox"/> Delivery place	
Load capacity	30
Height	
Default capacity	30
Width	
Depth	
Storage policy	None
<input checked="" type="checkbox"/> Status	

Figure 3. Definition of storage location parameters

Source: own research.

Next, a new article group should be defined for the dangerous goods (Figure 4).



The screenshot shows a 'General' tab in a software application. The form contains the following fields and options:

Short name	DG-FIREWORKS
Long name	Christmas fireworks
Default stock	Dangerous Goods
Number	
Ext. number	
Classification	
Default qty on picking	

Figure 4. Definition of groups

Source: own research.

Once these initial operations have been performed, the definition of the new article can begin (Figure 5).

Figure 5. Definition of new article

Source: own research.

An important part of the definition for dangerous goods is the assignment of a previously defined stock (Figure 6) and the determination of the weight of a single item, which allows the placement of products to be controlled, taking into account the permitted capacity of the storage locations (Figure 7).

Stock	Warning quantity	Minimum quantity	Maximum quantity	Target
Dangerous Goods	5	1		40

Figure 6. Add stock to article

Source: own research.

Unit	Weight	Height	Width	Depth	Orders	Price label	Sales	Conversion factor
Sztuk SZT	2				<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Figure 7. Definition of article weight

Source: own research.

Access to this type of storage can be restricted, e.g. users can only access the specific type of storage after completing training courses or obtaining certificates (Figure 8).

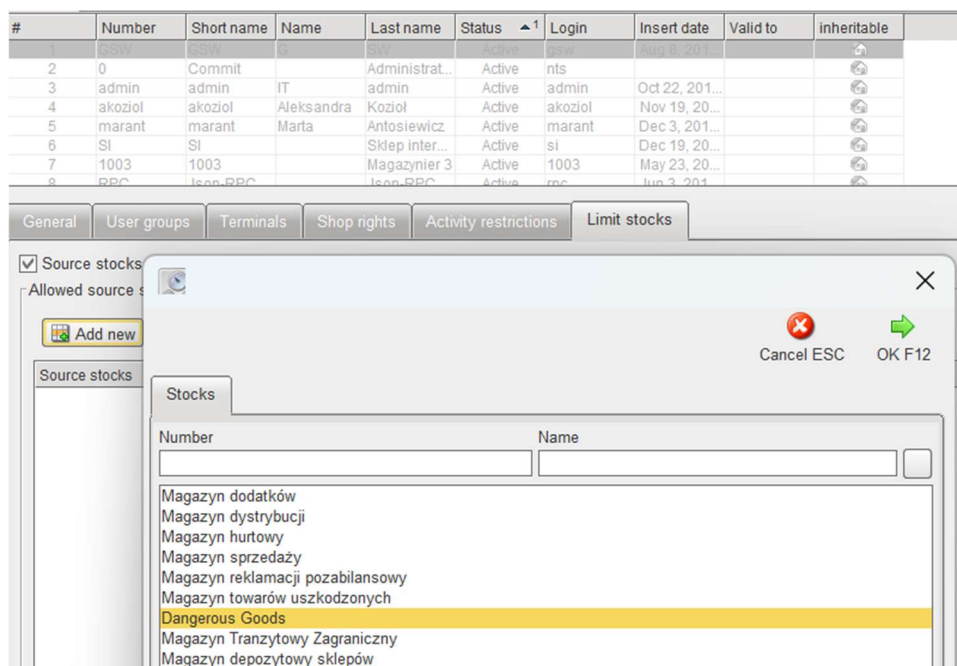


Figure 8. Allow user access to dangerous goods stock

Source: own research.

These relatively simple configuration tasks enable companies to store and trade dangerous goods. In the case of a retail network, the ability to manage all warehouses centrally is an important factor. As a result, a company's decision to introduce a new type of product can be implemented in all shops without high labour costs and with a minimum of potential mistakes.

### 3. SUMMARY

The management and storage of dangerous goods is associated with many challenges. Implementing a management decision to market a specific product is usually associated with a number of difficulties. In the case of dangerous goods, the number of difficulties appears to be much greater, especially as a large number of legal regulations have to be implemented. This is a big problem for a single independent retailer, but for a retail chain, it is a real challenge. In such a case, the ability to centrally manage the whole retail network seems extremely important. An IT system can be particularly helpful in this context. This paper presents a relatively simple way to obtain basic IT operational support for a dangerous goods launch intention. The results of the study indicate that this is important in the context of dangerous goods management, especially if such a system makes it relatively easy to set up and handle these types of case.

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## **ADDITIONAL INFORMATION**

**The Journal annually publishes a list of reviewers: in the last issue of the quarterly – No. 4 (2023) – part II and on the website:**

<https://journals.prz.edu.pl/hss/recenzenci>

**Previous name of the Journal:** *Ekonomia i Nauki Humanistyczne*, ISSN 1234-3684

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Reviewing standards, information for authors, the review form, instruction for authors and contact details to HSS Editors and to Publishing House are also published in the fourth number of Humanities and Social Sciences, 30, No. 4 (2023) – part II.

Manuscript completed in December 2023.

Printing Publishing House, 12 Powstańców Warszawy Ave., 35-959 Rzeszów

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1. To evaluate each article editors appoint two independent reviewers outside of the author's institution. At least one of the reviewers is affiliated with a foreign institution other than the author's nationality.
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12. Detailed information on reviewing articles and works proceedings of the papers and the Publishing House are described in the guidelines for authors of scientific papers.
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To prevent misconduct in science (**ghostwriting, guest authorship**), the editorial staff of Journals of the Rzeszow University of Technology has introduced appropriate procedures specific to the disciplines represented and has taken the following measures:

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2. The editors will explain the concept of **ghostwriting** and **guest authorship** to the authors, which are a manifestation of scientific misconduct, and any detected cases of this type of action on the part of the authors will be revealed, including the notification of the appropriate bodies.
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**8. Is the paper suitable for publication?**

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- Yes, but after the remarks specified in point 9 are corrected
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**9. Suggested changes by the Reviewer:**

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Jan KOWALSKI<sup>1</sup> (font size 10, bold, left aligned)

## TITLE OF THE ARTICLE (FONT SIZE 14, CAPITAL LETTERS, JUSTIFIED, BOLD, SPACE BEFORE PARAGRAPH SIZE 42, SPACE AFTER PARAGRAPH SIZE 18)

Abstract – 1 paragraph with **100–150 words**. Font size 9, mirror indents size 0.5, indent of the first line size 0.5, justified.

**1. INTRODUCTION** (font size 10, capital letters, bold, hanging indent 0.5 cm, numbered, space before paragraph size 12, space after paragraph size 3)

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Drawing 1. Sample drawing and caption (caption located under the drawing, font size 9, justified, mirror indent size 0.5 cm, hanging indent size 1 cm, space before paragraph size 6, space after paragraph size 3)

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Template for equations:

$$A_2^1 = \sum_{i=1}^n \frac{b_i \cdot \cos^2 \alpha}{2 \cdot a \cdot c} \quad (1)$$

Each equation has to be centred, space before and after paragraph size 3, numbering aligned to the right side of the margin.

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- The author's surname is put in round brackets with the year of publishing the work, page numbers are provided in case of a direct quote. According to the APA standard, surnames, years and page numbers are separated with a comma: **(Kowalski, 1999)**.
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