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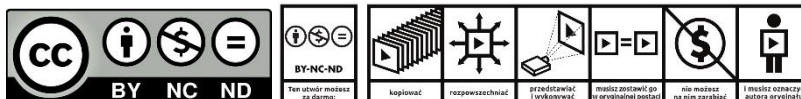
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CONTENTS

1. Felicjan BYLOK – Impact of resources of organizational social capital on the innovativeness of enterprises	5
2. Anna HORZELA, Jakub Krzysztof SEMRAU – Use of tools to improve production and logistics processes	23
3. Anna Aleksandra KARCZEWSKA – Relationship between pro-innovative organizational culture and development and profitability of companies	43
4. Dominik KONATOWSKI, Helena KOŚCIELNIAK – Process innovations and market success in enterprises – results of empirical research	59
5. Adam KOWALIK – The perception of business wargaming results among strategic and competitive intelligence community	69
6. Anna KWIOTKOWSKA – Corporate global mindset and internationalization of SMEs	83
7. Filip LIEBERT, Krzysztof WODARSKI – Conceptual framework for measuring awareness and needs of city residents towards a smart city	97
8. Oleksandr OKSANYCH – Innovation strategy and its impact on the company's competitive position	125
9. Lubomira TROJAN – The role of design management in an organisation in a turbulent environment	141
10. Barbara WYRZYKOWSKA – Evaluation of internal communication tools in a bank	153

IMPACT OF RESOURCES OF ORGANIZATIONAL SOCIAL CAPITAL ON THE INNOVATIVENESS OF ENTERPRISES

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Introduction/background: Social capital supports the flow of knowledge and information that are necessary for the creation of innovations in enterprises. Acceptance of the assumption that social capital has an impact on the creation of innovations had an influence on the formulation of the aim of the research.

Aim of the paper: The aim of the paper is identification of the relations between the organizational resources of social capital and innovative activities in enterprises.

Materials and methods: The assumed goal was executed thanks to the application of the survey method with the questionnaire technique. The research tool was a standardized survey questionnaire conducted by means of the CATI and CAWI techniques.

Results and conclusions: As a result of research, statistically significant dependencies between the resources of social capital and innovative activity were noted. Firstly, the resources of cooperation and values exert the greatest positive impact on cooperation with universities and research institutions in research projects that were conducted jointly, while also on the process of creating innovations and implementing innovative projects in enterprises. Secondly, the principles of cooperation, solidarity and values support the activities of managers aimed at stimulating the innovative attitudes of employees. Thirdly, the principles of cooperation, loyalty and solidarity have a positive impact on the creation of the optimal conditions for the formation and implementation of innovative projects.

Keywords: organizational social capital, innovations, enterprise, manager.

1. Introduction

The development of enterprises and their competitive position on the market to an increasingly greater extent depends on their innovative activities. Innovations are a significant means to achieve success in business activities (Evanschitzky et al., 2012). Currently, some enterprises are trying to advocate innovations in their activities, processes, products and services with the aim of enhancing their level of competitiveness. It has become important to create new knowledge that is essential to implement innovations, which should be distributed among their employees and availed of in all their everyday and routine activities.

This is a necessity in order for the enterprises to be able to respond to the requirements of a competitive market and rapidly changing requirements of clients.

In analysing the innovative conditions of an organization, the majority of researchers focus on the identification of the economic factors that have an impact on the innovative activities of enterprises, namely, outlays on R&D, the magnitude of companies, the form of ownership, the magnitude of competition, etc. (Baldwin et al., 2002). Relatively seldom does the focus of researchers lie on the determinants of intangible innovations. One of these is social capital, which creates the foundation of cooperation among employees, which is essential for undertaking innovative activities.

The notion of organizational social capital in essence relates to the ties and relations between the network members as a valuable source of knowledge and new ideas. Such aspects of organizational social capital, such as social relations, cooperation, participation, solidarity and loyalty are values that may support the innovative processes. By taking the resources of the organizational social capital into account, which place emphasis on the relations and interactions between employees, as well as the management and the organization, the author at hand has formulated the aim of this paper, which is to identify the ties between the resources of the organizational social capital and innovative activities. With relation to this aim, four research questions were created as follows: What is the scope of occurrence of social capital in the largest enterprises in Poland? Is there a relation between the organizational social capital and innovative activities and what is its nature? To what extent do the resources of social capital have an impact on the activities of managers in terms of stimulating the innovativeness of employees? In what sphere do the resources of social capital have an impact on the organizational factors supporting innovations in enterprises?

2. Theoretical background

Innovations in enterprises are the subject matter of interest of researchers and practitioners, who view them as the panacea for the development of an organization and reinforcement of their market position. In scientific literature, innovations are defined in various ways. For instance, Dziallas and Blind (2019) define innovations as “invention plus exploitation”, or in other words, they encompass the implementation of a new or significantly enhanced product, process or service, while also the commercialization of the innovation. Hence, the notion of innovation relates to innovative ideas that are to be commercialized on the market, as well as the ideas that have already been successfully commercialized. In turn, Kahn (2018) presented a holistic notion of innovations. According to the writer, it is possible to distinguish three ways of definition. Firstly, as a result, namely, explaining it in the context of a product, e.g. product innovations, as well as process and marketing innovations in a business model in

the supply chain and organizational network. Secondly, as a process, namely, presenting how the innovation should be organized, e.g. the general process of innovations and the process of developing a new product. Thirdly, innovations as a way of thinking relating to the internalization of innovations by the particular members of the organization in which innovations are instilled and embedded, together with the creation of the organizational culture supporting innovativeness.

A significant impact on innovations is exerted by social factors. One of these key factors is the organizational culture which supports creativity and innovativeness (Naranjo-Valencia et al., 2010). Research conducted by Lau and Ngo (2004) reveals that there is a strong relation between some types of organizational culture and the level of innovations. Researchers suggest that a developmental culture is favourable towards product innovations.

Another important factor that has an impact on innovativeness is that of the organizational social capital, which may be perceived as a resource, namely, a set of existing or potential resources of a productive nature that lies within the structure of an organization, or as a process encompassing the activities and interactions between entities of an intangible nature (Skawińska, 2012). One of the principal research trends is the resource approach in research and in the description of organizational social capital. According to Leana and van Buren (1999), the social capital of an organization may be defined as resources that reflect the nature of social ties in an organization. Inkpen and Tsang (2005), indicate that social capital is the aggregation of the resources that are available and are derived from the network of ties for physical entities or organizations. The members of an organization may avail of the resources of a network functioning in an organization without necessarily being their members. Likewise, Nahapiet and Ghoshal (1998) perceive social capital as organizational resources, according to which, it is the sum of actual and potential resources within an organization, which is available by means of the network of ties, involving the possession of an individual entity or social unit, as the basis of trust and cooperation between people that has an impact on the social ties enhancing the efficiency of the organization. In general terms, it is possible to say that the organizational social capital is an organizational resource that is based on the social ties connecting employees and creating a vibe of cooperation that is essential to accomplish collective goals effectively by the employees and the enterprise itself (Bylok, 2020).

A review of the numerous works relating to social capital in an organization facilitates the distinction of two fundamental approaches to its perception as follows: as a form of the ties of an organization with its stakeholders, partners, competitors (external notion of capital) and as the form and nature of ties between the members of an organization (internal notion of capital) (Leana, and Frits, 2006). External social capital takes on the form of network ties between the organization and external entities, namely, people, organizations, institutions and communities. However, internal social capital relates to the social ties connecting the employees of a particular enterprise that have an impact on the creation of the vibe of cooperation. The composition of this capital includes the ties of employees within the employee team and

inter-group ties that connect the members of various teams. The fundamental assumption of this approach is the conviction that the engagement and participation in an organization may bring benefits to both the organization and its participants.

In the analysis of the organizational social capital, it is possible to describe its dimensions. Nahapiet and Ghoshal (1998) built a research construct consisting of three dimensions of social capital, which mutually interpermeate. The first one is the structural dimension that encompasses the ties between the members of the network, the configuration and the adequateness of the network. Network ties are connections between the members of an organization and may have an impact on the scope of information transfer, e.g. in a situation where the employees are more connected with each other and due to this fact, they share information or knowledge to others willingly. The second one is the cognitive dimension which consists of symbols, codes, common language and non-verbal artefacts that constitute the significance of the network. Their significance stems from the fact that common codes and codification as part of the common language support the diffusion of knowledge. The third one is the relational dimension that appears in the obligations, norms and trust. It encompasses trust, norms, regulations and identification, which all fulfil important functions in social relations.

Analysis of the dimensions of social capital in enterprises facilitates the definition of its attributes. The first of them is the structural element which encompasses social networks and information channels. It is possible to term this the capital of social networks. P. Bourdieu (1986) perceived the importance of social networks in the creation of resources. Participation in the network facilitates the acquisition of various benefits for individuals, albeit only in situations when they are long-lasting and geared towards mutual cooperation. The second one is of a normative nature in terms of creating the capital of values. It includes social norms that regulate the social ties in an organization and values. These ties are bilateral, mutual and are regulated by the organizational structure. Their shape is influenced by the degree of sharing a common vision of the organization that is determined by collective values (subject to the aims of the individuals and the aims of the organization itself). The third is of a moral nature, which include the norms of trust and mutuality. It is possible to term this the capital of trust, which signifies, according to the perception of Sztompka “resources and benefits flowing from the defined position in the networks of trust” (2007, p. 263). These three dimensions interpermeate, thus creating a multi-dimensional organizational fabric, which has a significant impact on the functioning of the organization. From the perspective of those managing an enterprise, it is important to have knowledge on the subject of the significance of the particular dimensions of social capital in order to be able to develop them in the appropriate way to achieve the assumed goals.

Research on the impact of social capital on the functioning of an organization reveals that the organizational social capital may help the innovativeness of the organization at hand. It is one of the key elements in transforming the business activities of an organization that is geared towards efficiency into an innovative one, which has an impact on the enhancement of

its competitiveness (Laužikas, and Dailydaitė, 2015). This stimulates innovations, education, while simultaneously influencing work efficiency (Sztaudynger, 2007). Apart from the benefits listed above, it is possible to indicate the role of social capital in terms of streamlining the transmission of knowledge and diffusion of new technological solutions among the network participants. Social capital favours the sharing of knowledge by means of providing access to tacit and explicit knowledge, while also the exchange of knowledge and innovations in a team (Hu, and Randel, 2014). The research findings of Ahmadi (2012) indicated that there is a significant relation between the dimensions of social capital and the effectiveness of knowledge management. Social capital as one of the most important organizational features supports the process of creating and sharing knowledge, which in turn leads to the achievement of a long-lasting competitive advantage. In addition, social capital has a positive impact on the growth of the position of the firm at hand on the market thanks to the transfer of knowledge acquired in the external networks, while also the spread of knowledge between the internal entities of the firm (Liu et al., 2010). In analyzing the impact of social capital on efficiency, Chiu et. al. (2006) observed that the organizational elements of social capital, such as trust, mutuality, common vision, common language norms and motivation have an impact on behaviour relating to sharing information. This is essential for the creation of innovations in the enterprises.

In sum, organizational social capital brings a multitude of benefits to an enterprise. This favours the diffusion of knowledge that is essential in terms of the creation of innovations, while also helping the process of the formation of innovations and their implementation. Thus, this is a strong prerogative for managers to develop their resources, which would bring measureable benefits for the enterprises they run.

3. Methods

Research was conducted in May 2019 among 179 enterprises from the list of the 500 largest enterprises in Poland in 2019 published by the Polish newspaper entitled *Rzeczpospolita*. The research was participated in by 74 manufacturing enterprises, 35 trading enterprises, 25 service enterprises, 20 manufacturing-service enterprises and 25 manufacturing-trading enterprises. Further variables were the magnitude of the employment structure and the level of revenue attained in the particular year of revenue, whereby the research was participated in by 139 companies employing between 201 and 500 workers and 46 companies employing over 501 workers, with revenues from 5 to 50 m PLN – 55 enterprises, from 51 to 200 m PLN – 85 enterprises, while over 200 m PLN – 39 enterprises. The respondents were representatives of these enterprises, e.g. personnel directors, HR department heads, while also specialists of the field of HR. In the selection of enterprises for research, the method of random selection was

applied. The collection of data involved the application of the opinion poll method with the survey technique. The research tool was a standardized survey questionnaire conducted with the CATI and CAWI techniques.

In the analysis of the research findings, independent and dependent variables were chosen. The resources of organizational social capital were chosen as the independent variable, whereas innovative activities in enterprises, the activities of department heads aimed at stimulating innovative undertakings and organizational factors influencing the innovativeness of employees were chosen as the dependent variables. With the aim of analysing the relations between the independent and dependent variables, Spearman's rank correlation coefficient was applied.

4. Results

4.1. Organizational resources of social capital in the enterprises analyzed

The level of social capital in an enterprise depends to a large extent on the degree of occurrence of its resources. On the basis of the resource concept of social capital, its resources have been distinguished, which include cooperation, solidarity, participation, loyalty and values. In Table 1, the research findings of five resources of social capital have been presented. One of the most important in the opinions of those analysed is that of cooperation, which is a behavioural component of social capital (48.1% of those analysed). Simultaneously, the most highly rated was sharing information, knowledge and learning from each other (52.1%) and possessing the skill of cooperation (50.8%). An equally important resource is that of values (48.5%) which is listed among the regulative dimensions of social capital. Among the indicators of this resource, respect for norms and values were the highest rated (51%). Another resource that is listed in the dimensions of social capital is solidarity, which is based on informal social norms. It increases the level of certainty in terms of taking risks on the part of the employees. In the enterprises analysed, it is the most lowly rated in comparison with the remaining resources (40.4%). An important resource of social capital is participation, which belongs to the structural dimension of social capital. Its significant indicator is the participation in integration events (53.7%), during which there is an opportunity to build informal ties between employees and department heads (46.4). The cognitive component of the dimension of social capital is that of loyalty. This first and foremost occurs when employees are ready to help other employees (55.5%).

By way of conclusion, social capital is at a medium level in the enterprises analysed, which may be acknowledged to be a significant factor that has an impact on their functioning. The high level of cooperation and values indicates the great potential opportunities of availing of them in terms of creating innovations in the enterprises analysed.

Table 1.*Evaluation of resources of social capital in enterprises analysed in percentage form*

Specification	Evaluation				
	1	2	3	4	5
Cooperation resource	16,3	17,0	18,6	27,1	21
Employees share information, knowledge and learn from each other	16,7	11,7	19,5	31,3	20,8
Employees apply knowledge from one area to resolve problems which appear in another area of the firm	18,4	19,5	19,5	25,7	16,9
Employees frequently contact the managers in the search for new solutions to the tasks commissioned for execution	18,4	16,7	18,4	25,7	20,8
The majority of employees have the skill of cooperation	15,1	17,9	16,2	29,1	21,7
Employees are creative in resolving problems at work	12,8	20,7	19,5	24,02	23,0
Solidarity resource	14,3	21,6	23,7	23,1	17,3
Employees display solidarity towards work colleagues	14,0	18,4	21,2	29,1	17,3
Employees place the general good over their own	19,6	24,6	26,8	15,1	13,9
Employees are ready to take risk in activities	7,8	25,7	22,3	20,7	23,5
Employees are featured by ethicality in their relations with other employees	10	17,8	24,6	27,9	20,7
Participation resource	17,8	19,7	17,3	24,9	20,3
Employees participate in integration events willingly	12,3	17,3	16,7	29,6	24,1
Employees create informal groups based on cooperation	17,3	19,5	21,2	27,3	14,7
The majority of employees are members of trade unions	24	22,9	18,9	17,8	16,4
Loyalty resource	15,2	16,6	24,3	26,6	17,3
Employees are loyal to each other	15,6	16,2	26,2	26,8	15,2
Employees are loyal to the firm where they work	15,6	21,7	27,3	19,5	15,9
Employees are ready to help other employees	12,8	11,1	20,6	30,1	25,4
Employees are benevolent and cordial with regard to each other	16,7	17,3	22,9	29,6	13,5
Value resource	15,2	16,5	19,5	27,7	20,8
The majority of employees have respect for norms and values	16,1	15,6	17,3	25,1	25,9
The majority of employees accept the dissimilarity of co-workers	17,3	17,3	20,1	29	16,3
Employees adhere to the ownership rights	11,7	16,7	21,2	29	21,4

Scale: 1 – I definitely disagree, 2 – I disagree, 3 – I neither agree nor disagree, 4 – I disagree, 5 – I definitely agree.

Source: self-analysis.

4.2. Relations between social capital and innovativeness of enterprises

Organizational social capital based on cooperation, solidarity, loyalty and values is favourable towards the formation of innovations. A starting point for the evaluation of its impact on innovations in the analysed enterprises was the evaluation of innovative activities (Table 2). The representatives of the analysed enterprises rated the impact of the implementation of innovations over the past five years the most highly in terms of the revenue acquired by the company (44.3% of ratings were rather good and totally good), while also the creation of innovations in the enterprise (43.2% of ratings were rather good and totally good). Subsequent to this, the respondents gave a positive appraisal of the cooperation with R&D units and universities (38.1% of ratings were rather good and totally good), while also the flow and creation of knowledge in the company (37% of ratings were rather good and totally good). The most negative appraisals were related to the cooperation with universities in research projects that led to the development of the company (39%) and activities undertaken in the sphere of the implementation of an innovative project (39%). In sum, the evaluation of

innovative activities is ambiguous as on the one hand, innovations are implemented in the analysed companies and are evaluated in a positive way, while on the other hand, they encounter obstacles. The negative appraisal of cooperation with universities in research projects by a significant percentage of respondents indicates that there is a need for change in this sphere. Financial incentives from the state would be helpful in terms of undertaking joint innovative projects by universities and enterprises.

Table 2.

Evaluation of innovative activities in enterprises in percentage form

Specification	Evaluation				
	1	2	3	4	5
Cooperation in research projects with universities led to the development of the firm.	19,5	19,5	27,9	18,4	14,7
Impact of implementation of innovations over the past 5 years on revenue acquired by the firm.	17,8	15,6	22,3	21,2	23,1
Cooperation with R&D units and universities.	18,4	17,3	26,2	20,1	18
Cooperation with innovation centres (transfer centre, technology parks).	16,2	19,5	29	19,5	15,8
Mechanisms of financing programs and projects devoted to innovativeness.	18,4	17,3	31,8	20,1	12,4
Activities undertaken in the sphere of implementing an innovative project.	22,3	16,7	30,1	13,9	17
Cooperation with brokers of innovation while implementing a project.	18,9	18,4	31,2	13,9	17,6
Creating innovation.	12,2	19,5	25,1	25,1	18,1
Flow and creation of knowledge in the firm.	19,5	18,4	25,1	19,5	17,5

Scale: 1 – totally bad, 2 – rather bad, 3 – neither good nor bad, 4 – rather good, 5 – totally good.

Source: Self-analysis.

The creation of innovations is a complicated process, in which the cooperation between employees, management and external entities is the key to the accomplishment of success. One of the factors that supports this process is the organizational social capital. In self-analysis, it was decided that the relations between the resources of social capital and innovative activities would be analysed. The Spearman rank correlation coefficient r_s was applied for analysing these relations, which illustrates the level of the impact of the resources of social capital on innovative activities. Analysis of the ties indicates that the cooperation as a resource of social capital has first and foremost a positive impact on cooperation with universities in research projects ($r_s = 0,233$, $p = 0,002$). A detailed analysis of the attributes of this resource indicates interesting ties. The attribute *of workers frequently contacting their managers in the search for new solutions to the commissioned tasks for execution* has a positive impact on cooperation in the research projects with universities ($r_s = 0,162$, $p = 0,029$) and on the activities undertaken in the sphere of the implementation of an innovative project ($r_s = 0,165$, $p = 0,030$). The attribute of the *majority of employees having the skill of cooperation* has a positive impact on cooperation in research projects with universities ($r_s = 0,269$, $p = 0,000$), on the revenue of the company that has been acquired over the past five years relating to the implementation of innovations ($r_s = 0,224$, $p = 0,003$) and cooperation with the innovation centres ($r_s = 0,175$,

$p = 0,019$). However, the attribute that *employees are creative in terms of solving problems at work* has a positive impact on cooperation with universities in research projects ($r_s = 0,152$, $p = 0,042$) and cooperation with the innovation centres ($r_s = 0,150$, $p = 0,044$).

The resource of solidarity has a positive impact on the process of creating innovations ($r_s = 0,237$, $p = 0,001$) and on the flow and creation of knowledge ($r_s = 0,247$, $p = 0,001$). Analysis of the indicators of this resource with innovative activities indicated the following relations: the process of creating innovations is influenced by the following attributes: *employees feel solidarity with their other work colleagues* ($r_s = 0,277$, $p = 0,000$), *employees are ready to undertake risk in their activities* ($r_s = 0,165$, $p = 0,027$) and *employees are featured by ethicality in relations with other employees* ($r_s = 0,277$, $p = 0,000$). The flow and creation of knowledge in the enterprise are positively influenced by the attributes of *employees placing the common good over their own* ($r_s = 0,208$, $p = 0,005$), *employees are ready to undertake risk in their activities* ($r_s = 0,162$, $p = 0,005$) and *employees are featured by ethicality in relations with other employees* ($r_s = 0,187$, $p = 0,013$).

The resource of participation has first and foremost a positive impact on the process of the flow and creation of knowledge ($r_s = 0,254$, $p = 0,001$). Analysis of the impact of its attributes on the innovative activities indicated relations between the indicator *employees participate in integration events willingly* and cooperation with universities in research projects ($r_s = 0,176$, $p = 0,018$), while also the process of the flow and creation of knowledge ($r_s = 0,162$, $p = 0,032$). However, the attribute that *the majority of employees are members of trade unions* has a positive impact on cooperation with R&D units and universities ($r_s = 0,225$, $p = 0,002$) and a negative impact on the mechanisms of financing programs and projects devoted to innovativeness ($r_s = -0,149$, $p = 0,049$) and on activities undertaken in the sphere of the implementation of an innovative project ($r_s = -0,160$, $p = 0,031$).

The resource of loyalty has a positive impact on the cooperation between a company and universities in research projects ($r_s = 0,233$, $p = 0,002$), cooperation with R&D units and universities ($r_s = 0,158$, $p = 0,035$) and in terms of activities undertaken in the sphere of implementing an innovative project ($r_s = 0,196$, $p = 0,009$). A detailed analysis of the impact of the attributes of loyalty on innovative activities illustrated the following: there is a significant impact of the attribute *employees are loyal to the company where they work* on the cooperation of the company with universities in research projects ($r_s = 0,195$, $p = 0,009$), while the attribute *employees are ready to help other employees* has an impact on the activities undertaken in the sphere of the innovative project undertaken ($r_s = 0,206$, $p = 0,006$) and the process of creating innovations ($r_s = 0,19$, $p = 0,007$), while also the attribute that *employees are kind and cordial to each other* has an impact on the cooperation with R&D units and universities ($r_s = 0,203$, $p = 0,006$) and the mechanism of financing programs and projects devoted to innovativeness ($r_s = 0,225$, $p = 0,002$.)

The resource of values has first and foremost a positive impact on the cooperation of a company with universities in research projects ($r_s = 176$, $p = 0,018$). The attribute that *the majority of employees have respect for norms and values* has a positive impact on the cooperation of a company with universities in research projects ($r_s = 180$, $p = 0,016$). Likewise, the attribute that *the employees conform with ownership rights* has a positive impact on the cooperation of the firm with universities in research projects ($r_s = 252$, $p = 0,001$). In turn, the attribute of *the majority of employees accepting the alterity of co-workers* has a positive impact on the cooperation of a company with universities in research projects ($r_s = 178$, $p = 0,017$), as well as the revenue of the company over the past five years arising from the implementation of innovations ($r_s = 152$, $p = 0,043$) and on the cooperation with R&D units and universities ($r_s = 0,152$, $p = 0,042$).

In sum, the resources of social capital have varying degrees of impact on the innovative activities of the analysed enterprises. The greatest positive impact is exerted by the cooperation with universities and research institutions in research projects that are jointly executed. This relates to the resources of loyalty, values and cooperation. Likewise, a significant impact is exerted on the process of creating innovations and on the implementation of an innovative project in enterprises.

4.3. Role of managers in creating innovation in an enterprise

The process of creating innovations in enterprises is influenced by internal factors that include the following: managerial, organizational, personnel, financial, etc. Of these factors, the managerial factors hold an important position. Managers initiate, support and control the innovative activities. Analysis of Table 3 reveals that in the analysed enterprises, the greatest significance is attached to the requirements of the manager with regard to the necessity of enhancing the skills and improving the knowledge of employees, which in turn, serves to support the innovative undertakings (56.1% of responses were in the form of “I partly agree”, or “I totally agree”). Likewise, an important task for a manager is to openly communicate with the employees with regard to the expectations relating to their innovativeness (49.5% of responses were in the form of “I partly agree”, or “I totally agree”). A further task for a manager is to encourage taking on challenges that may bring benefits for the enterprise (48.8% of responses were in the form of “I partly agree”, or “I totally agree”). The smallest role in terms of stimulating the innovativeness of employees is played by the help on the part of the manager in terms of breaking down barriers in the process of implementing innovations (41.2% of responses were in the form of “I partly agree”, or “I totally agree”).

By way of conclusion, managers may significantly influence the creation of the innovative vibe in enterprises by means of encouraging employees to take action in favour of innovativeness, while also to enhance skills and improve knowledge that support these actions and open communication.

Table 3.*Activities of managers in stimulating the innovativeness of employees in percentage form*

Specification	Evaluation				
	1	2	3	4	5
Having high level of autonomy that facilitates the acceleration, slowdown or total resignation of the innovative undertaking.	24,5	14,5	15,6	13,4	32
Encouragement of taking on challenges, if the opinion is that they will bring benefits.	24	12,2	15	17,3	31,5
Expectation of enhancing skills and increasing knowledge, which may serve the support of innovative undertakings.	18,9	11,1	13,9	13,9	42,2
Expectation of creativity, thinking and activities in a novel and original way from the employees.	26,8	10,6	18,9	17,3	26,4
Aid in breaking down barriers in process of implementing innovations.	30,1	11,1	14,5	15,6	28,7
Openness of communication with employees relating to innovativeness.	25,1	12,6	12,8	23,4	26,1
Support by the managers of employees who want to search for novel solutions.	24	11,8	20,6	21,2	22,4

Scale: 1 – I totally disagree, 2 – I partly disagree, 3 – I neither agree, nor disagree, 4 – I partly agree, 5 – I totally agree.

Source: Self-analysis.

The principles of organizational social capital support the activities of managers with regard to the formation of innovative undertakings. Analysis of the mutual relations between the resources of social capital and the activities of managers that support the innovativeness of employees reveals that the resources of cooperation have a positive impact on their expectations with reference to their employees in the sphere of enhancing skills and increasing knowledge, which may serve the support of innovative undertakings ($r_s = 226$, $p = 0,002$). Likewise, the resources of cooperation have a positive impact on the scope of autonomy of the manager that facilitates the acceleration, slowdown or total resignation from the innovative undertaking ($r_s = 196$, $p = 0,009$). The resource of solidarity is positively correlated with several activities of the manager that are aimed at the creation of innovation. The strongest relation occurred between these resources and the expectation of creativity, thinking and activities of a novel and original manner from the employees ($r_s = 252$, $p = 0,001$). Apart from this fact, solidarity is positively correlated with the support of employees who want to search for novel solutions on the part of their managers ($r_s = 196$, $p = 0,009$), expectation of creativity, thinking and activities in a novel and original way by the employees ($r_s = 173$, $p = 0,021$), while also encouragement of the employees to take on challenges if they are acknowledged to bring benefits to the company ($r_s = 169$, $p = 0,029$). The resources of participation are positively correlated with the help provided by the managers to break down barriers in the process of implementing innovations ($r_s = 189$, $p = 0,011$). Apart from this, the resources of participation have a positive impact on the autonomy of the project manager that facilitates the acceleration, slowdown or total resignation from the innovative undertaking ($r_s = 180$, $p = 0,016$) and the support of the employees who want to search for novel solutions on the part of their managers ($r_s = 180$, $p = 0,016$). Analysis of the relations between the resource of loyalty and the activities of the manager in the sphere of stimulating innovative activities facilitated the establishment of

significant dependency between this resource and the openness of communication with employees with regard to the expectations relating to innovativeness ($r_s = 148$, $p = 0,016$). The resource of values has a significant impact on the help provided by managers in terms of breaking down the barriers in the process of implementing innovations ($r_s = 227$, $p = 0,002$) and on the encouragement of employees to take on challenges if they are acknowledged to bring benefits to the company ($r_s = 221$, $p = 0,001$).

In sum, the resources of social capital support the activities of managers in terms of stimulating the innovative attitudes among the employees. The resources of cooperation and values have the greatest impact on particularly such activities of the managers as openness of communication with the employees relating to the expectations regarding innovativeness, help provided to the employees in terms of breaking down the barriers in the process of implementing innovations and expectations with regard to employees in terms of enhancing their skills and increasing knowledge, which may serve the support of innovative undertakings.

4.4. Role of organizational factors in development of innovation in enterprises

The development of the innovativeness of the employees in enterprises is influenced by a multitude of organizational factors. In research, evaluation has been conducted on several of these, which may be acknowledged to be significant. Analysis of Table 4 reveals that the most important is the utilization of the creativity of the employees in activities geared towards new solutions (53.7 % of responses were in the form of “I partly agree”, or “I totally agree”). Likewise, the functioning of easy availability for employees to information and knowledge in the enterprise is important (51.4% of responses were in the form of “I partly agree”, or “I totally agree”). Apart from this fact, the existence of cohesive goals of development relating to innovative undertakings is significant (49.8% of responses were in the form of “I partly agree”, or “I totally agree”), while also the creation of optimal conditions for cooperation between units/departments (49.4% of responses were in the form of “I partly agree”, or “I totally agree”). However, the majority of the negative ratings were attributed to the factor of the functioning of the system of rewarding employees for supporting the creation of new solutions (42.9% of responses were in the form of “I partly agree”, or “I totally agree”).

In sum, the factors that had a positive impact on the development of innovations are first and foremost the cohesion of the aims of development of innovation, creativity of employees in innovative activities and the creation of easy access to information and knowledge, while also the optimal conditions for cooperation within the enterprise. The task of the management of enterprises should be the creation of a motivational system that would encourage employees to undertake innovative activities.

Table 4.*Role of organizational factors in development of innovations in enterprises*

Specification	Evaluation				
	1	2	3	4	5
Existence of cohesive aims for the development of innovative undertakings.	24	14,5	11,7	16,2	33,6
Availing of the suggestions of clients or competition, which facilitates the enhancement of products.	26,8	11,1	15	20,6	26,5
Functioning of easy access of employees to information and knowledge.	25,8	15	7,8	13,4	38
Creation of optimal conditions for cooperation between units/departments.	18,9	12,2	19,5	17,3	32,1
Functioning of the conviction that innovations have much greater opportunities for success if the employees may apply untypical and unique solutions in their everyday work.	26,8	12,2	15,6	15	30,4
Availing of the creativity of employees in terms of activities aimed at innovations.	21,7	12,8	17,8	20,6	27,1
Functioning of the system of rewarding that supports the creation of new solutions.	25,6	17,3	12,2	16,7	28,2
Expectation of initiatives from the employees in terms of activities aimed at innovations.	21,7	12,8	17,8	20,1	27,6

Scale: 1 – I totally disagree, 2 – I partly disagree, 3 – I neither agree, nor disagree, 4 – I partly agree, 5 – I totally agree.

Source: Self-analysis.

One of the aims of this paper was to define the impact of social capital on the organizational factors that support innovations in enterprises. Analysis of research reveals that the strength of the impact of the particular resources of social capital on the organizational factors was differentiated. The resource of cooperation had the greatest impact on the existence of the cohesive aims of the development of innovative undertakings that are well-known to the employees ($r_s = 0,322$, $p = 0,000$). Subsequent to this, it had an impact on the creation of the optimal conditions of cooperation between units/departments ($r_s = 0,214$, $p = 0,004$) and on the motivation of the employees associated with the increase in acknowledgement in the company for the outcome of creating new solutions ($r_s = 0,192$, $p = 0,010$).

The resource of solidarity had an impact on the skill of transforming ideas into profitable undertakings ($r_s = 0,217$, $p = 0,003$), and on the motivation of the employees associated with the increase in acknowledgement in the company for the outcome of creating new solutions ($r_s = 0,207$, $p = 0,005$) and on the existence of the cohesive aims of the development of innovative undertakings that are well-known to the employees ($r_s = 0,184$, $p = 0,014$).

The resource of participation had a significant impact on first and foremost the cohesive aims of the development of innovative undertakings that are well-known to the employees ($r_s = 0,241$, $p = 0,001$). Apart from this fact, it had an impact on the motivation of the employees associated with the increase in acknowledgement in the company for the outcome of creating new solutions ($r_s = 0,184$, $p = 0,014$).

The resource of loyalty significantly influenced the creation of the optimal conditions of cooperation between units/departments ($r_s = 0,245$, $p = 0,001$). Apart from this fact, it had a positive impact on the feeling that innovations have a greater chance of success if the

employees can apply the untypical and unique solutions in their everyday work ($r_s = 0,185$, $p = 0,013$) and on the speed of availing of the suggestions of clients or competitors in terms of enhancing the products ($r_s = 0,189$, $p = 0,011$).

The resource of values significantly influenced the cohesion of the aims of the innovative undertakings that are well-known to the employees ($r_s = 0,277$, $p = 0,000$) and the feeling that innovations have a greater chance of success if the employees can apply the untypical and unique solutions in their everyday work ($r_s = 0,214$, $p = 0,001$). Apart from this fact, the resource of values to a lesser extent had an impact on the use of the creativity of employees with the aim of achieving profit ($r_s = 0,189$, $p = 0,011$) and on the creation of optimal conditions for cooperation between units/departments ($r_s = 0,167$, $p = 0,025$).

In sum, the analysis of the relations between the organizational resources of social capital and the organizational factors that support innovations illustrated that a significant impact was observed in the case of the resource of values, followed by the resources of cooperation, loyalty and solidarity. These resources first and foremost had an impact on the creation of the optimal conditions for cooperation between units/departments, while also on the cohesion of the aims of developing innovative undertakings, as well as the functioning of the system of rewarding employees for supporting the creation of new solutions.

5. Discussion and Summary

From the viewpoint of research on the innovativeness of enterprises, this research facilitated the identification of the resources of organizational social capital in large enterprises in Poland and the definition of their impact on investment activities. The fundamental contribution of this research is the integration of the construct of the resources of organizational social capital with the factors that have an impact on the innovative activities in an enterprise.

The findings of the research conducted facilitated the formulation of the conclusions. Firstly, the research findings indicate the medium level of occurrence of the resources of social capital in large enterprises in Poland. The resources of cooperation and values appear to the greatest extent. In the case of the resource of values, the most important attributes are sharing information, knowledge and learning from each other, while also the large frequency between the manager and the employees in the search for new solutions. However, in the resource of values, respect for the norms and values of the majority of employees and conforming with the ownership rights are of key significance. These resources create favourable conditions for undertaking innovative activities on the part of their employees.

Secondly, the generalized indicator of innovativeness in the largest companies is at a medium level. Out of the innovative activities undertaken by the enterprises, the cooperation with R&D centres and universities was rated the most highly, while the impact of the implementation of innovations over the past five years on the revenue acquired by the company,

while also creating innovations in the enterprise, whereas activities undertaken in the sphere of implementing an innovative project and cooperation with universities in research projects were rated the lowest. It may be reflected that enterprises should place greater emphasis on cooperation with universities and research institutions with the aim of generating new solutions and creating innovative products. Likewise, it is necessary to strengthen activities associated with implementing innovative projects.

Thirdly, the resources of social capital have an impact to varying degrees on the innovative activities of the analysed enterprises. The greatest positive impact of these resources is exerted in terms of cooperation with universities and research institutions in research projects that are conducted jointly. Likewise, they exert a significant impact on the process and implementation of an innovative project in enterprises.

Fourthly, an important factor that has an impact on the level of innovation in an enterprise relates to the activities of managers that stimulate the innovativeness of the employees. The actions of the manager are of the greatest significance as they involve the open communication with the employees with regard to the expectations referring to their innovativeness and encouragement towards innovative activities, which may bring benefits to the enterprise, while also expectations from the employees relating to the enhancement of their skills, while also increasing their knowledge, which in turn, may serve to support innovative activities. The actions of the manager support the resources of organizational social capital, particularly the resources of cooperation, solidarity and values.

Fifthly, the impact of the organizational factors was identified, first and foremost the use of the creativity of employees in terms of activities aimed at new solutions, the functioning of easy access for employees to information and knowledge in an enterprise, cohesion of the aims of the development of innovative undertakings (while also the creation of the optimal conditions of cooperation between units/departments in terms of the innovativeness of the employees. The research findings on the dependencies between these factors and the resources of social capital indicate the existence of significant relations between them. This particularly relates to cooperation, loyalty and solidarity that have an impact on the creation of the optimal conditions for the creation and implementation of innovative projects.

The author of this paper wishes to indicate the limitations in the use of the research findings on the impact of the resources of social capital in terms of innovativeness in enterprises. The limitation on the research referred to the application of the survey method which did not facilitate a more profound analysis of the mechanisms of the impact of social capital on the process of creating innovations. With relation to this fact, it is worth undertaking qualitative research, which would facilitate the discovery of the mechanism of its impact and work out indications as to in what way social capital should be used in order to support the process of creating innovations in enterprises. The aim of future research could be to prepare a conceptual model that would outline the organizational role of social capital in terms of stimulating the innovative attitudes of employees and creating innovative solutions in their work.

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USE OF TOOLS TO IMPROVE PRODUCTION AND LOGISTICS PROCESSES

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Introduction/background: This article presents the functioning of a production company in the construction chemicals industry. Based on the literature research, the following thesis was formulated: the use of tools to improve logistics processes significantly improves and increases the efficiency of production processes in the analysed enterprise. In the article, the following issues were indicated: analysing the course of logistics and production processes in the analysed enterprise, developing a map of the production implementation process and the products on Line retooling process, analysing the possibilities of implementing tools to improve logistics and production processes and developing recommendations for the enterprise.

Aim of the paper: The main purpose of the study is to identify irregularities in the implementation of logistic processes in the examined enterprise and to propose improvement measures.

Materials and methods: In the research part, the authors proposed Lean Production improvement tools (SMED, TPM) to optimize logistics processes and production.

Results and conclusions: The work created by the authors is a research article that includes a full analysis of the production and logistics processes of a company from the construction industry. The paper presents irregularities occurring during logistics and production processes, and proposes improvements. The authors argue that it is important to introduce the proposed improvements to optimize logistics processes and production, and that they are possible to implement in other manufacturing companies.

Keywords: Construction Industry, Lean Production, SMED, TPM.

1. Introduction

Changes occurring in the environment and changes arising in the enterprise force it to adapt to the prevailing conditions. This can mean the need for improvement, and its subject can be both materials (products, functions, structures) and people (employees and managers, specifically their skills, attitudes and behaviours) and processes in the company. The logistics

and production processes analyzed in the article support the core processes of the enterprise and are subject to continuous improvement. Improvement of this processes can be in the form of ongoing adjustments and/or major changes. It becomes extremely important to properly manage the logistics and production processes in a company. As a result, various concepts, such as project management, process management or quality management, can be applied simultaneously in the optimization of a company's logistic and production processes. The article presents the characteristics of production processes, production capacity and production systems in theoretical aspect. In the research part of the article, the authors proposed selected Lean Production improvement tools (SMED, TPM) for the optimization of logistic and production processes in a selected enterprise.

2. Selected literature issues related to logistics and manufacturing processes

2.1. Production process

The term production refers to the use of various technical means, materials and services to create new products desired by the customer (Burchart-Korol, Furman, 2007). On the other hand, the production process is the process of evolution of the input elements of the production system into the output elements of the production system. It is a set of ordered activities, actions and operations, whose purpose is to produce a product desired by the customer, the user. In an industrial company, the production process will include all activities, starting from the collection of input materials and raw materials from the warehouse, through the control activities, transport, storage and technological operations, up to and including the delivery of the finished product (Pasternak, 2005). The structure of the production process is shown in Figure 1.

The production process includes: manufacturing processes, development and research process, customer service and distribution process (Burchart-Korol, Furman, 2007). The manufacturing process refers to the production of a product, that is, the transformation of the components of production into services and finished goods. It includes operational scheduling, operation planning, quantity and quality control of manufacturing (Burchart-Korol, Furman, 2007). The process of research and development in all three areas: organizational, construction and technology is responsible for the preparation of production. It is concerned with financing the company, forecasting and strategic planning, training personnel, raising capital, designing the product, process and location, and providing the raw material base (Pajak, 2006). The customer service and distribution process deals with the operation and organization of marketing research, service and sales. This process is responsible for establishing distribution channels to deliver the final product to customers (Burchart-Korol, Furman, 2007; Pajak, 2006). Figure 2 shows the elements of the manufacturing process.

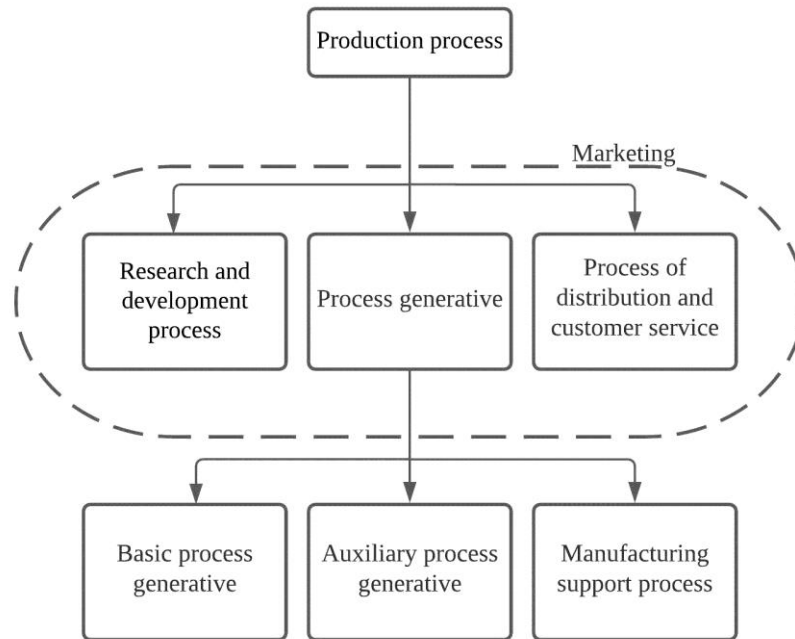


Figure 1. Structure of the production process. Adapted from: “Zarządzanie produkcją i usługami” by D. Burchart-Korol, J. Furman. Wyd. Politechniki Śląskiej, Gliwice 2007, p. 33.

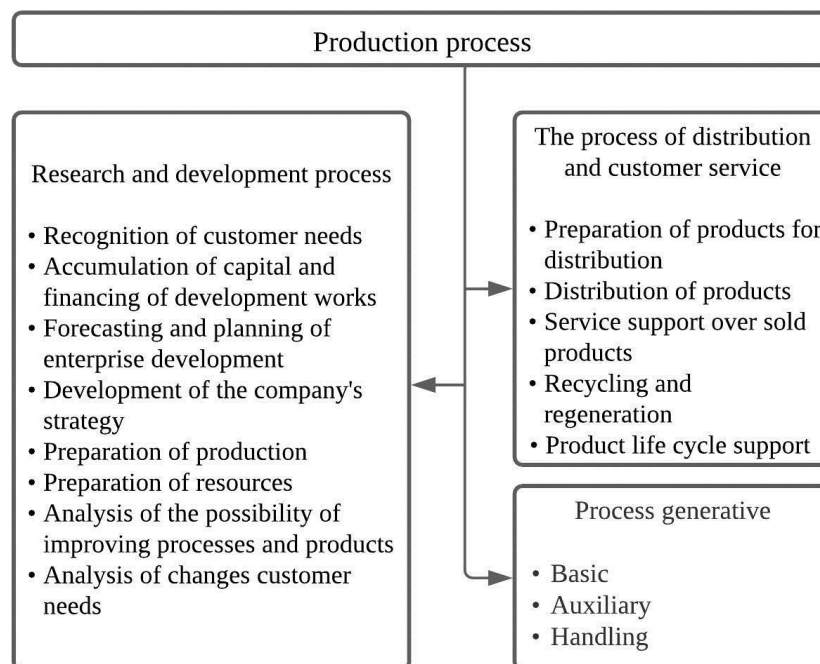


Figure 2. Production proces. Adapted from: “Zarządzanie produkcją” by E. Pająk. Wyd. PWN, Warszawa 2006, p. 85.

The type of production organization is called the specialization of individual workstations and their associated levels of stability, associated with the performance of designated operations and parts of production processes. The type of production is taken from the frequency of changeover of workstations in the company and refers to individual workstations, which are the

production links that determine the structure of the manufacturing process (Szymonik, 2012). There are three types of production: unit, serial and mass production (Burchart-Korol, Furman, 2007). Unit production is characterized by repetitive in irregular stretches of time or unique production of several or one piece of products. Unit production occurs if demand has been misestimated, demand is one-time, production standardization and plant specialization is limited. Production planning reveals: large scope of preparation, uneven use of production capacity, requirement to employ qualified specialists, variety of products, increase in storage space, low efficiency and productivity of production, variety of operations and activities, extension of the production cycle (Burchart-Korol, Furman, 2007). Serial production is characterized by periodical production of a certain number of identical products. The start of serial production does not depend on the number of products, but on the periodicity of their repetition and similarity. The stabilization of production is led by the reduction of manufactured products, it is characterized by an increased frequency of operations to be performed at individual workstations. Batch production increases the efficiency of work, increases the possibility of automation and mechanization of production processes, reduces the idle time of machines and breaks in work, increases the skills of employees as well as the specialization of individual workstations (Burchart-Korol, Furman, 2007). Mass production is characterized by a constant range of production over a long period of time. In mass production, the continuity of production and repeatability of activities at individual workstations is important. It is characterized by full automation and mechanization of production processes, specialized equipment, lack of retooling, good inventory management and efficient material supply (Łubniewski, Waclawek, Zymonik, 1986).

The production process and its structure differs in different industries and sectors. Different processes are found in the steel industry and completely different in the engineering industry. The difference is due to the different products produced and the technology required to produce them. To be able to proceed to the design of production or its initiation, the production organizer must know the detailed technical characteristics of the manufactured products.

2.2. Production capacity

Production capacity is a fundamental problem of production organization. It is a factor that determines the production capacity of an enterprise. Production capacity can be defined as the possibility of producing in an enterprise, in a given period of time, the maximum number of products in accordance with the observed quality standards, with the proper use of production factors and the use of the most advantageous methods of production (Borowiecki, 1990). Depending on the time and management level, three different levels of production capacity are distinguished (Muhlemann, Oakland, Lockyer, 1995):

- effective – represents the actual utilization in the current planning period of the enterprise,
- potential – represents what the top management of the enterprise can give within its competence,
- actual – represents what can be achieved with the budget planned for the given planning period.

Production capacity is determined by optimal technical and economic standards, which determine the maximum use of production space, equipment and machinery, taking into account the most favourable conditions for the organizational and production process of work. When calculating the production capacity, only the elements of the basic production departments are taken into account, the other elements should ensure the correct operation and preparation of the main production process. The calculation does not take into account elements lent to other plants and departments, but also equipment and machinery that are delegated to a permanent production reserve and are used only during the downtime of the actual production machine. Production capacity is never determined only once for a given company, since after a longer period of time it can show an increase due to improvements in manufacturing methods, modernization, structural improvements and the replacement of old machines with new ones. Production capacity is designed to determine the production capacity for a given company and to show the reasons why the production capacity is not fully utilized (Borowiecki, 1990, Brzezinski, 2002).

The basic factors affecting the production capacity are internal factors that determine the production capacity (Burchart-Korol, Furman, 2007):

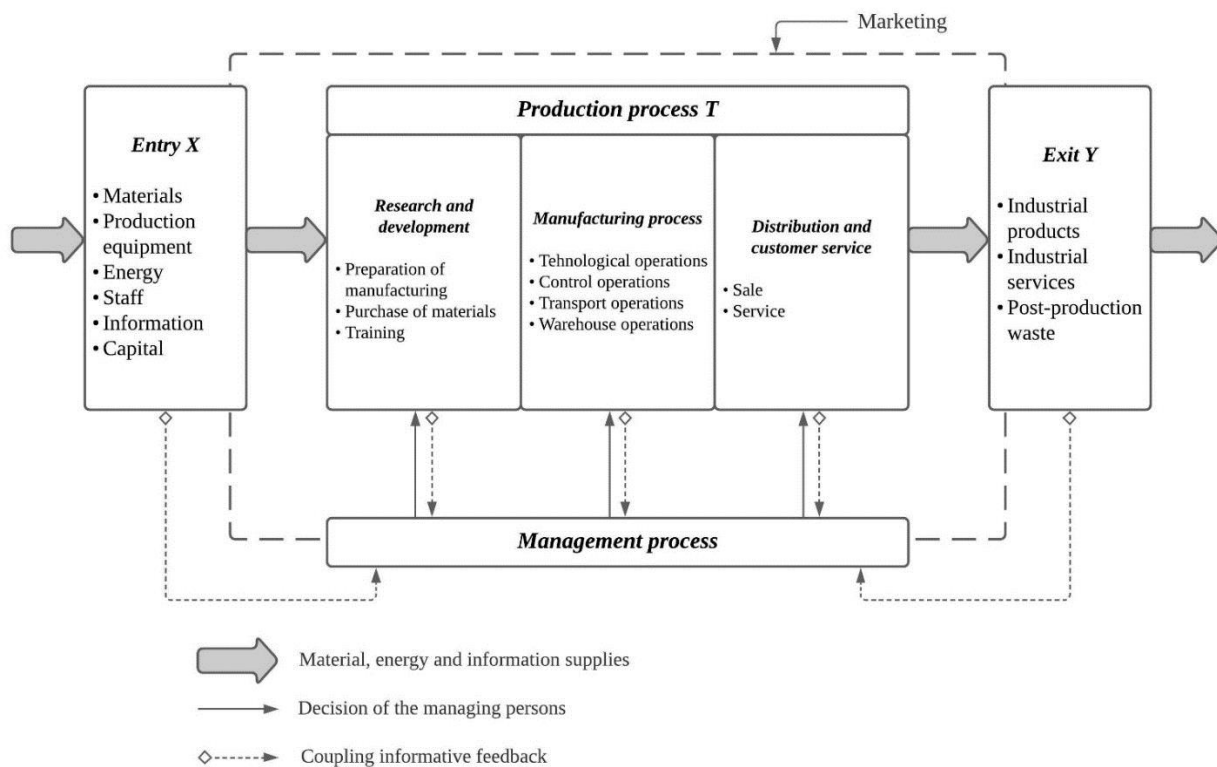
- production organization – technical standards representing the production technology, only possible to achieve thanks to the owned machinery, the optimal operating time of equipment and machinery and the production area of the enterprise throughout the production year and the appropriate level of work organization and type of production,
- factors of production – owned production equipment and machinery of the enterprise, their number, types and size of work area and technical characteristics,
- the assortment structure of production – the technical fuel, raw materials, materials used and the full assortment program of production.

External factors affecting the production capacity are defined as macroeconomic factors, political factors and demand expressed in terms of assortment, quality and quantity of products needed (Wojownik, 1984).

2.3. Production system

A production system is a deliberately organized and designed system of information, material, and energy operated by employees and used to produce various products, outputs, and services to satisfy the customer. Five elements enter into the production system. These are (Burchart-Korol, Furman, 2007):

- input X – all factors of production are included in this element,
- output Y – this element includes services, production waste and products,
- product process T – in this process input X is transformed into output Y,
- system management process,
- information, material and energy couplings – occurring connections between elements of the production system.



The elements of input X, output Y, production process T and the connections occurring between these elements are called the production or processing subsystem, and all information couplings together with the system management process constitute the management subsystem. Figure 3 shows the general accepted model of the production system (Burchart-Korol, Furman, 2007). The elements of input X and output Y are presented in Table 1.

Figure 3. A general model of the production system. Adapted from: “Inżynieria zarządzania cz. 1” by I. Durlík. Agencja Wydawnicza Placet, Warszawa 2007, p. 130.

Table 1.*Input elements X and output elements Y*

Input elements X of the production system	Output elements Y of the production system
Capital frozen in finished goods, equipment, semi-finished goods, materials and capital placed in banks, cash or with customers.	Secondary raw materials and production shortages.
Knowledge, information, decisions.	Waste that harms the environment such as garbage, noise, solid waste and sewage.
Object of work – semi-finished products, materials for assembly or further production, human factors.	Information about the status of the production process, the actual cost of ownership, the quality of the product, and the experience of the production crew.
Technical means of production – buildings and structures, production area, industrial plant premises, IT networks, power installations and technological equipment.	
Energy factors – electricity, solid and gaseous fuels, heat and cooling agents, water, compressed air and gases.	

Adapted from: "Inżynieria zarządzania, cz. 1" by I. Durlik. Agencja Wydawnicza Placet, Warszawa 2007, p. 132; "Zarządzanie produkcją i usługami" by D. Burchart-Korol, J. Furman. Wyd. Politechniki Śląskiej, Gliwice 2007, p. 32.

Businesses, in pursuing their main objectives, strive to earn a certain profit. Costs, profits and revenues are dynamic and depend on many factors related to the operation of the production system. There are three goals of designing and building production systems (Burchart-Korol, Furman, 2007):

1. to reduce manufacturing costs,
2. gaining higher productivity,
3. obtaining modern products of high quality.

2.4. Lean Production

Lean Production can be considered one of the most significant contributions to the history of operations management (Zhang et al., 2019; Krafcik, 1988). This concept was introduced by Krafcik (Womack, Jones, 1991) and was first used by scientists from the Massachusetts Institute of Technology. At the turn of the 90s, Daniel Roos, James P. Womack and Daniel T. Jones published *The Machine That Changed the World* (Abualfaraa et al., 2020) where they compared the parameters of results and outlays in American, European and Japanese enterprises. Toyota Motor Production was been recognized as a leader along with its Toyota Production System (Alhuraish et al., 2016). The authors defined the system as the first lean production system and referred to as Lean Production. Current references also use terms like Lean Manufacturing and Lean Thinking. In production practice, Lean Production and Lean Manufacturing are used alternatively and have the same meaning. Lean Production refers to "a methodology designed to reduce production costs to minimize waste" (Snee, 2010). Snee defined Lean Manufacturing as "a business strategy and methodology that increases process efficiency, which translates into greater customer satisfaction and better financial results" (Szymonik, 2012). The concept of lean manufacturing stems from the use of the fewest

of these factors during the production process compared to the traditional production method (Vanichchinchai, 2019):

- half of the time spent by engineers working on newly designed products,
- half of the funds used for tools and devices,
- half of the efforts by employees,
- half of the space used in production,
- implementing newly designed products in half the time.

Lean Production as a concept leads to overcoming the number of production shortages and increasing the range of manufactured products due to maintaining only half of inventories (Womack, Jones, 1996). The organization of production, where the goal is to minimize all the resources used for various types of activities in the enterprise, provides for the identification and elimination of activities that do not provide value added in supply chain management, production, customer relations and design (Hines et al., 2004). Entrepreneurs operating according to certain rules use robots that allow them to produce larger quantities of products with an increased degree of diversity. Manufacturers at various levels of the organization also employ specialized multi-tasking employees. In lean production, a number of practical tips and principles must be used to reduce costs by eliminating wastefulness and simplifying service and production processes. The main principle at Lean Production is continuous improvement. Once the goals have been achieved, the efforts to improve the process should not end (Zhao, Heng, 2019). Better solutions must be sought and the standards of functioning must be raised, as the environment of the enterprise is constantly changing (Wu et al., 2019). Toyota, which is the leading production company in the world, bases its success on this principle. Lean Manufacturing was created based on the Just in Time system, which was later transformed into the entire enterprise management system, namely Lean Management. All this is the essence of a modern Lean Management company where one of the most important tasks is now digitization of the global business space (Koranda et al., 2012). The basic principle of Lean Management is to reduce waste of resources by asking if a given task or process constitutes any value added to the enterprise (Al-Aomar, 2011). The concept of cost-effective management identifies waste as any type of process or resource that is unnecessary or increases costs or time consumption (Aziz, Hafez, 2013; Issa, 2013). Lean Production includes organization, material order control, planning, development and research. Tasks and procedures associated with the supply chain are viewed from a project-focused perspective, rather than from a general or standardized perspective, which makes it easier for project managers to focus on specific project results and unique customer requirements (García-Alcaraz et al., 2019; Abdallah et al., 2018). The implementation of Lean principles requires the implementation of many typical tools that will improve the functioning of the company (Filla, 2016). In practice, these techniques are usually referred to as Lean Toolbox (Corrizo Moreira, Torrez Garcez, 2013). In the research part, the authors proposed using Lean Production tools such as: SMED and TPM.

3. Research part

3.1. Improvement tools introduced in the examined enterprise

SMED (Single Minute Exchange of Die) means shortening changeovers time or putting it more precisely, the impact on reducing the production batch is the basis of Lean Manufacturing and Just in Time methods (Pawłowski et al., 2010). SMED is defined as improving production flexibility and a TPM element, which is designed to enable retooling of the production line in less than ten minutes (Godina et al., 2018; Boram, and Ekincioğlu, 2017). The SMED methodology gives us three concepts: external retooling, internal retooling and retooling itself. Retooling, i.e. introducing changes to a group of machines or a machine, involving replacing the mounting fixture, mould, matrix, tools, etc. to allow other products to be made in the manufacturing process. The time needed for retooling is counted from the last product "A" to the first product "B" in appropriate quality with standardized parameters. External retooling is part of the overall retooling, carried out during the production line or machine operation. Usually, these are preparatory activities before stopping the production line. Internal retooling is part of the retooling performed when the production line or machine is stopped. Achieving standard performance, start time and device start-up are included in the time of internal retooling (Díaz-Reza et al., 2018; Horzela, Semrau, 2020). This tool is increasingly used in enterprises that have variable and complex production lines (Gligorijevic et al., 2016; Sayer, and Williams, 2015).

TPM (Total Productive Maintenance) is one of the most important Lean Management tools and it is a global maintenance management in an enterprise (Nakajima, 1998). It is the method with which we can maximize productivity and ongoing maintenance of tools and equipment. TPM's goal is to minimize production losses associated with breakdowns or malfunctions, maximize the efficiency of production equipment and optimize the entire maintenance program established throughout the enterprise (Bon, and Lim, 2015). Equipment performance as an indicator of performance is recorded in a balanced table, especially in manufacturing companies. TPM method is divided into three areas (Imai, 2012):

- Preventive maintenance – cost control and proper people management allow predicting the occurrence of failure event by performing maintenance at the right time. Also, parts necessary to have in stock for routine and scheduled maintenance can be defined.
- Autonomous maintenance – means that a team of employees performs maintenance as part of activities of the work schedule. Thus specialized employees can focus on heavier tasks that are to prevent malfunctions and are planned in the department work schedule. A description of maintenance work is used for tasks allowing employees to perform them regularly and on time.

- Planned maintenance – heavily used or high risk parts must be regularly replaced or maintained. This type of work must be planned because tools, parts or equipment must be out of service. In a Lean environment, maintenance planning is very important. When replacing parts, data must be downloaded to allow making predictions about possible failures.

TPM can also be defined as an approach which, due to the involvement and empowerment of employees, dramatically improves production processes (Jiménez et al., 2019).

3.2. Production line retooling process

The process of retooling the production line in the examined company is a very important element that has a direct impact on the highest quality of manufactured products and their reliability. When starting the production line, no material may be present that is not part of the product's composition, which may affect its physical and chemical properties. The process of retooling the production line begins with the introduction of the Betolix waste dissolving substance into the main mixer. The entire dissolution process takes 10 minutes and the substance can be used only once. After being pumped out of the mixer, it is sent in metal tanks to a recycling company. The equipment and machine maintenance worker must then check the mixer ducts manually, using the engine control module. All parameters should be within the standards and the operation report must not show any errors. Depending on the production line settings, the mixer rotor must be replaced for the production of the product.

The next step in retooling the production line is to replace the conveyor belt appropriate for a given product. It must be replaced in every process of retooling the production line. After the installation of a new belt, the conveyor motor must always be tested under operating conditions. The maintenance worker blows all of the fifteen channels of the packing machine with compressed air to prevent unwanted substances from entering the newly manufactured product. Betolix waste dissolving substance is then being introduced into the packing machine. The packing machine is started to flush the channels. All channels must be properly dried with compressed air. During the inspection of the packing machine, the bags are also replaced with other bags, appropriate for the material subsequently produced.

The production department manager archives on the disk of the production line control module the settings for previous production and uploads new settings for the next product. After programming the line, the production line must be started to check the proper functioning of all devices necessary for the production of new products. Production line employees, after receiving guidelines from the production manager, are tasked with preparing new semi-finished products that will be used during production. The times of the above-mentioned activities are presented in table 2.

Table 2.*The times of tasks performed when retooling the production line*

No.	The activity performed during the retooling of the production line	Time
1.	Introduction of waste dissolving substance into industrial mixer.	12:15 min
2.	Rising the tank industrial mixer.	10 min
3.	Pump down the dissolving substance.	13:10 min
4.	Inspection channels industrial mixer.	5:30 min
5.	Inspection engine industrial mixer.	12 min
6.	Replacement of the rotor for the corresponding product.	31:10 min
7.	Disassembly conveyor tape.	14:20 min
8.	Installation of a suitable conveyor tape.	10 min
9.	Inspection conveyor engine.	7 min
10.	Blowing with compressed air channels packing machine.	2:45 min
11.	Introduction of waste dissolving substance to channels packing machine.	2 min
12.	Rinsing the packing machine channels.	10 min
13.	Pump down the dissolving substance.	2 min
14.	Desiccation channels packing machine.	5 min
15.	Replacement of bags in a packing machine with a suitable for product.	15 min
16.	Saving software from the production line.	1 min
17.	Uploading new software from the production line.	1 min
18.	Test launch of the production line.	5 min
19.	Production line inspection.	5 min
20.	Preparation of materials for production.	21 min

Source: author's own research.

The process of retooling the production line described in table 2 is presented using the process map in fig. 4.

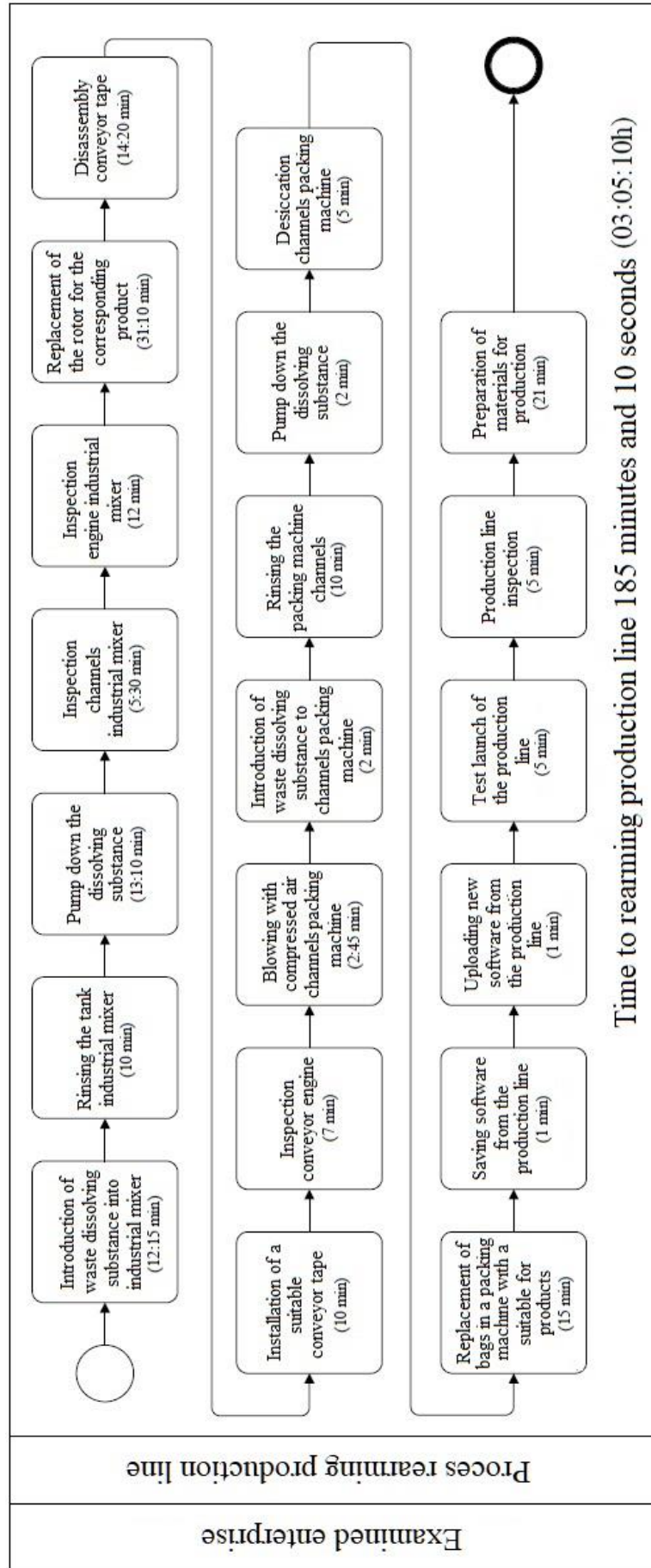


Figure 4. Production line retooling process map. Source: author's own research.

3.3. Results

Based on research, implementation of several process improvement tools was suggested for the examined company.

3.4. SMED – shortening the retooling duration

In the studied company, the retooling process is very common due to the large range of manufactured products. Currently, the retooling process is 3 hours, 5 minutes and 10 seconds. In order for the company to minimize the time needed to retool the production line, it must introduce several modern solutions to the entire process. The first proposed solution is to create an installation for the introduction and pumping of substances dissolving waste from the main mixer and packing machine channels.

The use of a modern system together with a single-stage centrifugal pump can shorten operation times and facilitate the entire process. Centrifugal pumps are used to introduce and pump hydrocarbons, acids, lyes and aggressive chemicals affecting the corrosion resistance of devices used in the enterprise. Centrifugal pumps are currently among the best and most often used in industrial plants. Due to the relatively simple construction and easy disassembly and operation, they allow access to all existing parts without the need to remove the entire pump from the system in the event of a breakdown or periodic inspections. Pumped-off dissolving liquids must be properly stored and prepared for transport to companies dealing with the recycling of chemical substances. The substances must be stored in IBC tanks adapted for the transport and storage of chemical, petrochemical and agrochemical liquids. The use of IBC tanks will save space in the storage area. The tanks can be stacked due to the internal polyethylene containers, plastic pallet and external grille made of stainless steel. The IBC tank when pumping a chemical in an enterprise must be placed on a capture pallet to ensure the safety of employees posted to the process of retooling the production line. The capture pallet is equipped with removable grilles, which allow keeping the container clean and make emptying the chemical from the pallet very easy. The pallet, as it has specially made bottom, is adapted for transport using forklifts used in the enterprise.

Another solution that can save a significant amount of time is the possibility of facilitating the replacement of the main mixer rotor. Currently, rotor replacement is performed using a forklift, which is inefficient and very dangerous for the life and health of the company's employees.

The company should invest in an electric crane that would be attached to the transverse reinforced concrete structure of the production zone. The crane is equipped with a 12-meter long rope, its lifting capacity is 800 kg, it has an IP54 safety certificate and an emergency system for emergency situations, i.e. an automatic brake. The device has a torsion-resistant steel rope, which reduces the rotation of the load being lifted. With such devices used to support the retooling process, the time needed for the activities can be significantly reduced. The total time

needed to retool the production line can be reduced by 40 minutes and 55 seconds. Table 3 shows the times for shortened retooling steps before and after upgrading.

Table 3.
The times of the shortened steps of the retooling process

Sequence number during the retooling process	Action	Time before modernization	Time after modernization	Time saved
1.	Introduction of waste dissolving substance into industrial mixer.	12:15 min	2 min	10:15 min
3.	Pump down the dissolving substance.	13:10 min	2 min	11:10 min
6.	Replacement of the rotor for the corresponding product.	31:10 min	15 min	16:10 min
11.	Introduction of waste dissolving substance to channels packing machine.	2 min	0:20 min	1:40 min
13.	Pump down the dissolving substance.	2 min	0:20 min	1:40 min
Suma				40:55 min

Source: author's own research.

The introduction of the SMED improvement tool allowed to increase the production capacity of the company and to minimize the losses generated by the production line downtime. The production time for an 8-hour working day of the production line, in which the retooling process is planned, before the introduction of SMED in the company was 04:54:50 h. On that day, the production capacity of the company was approximately 15.58 tonnes of the manufactured product. After the introduction of the SMED tool, the production time of the line increased to 05:35:45 h, which resulted in an increase in the production capacity on a given day to about 17.75 tons.

Figure 5 shows a comparison of a production line's working day before and after the improvement.

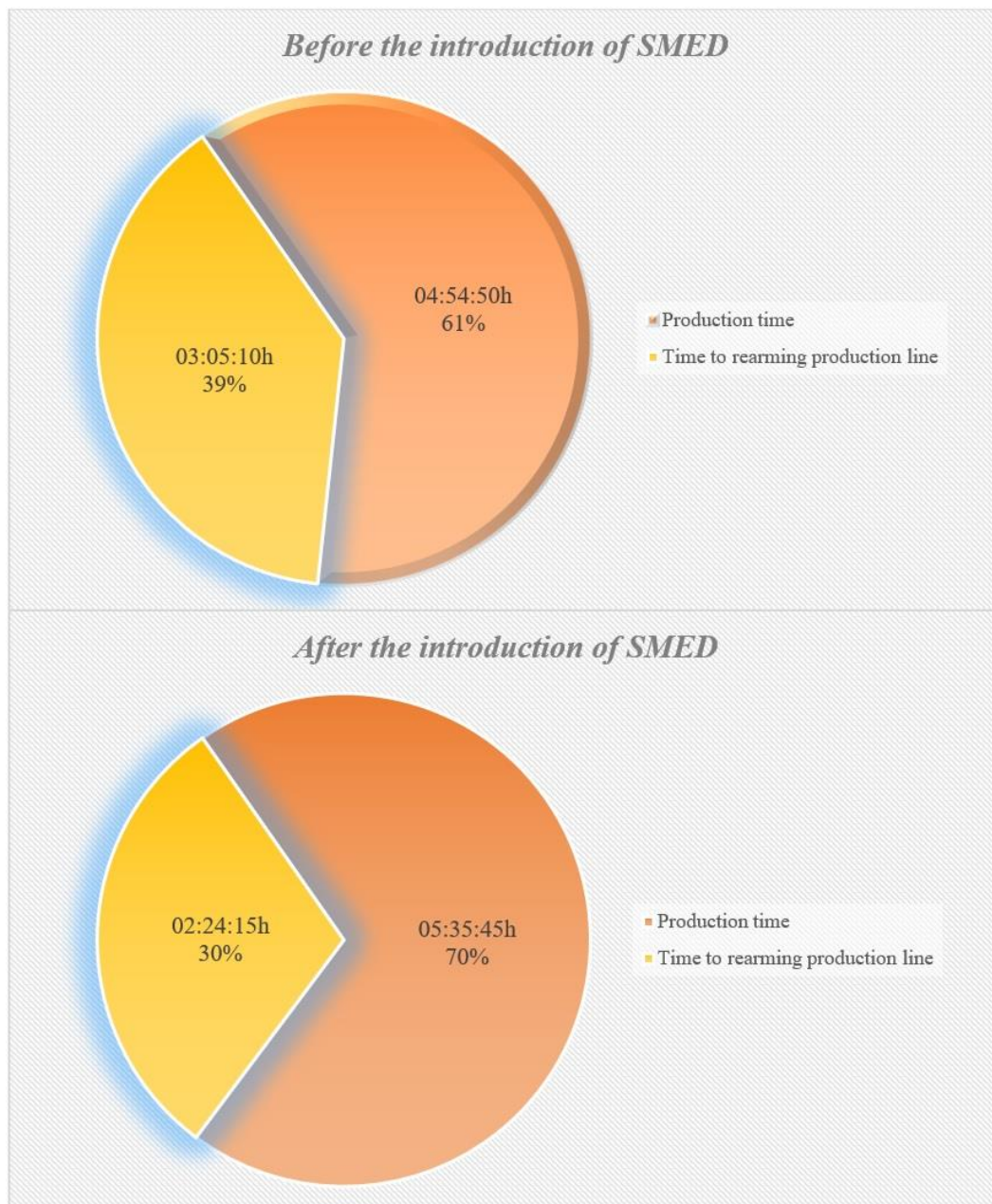


Figure 5. Comparison of the working day of the production line before and after the application of SMED. Source: author's own research.

3.5. TPM – equipment and machinery maintenance carried out by production staff and operators

By organizing appropriate cooperation between production and maintenance, the examined company found it possible to significantly improve the efficiency of a utilized machine park and reduce risks to production continuity, such as unplanned downtime or production line failures. The main purpose of introducing TPM in the examined company is to reduce the costs of maintaining equipment and machinery, extend the life and increase stability during the production process. The key objectives for the examined company under TPM are:

- Involvement of all company employees in the design, use, planning and maintenance of the equipment used in the company.
- The production line employees taking over simple activities, e.g. equipment adjustment or inspection.
- Extending the life of the company's equipment by developing a maintenance system.
- Involvement of operators of individual devices in independent reviews.
- Maximizing device performance by eliminating losses.
- Obtaining the support of all employees and the entire management of the company.

Figure 6 shows the proposed organization of working time changes.

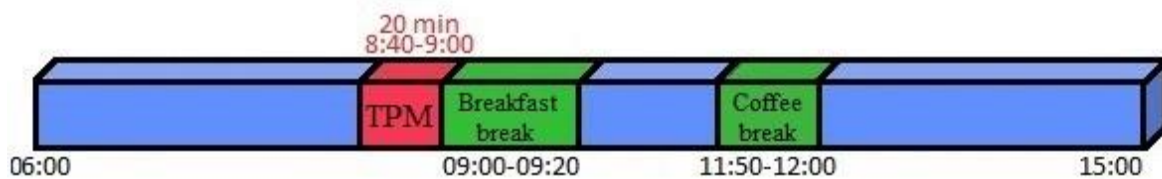


Figure 6. Organization of working time changes. Source: author's own research.

Elements of TPM implementation used in the company:

- Purchase of the necessary tools for employees - cutters, brushes, screwdrivers, etc.
- Creation of about 7 working instructions for the maintenance and operation of machinery and equipment.
- Allowing 20 minutes to change the production time to TPM.
- Placement of about 10 TPM boards, including a reporting system to notify of the smallest failures on TPM cards.
- Training employees in individual departments – 2 hrs on the basics of TPM operation and the operation and construction of production line equipment.

Table 4 shows an example of a mixer failure before and after application TPM.

Table 4.

Example of a mixer failure before and after application TPM

Before the introduction of TPM		After the introducing of TPM	
Time	Action	Time	Action
6:00 – 6:20	Introduction of the production program to the computer of the production line.	6:00 – 6:20	Introduction of the production program to the computer of the production line.
6:21	Production start.	6:21	Production start.
6:22 – 8:58	Production realization.	6:22 – 8:38	Production realization.
8:59	Stop production.	8:39	Stop production.
9:00 – 9:20	Breakfast break.	8:40	Beginning TPM.
9:21	Production start.	8:50	Detection of a faulty operation of the mixer rotor by a production worker. Blunt rotor blade.
9:22 – 10:45	Production realization.	8:51 – 9:20	Sharpening the mixer rotor by a production worker.

Cont. table 4.

10:46	Production line failure.	9:21 – 9:29	Mixer impeller operation test.
10:47 – 11:15	Detection of damage to the mixer rotor blades by a production worker.	9:30 – 9:50	Breakfast break.
11:16 – 11:25	Management approval to replace the mixer impeller.	9:51	Production start.
11:26 – 11:57	Mixer rotor replacement.	9:52 – 11:48	Production realization.
11:58 – 12:06	New mixer impeller operation test.	11:49	Stop production.
12:07 – 12:17	Coffee break.	11:50 – 12:00	Coffee break.
12:18	Production start.	12:01	Production start.
12:19 – 14:58	Production realization.	12:02 – 14:58	Production realization.
14:59	Stop production.	14:59	Stop production.
15:00	Employees going to the cloakroom.	15:00	Employees going to the cloakroom.
Total time of uninterrupted operation of the production line.	6:43h	Total time of uninterrupted operation of the production line.	7:14h

Source: author's own research.

By using TPM, it is possible to extend the working time of the production line by 31 minutes. Thanks to the applied tool, the company is not exposed to losses generated by downtime of production lines.

4. Conclusion

Logistics has a direct impact on shaping the economy of the company, i.e. its cost level, revenue dynamics or inventory optimization. Planning is an important element of production logistics, especially at the stage of designing the flow of raw materials, materials, as well as parts for production. In order to improve the efficiency of logistics and production processes in the company, it is necessary to understand them properly. Logistics and production processes have a direct relationship with the short- and long-term objectives as well as the overall activity of the company. Logistics process issues and selected Lean Production methods describes in the article allow to properly use them as a set of means and tools for the implementation of operational and strategic objectives, which, if properly managed, allow to maximize revenue from the company's activities and can also be a source of cost reduction.

Summing up the obtained literature and empirical research results carried out in a company from the construction industry, it can be concluded that the thesis of the article has been confirmed. Production line optimization has a significant impact on the functioning of the company. The proposed Lean Manufacturing tools improve production processes and all activities related to them. Implementation of all the proposed tools is a must in reducing losses by the manufacturing company under study. It will also improve and increase the efficiency of production processes in the analyzed enterprise.

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RELATIONSHIP BETWEEN PRO-INNOVATIVE ORGANIZATIONAL CULTURE AND DEVELOPMENT AND PROFITABILITY OF COMPANIES

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Introduction/background: In the constantly changing economic and social environment, the management of a company aiming at staying competitive on the market becomes a challenge. Constant development and adjustment to the changeable conditions require flexible and pro-innovative organizational culture in a company. There is still a relative paucity of up-to-date knowledge about the relationship between the innovative organizational culture in large Polish companies and their development and profitability.

Aims of the paper: The purpose of this paper is to identify the relationship between pro-innovative organizational culture in large Polish companies and their development and profitability. Several indicators of the above mentioned phenomena have been chosen and investigated in terms of interdependencies.

Material and methods: The research was conducted with the use of the survey method and the tool of questionnaire distributed with the CATI (Computer Assisted Telephone Interview) and CAWI (Computer Assisted Web Interview) technique. The research is of quantitative nature. The research is part of the scientific project conducted in 2019 on 179 largest by revenue companies in Poland.

Results and conclusion: Several interesting relationships between the indicators of pro-innovative culture and the indicators of development and profitability have been observed. Pro-innovative aspects of organizational culture in large Polish organizations facilitate their flexibility and development as well as support their profitability. It is especially evident in the present pandemic situation, where flexibility and innovativeness of companies becomes one of their most important quality.

Keywords: pro-innovative organizational culture, human resources management, large companies, development, profitability.

1. Introduction

Innovation is key to improvement in people's standards of living. Innovative solutions influence both the lives of individuals, as well as the economic sectors, and the entire countries. Global economy forces companies to create innovations which are able to reach consumers fast

in the form of new products or services. It has become very important for managers and employees to learn the mechanisms of new technology and knowledge transfer to enhance innovativeness in companies.

The meaning of innovation for the quality of human life has been highlighted in particular in the times of COVID-19 pandemic. The crisis created opportunities for creativeness in solving new problems. One side effect of the pandemic crisis was an increase of interest in innovative solutions for health, biotechnology, remote work, e-commerce, distance education, and other mobility solutions (Global Innovation Index 2020). In the year 2020 Poland reached 38th place out of 131 countries in the Global Innovation Index ranking. It reached 35th place when considering subcategory Online creativity, 36th place in terms of Knowledge and technology outputs (jump three places up in each subcategory), yet 42nd in the subcategory Infrastructure and 69th in terms of Market sophistication. In the year 2019 generally it took lower, 39th position, which means some progress has been made recently. However, there are fields of innovativeness yet to be improved (Global Innovation Index, 2020).

In the new economic circumstances it has become clear that innovativeness of companies may be their most important quality. The innovative behaviour of people in the workplace is the basis for a high-performance company, hence knowledge on the factors that motivate or enable individuals' innovative behavior is crucial for organization. Creativity is a precursor and basis for innovation. An innovation may be perceived as successful implementing of a creative idea or generating ideas that are both useful and novel (George, 2007, p. 441). An innovation in a business context is "a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)" (Oslo Manual, 2018, p. 20). It can be given broader, procedural meaning by treating it as a process providing added value and a specific degree of innovation to the organization itself, its suppliers and customers, by developing new solutions, procedures, business processes, products and services (Baruk, 2011, pp. 117-118). Innovativeness may be regarded as an attribute of an organization as its capacity to provide and implement innovation. This is the ability to create something new or make significant changes, to act in a way that uses this capability (Hilami et al., 2010).

One of the factors contributing to the creativity and innovativeness of people in a company is the culture of an organization (Martins, Terblanche, 2003, p. 64). The first definition by E. Jaques took this concept as "a customary and traditional way of thinking and acting, shared in greater or lesser extent by all members" (Aniszewska, 2007, p. 13). One of the most common theory of organizational culture defines it as "shared assumptions and beliefs of employees about the organization and its environment" (Schein, 2004). While investigating the relationship between organizational culture and innovation, the researchers indicate the need to combine activities including seven areas such as: organization strategy, trust relationships, staff orientation on organizational goals, behaviour stimulating innovation, customer orientation,

work environment, and support from management for creating pro-innovative organizational culture (Martins, Terblanche, 2003).

In the age of information society and digital economy the processes of digitalization and data management are very important in appropriate knowledge management, which is crucial for innovative processes. A culture which enhance innovativeness is also oriented on knowledge. It appreciates constant learning and ranks innovativeness highly in the hierarchy of values. It offers incentives for creative people to share their knowledge and appreciates teamwork. In this kind of organizational culture, the employees are eager to explore and create and do not think that sharing knowledge will lower their position in a company (Davenport, De Long, and Beers, 1998).

In the newest research the subject of the relationship between the investigated issues received little attention in terms of large Polish companies. The aim of this paper is to identify the relationship between pro-innovative organizational culture in large companies and their development and profitability. Presented study is an attempt to provide more insight into these issues.

2. Pro-innovative organizational culture and its meaning for the company's activity. Literature review

The subject of organizational culture and its influence on innovativeness has been undertaken in numerous researches. The literature presents the characteristics of an organizational culture which enhance and generate innovative solutions. These issues has been studied by Martins, Terblanche (2003), Chang & Lee (2007), Zimmer et al. (2018). Botelho (2019) proves that human resources practices have a significant effect over organizational culture which can promote organizations' innovative capability. Organizational culture has been acknowledged as key to managing innovation, particularly by directing personnel attitudes and behaviors toward creativity and innovation (Dutch, 2013; Seeck, and Diehl, 2017).

In Poland these issues was investigated by Kamiński (2002), Pierzchawka (2004), Huczek (2011), Jończyk (2011), and recently by Sitko-Lutek (2015) and Stefaniuk (2019). The subject was researched in Polish small and medium enterprises by Szymańska (2014) and Mazur & Zaborek (2016), Żołnierski (2018) studied the organizational culture of innovative entities in both public and private sector. The influence of organizational culture on the strategic decision-making in the Polish logistics, pharmaceutical and touristic industries has been researched (Dubas-Matela, 2018). Wojkowicz et al. (2018) analyzed the organizational and cultural conditions of innovativeness of companies in Poland. As the empirical results show, cultural

and organizational factors have a significant impact on the innovative ability of companies, and as a result on innovative activity (number of introduced innovations).

Innovation management concerns the variety of activities aimed at initiating, developing, and achieving desirable results from innovation. The appropriate competencies are strongly connected with general organizational and managerial capabilities in a company. They are as follows:

- recognizing, generating, and following ideas for innovation,
- organizing innovation activities within the company,
- allocating resources to activities connected with creating innovation,
- conducting innovation activities in cooperation with external partners,
- integrating external knowledge into a company innovation activities,
- controlling the results of innovation activities and learning from acquired experience,
- using and managing innovations and knowledge, including protecting knowledge and innovation assets (Oslo Manual, 2018; Park et al., 2014; Stańczyk, 2004).

The areas and factors that indicate a pro-innovative organizational culture are among others: the organization strategy, the organizational structure, orientation of staff on organizational goals, communication based on trust relationships, behaviour stimulating innovation, work environment, orientation on customer needs and management methods (Martins, Terblanche, 2003, Jończyk, 2011, Zimmer et al., 2018) The following five pillars have been distinguished:

- Organizational strategy – supporting generating and implementing new products and services. A vision and mission of a company focused on the future. Orientation of staff on mission of an organization and organizational goals.
- Organizational structure – ensuring flexibility and freedom, which gives the employees the sense of empowerment, autonomy and influence on decision-making. Providing opportunity to cooperative teamwork and group interaction.
- Support mechanisms – employees should be rewarded for risk taking and experimenting. The access to the resources of time, technology and creative coworkers should be provided.
- Behaviour encouraging innovation – handling mistakes as an opportunity to learn, not a reason to punishment, tolerance towards mistakes and risk taking. Promoting learning culture by supporting continuous learning orientation. Tolerance of conflict and handling it constructively to promote creativity, especially in terms of conflict of ideas and thinking styles.
- Communication – open communication, based on trust and easy flow of information and access to knowledge. (Martins, Terblanche 2003; Flamholtz 2001).

A significant role in creating innovative organizational culture in a company plays human resources management department. It is crucial in conveying the standards of behaviour in organization, informing about desired attitudes, transforming norms and patterns of behavior in

the desired direction. It convey company's main values from the very beginning, in the recruitment and selection processes, and later in employment, adaptation and employee evaluation system, incentive system, promoting the acceptance of changes as well as loyalty to the organization (Stańczyk, 2004, p. 454). The basis for efficient knowledge and innovation management is making managers aware of what knowledge and innovation is, how it affects business development and competitiveness and how systemic knowledge acquisition leads to innovation creation and implementation processes (Baruk, 2011, p. 125). There is a number of activities aiming at stimulation of creative and innovative ideas: introducing proper knowledge management systems, idea management platforms, gathering employees suggestions, financial and non-financial incentives for employees for innovative solutions, delegating decision-making to innovation project managers and innovation staff, activities identifying, promoting and motivating key individuals or teams to drive innovation (Oslo Manual, 2018, p. 111).

There are numerous researches from different countries investigating the subject of the influence of the innovative culture on the performance of companies, using different methods and scientific approaches. Flamholtz (2001) proved at the case of US company, that there is a statistically significant relationship between the company's culture and its financial performance (measured by earnings before interest and taxes). Ramdhany et al. (2018) researched the organizational culture and effectiveness at public universities in Indonesia. Sitko-Lutek (2015) compared the innovativeness of a few national cultures like Poland, Slovenia, Ukraine and Thailand to indicate that countries with a higher score in the Global Innovation Index reach a higher level of regional development. The research conducted on Spanish companies shows that the innovation culture enables companies to be more resilient but does not automatically leads to higher returns (Koller et al., 2017). A study on the banking sector in Turkey investigated relationship between organizational culture and innovations of the organizations' performance. Organizational culture and an organization's innovations had a significantly positive relationship with company's performance (Uzkurt et al., 2013).

In Poland Piłka (2019) studied the influence of innovations on the development of the Polish industry. According to the researcher, they strengthen the company's position on the market, and often enable gaining a significant advantage over the competition. Kamiński (2000) focused on the influence of organizational culture on the efficiency of an organization in general, yet not addressing specifically to the innovativeness. Marchewka (2013) analyzed the effectiveness of an organization including the examination of different types of organizational culture. The latest research conducted on Polish companies in terms of influence of the organizational culture on the performance of a company rarely focuses both on the innovativeness and the aspects such as development and profitability of large companies. The presented paper aims at completing this piece of knowledge in the field.

3. Methodology

The purpose of the paper is to investigate the relationship between pro-innovative organizational culture in largest by revenue companies in Poland and some indicators concerning development and profitability of these companies. Hence, the research question posed by the author of the article was: what is the relationship between pro-innovative culture and development and profitability of large companies in Poland?

The adopted method was survey method with the use of the tool of questionnaire. The survey of the managers and representatives of the companies with the largest profit chosen from the 500 companies in Poland (based on the ranking of Rzeczpospolita newspaper, which served as a sampling frame) was conducted in 2019. The research was conducted using quantitative research methods and mixed techniques such as: the CAWI technique (Computer Assisted Web Interview – electronic questionnaire filled in by the respondent) and the CATI technique (Computer Assisted Telephone Interview – interview with the respondent by the phone). The combination of these two quantitative methods was adopted to increase response rate. Research was started with the use of CATI method. Those respondents who refused to participate in the study or who interrupted the survey had the opportunity to complete the survey through dedicated online platform (CAWI method).

Nearly 42% of the researched companies were manufacturing companies, 27% of them were service enterprises, 14.5% were manufacturing and service enterprises, 8.5% were trading enterprises and the last 8% - manufacturing and trading enterprises. The respondents consisted of managers and representatives from the human resources management who provided facts and opinions on the issues regarding the whole company. The random sampling was used. Statistical data analysis was carried out with the use of Statistica software. The answers to the questions were created with the use of the Likert scale (ranging from “I strongly agree” to “I strongly disagree”). For the statistical testing purpose in the comparisons, $p < 0,05$ was adopted. To measure the statistical correlations between the variables Spearman's rank correlation coefficient (Spearman's ρ/ρ) was used.

4. Results and discussion

Process of innovation generation and implementation in a company is usually complex and involving several departments and business processes. One of the most important part of innovation management is pro-innovative organizational culture. For the purpose of this study, the following behaviours and characteristics have been researched in terms of this type of culture:

- availability of mission, aims, and rules concerning innovation to every employee,
- encouragement to take the challenges if it provides benefit,
- company is able to transform ideas into profitable ventures,
- the suggestions of the customers or competitors are used to enable product improvement,
- free access to information and knowledge is provided,
- each employee's contribution into the innovative venture is appreciated,
- allowing the employees to express atypical and unique ideas conducive to innovations,
- expecting from the employee to be flexible and adapt quickly to changes.

The respondents have been asked to assess the process of creating innovation in their company on a scale ranging from “very low” to “very high”. The answers are depicted in figure (Figure 1).

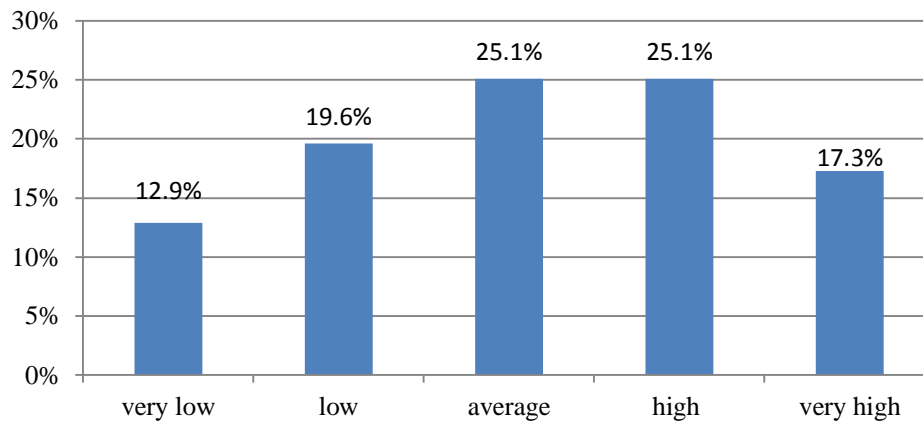


Figure 1. The assessment of the process of creating innovation in the company, N = 179.

The majority of Polish largest companies assess the creating innovation process in their companies as at least average (together over 67%), and only around 32% is of opinion that it is very low or low. High or very high assessment of this process concerned over 42% of companies.

Another question involved one of the most significant aspect of managing human resources towards the innovation, which is the support which employees receive from the managers in overcoming the barriers in implementing innovative ideas and solutions. The answers of the respondents are shown in figure (Figure 2).

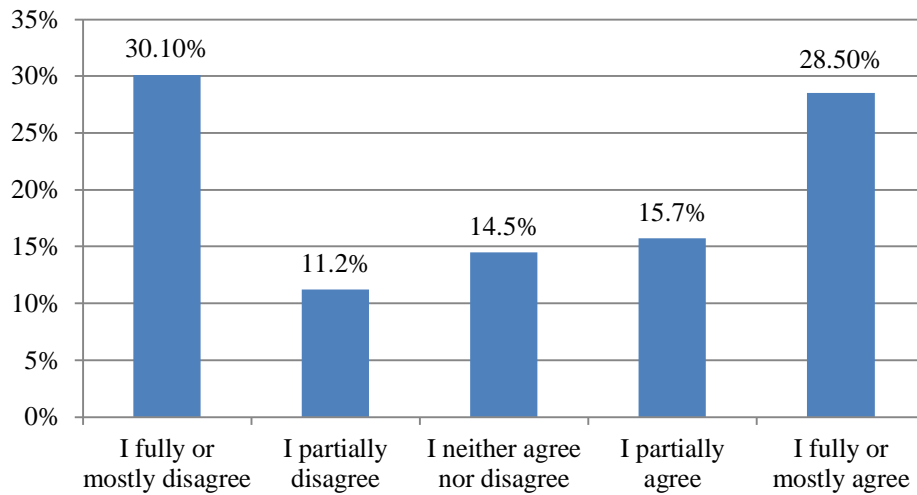


Figure 2. Receiving support from the managers to overcome barriers in implementing innovations. The level of agreement with the statement: “in our company the manager provide support to overcome barriers in implementing innovations”, N = 179.

Around 44% of employees of large companies are provided with the support from managers in overcoming the barriers in implementing innovations. However, one third definitely claims that they do not receive it and nearly 15% has no clearly defined opinion on this matter.

One of the crucial aspect of generating innovative, improved goods and services is openness to the opinion and ideas received from the external sources like customers. The research included question on this matter. The answers are presented in figure (Figure 3).

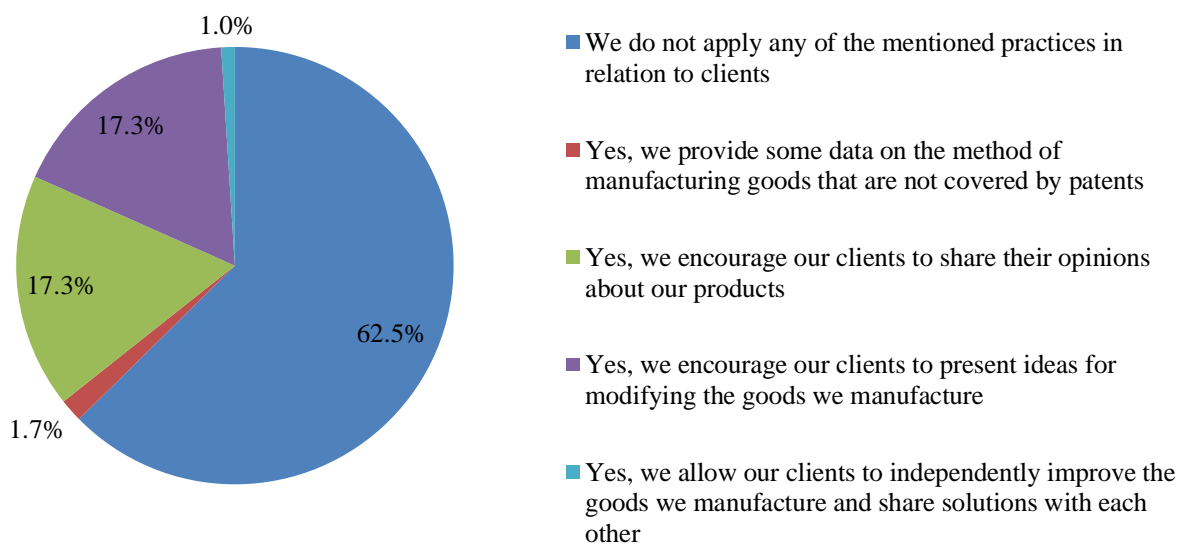


Figure 3. The use of the practices of involving customers in the process of creating goods/services, N = 179.

In terms of the involvement of customers in the process of creating goods or services, the majority of large Polish companies (62%) do not apply any of this kind of practices. Only around 17% of companies encourage clients to share their opinions on the produced goods and encourage them to present ideas for modifying manufactured goods.

One of the main investigated aspects was the relationship between the pro-innovative organizational culture and characteristics concerning the development of the company. The development was investigated with the use of several indicators like: occurrence of new investments, implementation of new technologies, the increase in the innovativeness of the employees, acquisition of new sales markets, an increase in product sales, an increase of the resources of the company, an increase in the number of customers of the company. Table 1 presents all the obtained results in detail.

Table 1.

The Spearman's rho correlation between chosen variables: organizational culture-development, (N = 179)

Chosen aspects of innovative organizational culture	Chosen characteristics concerning development						
	new investments have occurred	implementation of new technologies has occurred	innovativeness of the employees has increased	new sales markets have been acquired	product sales has increased	resources of the company has increased	the number of customers has increased
mission, aims and rules concerning innovations are easily available to every employee	x	x	x	x	x	0,194111	0,227743
company is able to transform ideas into profitable ventures	x	x	0,165269	0,214081	x	0,213864	0,208264
the suggestions of the customers or competitors are used to enable product improvement	x	0,181666	x	x	x	0,153918	x
free access to information and knowledge	0,204581	x	x	x	0,240040	0,207345	x
appreciation of each employee's contribution into the innovative venture	0,239987	x	0,211158	0,153728	0,148624	x	0,211044
encouragement to take the challenges if it provides benefit	0,158822	x	0,148013	x	x	x	x
allowing the employees to express atypical and unique ideas conducive to innovations	x	0,165317	0,072033	0,188133	0,198046	0,221321	0,200016
the employee is expected to be flexible and adapt quickly to changes	x	x	x	x	0,168684	x	x

The values of the Spearman's rho correlation coefficient confirms that there appears to be a positive correlation of weak or medium strength between several of the presented variables. The indicators of innovative culture which correlated with the largest number indicators of development were: appreciation of each employee's contribution into the innovative venture, allowing the employees to express atypical and unique ideas conducive to innovations and the ability of a company to transform ideas into profitable ventures.

Other investigated issues were the correlations between the relationship between the pro-innovative organizational culture and characteristics concerning the profitability of the company. The profitability of the company was investigated with the use of several indicators like: an increase in company's income last year comparing to the previous year, achieving positive financial result last year, bringing greater profit than the competition, incurring lower costs comparing to the competition, an increase in the value of company's assets last year comparing to the previous year, an increase in the market value of the company last year, and achieving an increasing net profit in recent years. Further data are presented in table 2.

Table 2.

The Spearman's rho correlation between chosen variables: organizational culture – profitability, (N = 179)

Chosen aspects of innovative organizational culture	Chosen characteristics concerning profitability						
	the company brings greater profit, compared to the competition	the company incurs lower costs, compared to the competition	the company achieved a positive financial result last year	last year, the company's income increased compared to the previous year	last year, the value of the company's assets increased compared to the previous year	last year, the market value of the company has increased	in recent years, the company has achieved an increasing net profit
mission, aims and rules concerning innovations are easily available to every employee	x	x	x	0,178370	x	0,152774	x
company is able to transform ideas into profitable ventures	0,253993	0,186004	0,181828	x	0,210626	0,168422	0,174327
the suggestions of the customers or competitors are used to enable product improvement	0,150177	x	x	0,167927	0,170541	x	0,190799
free access to information and knowledge	x	0,225049	0,234948	0,147574	x	0,157025	0,188175
appreciation of each employee's contribution into the innovative venture	0,205842	0,173658	x	x	0,189166	x	x

Cont. table 2.

encouragement to take the challenges if it provides benefit	0,151432	0,183221	0,172880	0,195780	0,229556	x	0,184690
allowing the employees to express atypical and unique ideas conducive to innovations	x	x	0,294706	x	0,151219	0,192780	0,173968
the employee is expected to be flexible and adapt quickly to changes	x	x	x	x	x	0,171605	0,203624

The values of the Spearman's rho correlation coefficient confirms that there appears to be a positive correlation of weak or medium strength between several of the presented variables. The indicators of innovative culture which correlated with the largest number indicators of profitability were: providing free access to information and knowledge, ability of a company to transform ideas into profitable ventures, encouragement to take the challenges if it provides benefit, allowing the employees to express atypical and unique ideas conducive to innovations, and using the suggestions of the customers or competitors to enable product improvement.

As illustrated in the presented research results, in the majority of Polish largest by revenue companies the assessment of the process of creating innovation in the company is at least average. However, the majority of the employees in these companies cannot definitely agree with the opinion that the managers provide them support in overcoming barriers during innovation processes. Moreover, the prosumer activity of customers still remains underestimated for the majority of companies (60% do not make use of the knowledge input from the customers). These important for the innovation aspects of organizational culture (Martins, Terblanche, 2003; Stańczyk, 2004) may be a large potential in the improvement of the level of innovativeness of Polish companies.

The results show that there are statistically significant positive correlations of weak or medium strength between several of the indicators of innovative organizational culture and development and profitability of the companies. Not all of them correlated with all the indicators, however the tendency is in line with other studies indicating existing relationships between the innovative organizational culture and performance. E.g. Uz Kurt et al. (2013) proved that innovation has a direct and positive effect on the performance dimensions (profitability, market share and market value) of Turkish companies. In case of US companies Flamholtz (2001) also proved that there is a statistically significant relationship between the company's culture and its financial performance (measured by earnings before interest and taxes). What is more, the countries with a higher score in the Global Innovation Index reached a higher level of regional development (Sitko-Lutek, 2015).

The characteristics of innovative cultures which correlated with largest number of development and profitability indicators were as follows: providing free access to information and knowledge to the employees, encouragement of the employees to take the challenges if it provides benefit, allowing the employees to express atypical and unique ideas conducive to innovations, appreciation of each employee's contribution into the innovative venture, and using

the suggestions of the customers or competitors to enable product improvement. These results are in accordance with the proposals of the Oslo Manual (2018), providing guidelines for innovation, among others concerning human resources management.

Some activities of HR managers or knowledge managers in terms of shaping the organizational culture and work environment in Polish companies might be recommended. These solutions may be beneficial for the innovation processes and finally for the financial outcome and development of a company. As many researchers point out, recommended activities include involving staff in the decision-making process, employee recruitment policies seeking creativity traits and skills, setting standards of work performance and providing regular feedback to the employees, promotion and career development opportunities and incentives for innovative ideas (Flamholtz, 2001; Jończyk, 2011; Zimmer et al., 2018; Oslo Manual, 2018). What may be especially taken into account by the Polish HR managers is including employees' pro-innovative attitudes and behaviour in the motivational and assessment systems. All mentioned solutions translate into improved communication, learning and professional development, as well as enhanced creativeness of the employees.

5. Conclusions

The issues discussed in the paper are particularly important for the contemporary managers of companies which try to build resilience and adapt to changing conditions of the present situation. Well built organizational culture may enhance innovativeness of the companies. This, in turn, can positively influence performance of companies, including the financial one. What is more, these aspects facilitate the development of a company and may have positive impact on its competitiveness on the market.

In the conducted research these relationships have partly confirmed. The positive correlations have been observed between chosen aspects of innovative organizational culture and chosen characteristic of development and profitability. As the presented in the paper results suggest, in general, pro-innovative organizational culture is conducive to development and the maximization of profit in large Polish companies. One of the limitation of the research is the fact, that not all of the indicators have correlated with the rest. However, the positive correlations which were obtained let to draw the conclusion, that there is a positive relationship between investigated variables. What is more, the study has got the limitation connected with narrowing the researched population to the companies largest by revenue. Some further study in the sector of SME and possibly on the larger population is recommended.

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PROCESS INNOVATIONS AND MARKET SUCCESS IN ENTERPRISES – RESULTS OF EMPIRICAL RESEARCH

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Introduction/background: Achieving competitive dominance is a challenge for every company operating on the market and for management team throughout the whole world. In order to achieve distinctive competence, the companies are forced to look for such unique solutions that would enable to achieve dominance and that are not available for other business entities. The study presents the results of empirical research verifying the relationship between innovation and market success of enterprises in the metal industry. By analyzing the determinants of innovation and market success, the existence of a significant relationship between the variables was confirmed.

Aim of the paper: The author of this paper conducted empirical research and analyzed their results in the area of innovation in order to identify the relationship between the success of metal industry enterprises and market success.

Materials and methods: The research covers the study of the innovativeness of enterprises and the analysis of the success rates of enterprises in the metal industry. The research was carried out using the CAWI (Computer Assisted Web Interview) method in the form of a questionnaire to be completed on a computer by the respondent and a paper questionnaire also for self-completion.

Results and conclusions: The research outcome was to indicate the relationship between the determinants of the company's success and their innovative activity, and to identify the strength of the impact between the variables.

Keywords: innovation, metal industry, market success, company improvements.

1. Introduction

In colloquial terms, innovation means something new and different from existing solutions; is equated with the need to change for the better and is very often used as a synonym for the word change (Janasz, and Koziół, 2007). It is most often perceived as changes in the technical scope, created by economic entities conducting research and development activities, as a result

of which inventions are created, which are most often new from the point of view of the consumer after being placed on the market (Kalinowski, 2010).

Today, the concept of innovation is seen in a broader sense. Innovations are equated with systematically implemented activities aimed at increasing the efficiency of the company, relating to the use of new processes, technologies, materials, as well as creating new business visions and complex strategies. Implementing innovations means not only introducing revolutionary changes in the manufactured product. The scope of implemented changes equated with innovations is much wider (Kraśnicka, and Ingram, 2014).

In the economic interpretation of innovation, it is assumed that it is related to knowledge and available technology, and causes changes in the production and demand functions (Borko, 2013). Innovative activity is a sequence of activities leading to the creation of new or improved products, technological processes or organizational systems. The precursor of the concept of innovation in economic sciences is considered to be J.A. Schumpeter, who in 1911 concentrated his scientific activities on an attempt to dynamize the static model of the market economy. He pointed out that the main cause of economic development are not exogenous but endogenous factors, which are innovations (Zastempowski, 2016). The key meaning in its concept is the word "new", identified in the sense of introducing a given factor for the first time, using it in practice and obtaining a positive economic result (Borko, 2013).

Schumpeter's considerations are considered a starting point for the present broad understanding of innovation and for establishing methodological assumptions in innovation research (Kamińska, 2017). In his studies, he also separated the meaning of the term "innovation" from "invention", noting that only the invention that is introduced into production and enables the achievement of a positive economic result becomes an innovation. To a large extent, Schumpeter's scientific activity focused on technical innovations and their importance for the economy, however, the theories created also indicated non-technological factors that could occur in the area of trade or transport. His first theory of innovation concerned the capitalist economy of the early 20th century, in which land, labor and capital played a fundamental rule (Borko, 2013).. Other factors were noticed by the scientist and indicated in the analyzed definition of innovation, however, they did not constitute the basis for his considerations.

Positive economic result is interpreted heterogeneously, it depends on the type of business activity and the entity's policy. There are also non-profit organizations for which development is not equated with the economic dimension of their activities. Therefore, it is advisable to use a uniform nomenclature for the measure of implementing the policy of an economic entity. In the literature, the terminology used indicates that the universal measure of the assessment of implemented activities is the measurement of the success achieved by the organization. Success is the successful outcome of an undertaking, achieving an intended goal. In personal terms, success means fulfillment in life, the source of which is a sense of meaning in work and personal life (Weitley, 2011). In terms of the market, the definition should be related to the goals the

achievement of which enables the development of the enterprise and effective competition on the open market. Due to the different nature of the business and target customers, success cannot be clearly defined. It is a subjective category, for each enterprise, it is an individual feature (Kozielski, and Mardosz, and Matuszewska, 2017). For some, success may mean staying on the market, stagnating, while for others, achieving the assumed goals in the form of increasing profitability, profits, turnover, etc. The moment of achieving success is also perceived differently. On the one hand, it may be determined by achieving the goal, and on the other hand, by keeping the organization on the market. Success is therefore a category that is difficult to define precisely.

J. Żurek adds that the company's success also means creating conditions inside the company, which will positively influence the development of rules facilitating the flow of information, building healthy relationships that mobilize for cooperation and integrating its staff into a friendly atmosphere at work, dominated by trust and openness (Żurek, 2016).

M. Grabowska and M. Drygas identifying the determinants of the success of enterprises defined a successful enterprise as a company that generates profits and has been operating on the market for at least several years, systematically developing by increasing revenues and strengthening its market position. The authors also emphasize that the company's success may be perceived differently, for example, by their employees, who identify it through a high level of remuneration, job security, as well as high quality of life. The real success of an organization, however, consists of successes in many areas, including in the area of the achieved position in a given sector or achieving a competitive advantage ensuring profits and development in the coming years (Grabowska, and Drygas, 2010).

Literature analysis allowed to identify the existence of links between innovation and the competitiveness of Polish enterprises in the global economy (Janas, 2019). The analysis of the literature by A. Litińska allowed for the identification of positive relationships between innovation, entrepreneurship and organizational results, either in financial or strategic terms in the fashion industry, considered one of the most innovative areas of the economy (Litińska, 2020). On the basis of the collected data, there are no similar studies in the area of metal industry enterprises. It was decided to verify the impact of innovation on the results of enterprises in this area to confirm the essence of this relationship in the process of competing on the global market.

2. Methods of empirical research

When analyzing the definitions of success and innovation, it is impossible to notice the universal nature of both terms. Their topicality applies to all activities and entities. However, research in the literature did not allow to identify the relationship between the two variables in the realities of a free market economy. The empirical study was carried out in 2019 among

enterprises in the metal industry employing at least 10 employees. The size of the surveyed enterprises is in line with the international innovation research methodology set out in the Oslo Manual. The research was carried out using the CAWI (Computer Assisted Web Interview) method in the form of a questionnaire to be completed on a computer by the respondent and a paper questionnaire also for self-completion.

Based on data from the Central Statistical Office of Poland from 2018, the entire population was estimated at the level of 69,053 enterprises in the metal industry in Poland. The minimum sample size for such a population for $\alpha = 0.95$ and the maximum error of 5% was 382 entities. Initially 384 companies took part in the survey. 76 business entities took an active part from the survey population, filling in the questionnaire, which constitutes 16.88% of the research sample. Only enterprises employing more than 10 employees were chosen for further research. Finally, responses from 53 companies from the metal industry were analyzed, which is 11.77% of the initially estimated research sample. With such a research sample size for the confidence level of $\alpha = 0.95$, the obtained results may differ from the actual value of the population by no more than 14% (maximum error).

In the conducted study, a research tool in the form of a questionnaire was used. The questionnaire contained a certificate allowing to identify the size of the examined economic entity and to define the province in which the examined entity conducted its business activity. The respondents were employees of metal industry enterprises. The research sample of enterprises comprised 50.9% of the surveyed entities from medium-sized enterprises. Both large and small enterprises had a 24.5% share each in the entire research population.

The aim of the empirical research was to examine whether there are significant relationship between the dependent variables in the area of innovation and business performance are considered indicators of success. The research survey made it possible to verify the dependence of the dynamics of outlays on innovative activities and the development of metal industry enterprises and the impact of implemented innovations on the long-term development of the company as well as the improvement of its competitive position. Cramer's V correlation analysis for nominal variables, Spearman's rho correlation for ordinal variables and Phi correlation for two-dimensional variables were used to study the significance as well as the strength and direction between the variables.

3. The role of process innovations in shaping the success of enterprises

The results obtained in the empirical study are presented in Table 1. The long-term development of enterprises as a result of introducing process innovations as a variable subject to verification showed a significant correlation with the four dependent variables. Spearman's rho correlation coefficient = -0.394 for the variable "impact of the availability of innovative

solutions on the achieved innovation"; showed a negative moderate relationship between the company's long-term development and the benefits of product innovation. Along with the development of the enterprise and the strengthening of the competitive position, the significant impact of product innovations on the company's results decreases.

Table 1.

The significance of the correlation between the long-term development of the studied enterprises and effective competition on the markets and other dependent variables

Variable X	Variable Y	Correlation rho-Spearmana	Relevance
Achieving long-term development as a result of introducing innovations	The impact of product innovations on the company's results	-0,394	0,004
	The impact of technological innovations on the company's results	-0,396	0,003
	Variable Y	Correlation V Cramera	Relevance
	Availability of innovative process solutions	0,340	0,016

Adapted from: own study based on empirical research.

A similar relationship was identified for the variable "The impact of technological innovations on the company's results". Spearman's rho-correlation coefficient = -0.396 indicates a negative moderate relationship between the long-term development of the company and the benefits of technological innovation. Along with the development of the enterprise and strengthening of the competitive position, the significant impact of technological innovations on the company's results decreases.

These dependencies indicate that each successive success, development of the company, increase in turnover, profit in absolute terms depends on many factors each time. Innovation, regardless of the size of the enterprise, has a positive effect on the chances of achieving the desired result of the conducted activity, it is an inseparable element of development. The results emphasize that the implemented innovations are not the only way to success, they should be perceived as one of the tools used to create and control the development of an enterprise.

In the results of empirical research, attention should also be paid to the obtained value of the Cramer's V correlation = 0.340 between the variables achieving long-term development as a result of introducing innovations and the availability of innovative solutions in the area of processes. The identified relationship proves a moderate relationship between the long-term development of the company and the assessment of the availability of innovative solutions. Therefore, the availability of innovative solutions in the process area does not constitute a barrier for developing enterprises. Along with the growth, these entities also have greater access to knowledge, which favors the creation of new innovative solutions.

The conducted empirical research was also focused on the identification of variables influencing the increase in turnover of the examined entities. The collected data made it possible to carry out a statistical analysis and to determine the correlation between the variables. The obtained statistical data allowed to distinguish four statistically significant variables

influencing the increase in turnover: dynamics of expenditure on innovation, achievement of long-term development as a result of the introduction of process innovation, the impact of technological innovations on the company's results and the dynamics of own funds allocated to innovation. Spearman's rho correlation = 0.310 indicated a positive moderate relationship between the increase in the company's turnover and expenditure on innovation. This means that the higher the turnover of the enterprise, the greater the expenditure on innovative activities. There was also a positive moderate relationship between the increased turnover of the enterprise and the long-term development of the enterprise. This is evidenced by the Spearman's rho correlation coefficient = 0.308. A statistically significant relationship with a moderately positive relationship was also identified for the variables increasing the company's turnover and the level of own funds allocated to innovation. The Spearman rho correlation = 0.413 indicates that along with the increase in the entity's turnover, the level of own funds for the implemented innovations is also increased. Therefore, it can be concluded that the financing of innovative activities in the examined group takes place both from external sources of financing and from own funds. Along with the development of enterprises, they increase outlays on innovation in general, which is influenced by the increase in the amount of own funds allocated for this purpose.

In the further part of the empirical research, the collected data was analyzed for predicting the value of the dependent variable based on a larger number of predictors. For this purpose, a regression analysis was performed. For the analysis of the influence of selected variables, a one-way logistic regression method was selected, consisting in the elimination in each subsequent step of the variable with the lowest impact on the dependent variable. The input model included the influence of all the examined independent variables, while the final model included only the influence of independent variables, or the model predictors, significantly affecting the dependent variable (expressed on a dichotomous scale).

Table 2.

Significance of the correlation between the turnover of the surveyed enterprises and other dependent variables

Variable X	Variable Y	Correlation rho-Spearmana	Relevance
The company increased its turnover	Dynamics of expenditure on innovation	0,310	0,024
	Achieving long-term development as a result of introducing process innovation	0,308	0,025
	The impact of technological innovations on the company's results	-0,303	0,027
	Dynamics of own resources allocated to innovation	0,413	0,002

Adapted from: own study based on empirical research.

The estimation of the independent variable "the company cooperates with research and development centers" and the dependent variable "The company has not lost any of its recipients in the last three years" was based on the model built. This model assumed that the entity's cooperation with research and development centers influenced the maintenance of cooperation with customers. In order to test whether the prediction was better than predicting only on the mean, the significance of the regression model was tested based on the analysis of variance between the study groups. The result of the analysis of variance is statistically significant $F(1,51) = 3.939$; $p < 0.05$. This means that the regression model predicts the outcomes of the dependent variable better than the mean. The statistical significance of the model coefficients was also tested further. The predictor allows for the development of cooperation with clients. Therefore, it can be assumed that the entire model is relevant, which allowed for its further verification process.

Table 3.

Statistical significance of the coefficients of the model of dependence of the enterprise size and the impact of the availability of innovative solutions on the achieved innovation

Model	Non-standardized coefficients		Standardized coefficients	t	Relevance
	B	Standard error	Beta		
Constant	1,240	0,204		6,091	0,000
The company cooperates with research and development centers	0,260	0,131	0,268	1,985	0,043

Adapted from: own study based on empirical research.

Statistical significance of the coefficient $t = 1.985$; $p < 0.05$ means that there is a relationship between the company's cooperation with research and development centers and the fact that the company has not lost any of its recipients in the last three years. The Beta value = 0.268 shows that this relationship has a weak relationship and is positive, which means that companies that have established cooperation with external research and development entities are less likely to risk losing their customers.

The estimation for the independent variable "the enterprise cooperates with higher education" and the dependent variable "The introduction of innovations in the production processes of the enterprise allowed for long-term development and effective competition on the markets" was performed in a similar way. The constructed model assumed that the cooperation of the entity with higher education influences the innovation of manufacturing processes carried out in the enterprise. The result of the analysis of variance is statistically significant $F = 5.441$; $p < 0.05$. This means that the regression model predicts the outcomes of the dependent variable better than the mean. The statistical significance of the model coefficients was also tested further. The predictor allows to predict the achievement of long-term development and effective competition in the markets based on the increase in the innovation of production processes. Therefore, it can be assumed that the entire model is important, which allows for its further verification process.

Table 4.

Statistical significance of the coefficients of the model of dependence of the enterprise size and the impact of the availability of innovative solutions on the achieved innovation

Model	Non-standardized coefficients		Standardized coefficients	t	Relevance
	B	Standard error	Beta		
Constant	1,510	0,154		9,793	0,000
The company cooperates with higher education	0,234	0,100	0,310	2,333	0,024

Adapted from: own study based on empirical research.

Statistical significance of the coefficient $t = 2.333$; $p < 0.05$ means that there is a relationship between the cooperation of the enterprise and higher education and the introduction of innovations in the production processes of the enterprise, which allowed for long-term development and effective competition in the markets. The value of $\beta = 0.310$ shows that this relation has a medium strength and is positive, which means that enterprises that cooperate with higher education have a better chance of increasing the innovation of their production processes.

4. Summary of empirical research

The investigated correlations between the variables allowed to identify numerous multiple connections between different pairs of dependent variables. The results showed that metal industry enterprises, in order to strengthen their market position, eagerly allocate their own resources to conducting innovative activities. As a result, the flexibility of their processes is better, which allows for a quick response to market information and improvement of the competitive position. At the same time, forced improvements in response to the portfolio of their clients mean that entities have a greater problem with strengthening their market position.

The obtained results of empirical research have shown that the achievement of long-term development and effective competition of entities on the markets by introducing innovations is determined by the need to improve processes as a result of cooperation with suppliers, monitoring the activities of competitors and the availability of innovative solutions. As a result of the decision to implement innovations, companies improve their competitive position, increase the supply and thus the turnover, some of which are transferred to further investments in new solutions. Increasing expenditure on innovation is in turn accompanied by an increase in the number of new customers.

The indicated relations between the variables confirmed the relationship between the conducted innovative activity and the achieved results of the metal industry enterprises, considered as determinants of market success. Metal industry enterprises allocating their own funds for innovation keep their existing customers and strengthen their market position. The increase in expenditure on innovative activities causes an increase in turnover. In addition,

innovative enterprises effectively compete, ensuring the development of the enterprise and increasing the production and sale of products. Therefore, it is essential to state that there is a need to implement innovative activities to create, use and implement long-term foundations for the growth of enterprises and achieve market success.

The results of empirical research and the analysis of the collected data confirm the positive impact of innovative activity on the development of metal industry enterprises and the factors that allow for achieving market success. Companies competing on the international market, wanting to maintain their current position or to disperse, are forced to constantly invest in new products. Innovations may be the result of conducting own research and development activities as well as cooperation with external entities.

As a result of data analysis, it is recommended to continue research in the area of using open innovations to obtain additional revenues and faster development of innovative projects.

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THE PERCEPTION OF BUSINESS WARGAMING RESULTS AMONG STRATEGIC AND COMPETITIVE INTELLIGENCE COMMUNITY

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Introduction/background: Achieving a market success is not an easy task for companies. To win in the market companies apply numerous strategic, market and competitive intelligence methods including business wargaming which is considered as one of the most advanced methods.

Aim of the paper: The main aim of this paper is to investigate the perception of business wargames practices among strategic and competitive intelligence professionals with special emphasis on results of business wargames.

Materials and methods: To achieve the aim of the paper the online survey was conducted among the members of a leading global professional association “Strategic and Competitive Intelligence Professionals”. The survey was sent to 12566 emails from SCIP database. The responses were collected anonymously via Survey Monkey in April-May 2017. As a result 227 responses were collected.

Results and conclusions: The results of the study suggest that according to respondents business wargaming allows to achieve results on each of the proposed 5 levels of results representing the cause-effect chain of translating business wargaming effects into business benefits, i.e. insights, recommendations, implementation, competitive situation, measurable benefits. Moreover, the respondents indicate that the business wargaming can be considered a relatively attractive analytical method in terms of its effectiveness. The costs of business wargaming are rated as slightly lower or significantly lower than the benefits. Business wargaming is also assessed as better than any other method of generating insight. The research suggests that the more difficult the conditions for competition, the more commonly the business wargaming method is used. Respondents predict that the use of this method will increase in the future.

Keywords: business wargaming, competitive intelligence, strategic simulations.

1. Introduction

1.1. Strategic, market, competitive intelligence

Achieving a lasting market success is not an easy task for companies. Market leaders constantly watch the market, competitors and customers to adjust business strategies. The role of Strategic, Market, Competitive Intelligence (SMCI) is of utmost importance in this process. The lack of proper SMCI may lead to market failures such as Polaroid, Kodak, Nokia. These companies were probably not able to detect the changes in their environments and respond to them accordingly.

Intelligence is as an information that has been analyzed and processed so that it is useful to decision-makers when making strategic and tactical decisions. Above all, it is a methodical assessment of future events. Companies use SMCI to improve the competitive position and win in the market.

Business requirements for SMCI can be strategic, operational or tactical. Strategic ones refer to understanding where the value is migrating, operational ones refer to evaluating the key investments or changes in the context of business strategy and tactical ones refer to supporting the process of winning market transactions against major competitors.

To initiate the SMCI program the decision-makers should provide relevant input to scope it correctly. The scoping ends up with formulating the Key Intelligence Topics (KITs). Running top class SMCI operations requires taking actions in six dimensions: scope, process, deliverables, tools, organization, culture (Hedin et al., 2011). Professional SMCI operations generate value added – companies which run SMCI activities claim their investments pay off (GIA, 2013).

SMCI activities are carried out in the course of traditional intelligence cycle which comprises the following steps: requirements, scoping, planning, collection, processing, analysis, reporting, dissemination. In practical terms those activities do not follow sequentially, but they intersect (Wheaton, 2012). Intelligence deliverables shall meet the six criteria of the FAROUT model (Fleisher, and Bensoussan, 2003) and be: future oriented, accurate, resource efficient, objective, useful, timely.

The critical element in the cycle is the analysis which leads to discovering new knowledge from collected information. The ability to see the disruptions and interpret them is the critical element of SMCI (Fuld, 2010). Analysis is not aimed at telling the future or anticipating the "black swan" events since it is impossible (Taleb, 2007). It should be aimed at assessing the most likely courses of action. During the analysis the questions being answered include: "what?", "so what?", "now what?" (Fleisher, and Bensoussan, 2003, 2007). The taxonomy of structured intelligence analysis techniques comprises dozens of items, including structured brainstorming, what if analysis, devil's advocacy, red team analysis, scenarios (Heuer, and Pherson, 2010). There are also analytical methods specific for business such as PESTEL,

Porter 5 Forces, Ansoff Matrix, strategic groups. Using those various methods should lead to developing possible competitors' strategic moves, possible competitors' reactions to those moves, possible competitors' reactions to industry changes and competitors' reactions to changes in the wider environment (Porter, 1980).

1.2. Business wargaming as a method of intelligence co-creation

Intelligence co-creation is as a joint effort of intelligence producers and consumers aimed at developing insights to support decision-making on strategic moves. It assumes involving decision-makers in the intelligence analysis and drawing conclusions together with the SMCI team. Such methods allow to generate high-value intelligence, assess strategic situation from different perspectives, provoke unconventional thinking, engage people across the company and also obtain human intelligence. They have the potential to produce excellent results but are difficult in execution since they require profound technical and social skills as well as industry knowledge.

Applying the intelligence co-creation methods is one of the measures to address the challenges the SMCI teams face today such as aligning KITs to strategic priorities, communicating competitive data and insights to stakeholders, using informal networks to capture human intelligence (Frost, & Sullivan, 2011). Co-creation fulfills such important axioms of intelligence analysts as aggressive thinking, avoiding mirror imaging, intelligence dissemination, proactive collection (Watanabe, 1997). Cocreation methods reduce the risk of human thinking errors such as the tendency of failing to see things that should be seen, the tendency of perceiving what we expect to see and the tendency of rapid opinion forming and adhering to it (Heuer, 2010). Cocreation also allows to use elements of critical thinking which include: clear purpose, precise question, clear assumptions, point of view, relevant information, concepts to express thinking, inferences or interpretations, implications or consequences (Moore, 2007). Such methods are part of a new paradigm for analysts and should be used routinely to cure the flaws in intelligence analysis (Cooper, 2006).

Wargaming derives from the military sector and can be defined as “a warfare model or simulation whose operation does not involve the activities of actual military forces, and whose sequence of events affects and is, in turn, affected by the decisions made by players representing the opposing sides” (Perla, 1990) or as “an attempt to get a jump on the future” (Dunnigan, 2010). In business context wargaming can be defined as “competitive time-based simulation in which participants ‘playing’ on teams develop and present competing strategies” (May, and Smith, 2012). Since there are some reservations with the use of “war” and “game” terms in business world wargaming is also being referred to as “strategy simulation”.

Wargaming assumes a rivalry between companies, although cooperation-oriented measures like cooperation are acceptable. Already in 1984 it was argued that the economic and social transformations required companies to take a new approach to market struggle, i.e. to adopt their strategies to reflect the combative nature of market competition (Barrie, 1984).

This assumption has not changed over time – business wargames are sometimes being referred to as “cognitive warfare” (Herman et al., 2008).

Business wargaming assumes that if a company wants to win against its competitors it needs to think the way they do. The ultimate goal is to discover the most likely actions of the competitors and develop plans to outsmart them. Wargame is a serious, realistic simulation and is not oriented for entertainment by any means. Business wargaming uses only real data on companies and markets. Wargaming shall not be confused nor associated with gamification which is oriented for increasing the engagement and motivation of people. There are various types of wargaming events: workshop, inductive/deductive game, scenario planning, alternative futures, etc. (Burns et al., 2013). The advanced form of wargaming is a multi-level simulation which links the strategic, operational and tactical levels (Perla, and Markowitz, 2009).

The value-added from such simulations is the creation of a situation which allows the host company to analyze the situation from different perspectives by temporarily entering the shoes of competitors (according to the Sun Tzu’s proverb “To know your enemy you must become your enemy”). This different perspective allows to discover new things. Wargaming can be perceived as one of the methods to generate foresight for companies. Some authors (Schwarz, 2009) claim it is possible because wargames have participative and dynamic nature and allow companies to deal with cognitive errors, challenge status quo, identify weak signals and refocus activities. Wargaming is probably the most powerful project the SMCI team may run. SMCI teams which engage in wargaming assess their operations as very effective and more strategic (Fletcher/CSI, 2014).

1.3. The practice of business wargaming

Business wargame is an interactive simulation attended by the company’s leadership. The executives are split into teams representing the competitors. Those teams develop the most likely business actions and reactions of competitors in an iterative manner, usually in 3-4 rounds. The proposed actions are then assessed by other teams representing clients, regulators, shareholders, etc. The content of each round derives from the goals of simulation. The simulation concludes with recommendations of strategic actions for the management board of a host company.

Wargaming can be applied to test the strategy, prepare crisis response, develop foresight, manage change, educate and recruit, develop early warnings (Oriesek, and Schwarz, 2008). It is the right solution when a company faces an important decision such as launching new product, entering new market, merger or is concerned about the uncertainty of the environment like changing technologies, regulations, social trends, economic situation, customer habits.

Business wargaming is a unique way to analyze the future market situation. Having such knowledge before making a key decision and engaging significant resources is invaluable. This is possible thanks to a structured, rigorous analysis of the most likely moves and counter-measures of competitors and stakeholders in the mid-term horizon.

Business wargaming is considered a valuable yet demanding analytical method that leads to groundbreaking conclusions about what a company should do to improve its position relative to competitors. There are three factors that can make this breakthrough possible. First of all, during business wargame, the participants additionally change their perspective thanks to the fact that they play the role of management boards of selected competitors. This gives a unique opportunity to look at the market situation from a completely different angle, which is to free the participants' unconventional thinking. Secondly, selected management representatives from various departments of the company are involved in the process. This gives the opportunity to accumulate the high potential of diversified experience and comprehensive business and industry knowledge of the company and use it for the purposes of analysis. Thirdly, the analytical process is carried out as a team and iterative process, which allows for the development of much more mature conclusions and recommendations than in the case of analyzes conducted individually by individual analysts.

2. Methods

2.1. Survey description

The survey aimed at investigating the perception of business wargames practices in companies. The aim of the survey was to identify and describe the perceived relationships between the use of wargaming and business results such as improving competitive position of companies.

The draft survey was designed by the author and was consulted with 2 dozens of individuals familiar with wargaming. All collected comments were analyzed and some of them implemented.

The target audience was the members of SCIP association who are SMCI practitioners. The survey was primarily targeted at individuals who deal with or dealt with business wargames. While probably not all the SCIP members had direct experience with business wargaming, most of them were probably familiar with this concept which made them relatively good target group for this survey.

The survey contained some explanations of terms to set a common denominator. Business wargaming was explained as “a simulation of possible future actions of various market stakeholders; it aims at developing the winning moves of the home company given the real market situation and data; this method is also being called ‘red hat analysis’, ‘red team analysis’”. Intelligence co-creation was explained as “a joint and highly interactive effort of intelligence team and company's leadership that is oriented for developing valuable insights to drive the actions of the company.”

Each question comprised the answer “Do not know/Difficult to answer/Not applicable”. This was aimed at reducing the risk of the respondents giving forced or false answers when they did not have an opinion on a given topic or did not understand a given question.

The survey was sent to 12566 emails from SCIP database. The responses were collected anonymously via Survey Monkey from 7th IV till 12 V 2017. 227 responses were collected but not all of them comprised answers to all the questions. The responses must not be treated as representative sample and therefore the survey results cannot be generalized.

2.2. Respondent profile

The primary industry focus of respondent’s company was manufacturing (25 responses); pharmaceuticals, health sciences, health care (24); information, communications, entertainment (18); financial services, insurance, banking (14); professional services (13). The primary geographical focus of respondent’s company was North America (64 responses), multiple geographies (62), Europe (13), Asia (4), South America (4), Africa (1) and Australia (1). The total yearly revenue of respondent’s company in all business units was as the following: \$0-100M – 34 responses; \$100-500M – 16; \$500M-1B – 14; \$1B-10B – 37; \$10B or above – 25. 117 respondents indicated they were in various roles in business wargaming such as designing, conducting, managing, coordinating, participating, advising, deciding, analyzing. 99 respondents declared no practical experience with business wargames.

The typical planning timespan of respondent’s company given the environment's predictability was from 0 to less than 1 year – 22 responses; from 1 to less than 3 years – 69 responses; from 3 to less than 5 years – 31 responses; from 5 to less than 10 years – 9 responses; 10 years or more – 1 response (based on 149 responses).

The total market share of respondent’s company in terms of revenues was (148 responses): from 0 to less than 20 percent – 57 responses; from 20 to less than 40 percent – 31 responses; from 40 to less than 60 percent – 14 responses; from 60 to less than 80 percent – 3 responses; from 80 to 100 percent – 2 responses. The competitive position of respondent’s company was described (based on 149 responses) as clear market leader by 30 respondents, one of the key market players by 78 respondents and one of many market players by 26 respondents.

The competitive situation of respondent’s company was assessed by respondents using a simple “high – medium – low” scale in five dimensions according to the Porter Five Forces model: power of customers, power of suppliers, threat of new entries, competitive rivalry, threat of substitutes. High competitive rivalry was indicated by 78 respondents and high power of customers was indicated by 77 respondents. The summary of all the responses is presented in Table 1 below.

Table 1.

Summary of responses to question “What is the competitive situation of your company?”

Q23: What is the competitive situation of your company?	HIGH	MEDIUM	LOW	Do not know/ Difficult to answer/ Not applicable	Total
Power of customers	77	47	8	16	148
Power of suppliers	21	54	47	25	147
Threat of new entries	42	42	45	17	146
Competitive rivalry	78	47	6	18	149
Threat of substitutes	40	40	45	23	148

Source: author's own research.

3. Results

As far as the typical results of business wargames are concerned 51 respondents somewhat agreed and 47 strongly agreed that business wargames generate insights of significant value; 63 respondents somewhat agreed and 39 strongly agreed that insights from wargames are translated into recommendations of specific actions; 46 respondents somewhat agreed and 19 strongly agreed that actions developed in the course of business wargames are launched and implemented; 57 respondents somewhat agreed and 19 strongly agreed that implemented actions result in improved competitive situation of a company; 48 respondents somewhat agreed and 21 strongly agreed that improved competitive situation translates into measurable benefits (i.e. market share). The summary of all responses follows in Table 2 below.

Table 2.

Summary of responses to question “What are the typical results of business wargames?”

Q10: What are the typical results of business wargames?	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree	Do not know/ Difficult to answer/Not applicable	Total
Level 1: Business wargames generate insights of significant value	47	51	12	3	1	38	152
Level 2: Insights from wargames are translated into recommendations of specific actions	39	63	8	5	1	36	152
Level 3: Actions developed in the course of business wargames are launched and implemented	19	46	37	12	1	36	151

Cont. table 2.

Level 4: Implemented actions result in improved competitive situation of a company	19	57	28	2	1	43	150
Level 5: Improved competitive situation translates into measurable benefits (i.e. market share)	21	48	28	7	2	45	151

Source: author's own research.

The percentage of business wargames that are considered to be worth the effort at the conclusion of the wargame was indicated by 14 respondents from 0 to less than 25%. 32 respondents declared from 25 to less than 50%; 20 respondents declared from 50 to less than 75% and 21 declared from 75 to 100% (based on 150 responses).

The respondents assessed the typical relationship between expected and achieved benefits of business wargames (153 responses). 16 respondents indicated that expected benefits are significantly higher than achieved benefits. 33 respondents indicated that expected benefits are somewhat higher than achieved benefits. 37 respondents indicated that expected benefits are equal to achieved benefits. 11 respondents indicated that expected benefits are somewhat lower than achieved benefits. 2 respondents indicated that expected benefits are significantly lower than achieved benefits.

The typical relationship between the costs and benefits of business wargames was evaluated by respondents (150 responses). 6 respondents answered that costs are significantly higher than benefits. 19 respondents answered that costs are somewhat higher than benefits. 16 respondents answered that costs are equal to benefits. 19 respondents answered that costs are somewhat lower than benefits. 36 respondents answered that costs are significantly lower than benefits.

The changes in the use of business wargames in a future were assessed by respondents (150 responses). According to 30 respondents it will significantly increase. 36 respondents assessed that it will slightly increase. 27 respondents assessed that it will not change. 6 respondents assessed that it will slightly decrease. 1 respondent assessed that it will significantly decrease.

The respondents compared wargaming to other analytical methods of generating insight on how to win in a market (152 answers). Business wargaming is significantly better than alternative methods according to 11 respondents. Business wargaming is somewhat better than alternative methods according to 54 respondents. Business wargaming is the same as alternative methods according to 27 respondents. Business wargaming is somewhat worse than alternative methods according to 8 respondents. Business wargaming is significantly worse than alternative methods according to 1 respondent.

The respondents also commented on what the future of business wargames may look like (Question "How will business wargames evolve in a future?"). It seems that the respondents' answers can be synthesized to the following several issues: the business wargame method will be more commonly used, it will be implemented with qualitative and quantitative methods, it will be enriched with artificial intelligence, it will be subject to virtualization.

4. Discussion

The main area of interest in the study was an attempt to determine whether business wargaming does indeed generate valuable results for companies and whether it leads to an improvement in the competitive position of companies. From this point of view, the question "What are the typical results of business wargames?" was crucial. The respondents assessed the results of business wargaming on 5 different levels – ranging from what seems to be the most direct effect of business wargaming (i.e. valuable insights) to what seems to be the least direct effect of business wargaming (i.e. market share). These 5 levels represented the cause-effect chain of translating business wargaming effects into business benefits: insights (level 1), recommendations (level 2), implementation (level 3), competitive situation (level 4), benefits like market share (level 5). Obviously, the higher the level, the more exogenous factors that could have an impact on it, and thus the less certainty that it was business wargaming that led to it. In other words, it is much easier to judge whether business wargaming generated valuable conclusions (direct business wargaming result) than to assess whether business wargaming led to an increase in market share (indirect business wargaming result).

The answers to this key question suggest that business wargaming allows to achieve results at any of the proposed 5 levels of results. This would be indicated by the percentage of positive responses, ie "Strongly agree" and "Somewhat agree" in the total number of responses, excluding non-diagnostic responses, ie "Do not know/Difficult to answer/Not applicable". For individual levels of results, this percentage was: 86% for level 1 (valuable insights), 88% for level 2 (recommendations), 57% for level 3 (implementation of actions), 71% for level 4 (competitive situation), 65% for level 5 (measurable benefits). The distribution of "Neutral" responses would suggest the conclusion that the assessment of intermediate results is more problematic (11% for level 1, 7% for level 2 versus 32% for level 3, 26% for level 4, 26% for level 5).

Analysis of responses to the question "What percentage of business wargames is considered to be worth the effort at the conclusion of the wargame?" presents difficulties, as 42% of respondents indicated a non-diagnostic answer, i.e. "Do not know/Difficult to answer/Not applicable" and, moreover, there is no visible polarization in the answers. This may indicate a faulty structure of this question, because since business wargaming leads to not only direct but also indirect results, then - taking into account the fact that indirect results are delayed in time – at the end of business wargaming it is difficult to assess whether business wargaming was worth the effort put into it.

Difficulties in interpreting the answers also occur with question "What is the typical relationship between expected and achieved benefits of business wargames?". The percentage of non-diagnostic responses is still high here, at the level of 35%, but they are polarized. Only 13% of respondents considered that the expected benefits are slightly lower or

significantly lower than the benefits achieved through business wargaming. Therefore, it can be said that the effect of a positive surprise with the effects of business wargaming is rare. Unfortunately, it is difficult to interpret these results unequivocally, because it is not known at what level the expectations were before conducting business wargaming.

More insight into the situation is provided by the analysis of the answer to the question "What is the typical relationship between the costs and benefits of business wargames?". Only 26% of responses indicate that the costs of business wargaming are slightly higher or much higher than the benefits. Meanwhile, as many as 57% of responses indicate that the costs of business wargaming are slightly lower or much lower than the benefits. This would suggest that business wargaming could be considered a relatively attractive analytical method in terms of its effectiveness.

The results of the assessment of the use of the business wargame method in the future are optimistic, which is the subject of the question "How will the use of business wargames change in a future?". Only 7% of respondents believed that the use of this method would slightly or significantly decrease, while 66% of respondents forecast that the use of this method would increase in the future.

The comparison of business wargaming with other analytical methods is also positive, as indicated by the answers to the question "How does business wargaming compare to other analytical methods of generating insight on how to win in a market?". 64% of respondents say that business wargaming is better than other methods of generating insight, while only 9% of respondents consider it worse than others.

It is puzzling whether the low degree of popularity of the business wargaming method is adequate to its high efficiency. Responses to the question "How does business wargaming compare to other analytical methods of generating insight on how to win in a market?" show that this is an effective method. Meanwhile, the relatively small number of responses to the survey (227 responses were received after the survey was sent out to 12,566 email addresses), compared to the fact that the survey was sent to members of an association associating professionals in the field of intelligence and strategic and competitive analysis, would suggest a low degree of widespread use of the business wargaming method. Perhaps this is due to the fact that business wargaming is, however, one of the most advanced analytical methods and, in addition, requires a lot of commitment from the management.

Interesting conclusions can be drawn from the analysis of the answer to the question "What is the competitive situation of your company?". The respondents assessed the competitive situation of their companies in five dimensions, in line with Porter's classic model of five forces. These assessments show that the companies represented by the respondents operate in conditions characterized by a high bargaining power of customers and, at the same time, a high intensity of competitive struggle in the sector. Such a distribution of competitive forces would suggest that the companies represented by respondents face multiple market and competitive pressures. In other words, these are difficult business conditions. It would therefore

not be surprising that, especially in this kind of demanding environment, companies will lean towards the use of business wargaming precisely to improve their competitive situation through introducing the winning strategic moves. The fact that the survey discussed in this article was answered mainly by representatives of companies experiencing competitive and market pressures (as indicated by the answers to this question) would suggest that business wargaming is particularly useful and common in companies with this type of characteristics. In other words, it seems that the more difficult the conditions for competition, the more common business wargaming will be.

It seems that in the future we should expect a progressive business wargame virtualization, i.e. it will be played by people and teams dispersed in different locations. Effective and proven technology for videoconferencing is already available today. Of course, it would be ideal if all participants of the business wargame could meet in one place and time, but the increasing globalization and hence the geographical dispersion of company employees is not conducive to this and forces virtual communication between employees.

5. Summary

The results of the study suggest that according to respondents business wargaming allows to achieve results on each of the proposed 5 levels of results representing the cause-effect chain of translating business wargaming effects into business benefits, i.e. insights, recommendations, implementation, competitive situation, measurable benefits. Moreover, the respondents indicate that the business wargaming can be considered a relatively attractive analytical method in terms of its effectiveness. The costs of business wargaming are rated as slightly lower or significantly lower than the benefits. Business wargaming is also assessed as better than any other method of generating insight. The research suggests that the more difficult the conditions for competition, the more commonly the business wargaming method is used. Respondents predict that the use of this method will increase in the future.

The research has certain limitations including the following: 1) very small number of responses to the survey despite addressing it to the group of professionals associated in the leading global industry organization, 2) uneven distribution of companies from various industries and countries which was inherited from the structure of the members of the industry organization to which the survey was sent, 3) lack of knowledge about whether responding to the survey the respondents took into account all their professional experience or just from the company in which they worked at the moment of completing the survey, 4) the risk of a different understanding of business wargame among the respondents despite the explanation of selected concepts in the introduction to the survey, 5) the risk of incorrect answers resulting from the lack of adequate knowledge of the respondents e.g. due to leaving the company where the

business wargaming was used, 6) using imprecise and ambiguous high–medium–low scale in survey question *What is the competitive situation of your company.*

Although the results of the survey provide answers to a number of questions, they simultaneously reveal new areas of interest such as types of strategic moves implemented by companies as a result of business wargaming (eg introducing a new product, entering a new market, mergers, acquisitions, strategic alliances), linking the strategic planning process with business wargaming, the use of business wargaming in the face of global crises such as the COVID-19 pandemic.

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CORPORATE GLOBAL MINDSET AND INTERNATIONALIZATION OF SMES

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Introduction/background: Although internationalization is crucial for SMEs' development little research exists on the relationship between the attributes that create corporate global mindset, and their effects on companies' internationalization. While existing research focuses on the isolated analysis of single factors, this paper introduces a set-theoretic approach, investigating interdependencies of complementarity, efficiency, and novelty among the various factors making up corporate global mindset.

Aim of the paper: The study's objectives are to: (1) identify attributes (business postures) relating to corporate global mindset; and (2) identify and evaluate the combinations of corporate global mindset attributes that lead to internationalization behavior.

Materials and methods: This study performs a fuzzy-set qualitative comparative analysis (fs/QCA) to analyze how corporate global mindset relates to SMEs internationalization. The sample consists of 73 Polish SMEs.

Results and conclusions: This study confirms that four different combinations of corporate global mindset attributes can lead to the same outcome – the high degree of internationalization. This research lies in providing an understanding of how different solutions can lead to the same result. This insight is helpful in gaining a deeper understanding of firms' internationalization.

Keywords: Corporate global mindset, internationalization, Fuzzy-set QCA, SME.

1. Introduction

In the literature, there are numerous studies on the role of corporate global mindset in the organization's performance (Felício, Caldeirinha, Rodrigues, Kyvik, 2013, Ananthram, Pearson, Chatterjee, 2010, Talke, 2007). However, still not much is known about the attributes that create corporate global mindset, and their effects on companies' internationalization. It is very important understand the corporate global mindset attributes because a company has routines, produces products and services, and develops many activities that interact with very different cultural realities that require adaptation and appropriate decisions to be successful

(Félicio, Caldeirinha, Rodrigues, 2012). In addition the knowledge about the operationalization of global mindset construct is still limited. Overall, the literature discusses global mindset from the perspective of large companies, and scarcely explores how small companies behave or take advantage of international opportunities.

This research builds on the resource-based view (Barney, 1991; Teece, Pisano, Shuen, 1997), the mindset theory (Gollwitzer, 1990), and the internalization theory (Rugman, Verbeke, 2004) which form the theoretical basis of this study. This research contributes significantly to literature by providing insight into two key areas: attributes relating to corporate global mindset, and relationship between corporate global mindset and degree of SMEs internationalization. It is worth emphasizing that traditional statistical methodologies are not fully suited to analyzing what different configurations of corporate global mindset attributes lead to internationalization performance. This is directly related to the challenges of the configuration approach, where the focus shifts from the net effect of a single attribute on outcome to the analysis of multiple configurations related to comparable outcome. Furthermore, the methodological challenge is to modeling many complex relationships between configuration attributes (Fiss, 2011). Traditional multivariate analytical methods are often less effective at capturing complex systems of interdependencies between configuration attributes and outcome variables. Given these challenges, the development of configuration theory and empirical testing of configuration approaches are rarely present in corporate global mindset research. Therefore, fuzzy-set qualitative comparative analysis (fs/QCA) was proposed, which is a useful tool to study these issues. Set-theoretic methods (Ragin, 2000, 2008; Ragin, Fiss, 2008; Rihoux, Ragin, 2009) provide tools to study combinations of factors, emphasizing that these combinations form solutions that explain individual cases. Importantly, set-theoretic approaches differ from conventional, variable-based approaches.

Using fs/QCA, this research evaluates combinations of corporate global mindset factors to understand the recipes that lead to SMEs internationalization behavior. The study's objectives are to: (1) identify attributes (business postures) relating to corporate global mindset; and (2) identify and evaluate the combinations of corporate global mindset attributes that lead to internationalization behavior. Another important aim of this research is to present the contribution and value of fs/QCA application to the study of corporate global mindset, providing a better understanding of which equifinal combinations of attributes lead to the SMEs internationalization.

The structure of the paper is as follows: after the introduction, the theoretical foundations were presented by analyzing the existing literature in the research field, and on this basis the propositions were formulated. Section 3 explains the research method, and Section 4 focuses on empirical results and their analysis. Section 5 discusses the results and conclusions.

2. Theoretical background

Corporate global mindset is essentially based on the resource-based view, mindset theory, and internalization theory. The resource-based view is a managerial framework used to determine the strategic resources and refers to all assets, capabilities, processes, information, and knowledge attributes that allow the company can exploit to achieve sustainable competitive advantage (Barney, 1991; Teece, Pisano, Shuen, 1997). From this point of view, companies are heterogeneous in relation to their resources and capabilities (Wernerfelt, 1984). A large body of research has shown that differences in the resources of companies competing in the same industry largely explain the differences in their performance. These results suggest the importance of company-specific factors.

The mindset theory consists of the distinction between the motivation to choose a target and the willingness to make the decision to achieve such objective (Gollwitzer, 1999). Global mindset is defined by Govindarajan and Gupta (2001, p. 111) as a mindset “that combines an openness to and awareness diversity across cultures and markets with a propensity and ability to synthesize across the diversity”. Kedia and Mukherji (1999) define it as openness and the ability to recognize complex connections. In this way, a global mindset facilitates the effective management of multinational corporations, allowing them to operate with greater strategic intent in the international arena (Nummela, Saarenketo, Puumalainen, 2004).

The internalization theory aims to understand the type of organization, company boundaries and the company's relations with the external environment, as well as to explain the existence, functioning and behavior of companies operating on the international market (Rugman, Verbeke, 2004). This theory aims to assess the conditions of functioning on international markets. Internationalization stems, among other reasons, from the need to diversify risks and broaden horizons to other markets. As indicated in the literature, this driver of internationalization, apart from requiring resources, depends on global mindset. Some studies confirm the relationship of global mindset with the successful internationalization of companies (e.g. Felicio, Caldeirinha, Rodrigues, Kyvik, 2013).

Global mindset has most often been studied at the individual level, but at the organizational/corporate level it has been considered a requirement for the organization to be globally competitive. Thus, in order for an organization to gain and maintain a global market leadership position in its industry, it has to regard the development of a global mindset as a goal that embraces every individual and every employee (Govindarajan, Gupta, 2001). Corporate global mindset has its roots in routine, operational practices, processes and behaviors, including experience, social relationships, and conventions. Corporate global mindset refers to the degree to which firms learn to think and operate both globally and as integrated entities, to reflect their structure and organization (Begley, Boyd, 2003). Corporate global mindset is an integrative,

multidimensional aptitude whose roots lies in organization's heritage, dominant culture and mobilized resources (Paul, 2000). These factors shape the behavior of the organization and its overall strategic orientation in the global market (Yin, Johnson, Bao, 2008).

Three general approaches to define or interpret global thinking from a cultural, strategic or multidimensional perspective have been identified in the literature (Levy et al., 2007). The multidimensional perspective includes both cultural and strategic perspectives in their attempts to define global mindset. The multidimensional perspective provides a more encompassing definition of what global mindset is. In the multidimensional perspective of the organization, the global mindset consists of global aptitude (integrates cognition), global knowledge, and global orientation (integrates behavior) (Felício, Caldeirinha, Rodrigues, Kyvik, 2013; Yin, Johnson, Bao, 2008).

As suggested by previous research (e.g. Felício, Caldeirinha, Rodrigues, Kyvik, 2013), and based on a multidimensional approach, the corporate global mindset is strongly related to the five business posture, constituting a multi-dimensional construct consisting of the following attributes: analytical posture (Talke, 2007; Venkatraman, 1989), aggressive posture (Morgan, Strong, 2003; Paul, 2000; Talke, 2007; Venkatraman, 1989), risk-taking posture (Talke, 2007; Venkatraman, 1989), situational posture and strategic posture (Begley, Boyd, 2003). The analytical posture reflects the company's ability to generate information and build knowledge in order to provide a competitive advantage (Morgan, Strong, 2003), relates to customer behavior, market planning, and attention to new products and technological innovation. The aggressive posture describes a company's behavioral attitude along a continuum from offensiveness to defensiveness, e.g. in response to external threats (Covin, Slevin, 1991). While some studies have found that aggressive posture negatively impacts outcomes (Venkatraman, 1989), others advocate positive relationships with outcomes (Covin, Slevin, 1991; Lumpkin, Dess, 2001). A risk-taking posture refers to how decisions are made and acted upon in relation to some knowledge of likely outcomes. It also refers to embarking on the unknown areas or engaging significant resources in uncertain projects (Dess, Lumpkin, 2005). The situational posture refers to ensuring transparency in a hierarchical structure, decentralization of responsibilities, the adoption of technologically advanced products and services, and the provision of resources for development, while the strategic posture involves planning the future to ensure global resources and market conditions for achieving economies of scale.

On the basis of the theoretical background, the following propositions can be made:

Proposition 1: The analytical posture, the aggressive posture, the risk-taking posture, the situational posture and the strategic posture combine to form alternative internationalization behavior solutions.

Proposition 2: Various combinations of analytical, aggressive, risk-taking, situational and strategic postures relates positively to the high degree of internationalization.

3. Measures, data collection, and analysis method

On this basis, a research model is presented that analyzes the presence or absence of corporate attitudes, five business posture of global thinking when the results of internationalization behavior emerge. The model also explains how these attributes combine to create different configurations for internationalization behavior outcome – the high degree of internationalization (Figure 1).

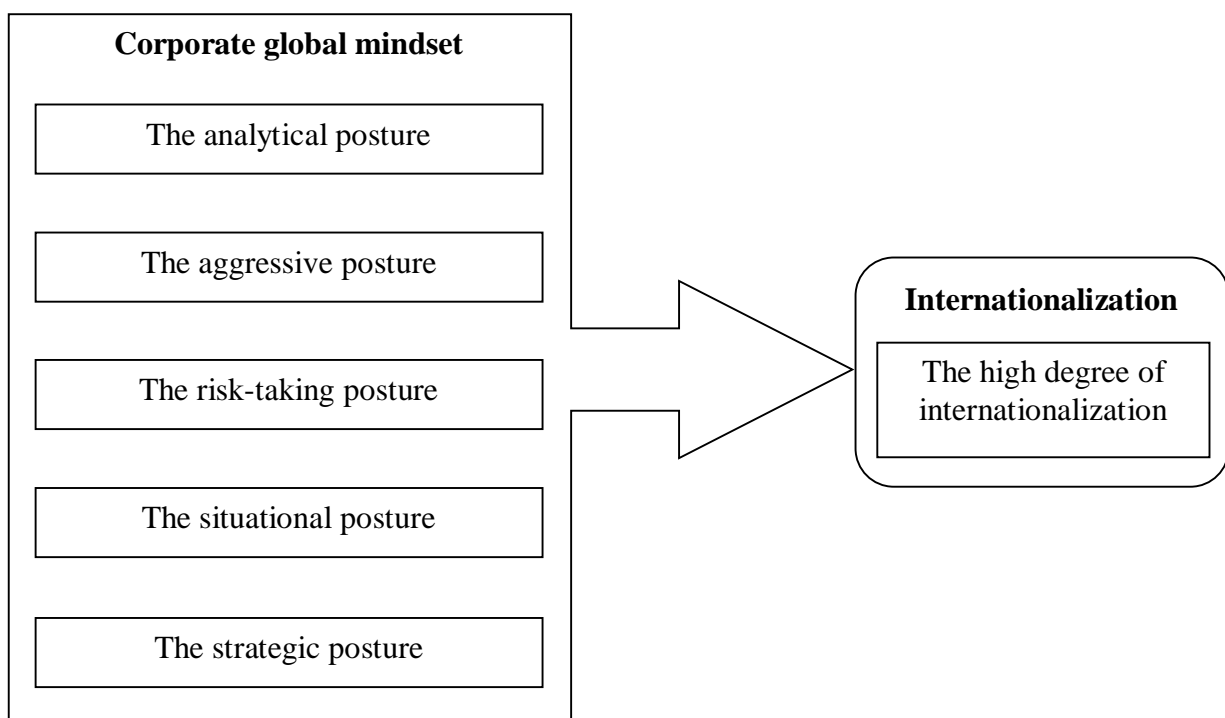


Figure 1. Research model. Source: own study.

The research model has five attributes (analytical posture, aggressive posture, risk-taking posture, situational posture, and strategic posture) resulting from 18 observed variables and one outcome resulting from one variable. The internationalization behavior outcome is the high degree of internationalization. Seven-point Likert-type scales (from 1 – totally disagree or inexistent to 7 – totally agree or excellent) were used to develop constructs for the study. Measurement scales had with reliable psychometric properties, validated in previous empirical studies. Reliability for each scale was determined using Cronbach's alpha. The reliability score is a measure of the internal consistency of the construct (Nunnally, 1978), and alpha values over 0.70 indicates sound reliable measures.

To measure analytical posture (Cronbach's alpha 0.78), the study uses five-item scale developed by Venkatraman (1989) and Talke, (2007). Aggressive posture (Cronbach's alpha 0.81), is measured based on four-item scale developed on the basis of research conducted by Morgan, Strong (2003), Paul (2000), Talke, (2007) and Venkatraman (1989). The measurement

of risk-taking posture (Cronbach's alpha 0.94), was based on the scale developed by Talke, (2007) and Venkatraman (1989) which consisted of three items. A two-item scale and a three-item scale developed by Begley, Boyd, (2003) were used to measure situational posture (Cronbach's alpha 0.72) and strategic posture (Cronbach's alpha 0.75) respectively.

International sales as a percentage of total sales is the most commonly used measure to capture the effectiveness of international performance (Yeoh, 2004). It is also a viable proxy for the degree of internationalization (Kumar, Singh, 2008). In this paper, an SME's high degree of internationalization is considered when foreign sales represent more than 25% of total sales (Zahra, Garvis, 2000; Lu, Beamish, 2001, 2004). Therefore, the variable takes a value of one if an SMS's foreign sales are greater than 25%; otherwise, it is zero (e.g., Ripolles-Melia, Menguzzato-Boulard, Sanchez-Peinado, 2007). Table 1 details information on these constructs and variables.

Table 1.

Attributes, variables, source, and reliability of the constructs

Attributes		Variables	Sources
Outcome	The degree of internationalization	Percentage of foreign sales to total sales	Zahra, Garvis, (2000); Lu, Beamish, (2001, 2004)
Attributes	Analytical posture (Cronbach Alpha = 0.78)	<ol style="list-style-type: none"> 1. Market-planning activities explicitly consider long-term future developments; 2. R&D is the firm's main way of guaranteeing sustainable competitive advantage; 3. The firm performs continuous analysis of the potential of new technologies; 4. The firm makes systematic predictions of trends in innovation; 5. The innovation and development strategy has a long-term focus. 	Talke, (2007); Venkatraman, (1989)
	Aggressive posture (Cronbach Alpha = 0.81)	<ol style="list-style-type: none"> 1. Sacrifice profitability to increase leadership in innovative products or services; 2. Generally engage in aggressive market activities; 3. Prioritize launching new products before competitors do; 4. Focus the product development strategy on aggressive innovation. 	Morgan, Strong, (2003); Paul, (2000); Talke, (2007); Venkatraman, (1989)
	Risk-taking posture (Cronbach Alpha = 0.94)	<ol style="list-style-type: none"> 1. A progressive, bold attitude to making important decisions; 2. A tendency to support promising projects even if their likelihood of success is uncertain; 3. A tendency to take risks when making important market-related decisions. 	Talke, (2007); Venkatraman, (1989)

Cont. table 1.

	Situational posture (Cronbach Alpha = 0.72)	1. The products/services are technologically advanced; 2. The firm performs its own R&D; 3. The firm has access to resources that enable the firm to grow.	Begley, Boyd, (2003)
	Strategic posture (Cronbach Alpha = 0.75)	1. The firm focuses on obtaining global resources; 2. The firm has entered new markets under the influence of global competition; 3. The perception of the firm's policies and organizational practices is relevant to resolving the challenges arising from globalization.	Begley, Boyd, (2003)

Source: own study.

Data collection took place through an online survey during the first quarter of 2020. The data used in this study was designed from previous high-accuracy studies. The online survey consisted of an introductory page, three pages of questions, and an ending page. Data was used from a sample of 73 small and medium-sized enterprises (SMEs) located in the Silesian Province in Poland. Prior to the survey, 10 interviews with managers were conducted to ensure that the concepts were relevant and that the phrasing of the variables and the meaning of the concepts were equally understandable. After three rounds of reminder emails, 293 responses were received, representing 20.39 percent of responses. In summary, 293 questionnaires completed by managers from 73 SMEs were received. Table 2 summarizes the main characteristics of the sample.

Table 2.
Characteristics of the research sample

Category		Statistic
Firm level	Age	<5 years (33,3%)
		6-10 years (42,7%)
		>11 years (24,0%)
	Size (employees)	<10 (33.4%)
		<50 (46.6%)
<250 (20.0%)		
Respondent level	Gender	Female (31,5%)
		Male (68,5%)
	Education	Higher (72%)
		Secondary (17%)
		Other education backgrounds (11%)
	Age	< 30 (36%)
		31-45 (43%)
		>46 (21%)
	Working experience of respondents	3-5 years (33%)
		6-10 (45%)
		More than 10 years (22%)

Source: own study.

In order to explore how the attributes contribute to the outcome in question, the current study employs a set-theoretic approach based on the fuzzy-set qualitative comparative analysis (fsQCA). Contrary to correlational methods, such as structural equation modeling, which estimate the net effect of an independent variable on a dependent variable, fs/QCA identifies the causal conditions that lead to internationalization behavior outcome (Cheng, Chang, Li, 2013; Schneider, Schulze-Bentrop, Paunescu, 2010). The aim of fs/QCA is not to prove the existence of causal relationships but rather to reveal patterns that support the existence of causal relationships (Schneider, Wagemann, 2010). In this way, fs/QCA supplements conventional correlational analyses thanks to its three main advantages: (1) asymmetry (i.e., the relationships between independent and dependent variables are treated as asymmetric), (2) equifinality (i.e., multiple pathways lead to the same outcome), and (3) causal complexity (i.e., combinations of causal antecedent conditions lead to the outcome, and hence, the focus is not on net effects, but on combinatorial effects) (Fiss, 2011; Ganter, Hecker, 2014). This study first uses fs/QCA to evaluate the group of attributes comprising the subsets of corporate global mindset attributes and then identifies the combinations of attributes that relate to internationalization behavior. Fs/QCA uses Boolean algebra and algorithms to reduce a large number of complex causal conditions to a small set of configurations that lead to a certain outcome. The fs/QCA 2.5 software was used in the analysis, which provided results consisting of a complex solution, a parsimonious solution and an intermediate solution. Based on the feed by Rihoux and Ragin (2009), for further analyzes an intermediate solution was used as better and with significant advantages over the other two solutions, and the results of the parsimonious solution was also taken into account.

4. Empirical results and analysis

Prior to performing fs/QCA, the original scales need to be calibrated into set membership values (indicating the degree of membership in a set) ranging from 0 to 1. To arrive at continuous set membership values (in the range between 0 and 1), the log odds method described by Ragin (2008) is applied. Consistent with recommendations in the literature (Ragin, 2008), three anchor points were used to perform this calibration: the 5%-percentile, the median, and the 95%-percentile of a variable. The extreme points define full non-membership/full membership in a set, whereas the median is the crossover point indicating that a case is neither in nor out of a set.

For each outcome, five conditions appear in the truth table. Hence, the number of possible combinations is 32. The next steps are to remove the logical remainders and analyze the raw consistency (Kwiotkowska, 2017; Fiss, 2011; Ragin, 2008), and to analyze the solutions (Fiss, 2011). The presentation of results uses the same notation as Ragin and Fiss (2008). To differentiate the cases belonging to the solution from those not belonging to the solution, the consistency cutoff point is 0.95 for the degree of internationalization. Table 3 presents results. Utilizing the notation system from Ragin and Fiss (2008), each column in the Table 3 represents a configuration of conditions linked to the respective outcome. Full circles (●) indicate the presence of a condition while blank spaces indicate “don’t care”. Each panel represents the alternative causal combinations or recipes for the outcome (Ragin, 2008). These are consecutively numbered S1a, S1b, S2a and S2b.

Table 3.
Configurations for high degree of internationalization

Configuration	Solution			
	S1a	S1b	S2a	S2b
Analytical posture	●			●
Aggressive posture		●	●	
Risk-taking posture			●●	●●
Situational posture	●●	●●		
Strategic posture		●		
Consistency	0,88	0,92	0,94	0,93
Raw coverage	0,65	0,47	0,47	0,62
Unique coverage	0,18	0,06	0,01	0,01
Solution consistency	0,91			
Solution coverage	0,83			

Note: ●● = core causal condition present; ● = peripheral causal condition present.

Source: own study.

The results with different solutions for high degree of internationalization have good consistency and solution coverage ($C = 0.91$; $SC = 0.83$), solution 1 and solution 2, both with neutral permutations. The overall solution for high degree of internationalization implies first-order (or across-type) equifinality of solutions. The neutral permutations within solution 1 (1a and 1b) and solution 2 (2a and 2b) imply second-order (or within-type) equifinality.

Four solutions lead to the high degree of internationalization. Solution 1a indicates that combining two corporate global mindset attributes: situational posture as the core condition and analytical posture – as a peripheral condition, leads to the high degree of internationalization. Solution 1b implies that three corporate global mindset attributes (situational as the core condition and aggressive and strategic as peripheral conditions) combine to yield the same high

degree of internationalization as in solution 1a. Solution 2a implies that two attributes of corporate global mindset attributes (aggressive posture as a peripheral condition and risk-taking posture as the core condition) lead to the high degree of internationalization. Finally, Solution 2b indicates that combining analytical posture and risk-taking posture (core condition) leads to the high degree of internationalization.

Table 3 lists two measures of fit: consistency and coverage. The measure of consistency assesses the degree to which cases sharing a given combination of conditions agree in displaying the outcome. It can range between 0 and 1, where 1 implies perfect consistency. The score is calculated for each configuration separately and for the solution as a whole. The scores for the solution (0.91) and for each configuration separately (0.88-0.94) suggest the presence of clear set-theoretic relationships. Solution coverage (0.83), by contrast, assesses the empirical importance of the solution. The raw coverage measures the degree to which an outcome is covered by each configuration. It is also interesting how much of the result is only covered by a specific configuration, i.e. a unique coverage. Different configurations can overlap, meaning that the same case can follow multiple paths toward the outcome. Therefore, a measure of the unique contribution of each configuration to the result is also provided. An analysis of the coverage suggests S1a is relatively distinct because of its high unique coverage. S2a and S2b have fairly raw coverage but lack unique coverage, indicating that these configurations overlap with other configurations (Schneider, Wagemann, 2012).

5. Discussion and conclusions

This study confirms that different combinations of corporate global mindset attributes can lead to the same outcome – the high degree of internationalization. For SMEs five attributes of the firms' global mindset: strategy (strategic posture); resources, products' technological advancement, and R&D capacity (situational posture); type of organizational environment and resource enhancement structure (aggressive posture); boldness when making important decisions and support for promising yet uncertain projects (risk-taking posture); and commitment to long-term conditions and sustainable competitive advantage (analytical posture) combine to form alternative internationalization behavior solutions. Results confirm Proposition 1. Begley and Boyd (2003) and Gupta and Govindarajan (2002) were the first to recognize that it was important to combine organizational features and extended this idea to the perspective of global thinking. These authors present global thinking as an organizational ability.

As the results of the conducted analyzes show SMEs that combine situational posture as a core condition with analytical posture, aggressive posture, and strategic posture as peripheral conditions achieve the high degree of internationalization. Alternatively, SMEs that combine the core condition of risk-taking posture with the peripheral conditions of analytical posture, and aggressive posture also achieve high degree of internationalization. Hence, results support Proposition 2. Yin, Johnson and Bao (2008) find that corporate global mindset positively influence the international strategy and operations in the international market.

It is also worth emphasizing that, in general, research uses conventional statistical methods based on variables for which the causal process of calculating the results is relevant. Whereas fs/QCA offers a viable methodological alternative. Using fs/QCA to study the impact of a corporate global mindset on SME internationalization provides a broader interpretation of the results than conventional methods. Rather than offering one solution, fs/QCA yields different terms of a solution. In this way, this approach improves scholars' interpretation using traditional methods. There are several alternatives for each proposal. These solutions combine attributes and distinguish different terms in the solution for the same configuration. In this way, a comprehensive interpretation of these results is possible. This research shows that the attributes of global corporate thinking are inherent in companies and that these attributes come together to provide multiple solutions. The use of fs/QCA to analyze configurations leading to internationalization behavior is an important contribution to the literature. An important theoretical and practical contribution of this research lies in understanding how different solutions can lead to the same result – high degree of internationalization. This knowledge helps to gain a deeper understanding of SME internationalization behavior. This paper demonstrates that the choice of theoretical perspectives used to identify configurations matters, and it is important for scholars to capture as many theoretical perspectives as required to holistically capture the phenomenon and underlying causal logics.

The current study has two significant limitations. First, fs/QCA uses interactive models. Hence, the need to consider all possible configurations means that the data matrices increase in size exponentially as a function of the number of causal conditions. Second, it is possible that the configurations may not be generalized to other property spaces constructed with the same conditions in different samples. Therefore, the results are bound by the conditions included in the study. Trying to analyze an intermediate and large number of cases in the future would improve the study.

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CONCEPTUAL FRAMEWORK FOR MEASURING AWARENESS AND NEEDS OF CITY RESIDENTS TOWARDS A SMART CITY

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Introduction/background: The level of residents' awareness of the Smart City concept and their approach towards the potential of Smart City dimensions requires a more detailed investigation. The research tool prepared in this article may have an interesting impact on the residents of developing cities. The framework will allow researchers to examine the knowledge of residents about the Smart City concept, and may contribute to the identification of new social needs among city' inhabitants.

Aim of the paper: The main objective of this paper is to define the Smart City as a community-driven phenomenon and determine the current trends in case of Smart City dimensions. Authors undertake the task of synthesizing all dimensions mentioned in the literature about the Smart City concept. Additionally, the paper presents a conceptual research framework that may be used as a research tool in order to measure the level of residents' awareness of the Smart City concept.

Materials and methods: A comprehensive desk research was conducted which included iterative analyses of Smart City literature and Smart City models. A research framework, in form of a questionnaire, was prepared in order to gather qualitative and quantitative data about awareness and needs of residents towards a Smart City. The findings concerning the Smart City concept, that were presented in the article, will require further verification – both in terms of empirical research and further literature analysis, due to the dynamic development of this particular issue.

Results and conclusions: The Smart City concept has many definitions and domains that are often perceived from the perspective of the investigated issue. This paper synthesizes all the dimensions mentioned in the available literature and adds new ones as well. Moreover, the preliminary research results indicate that the awareness of the Smart City phenomenon among residents of a developing town is quite high. Research results may be of great interest for the authorities of a particular city. Therefore, the presented framework may induce communication between local communities and city authorities.

Keywords: Smart City, Awareness, Smart City Dimensions, Smart City Domains.

1. Introduction

Progressive urbanization processes have gradually contributed to the establishment of an increasing number of large-scale urban agglomerations with high density of population. The rapid expansion of urban and residential territories, including living areas around towns and newly emerging networks of large cities, has created a number of serious problems such as (Riffat et al., 2016): excessive consumption of all kinds of resources, high level of air pollution and regular occurrence of smog, severe traffic jams, passengers overload in public transport, problems related to waste management and water resources management, excessive consumption of electricity and energy, problems with accessibility of services, issues associated with meeting social needs in terms of tourism, issues related to medical care services. In order to prevent these growing and unfavorable issues, the concept of intelligent cities called Smart City has emerged in the last two decades, in which modern communication and information technologies (ICT) and advanced devices are being used to solve complex problems (Stawiasz et al., 2012). These technologies, that are usually being used in a Smart City, may include the following solutions (Lu His-Peng et al., 2019):

- *Internet of Things* – an integrated network of receivers, sensors and cameras that are closely interconnected and combined with other devices for a specific purpose.
- *Big Data Analyses* – systems which are collecting and analyzing massive amounts of data to find better solutions or valuable information.
- *AI Systems* – artificial intelligence algorithms and neural networks (e.g., application of intelligent road intersections and crossroads that are aware of the traffic situation).
- *Cloud Computing* – application of cloud computing technology.
- *Community-driven apps* – autonomous mobile applications and advanced software used to support residents and tourists visiting the city with a variety of services to meet social needs.
- *Advanced IT platforms* – consisting of all types of necessary hardware and software that also supports all of the technologies mentioned above.

The aforementioned technologies can be considered as some of the basic attributes and features of Smart Cities. Therefore, the Smart City can be defined as a system that integrates the layers of city authorities and city residents in order to launch and develop intelligent economy, intelligent mobility and transportation, intelligent living spaces, smart society and smart management of city resources (Bruneo et al., 2019). Usually, the *intelligent* or *smart* adjectives stand for self-aware, evolving and adjustable to the dynamically-changing surroundings. This is just one of the many definitions of Smart City that can be found in international scientific papers. In general, the entire concept aims to meet the sophisticated needs of city residents, to guarantee them a better quality of life and, above all, to develop cities according to the trend of *smart growth*, which is based on the optimal management of resources.

Furthermore, the idea of Smart City encourages local residents to develop a greater commitment towards the local society they are currently living in.

The main objective of this paper is to describe the development of a research tool in the form of a questionnaire that can be used to measure the awareness of Smart City concept among city residents. Also, the suggested research framework can be used to identify the social needs of city inhabitants which could be met by the implementation of modern technologies within the Smart City concept in the fast-growing cities. In addition, authors of the paper describe the proposed research methodology, attempt to determine what a Smart City actually is, and conduct an overview a few interesting examples of modern ICT solutions which were used in various Smart Cities located in USA and Europe.

2. How to Define a Smart City? Overview of Smart City Interpretations

Smart Cities have many terms or descriptive attributes and are usually referred to as *knowledge city*, *information city*, *virtual city*, *digital city*, *eco-modern city*, *innovative city*, *intelligent city*, *creative city*, *self-developing* and *self-learning city*, *green city*, *social-oriented city* (Finger, 2018). All of these approaches regarding the perception of Smart City are, in most cases, dependent on the type of problem which is being described and the point of view of a particular group of researchers. Thus, there are many nomenclatures, names, and epithets that attempt to reflect the proper context of the Smart City concept (Hollands, 2008). Perhaps the most accurate description that captures the general idea of the Smart City phenomenon, from the point of view of management and economics, seems to be the widely used ‘*Smart*’ adjective. However, even the common term of Smart City has its own genesis (Pardo & Nam, 2011), that is, in the past it was described as a combination of a knowledge society (also known as knowledge-based community) and a digitalized city. The latter stands for a city in which a high level of digitalization of services and technologies was implemented in order to increase effectiveness of city-related processes and activities (Deakin, Al Waer, 2011). The term of digitalized city was quite popular in the 90-ties and was rather related to one aspect, namely the development of ICT and digital services within a specific city (Dameri, Cocchia, 2012). The term Smart City became more fashionable around 2009 as a result of the expanding awareness of knowledge-based community, as well as the increasingly popular concept of sustainable development (Eremia et al., 2017). Regarding the latter aspect, the Smart City should not be confused with the concept of sustainable-developed cities as an empirical study conducted in 2017 has revealed (Ahvenniemi, 2017). The Smart City concept puts more emphasis on the social benefits of improving the quality of life economically and culturally. On the other hand, the concept of sustainable development mainly focuses on optimal use of resources and environmental protection.

Table 1 presents a summary of all the most popular definitions of Smart City that have appeared in the scientific literature over the last 20 years. As shown in Table 1, most authors of Smart City definitions emphasize that the quality of life of residents and the use of complex systems based on different types of ICT technologies are usually considered as one of the key objectives or even hallmarks of an intelligent city. The definitions often include statements such as: *increased efficiency, ICT, integration, increased awareness, increased accessibility, optimal use of resources* or *ability to solve social and public problems*. From the point of view of the research tool developed in this paper, it is quite difficult to choose just one proper definition of Smart City. Each definition has some important elements or highlights particular Smart City domains. Therefore, defining Smart City is a challenge due to the broad and complex meaning of the entire concept that can encompass different areas of management, such as project management, public management, technology management, public space management, innovation management, knowledge management, environmental management and many other areas. Nonetheless, it is important to emphasize that by the intelligence of a city, most scholars refer to the ability of community-driven development (Albino et al., 2015) and fulfillment of needs of most residents. Taking into account the number of different definitions, verifying residents' awareness of the Smart City concept can be quite a challenge. Some scholars have even decided to develop a taxonomy of Smart City definitions, in which they distinguish different categories that reflect general perceptions of the concept: technology-based definitions, domain-based definitions, definitions based on the integration of the system, definitions focused on the data gathering.

On the other hand there are scientific studies on defining the Smart City concept that highlight the frequent lack of the satisfaction aspect of local communities (Prado, Da Costa, 2016). Prado and Da Costa reveal that definitions available in the scientific literature have limited scope, and in most cases are only focused on strategic actions from a city perspective instead of concentrating on social aspects and happiness of citizens. Also, other articles point out that the trends towards Smart City are gradually changing and Smart Sustainability will become even more popular in the upcoming years than the Smart City concept itself (Stübinger, Schneider, 2020). Smart Sustainability can be defined as the usage of modern ICT in smart urban areas (and associated layers) in order to achieve a sustainable development, which consists in fulfilling the needs of current communities without sacrificing the needs of future generations with respect to economic, social and environmental aspects.

Table 1.
Overview of various definitions of Smart City concept

Overview of most popular Smart City definitions	
Authors of Smart City definition	Content of particular Smart City definition and general interpretation
Hall, R.E. (2000). The vision of a smart city. Proceedings of the 2nd International Life Extension Technology Workshop (Paris, France, Sep 28).	<i>A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens.</i>
Partridge, H. (2004). Developing a human perspective to the digital divide in the smart city. Proceedings of the Biennial Conference of Australian Library and information Association (Queensland, Australia, Sep 21-24).	<i>A city where the ICT strengthen the freedom of speech and the accessibility to public information and services.</i>
Giffinger, R. et al. (2007). Smart Cities: Ranking of European Medium-Sized Cities. Vienna, Austria: Centre of Regional Science (SRF), Vienna University of Technology.	<i>A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens.</i>
Rios, P. (2008). Creating “the smart city”.	<i>A city that gives inspiration, shares culture, knowledge, and life, a city that motivates its inhabitants to create and flourish in their own lives.</i>
Caragliu, A., Bo, C.D., & Nijkamp, P. (2009). Smart cities in Europe. 3rd Central European Conference in Regional Science (pp. 45-60).	<i>A city to be smart when investments in human and social capital and traditional(transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.</i>
Washburn, D. et al. (2010). Helping CIOs Understand “Smart City” Initiatives: Defining the Smart City, Its Drivers, and the Role of the CIO. Cambridge, MA: Forrester Research, Inc.	<i>The use of Smart Computing technologies to make the critical infrastructure components and services of a city – which include city administration, education, healthcare, public safety, real estate, transportation, and utilities – more intelligent, more interconnected, and efficient.</i>
Harrison, C. et al. (2010). Foundations for Smarter Cities. IBM Journal of Research and Development, 54(4).	<i>An instrumented, interconnected, and intelligent city. Instrumentation enables the capture and integration of live-world data through the use of various devices and sensors. Interconnected means the integration of those data into an enterprise computing platform and the communication of such information among the various city services. Intelligent refers to the inclusion of complex analytics, modeling, optimization and visualization in the operational business processes to make better operational decisions.</i>
González, J.A., & Rossi, A. (2011). New trends for smart cities. Competitiveness and Innovation Framework Programme.	<i>A public administration or authorities that delivers (or aims to) a set of new generation services and infrastructure, based on information and communication technologies.</i>
Zhao, J. (2011). Towards sustainable cities in China: analysis and assessment of some Chinese cities in 2008. Berlin: Springer.	<i>Improving the quality of life in a city, including ecological, cultural, political, institutional, social, and economic components without leaving a burden on future generations.</i>
Lazaroiu, G.C. (2012). Definition methodology for the smart cities model. Energy, 20(1), 326-335.	<i>The smart city represents the future challenge, a city model where the technology is in service to the person and to his economic and social life quality improvement.</i>
Schaffers, H., Komninos, N., Tsarchopoulos, P., Pallot, M., Trousse, B., Posio, E., Carter, D. (2012). Landscape and Roadmap of Future Internet and Smart Cities.	<i>Smart city is referred as the safe, secure environmentally green, and efficient urban Centre of the future with advanced infrastructures such as sensors, electronics, and networks to stimulate sustainable economic growth and a high quality of life.</i>

Cont. table 1.

Dameri, R.P. (2013). Searching for smart city definition: A comprehensive proposal. <i>International Journal of Computers & Technology</i> , 11(5), 2544–2551.	<i>A smart city is a well-defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of well-being, inclusion and participation, environmental quality, intelligent development; it is governed by a well-defined pool of subjects, able to state the rules and policy for the city government and development.</i>
Manville, C. et al. (2014). Mapping smart cities in the UE, European Parliament. Directorate-General for Internal Policies. Policy Department: Economic and Scientific Policy A.	<i>A Smart City is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership.</i>
Piro, G., Cianci, I., Grieco, L.A., Boggia, G., & Camarda, P. (2014). Information centric services in smart cities. <i>Journal of Systems and Software</i> , 88(1), 169-188	<i>A smart city is intended as an urban environment which, supported by pervasive ICT systems, is able to offer advanced and innovative services to citizens in order to improve the overall quality of their life.</i>
Prado, A.L., Da Costa, E.M., Thiago, Z., Tan, Y. (2016). Smartness that matters: towards a comprehensive and human-centred characterization of smart cities, <i>Journal of Open Innovation: Technology, Market, and Complexity</i> , ISSN 2199-8531, Springer, Heidelberg, Vol. 2, Iss. 8.	<i>Smart city is a community that systematically promotes the overall wellbeing for all of its members, and flexible enough to proactively and sustainably become an increasingly better place to live, work and play.</i>
Bibri, J. (2019). On the sustainability of smart and smarter cities in the era of big data: an interdisciplinary and transdisciplinary literature review. <i>Big Data</i> , 6(25), 2-64.	<i>A smart city can [...] mean a technologically and data-analytically advanced city that is able to monitor and understand its environment and citizens and explore and analyze various forms of data to generate useful knowledge in the form of applied intelligence that can immediately be used to solve different problems, or to make changes to improve the quality of life and the health of the city.</i>
Toli, A.M., Murtagh, N. (2020). The concept of sustainability in smart city definitions. <i>Front. Built Environ.</i> , 6, p. 77.	<i>Smart city is a concept of urban transformation that should aim to achieve a more environmentally sustainable city with a higher quality of life, that offers opportunities for economic growth for all of its citizens, but with respect to the particularities of each locality and its existing inhabitants. This transformation is currently enabled by various types of technologies that are embedded into the city's infrastructure system.</i>

Many scientists perceive the Smart City as a system or ecosystem created in order to implement innovation and enable the transfer of knowledge. These ecosystems integrate technological and social aspects in the pursuit of the so-called green growth concept, which searches for the optimal solutions to environmental problems (Zygiaris, 2013). From this perspective, cities are being perceived as a set of urban spaces and resorts that provide safety for the natural environment and enhance the potential development of all residents. Researchers emphasize the important factor of collaboration and integration of city authorities with the citizens by means of artificial intelligence and other modern technologies. As a result of this integration, Smart Cities can perform four unique functions (Komninos, 2006) – create collective strategic intelligence (pieces of information which are important to the city and its residents is processed and used by entire local communities), transfer technologies through digital platforms, create innovation-friendly environments through the cooperation of social

groups and city authorities, promote local communities and tourist attractions by using all sorts of IT hardware and software.

Scholars are also trying to describe the Smart City by using various models and frameworks. One of the most popular models of the Smart City concept has been proposed by researchers of the Vienna University of Technology, which has been the foundation of many other Smart City models (Giffinger, 2007). This model consists of 6 dimensions – smart economy, smart governance, smart living, smart environment, smart people, smart mobility. All of these dimensions are interlinked and can be gradually developed by the actions of informed, independent and empowered residents of a Smart City (Giffinger, 2007). Researchers from India have come up with the SMELTS framework (Sujata et al., 2016), which indicate that the core of Smart City consists of three layers – technology, economy and law. On the other hand, elements of sustainable development, management and social activity were considered as complementary aspects. Scientists at University of Cambridge point out that the number of Smart City models and frameworks which describe the phenomenon are constantly increasing and are being updated on a regular basis (Heaton, & Parlikad, 2019). Thereby, in the paper published in 2019, they present a unique solution, the so-called Smart Asset Alignment to Citizen Requirements Framework, in which they demonstrate important correlations between the requirements of Smart Citizens, the dimensions of Smart City and the available infrastructure of the city.

Summarizing the above discussion, we can consider Smart City as *a concept which consists in developing a particular city towards optimal use of resources (tangible, environmental, knowledge capital and social capital) by the means of modern ICT technologies and smart sustainability, which can deliver a wide range of benefits to residents, city authorities and local businesses, as well as increase the overall quality of life of local communities in a particular agglomeration*. Smart City integrates the physical realm of the city with its virtual dimensions, which encourages the creation of local networks and strengthens the processes of optimal resource utilization.

3. Dimensions and Attributes of Smart Cities – An Attempt of Synthesis

Implementing and launching the development of a Smart City is an overwhelming endeavor in case of smaller or medium-sized cities that may face various impediments, especially associated with lack of resources. In order to successfully implement all the attributes and domains of the Smart City concept, such as *smart governance*, *smart energy* or *smart safety*, developing cities have to meet a number of key success factors for the implementation of this modern concept. The key success factors for launching a Smart City and transforming a city into a smart metropolis include the following (Chourabii, 2012):

- proper city affairs management and organization,
- access to technology and the ability of using its potential,
- skillful resource management,
- properly selected operation and development policies,
- satisfactory communication with city residents and local communities,
- positive economic factors,
- current state of infrastructure and its potential for further expansion,
- natural environment and ability to manage natural resources.

Executing a Smart City development project is extremely difficult and there are scientific studies that indicate high requirements in the area of infrastructure and currently used technologies (Su et al., 2011). The entire endeavor of launching and developing a Smart City within a particular town or city should be implemented gradually throughout a project programme. The launch of the entire programme should consist in preparing a special public platform. This platform should primarily be based on special technical infrastructure (hardware and software, including all sorts of ICT devices), systems that collect data and enable cloud computing, and an advanced sensor network (Internet of Things). Moreover, other papers point out the need for bilateral cooperation – technologies and infrastructure alone are not enough to successfully develop the concept of a Smart City. Such endeavor also requires the support from the residents and local communities who must be aware of the Smart City potential as it may affect their daily living (Bouzgeuenda et al., 2019).

There are many research results and academic papers which analyze the unique characteristics and attributes (also known as domains or dimensions) of a Smart City concept. However, despite some cosmetic differences, the substantive content of commonly available studies and articles in this field is almost identical, complementary and reflects the same context. This paper attempts to list all the currently known domains of Smart City. Therefore, the dimensions, also known as domains of Smart City, include the following items (Hollands et al., 2008; Caragliu et al., 2011; Czupich et al., 2016; Camero, & Alba, 2019):

- **Smart Transportation** – includes a range of smart city practices or applications, such as integrated electronic timetables or advanced e-ticketing systems.
- **Smart Environment & Green Zones** – is usually related to the monitoring of urban environmental conditions through sensors and other measuring devices. This dimension is also associated with the creation of *green belts* and *green spaces*, that is, areas filled with natural vegetation accessible to residents (Sanchez-Corcuera, 2019).
- **Smart Energy** – mainly refers to smart management of electricity usage and monitoring of electricity consumption. Smart street lights or dynamic ambient lighting can also belong to this dimension.
- **Smart Water** – is related to optimal management of water resources in urban areas.

- **Smart Buildings & Public Spaces** – may include the above items (Smart Water as well as Smart Energy) in combination with intelligent buildings that monitor their current status according to a set of parameters (consumption, states, lighting levels, etc.). This dimension also applies to publicly accessible co-working offices and urban spaces. In other words, this dimension represents all accessible places or facilities that offer a collection of different technologies and services to city residents.
- **Smart Safety** – refers to surveillance systems and devices (especially cameras) that monitor people and traffic throughout the city in order to increase safety measures.
- **Smart Healthcare** – sometimes also referred to as e-Health, this dimension covers the digitization of health services, such as online diagnostics (e-services and by-phone treatments), but also to more efficient management of dispersed healthcare systems.
- **Smart Governance** – also known as *e-government*, refers to the digitization of traditional, paper-based official matters and city hall services.
- **Smart Economy & Entrepreneurship** – these include *e-business* and *e-commerce* activities. These domains usually consist of various types of ICT-enabled systems and platforms to support local business activity of minor or medium business entities.
- **Smart Living & Smart People** – this dimension includes the integration of local communities, the exchange of knowledge among city inhabitants, full-scale support of personal development of city residents (for example, expanding IT competences), and a more conscious lifestyle, that is, striving for sustainable development.
- **Smart Infrastructure & Technologies** – this dimension is often mentioned in the definitions of Smart City and consists in equipping cities with modern ICT infrastructure (such as Wi-Fi, LTE, 5G and even newer or better technologies).
- **Smart Logistics** – consists in optimizing and adapting the supply chains among city activities depending on the increasing demand for certain goods and services.
- **Smart Education** – is associated with remote education and various training courses or profession exams which are being conducted by special institutes. Also, it refers to the better support of elementary schools, high schools or universities.
- **Smart Stakeholders** – it is quite surprising that this important dimension, which connects important representatives of all research institutions, city offices and the business zone, is often completely missing or is being omitted in the models available in scientific papers and literature. The literature emphasizes the existence of strong links between Smart City and the triple helix model of innovation (Lombardi et al., 2012). In addition, some researchers pointed out that stakeholders can often help in determining what a Smart City actually is or rather it should be in a particular urban area (Praharaj, & Han, 2019).
- **Other types of unique domains affiliated with Smart City.** These can be various types of new technologies or aspects that emerge as the city continues to develop.

In order to provide a clearer overview of all Smart City dimensions included in the list above, we have decided to present them in a synthetic visual form in Figure 1. Initially, we have made an attempt to assign individual dimensions to four main categories – governance, technology (and infrastructure), environmental protection and social aspects. However, it turns out that these categories are to some extent complementary from the perspective of the Smart City concept itself and can mutually supplement each other in the case of a particular dimension. In other words, proper classification and taxonomy of the dimensions and assigning them to the key elements of the Smart City concept (by which we mean people, technology, management, environment) is a difficult task that requires further scientific verification.

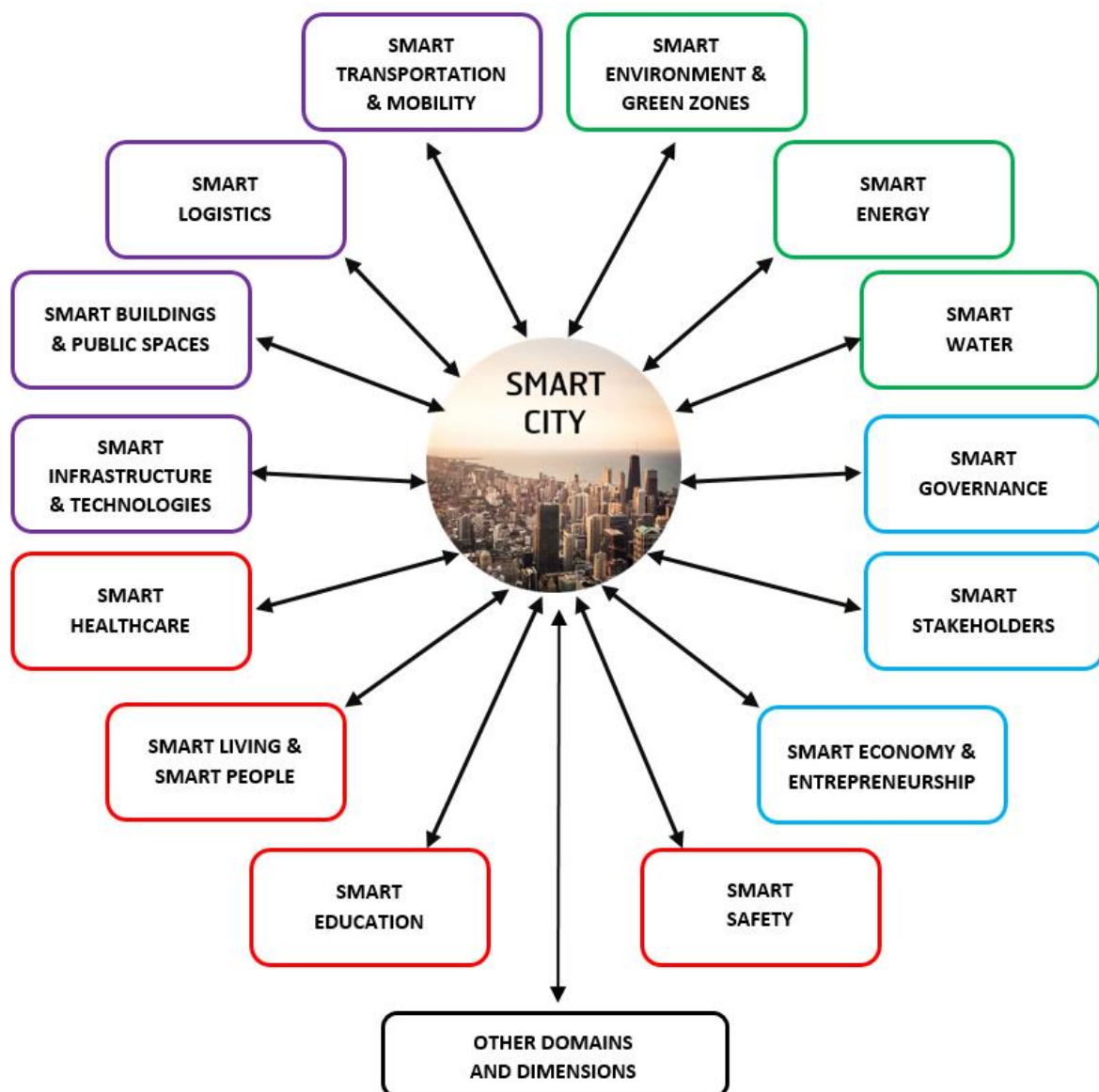


Figure 1. Dimensions and main domains of a Smart City – synthetic approach. Source: own work.

4. Examples of advanced ICT solutions used in Smart Cities – Discussion

The following examples of the application of Smart City technologies illustrate how the cooperation of local communities, companies and city authorities can improve the general quality of life of all inhabitants of a developing city. In addition, some of the questions in the research questionnaire presented in this paper were developed on the basis of the mentioned examples.

The information extracted from the Big Data processes certainly enriches the knowledge of city halls about the functioning of a city and offers many new opportunities associated with social interaction. Also, Big Data may support decision-making in various areas of city management. A great example is the application of a system that processes huge data volumes of public rail transport in London (Batty, 2013), where data mining led to the discovery of a gap – it turned out that a large percentage of public transport users do not swipe their magnetic travel cards before boarding trains or subways. The number of people with public transport cards deviated from the number of cards used by as much as 15%. This is a result of the enormous passenger overloading in the public transport system caused by a very high number of travelers. The researchers also highlight the fact that the Big Data phenomenon and gathering basic data may be not enough – more advanced systems for data analysis and processing are needed, as well as appropriate data sources which can be processed further. The latter could, for example, improve public transport services in certain districts or provide additional transportation connections during rush hours on the basis of selected information (or events, which could indicate that there is a need for additional bus routes). Interesting applications of Big Data within Smart City were presented in the 2016' case study analysis (Hashem et al., 2016). The cited paper indicates that Stockholm has introduced an autonomous system of small vehicles to collect waste in urban areas. In Helsinki, huge amounts of data were made available in the form of databases that residents and local businesses could use for their own purposes in order to improve services or public living spaces. Copenhagen has implemented innovative transportation solutions, waste management, water management and optimized the use of alternative energy sources. All that was available due to the implementation of the Big Data approach.

The Internet of Things (IoT) consists of interconnected and linked sensors, indicators, and devices that perform a variety of specialized measurements or identify certain phenomena and then transmit that data to other systems and other Smart City assets. In terms of IoT, Smart City infrastructure usually includes (Gaur et al., 2015): 3G/4G/5G, LTE, Wi-Fi, WiMAX (interoperability of microwave access), cable TV and satellite communication. The main goal is to connect all kinds of devices (sensors, devices, and electronic objects) that can help in improving the comfort and safety of citizens' lives. A good example can be the new networking solutions which provide faster mobile network technologies, as well as services in virtual cloud

environments that use dozens of public sensors. For example, by monitoring the GPS signal of a particular resident's (or tourist's) phone the integrated system could automatically recommend interesting points of interests or launch a traveler's guide with local sightseeing attractions. All that could be available by using an app released for the most popular Android/iOS operating systems. In case of city authorities, the advantage lies in collecting real-time data about the city and processing it in the cloud in order to obtain important and valuable information. For example, city authorities may decide to use advanced sensors which monitor and manage power consumption in the city depending on the time of day and weather conditions and automatically adjust power consumption to establish the optimal operating conditions. In addition, systems equipped with IoT sensors can be interlinked with healthcare services. In case of the latter the so-called intelligent intersections can identify an accident or any sort of unfortunate events among city area and summon appropriate emergency services to the accident's site (Toh et al., 2019). Another example of IoT application in Smart City can be the integration of the entire local healthcare system with mobile phones and health applications of the residents (Cook et al., 2019). Also, the information containing statistical data about medical conditions and GPS location sensors will prevent potential shortages of drugs in pharmacies located in particular neighborhoods of the city.

Advanced IoT systems can also be used for citywide security monitoring in order to extend the camera modules of regular monitoring of local landmarks (or neighborhoods) with fire detection software and other variety of safety-monitoring devices. It is also worth to mention that IoT technologies often take part in such domains as smart energy management, smart waste management, parking assistance and traffic control systems (Gaur et al., 2015). These are just a few of the many examples of IoT applications in a Smart City. All of the IoT application examples cited here are already being used in practice in such cities as Padova in Italy or Vienna in Austria.

Artificial Intelligence (AI) is usually associated with intelligent, autonomous drones that deliver packages, driverless cars, or even intelligent buildings that take care of the maintenance on their own (e.g. by using an advanced system of autonomous vacuum cleaners that clean floor space or autonomous drones to clean windows). However, these are technologies and solutions which are still being tested and implemented in the form of prototypes. Despite that, AI algorithms are significantly speeding up data processing and are complementary to the autonomous decision-making systems within the management services and economic activities of a Smart City (Allam, & Dhunny, 2019). In the case of large data sets collected by IoT sensors, the use of artificial intelligence is actually required (Patel, & Doshi, 2019). There are many Smart City domains in which AI plays a supporting or key role, namely: education, environment, energy management, healthcare, development policy, financial services and financial management (city finance), mobility, sustainable development, IoT services and technologies, Big Data processing and cloud computing. A good example of the practical application of AI can be the already mentioned intelligent intersections. These junction-

controlling systems change the frequency of traffic light shifts depending on traffic intensity and can detect dangerous vehicle collisions. The latter system makes it possible to call medical services as soon as the incident occurs, which can increase the chances of survival of those who got injured. Another interesting example can be the so-called anti-smog zone. If IoT sensors detect high air pollution in the city center, a number of streets can become a temporary car-restricted areas in order to reduce the level of air pollution. Limited traffic zones can be controlled by the AI system which, based on the collected and analyzed data about the current status of the air quality, will change traffic lights or display important notification on the LED street signs.

All examples and cases which were mentioned above should be treated as a general overview of most popular solutions and technologies that improve the quality of life within a Smart City.

5. Conceptual Research Framework – Methodology & Research Tools

5.1. Instructions and recommended research method

This type of research can be conducted in a city that exhibits potential or willingness towards implementing the Smart City concept. The research sample should be determined according to the number of residents of the examined city. We suggest to carry out the questionnaire in anonymous form and to address it only to the residents of one particular city. Each questionnaire respondent should be at least 15 years old (and should have been living in the investigated city for at least 3 years). The research tool in a form of a questionnaire includes both quantitative and qualitative questions. We have analyzed and verified other tools which were used in similar studies. This allowed us to polish our own approach and determine a set of unique questions (check subchapter 5.2 and 5.3 of this article). The quantitative questions are mainly related to the study of residents' awareness of the Smart City concept, as well as their views on this phenomenon. The qualitative part of the research mainly focuses on the evaluation and identification of the needs of local communities that could be fulfilled by the implementation of the Smart City concept in a selected urban area.

5.2. Overview of available tools for measuring and governing Smart City capabilities

Since the mid-90s, large cities have already begun to use comprehensive measurement systems in order to check the status of local urban processes on a massive scale. Therefore, the monitoring of various environmental and social parameters within particular agglomerations has been carried out on a regular basis for many years. Usually, such activities are being conducted by the use of analytical IT systems which are combined with information

boards, local enterprises, sensors placed around the city and any other devices or systems that may be related to public services. This has ignited the need of new measurement tools that would allow local authorities to measure the level of intelligence of a specific city. These tools include various models and approaches, namely:

- Smart City Model developed by researchers at Vienna University of Technology (Giffinger et al., 2007) – has a number of different indicators and factors (90 indicators contained in 27 factors) that allow to assess the level of intelligence of the studied city.
- Smart City performance measurement tool developed by Kominos N. & Sefertzi E. (2009), consisting of 40 indicators in four categories: education and skills of the population, institutions influencing knowledge and innovation, digital infrastructure and e-services, innovation performance.
- Lombardi's Quadruple Helix model (2012) – based on the verification of 60 indicators in five categories: economy, quality of life, environment, people and management.
- Priano & Fajardo's (2014) model of independent evaluation of n-dimensions of a Smart City – consists in individual measurement of the development level of a particular area or attribute without associating it with other parameters.
- Smart City intelligence and resource measurement methodology based on Digital-Twin model developed by Petrova-Antonova and Ilyeva (2019) – it integrates the virtual layer with the tangible layer of the city through appropriate systems and indicators.
- Conceptual multidimensional model for measuring Smart City potential (Nasrawi et al., 2015).
- The Smart City Maturity (SCM) Model (Caird, & Hallett, 2019) – helps to determine the level of maturity of a city and its development perspectives in relation to other cities by performing benchmarking analyses.

The social implications of a Smart City are being constantly discussed in the literature (Patel, & Doshi, 2019). The main reason which led us to the development of this research tool was the very poor performance of Polish cities in terms of the entire Smart City concept. According to various studies and reports, Polish cities are only starting to take an interest in the Smart City concept and are at an early stage of development of Smart City dimensions (Pichlak, 2018). One of the main problems of Polish cities is their continuous focus on current problems such as road infrastructure, lack of interest in newer technologies, lack of funds for research and development activities and, first and foremost, a constantly growing debt level caused by the number of investments which must be carried out instantly. The most developed cities in terms of the Smart City concept in Poland include Warsaw, Cracow, Wroclaw, Poznan and Gdansk. Therefore, there is a significant research potential in this particular area.

5.3. Overview of tools and frameworks for measuring residents' satisfaction and awareness towards Smart City

Scientific literature offers a wide range of tools and frameworks to verify the Smart City effectiveness and efficiency of Smart City dimensions. Both of these aspects mainly consists in identifying residents' opinions about Smart City or examining the performance of various resources and services that are being used in a Smart City. Such tools can be divided into pre-Smart City frameworks and post-Smart City frameworks. Pre-Smart City research relates to emerging Smart Cities or covers a range of activities and events prior to their potential creation such as papers which conduct studies in the area of advantages of Smart City construction and its impact on people's lives based on big data and rational planning theory (Xiao, Xie, 2021). Other articles which can be assigned to this type of research often highlight the main requirements and factors of creating a Smart City in particular areas (Jonek-Kowalska, Wolniak, 2021). The post-Smart City research involves advanced Smart Cities or cities that are currently in-development in order to achieve the Smart status. These type of frameworks strive to measure social capital indicators in order to determine the level of neighborhood management (Nanako, Washizu) and key performance indicators of advanced Smart City services which are being used by residents (Airaksinen et al., 2017). Therefore, it should be pointed out that the type of research carried out and the types of research tools are determined by such criteria as the level of development of a particular city towards the desired Smart City vision (e.g. ethical framework for Smart Cities, that focuses on measuring the ethical and non-ethical issues in big data analytics applications in Smart Cities and public transportation systems – Chang, 2021), the object and the subject of the research, and the period of time in which the research was conducted.

However, due to the scope of this paper we have decided to focus only on those frameworks which contributed to measuring the awareness and satisfaction of Smart City residents or local communities that may become a part of a Smart City in the nearest future. The most recent research frameworks and most popular research tools, which were used to measure the residents opinion about Smart City in the context of awareness have been presented in table 2.

Table 2.

Analysis of studies and research results relating to the issue of citizen or resident awareness towards Smart City concept

Authors & year of the study	Research's objective	Key findings and conclusions
Kopackova H., Komarkova J. (2020)	Participatory technologies in smart cities: What citizens want and how to ask them.	This study reveals that younger groups of citizens are willing to be aware of city issues and smart city events only if they get the proper mobile communication tools, that is, software solutions developed towards better participation between particular groups of citizens and city authorities.

Cont. table 2.

Macke, J. & Casagrande, R. & Sarate, J. & Silva, K. Kelin (2018)	Smart City and Quality of Life: citizens' perception in a Brazilian case study	The research analysed the city of Curitiba, in Southern Brazil, claimed to be one of the Smartest Cities in the world. The results revealed that most citizens are not only satisfied of the offered Smart City services but also not aware of all available services.
Tingting Ji, Jieh-Haur Chen, Hsi-Hsien Wei, Yu-Ching Su (2021)	Investigation of citizens' preferences and perceptions about smart-city services in Taiwan	Citizens had to rate 35 Smart City services of seven dimensions classified in two domains in the context of the usefulness of all mentioned services in the realization of human needs. The results show that most of the respondents clearly perceived Smart City services as both important and useful to their existence, relatedness, and growth needs.
Kamnuansilpa, P. et al. (2020)	Citizen Awareness of the Smart City: A Study of Khon Kaen, Thailand.	Around 50% of respondents were aware of the Smart City concept and over 85% were not aware that city authorities may be planning to implement the concept in a particular urban area.
Min Jee Nikki Han, Mi Jeong Kim (2021)	A critical review of the smart city in relation to citizen adoption towards sustainable smart living	There is a lack of research from a human-centric viewpoint (citizen adoption) and it's worth to explore the citizens perception in that matter.
McKinsey Global Institute (MGI), June 2018, McKinsey&Company	Smart City Report: Smart Cities: Digital Solutions For A More Livable Future	MGI has conducted an international research on awareness, usage and satisfaction levels among the residents of 50 Smart Cities worldwide (including developing Smart Cities). It turns out that young population has the highest awareness of Smart City services and even demands many digital utilities mainly as a result of increasing popularity of modern and seamless technologies.
Rasic M., Milenkovic M., Vojkovic G. (2018)	Smart-city — Awareness amongst Croatian citizens	The research questionnaire was completed by a total of 673 respondents. This study revealed that 69% of respondents were aware of the Smart City concept and Smart City services, but 88% of them stated that they don't live in a Smart City yet and only 19.3% of them knew what their local government is doing regarding smart-city implementation projects.
Cagánová, D., Stareček, A., Hornáková, N. et al. (2019)	The Analysis of the Slovak Citizens' Awareness about the Smart City Concept	Key findings revealed that 65% of respondents had no idea what a Smart City actually is. The researchers suggest the best ways of solving that issue as informed and participating citizens can make Smart City implementation more effective or efficient.
Molinillo S., et al. (2019)	Smart city communication via social media: Analysing residents' and visitors' engagement	This research conducted in major cities of Spain indicates that Smart City fails in terms of social media aspects and the awareness of Smart City social media content is very low.

5.4. Detailed description of the research tool – a questionnaire

This subsection includes a series of quantitative and qualitative questions used in the research tool that will identify the respondents' level of knowledge about Smart City, as well as identify the key needs of residents who live in a developing Smart City. Table 3 provides the key quantitative research survey questions.

Table 3.*Questions regarding residents' awareness of the Smart City concept*

Have you ever heard of such a term as Smart City? (Please underline or bold the selected answer)			
Yes, I know this term	Probably/Maybe I have heard it somewhere	It's hard to say/ I don't know	No, I have never heard it before
What is a Smart City in your opinion and what does this term actually mean? (This is a single-choice question. Please fill in the 'X' symbol in the appropriate box.)			Answer (single-choice)
It is a concept and idea of city development which uses modern ICT technologies in order to provide benefits to local entrepreneurs			
It is a concept and idea of city development which uses modern ICT technologies, provides benefits to citizens, and supports city authorities and local entrepreneurs			
It's a complex tool designed to build new cities that can be used by city authorities and officials			
Smart City consists in possessing the knowledge on how to live in a modern city and it is a new way and style of living of the 21st century			
It is a modern technology used for managing the city, which can be purchased from an IT company - it is mainly dedicated to the city authorities			
It is a new type of product made by innovative companies			
Which of the following items can be considered as key benefits of a Smart City? (Please select the proper answer YES or NO.)			Answer
Lower prices in stores located within the city			YES NO
Increased wages for residents working at city businesses			YES NO
Free public transport services			YES NO
Transparency of information and access to city databases for citizens (e.g., providing public data on transportation, the number of businesses operating, or the current state of the environment, etc.)			YES NO
Active protection of the local natural environment and reduction of pollution (e.g. introduction of green zones, electric cabs, etc.)			YES NO
Better management of urban space (e.g. creation of new leisure and tourist zones, etc.)			YES NO
Modernization and optimization of transportation services (e.g. introduction of electric buses – less noise and less car fumes, modern phone applications monitoring the condition of public transport lines)			YES NO
Improving the quality of life of residents by enabling e-services (e.g. launching such services as e-doctor, remote education, etc.)			YES NO
Increased level of security in the city (e.g. use of artificial intelligence in city monitoring)			YES NO
Improved communication between city authorities and citizens (e.g. launching an Internet platform and IT systems enabling the resident to evaluate various services of the city and to make decisions on its further development)			YES NO
Support in the area of energy (e.g. installing generators of renewable energy sources, creating local and complementary energy networks)			YES NO
E-Office and E-Government – facilitation of official matters and services available to the city residents (e.g. better support in conducting business activity within the city, simpler procedures in dealing with official matters – virtual online service)			YES NO
Easier access to high-speed Internet connection and modern technologies (e.g. better access to fiber optic infrastructure and network devices)			YES NO
Other benefits:.....			YES NO

Cont. table 3.

Have you ever used the services of another, fully-developed or partially established, Smart City?	
YES	NO
1. Name of the city:	
2. Description of the Smart City service:	
3. Please indicate your level of satisfaction of the service in a scale from 1 (low satisfaction) to 5 (high satisfaction):	
Please specify three words by which you could define the concept of a Smart City (or which you associate with Smart City - open question)	
.....	
Please describe what sort of domains or dimensions should be included in a Smart City concept. In other words, what sort of activities should be involved within a Smart City? (open question)	
.....	
.....	

Source: own work on the basis of various approaches indicated in Mohanty S. (2016). *Everything You Wanted to Know About Smart Cities. IEEE Consumer Electronics Magazine*. 5 and Hamilton E. (2016) *The Benefits and Risks of Policymakers' Use of Smart City Technology*. Mercantus Center, George Mason University, Arlington, Virginia.

Key qualitative research questions of the questionnaire were listed in Table 4. As can be seen in the Table 3, each question should be answered in the Liker scale, that is, with a score rating in the scale of 1 to 5. This will allow respondents to specify their level of agreement or disagreement with suggested potential of specific attributes of Smart City.

Table 4.

Questions regarding the identification of key resident needs that can be met by using the Smart City concept

Smart City Attribute (also known as Smart City dimension or domain)	Technologies and examples of their application in a particular area - please try to assess to what extent a certain technology could be applied in your city (evaluation of the potential of each attribute/dimension of Smart City)	Score & Ratings (please use the Likert scale of 1 to 5, where 5 is the most needed solution and 3 is a neutral rating)				
		1	2	3	4	5
Smart Buildings & Public Spaces	Intelligent buildings with automatic heating, air conditioning and ventilation systems (or other systems that adapt to the environment)					
Smart Healthcare	GPS monitoring system for the elderly					
Smart Healthcare	Monitoring of vital signs integrated with the resident's healthcare office/medical clinic					
Smart Healthcare & Smart Logistics	Intelligent drug stock replenishment system in pharmacies, for example, usable in cases of high demand for a particular drug					
Smart Energy	Smart Grid systems and applications – intelligent city lighting depending on the time of day					
Smart Parking	Smart Grid applications – smart parking lots (Google Maps applications can inform residents where to park), intelligent traffic monitoring and traffic intensity management (may reduce traffic intensity or traffic jams at busy intersections)					
Smart Utilities	Measurement of water, gas and energy consumption in real time – module available to residents as well as city authorities					

Cont. table 4.

Smart Logistics	Synchronization of supply with demand for goods, for example, the stock of certain goods may be refilled quickly					
Smart Transportation & Mobility	Electric cars – online vehicle sharing service (accessible via mobile apps)					
Smart Transportation & Mobility	Intelligent intersections and traffic monitoring (imposing restrictions in case of an accident and immediate notification of emergency services provided by the AI system)					
Smart Governance	Access to the city's virtual platform via mobile phones/computers – residents will have an opportunity to establish direct contact with city authorities/offices. Transparent access to statistical data of the city					
Smart Environment	Additional air quality sensors and weather monitoring that alerts residents of hazardous conditions					
Smart People	Possibility to work in virtual environments and take online self-development courses (provided by the city hall or other institutions) – remote expansion of residents' knowledge					
Smart Living	Additional sports & healthy living services, for example, smart bikes and scooters					
Smart Environment	Smart bins, waste containers and additional notification systems which notify about overfilled disposal containers					
Smart Transportation & Mobility	Smart notification system that notifies residents about dangerous events, various unforeseen events or other activities					
Smart Economy	Launching of a local technology transfer platform for smaller entrepreneurs – support from wealthy residents and knowledge exchange among residents					
Smart Economy	Additional support in launching modern technologies or new products by establishing a local crowdfunding or public e-commerce platforms					
Smart Living	Additional tourism and educational services, such as an interactive sightseeing app					
Smart People	Establishment of a greater number of supporting initiatives of various types and initiatives to promote creativity among local communities					
Smart Transportation & Mobility	Increased accessibility to high-speed Internet and public Wi-Fi in many city neighborhoods					
Smart Living & Smart Environment	Access to real-time measurements of noise emissions at selected locations					
Smart Environment	Creation of publicly accessible green zones in the city					
Smart Energy	Advanced energy management – more efficient and cost-effective use of energy based on traffic conditions, weather conditions, and real-time power consumption					
Smart Safety	Additional security systems to monitor and warn of dangerous events/people (crime or accident detection system supported by AI)					
Smart Healthcare	E-Doctor or E-Healthcare services used for faster disease diagnosis and prevention of illnesses					

Cont. table 4.

Smart Safety	Monitoring of disasters and unexpected events such as fires					
Smart Water	Optimal water management, especially in cases of hot weather or in case of sewage flow optimization					
Smart Safety	Advanced network connection encryption systems – greater security of city residents while using the Internet services					
Other attributes and needs suggested by city residents:						
Attribute/Smart City Domain	Description of needs that can be met through the use of Smart City concept and modern technologies - are there any other technologies or facilities that, in your opinion, could be useful?					
	(Please write down your ideas, domains, needs or initiatives in the rows available below)					
.....					
.....					
.....					

Source: own work.

One of the key elements of the questionnaire should be the demographics section in which each respondent has to provide important information about his or her unique characteristics, as we have recommended in Table 5.

Table 5.
Recommended Demographics Section of the research tool

Questionnaire’s Demographics Section	
1. City of residence within the last 3 years:
2. Age group:	Answer:
- 15-20,	
- 21-25,	
- 26-30,	
- 31-35,	
- 36-40,	
- 41-45,	
- 46-50,	
- 51-55,	
- 56-60,	
- 61+	
3. Gender:	Answer:
- Male	
- Female	
4. Education:	Answer:
- Primary Education	
- Secondary Education (Undergraduate)	
- Higher Education (Postgraduate)	
- Trade School or other form of Education	

Cont. table 5.

5. Working experience and status:	Answer:
- Pupil of Secondary School/High School	
- University Student	
- Employee of a Business Entity/Company	
- Entrepreneur/Manager (Large Company, Medium, Small or Micro Company – please underline the company size)	
6. Use of public services:	Answer:
- public transportation,	
- libraries and public institutions,	
- co-working zones,	
- apps that monitor local events and air pollution levels,	
- other services:	

Source: own work.

5.5. Preliminary research results – verification of usefulness of the research tool

In order to verify the reliability and usefulness of the research questionnaire developed in this paper, we have decided to use the preliminary results of the first phase of research on the awareness of residents towards Smart City in the Silesian Voivodeship in Poland. The questionnaire was filled by 103 individuals, of which 60% were residents of Gliwice city and 20% were residents of Zabrze city. The remaining part of the respondents live in various neighboring cities. The first phase of the research was addressed mainly to the younger generation, therefore out of 103 respondents as many as 80% belonged to the age group between 21 and 25 years old. The first part of the study helped to determine the extent of residents' awareness of the Smart City. As many as 80,5% of the respondents indicated the most optimal definition of Smart City, referring to all the benefits of this concept. In addition, 34% of the respondents are familiar with the concept of Smart City and 47.5% of the respondents said that they have heard about the Smart City idea in the past. The open-text questions performed very well, as 92% of respondents identified unique words to describe Smart City and identified domains or services which they thought Smart City should be identified with. The second part of the questionnaire allowed to determine the preferences of residents of the selected territory in terms of Smart City services and domains. We were also able to get feedback from several respondents who said that these types of questions, which contain pre-defined Smart City domains and services, are very reasonable, because many city residents may not have enough knowledge about all the services the Smart City can offer.

6. Conclusion

This research paper proves how complex and complicated the concept of Smart City is. The literature review of Smart City definitions revealed that the main objective of the entire Smart City approach is to improve the quality of life of residents of modern agglomerations and simultaneously support the local entrepreneurship. Integration of the local community sphere, infrastructure and city authorities by applying modern ICT technologies is the foundation of the Smart City concept. This study characterizes all Smart City attributes and offers a synthesis of commonly known domains and dimensions of a Smart City. Identifying all commonly used (or known) dimensions of Smart City is challenging but it proves the multidimensional nature of the concept. Launching a Smart City project in small and medium towns or in large developing cities can be a tremendous challenge in financial and infrastructural terms, but city authorities shouldn't forget about the most important factor - the beneficiaries of such endeavor, that is, city residents. The latter can be considered as the key stakeholders of the Smart City project, who should express their opinion about the progress of the particular development tasks on a regular basis. In other words, city residents should determine whether they are ready for modern technologies, whether they know how they could use them, and above all, whether they understand the potential of modern tools that make it possible to create transparent knowledge-based communities. The presented research tool in the form of a questionnaire can be used in case of empirical studies that aim to identify public awareness of Smart City and to identify social needs within the Smart City concept. The research survey can be modified and expanded with additional questions. The topic of Smart City is constantly evolving and its scope is quite extensive. Therefore, conducting regular studies (from different perspectives) on Smart City seems to be justified and valuable.

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INNOVATION STRATEGY AND ITS IMPACT ON THE COMPANY'S COMPETITIVE POSITION

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Introduction/background: The creation of a knowledge-based economy determines the growth of interest in innovations and the possibility of using them as a tool for building a competitive advantage. This requires companies to develop an appropriate innovation strategy. Its choice is determined by the environment and the company's own capabilities. On the other hand, the effectiveness of strategic decisions in the area of innovation contributes to building a company's competitive advantage.

Aim of the article: The aim of the article is to present the cause-effect relations between the choice of innovation strategy and the competitive position of the enterprise.

Materials and methods: The methods of critical analysis and synthesis, the method of generalization and logical methods as well as the desk research method were used in the research process.

Result and conclusions: As a result of the work, a concept has been developed and direct and indirect consequences of innovation activity have been classified.

The choice of innovation strategy usually is based on the direct financial results. But the indirect results are important for creating innovative potential of company and give a multiplier effects. These effects should be taken into account in the process of creating and strategy of innovation. The author presents a diagram of creating a innovative strategy, the direct and indirect effects of innovative activity and the cause and effect relations between the results of innovative activity and the creation of a strong competitive position of the company.

The article is aimed at enterprise managers, decision makers of state institutions and scientists dealing with innovation problems.

Keywords: innovation strategy, competitiveness, enterprise.

1. Introduction

Creating a knowledge-based economy determines the growth of interest in innovations and the possibility of using them as a tool for building a competitive advantage. Nowadays it is the fact the innovation is a fundamental factor in creating the added value and ensuring a lasting market advantage (Setiawanta, and Purwanto, 2019; Rowley et al., 2011). However, the innovative activity requires more and more effort from enterprises. The costs of innovation

are rising, the life cycle of innovative products is being reduced and the level of competition is growing. Under these conditions, it is necessary to develop an appropriate innovation strategy.

When perceiving the strategy as a system of long-term goals and visions, it is worth considering the cause-effect relationships that exist between the innovative capacity of the company and the results of its innovative activity.

The effectiveness of innovation is verified by the market. However, apart from the direct results of the innovative activity, attention should be paid to its indirect results, such as accumulating new knowledge, improving the skills and qualifications of employees, creating intellectual capital and innovative corporate culture.

The study of these aspects of the innovative activity allows determining the possibilities of using innovation to achieve long-term market advantage.

2. Innovations as a factor of increasing competitiveness

Globalization of the economy and the development of information technology have changed the economic development model. Theories based on knowledge development are becoming increasingly important as against the concepts of development based on the assumptions of the resource theory. The importance of innovation as a factor in the economic development is constantly growing. According to many experts, 2/3 of the economic growth of the developed countries should be associated with the introduction of innovations (Pysiak, 2006).

Assessments of the size and structure of the national income are the basic group of measures of the competitive position of economies. They allow estimating the level of development of a given economy, as well as the stage of its competitiveness development. According to M. Porter, "the only meaningful concept of competitiveness at the national level is productivity" (Porter, 1990). This thought of M. Porter remains relevant today. According to K. Schwab, "the only sensible concept of competitiveness at the national level is productivity" (Schwab, 2013). In line with this assumption, the basic measures of competitive position include: Gross Domestic Product (GDP) and Gross National Product (GNP) (Mróz, 2016). Figure 1 presents a comparison of GDP per capita and the total SII innovation index of the EU countries. The presented data lead to the conclusion that there is a fairly close relationship between these indicators. This is also confirmed by the correlation coefficient of 0.685.

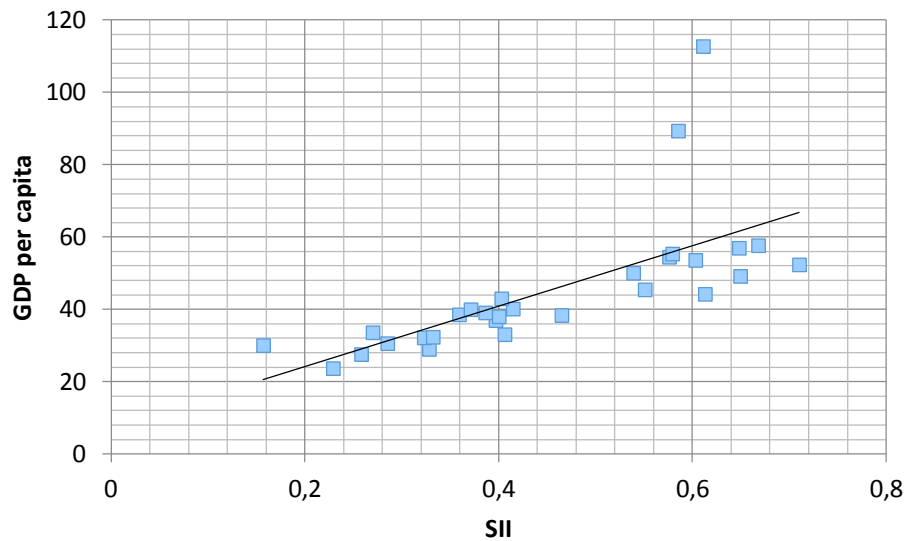


Figure 1. GDP per capita and the total innovation index (SII) of the EU countries in 2018. Source: own study based on data (EIS, 2020).

The competitiveness of an enterprise is perceived as "the ability of a company to preempt the competitors in the same market and continue to be market leader" (Tam, and Fernando, 2018), "and its measure is market share and profit level" (Buckley et al., 1988). Higher profits and market share growth are primarily the result of innovation because product, technological and organizational innovations ensure lower average costs and higher production quality while product and marketing innovations – higher sales.

Enterprise managerial staff understands the importance of innovation as a factor in increasing competitiveness. According to a survey conducted by McKinsey, "more than 70 percent of senior executives say innovation will be at least one of the three main drivers of their companies' growth in the next three to five years" (Barsh et al., 2008). This determines the intensification of the innovative activity, which depends on:

- structure of the economy,
- competitive intensities,
- no alternative to innovative problem solving,
- pro-innovative attitudes of company managers – beneficiaries of innovative products,
- business conditions (innovations, mainly technological ones, are associated with time-consuming investments, whose implementation requires a sustainable and friendly investment climate) (Oksanych, 2020).

In the high and medium-high technology sectors and high competitive intensity, development based on the growth of innovation is often a non-alternative strategy of enterprises operating in them. The higher the performance of competitors in the same industry, the more likely each company will rely on innovation as a competitive tool, and the stronger the sustainability of the innovation will be (Aghion, 2005). According to the concept by M. Porter, a company achieves a competitive advantage using a cost leadership strategy, a differentiation

strategy and a concentration strategy, which means cost leadership in the selected markets and leadership in differentiation in the selected markets (Porter, 1980).

However, innovations do not always lead to increased productivity and competitiveness, although they have a large impact on them (Atkinson, 2013). The success of an innovation largely depends on the selection of the appropriate innovation strategy.

3. Innovation strategy as a tool for implementing innovation-based development

Occasional innovations, which are often implemented by the company under pressure from the environment and are often the only way to survive on the market, cannot be the basis for the growth of competitiveness for the following reasons.

1. Such innovations usually result from the transfer of innovative products – purchase of technologies, licenses, software, etc., also available to competitors. This means that competitors can also take advantage of these innovations (if they no longer use them or more advanced innovative products are in place).
2. Such innovations relate to the selected areas of the company's activity and translate into creating the foundations of its innovative culture.
3. Occasional innovation means no innovation potential. Otherwise, the innovative activity of the company would be consistently consistent.

Building a competitive advantage based on innovation requires the development of an appropriate innovation strategy "as a pattern of decisions in an organization which formulates goals, objectives and purposes and produces principle policies and plans to achieve those goals and defines the economic and non-economic contribution it is going to make to its stakeholders"(Andrews, 1980).

The reviewed research publications supports the conclusion that a company intending to make innovation its key asset in ensuring a competitive advantage should perceive innovation strategies and business strategies as an integrated whole. "An organization's capacity for innovation stems from an innovation system: a coherent set of interdependent processes and structures that dictates how the company searches for novel problems and solutions, synthesizes ideas into a business concept and product designs, and selects which projects get funded" (Pisano, 2015).

However, the problem with many companies is that they "rarely develop strategies to align their innovations with business strategies. The company's innovation strategy should define how different types of innovation fit into the business strategy and the resources that should be allocated to each of them" (Pisano, 2015).

Also D.J. Teece draws attention to the need to link innovative activities with business strategy, because technological innovation does not guarantee business success e new product development efforts should be coupled with a business model defining their 'go to market' and 'capturing value' strategies (Teece, 2010).

The innovation strategy is determined by the external environment, own resources and the management system (which can be defined as part of the company's resources).

The various types of enterprise resources are closely related to each other. Financial resources are strongly correlated with the size of human capital, because on the one hand, large profits are determined by the competitive advantages of a company that is a derivative of the innovative activity, on the other hand – high profits allow significantly increasing investment in human capital and the level of innovation of the company.

Innovations by increasing sales and profits allow increase of the investments in human capital and generation of new innovations. The market success of innovations means qualitatively greater opportunities for future innovative activities of the company.

A large market share means great opportunities to use the economies of scale. According to the results of research carried out by the Boston Consulting Group and the Institute of Strategic Planning in Cambridge/Mass, the effect of using the scale (experience) is a significant reduction in the average production costs (Niestrój, 1998). Each doubling of the sales volume reduces the average cost of processing and selling a product by 20-30% of its previous volume (Becker, 1988). Table 1 shows a simulation of the effect of economies of scale on the amount of profits. In the initial calculations, the average total cost was set at € 9, and the price per unit of goods was set at €10. The simulation presents three variants of the cost structure. The first variant provides for the share of processing and sales costs (APC) in the average total costs (ATC) at the level of 50%, the second option – at the level of 66%, and the third – at the level of 80%.

Table 1.
Scale effects

Sales, € M	Profits, € M, by APC = 50%	Profits, € M, by APC = 66%	Profits, € M, by APC = 80%
1M	1	1	1
2M	4,7	5,6	6,32
4M	8,22	9,96	11,37
8M	12,08	14,76	16,92

Source: author's own elaboration.

The data presented in the table shows that with a two-fold increase in the quantity of sales – from 1 million to 2 million items of the product, profits increase from €1 million to €4.7-6.32 million (i.e. 4.7-6.32 times) depending on the cost structure. With an 8-fold increase in sales, the company's profits will increase by 12.08-16.92 times. The growth rate of profit in 1.5-2 times exceeds the growth rate of sales. Therefore, enterprises classified as market leaders with the largest market share (usually large enterprises) have significantly greater financial opportunities to conduct innovative activities and create human capital.

The effectiveness of innovative activity and its role in creating a strong competitive position depends on the extent to which the enterprise management system is open to innovation. "The pursuit of innovation in management goes far beyond the original intention of managing innovation in a limited area. Management soon sees the benefits of creating an environment where everyone in the company can contribute, and creating an innovative corporate culture is becoming a top priority in the senior management and board of directors program" (Vilia, 2011).

An effective management system allows making and implementing rational decisions proactively responding to changes in the environment. Its effectiveness should be seen as the results of consistent intellectual potential creation. Among the factors determining the scope, nature and effectiveness of the innovative activities, its intellectual capital reflects the company's resources on the one hand, and the management system on the other.

Human capital, as a certain type of resource, represents the potential of knowledge, skills and qualifications of personnel, the ability to effectively innovate at each stage of the innovation cycle – from generating an idea to commercializing the innovation.

The management system can be interpreted as the integration of formal knowledge (e.g., formalized processes of preparation and decision-making, organizing, motivating and controlling etc.) and informal (soft) knowledge, which is also based on human capital. Formal knowledge is the result of the prior intellectual effort of employees, presented in the form of reports, algorithms, programs, databases, standards, norms and regulations.

Changes in the environment determine the nature of the company's reaction. Favorable changes mean opportunities and encourage enterprises to apply offensive development strategies. In the innovation area, these are primarily product and marketing innovations basically targeted to influence consumers of the products and services offered by the company.

Threats from the market force an enterprise to take defensive actions, which requires the development and implementation of an appropriate strategy.

The innovation strategy provides for a choice not only between the defensive and offensive nature of innovation goals, but also between transferring innovation and its generating on its own. The two innovative strategies of opening to the outside (open innovation model) and the exploitation of internal expertise have been considered (Chesbrough, 2003). These dilemmas are to a large extent related, because in the event of choosing a defensive strategy, the company must react quickly and with minimal risk to pressures from the market environment, which makes the choice of innovation transfer a priority solution.

In practice, the innovations transferred mean the purchase of innovative products (software, techniques, technological systems and their components). Their impact on the level of competitiveness is short-term, as the competitive advantage is limited by the time that the competition needs to implement the same or better innovative product. The impact of such innovations on the intellectual capital of the enterprise is limited to receiving limited new knowledge and skills related to the transferred innovation.

In the case of innovation transfer, the company receives formal knowledge in the form of instructions, regulations, standards, algorithms, etc., and informal knowledge in the form of the upgraded skills and qualifications of staff as a result of training, internship, which is usually included in the package of services provided by the seller of the transferred innovative product.

In the case of proprietary innovations, this type of knowledge is created as a result of own R&D works. The benefits of an innovation strategy over an imitation strategy become stronger as market demand is increasingly uncertain, technology changes rapidly, and competition intensifies (Zhou, 2006).

The knowledge achieved as a result of the company's involvement in the cooperation network in innovative activities should be particularly distinguished. Participation in the cooperation networks, application of the open innovation strategy not only translates into the creation of intellectual capital, but is also an opportunity for SMEs.

Own innovations usually arise as a result of consistent long-term activities – from the creation of an idea, R&D works up to product commercialization. As a result of this work, "by-products", "innovative semi-finished products" are created, which are often "frozen projects" due to the existence of certain barriers. These barriers include:

- no cash,
- no demand (innovation "overtakes" demand),
- technological limitations.

Such "side effects" of the innovative activity become one of the elements of intellectual capital and may become a serious asset of the company, as soon as there are conditions favorable for their use. Creating human capital, strong and soft knowledge are the most important intermediate result of own innovation.

The simplified scheme of creating an enterprise's innovation strategy presented in Fig. 2 assumes that the process starts with the assessment of the company's own innovation potential, the analysis of the macro-environment and the market environment.

The assessment of the innovative potential should include the assessment of resources (intellectual capital, knowledge resources, financial resources), processes (procedures, algorithms, standards, norms) and the motivation system. The latter is very important due to the need to involve the entire team of employees in the innovation processes, not only those groups of staff that will directly participate in the development and implementation of the innovation strategy.

The analysis of the market environment is necessary due to the need to recognize the competition strategy, the condition and development trends of the target market and the market for innovative products and services. The result of this analysis, among other things, will be the choice of the nature of the impact on the environment through innovation – whether they will be offensive or defensive.

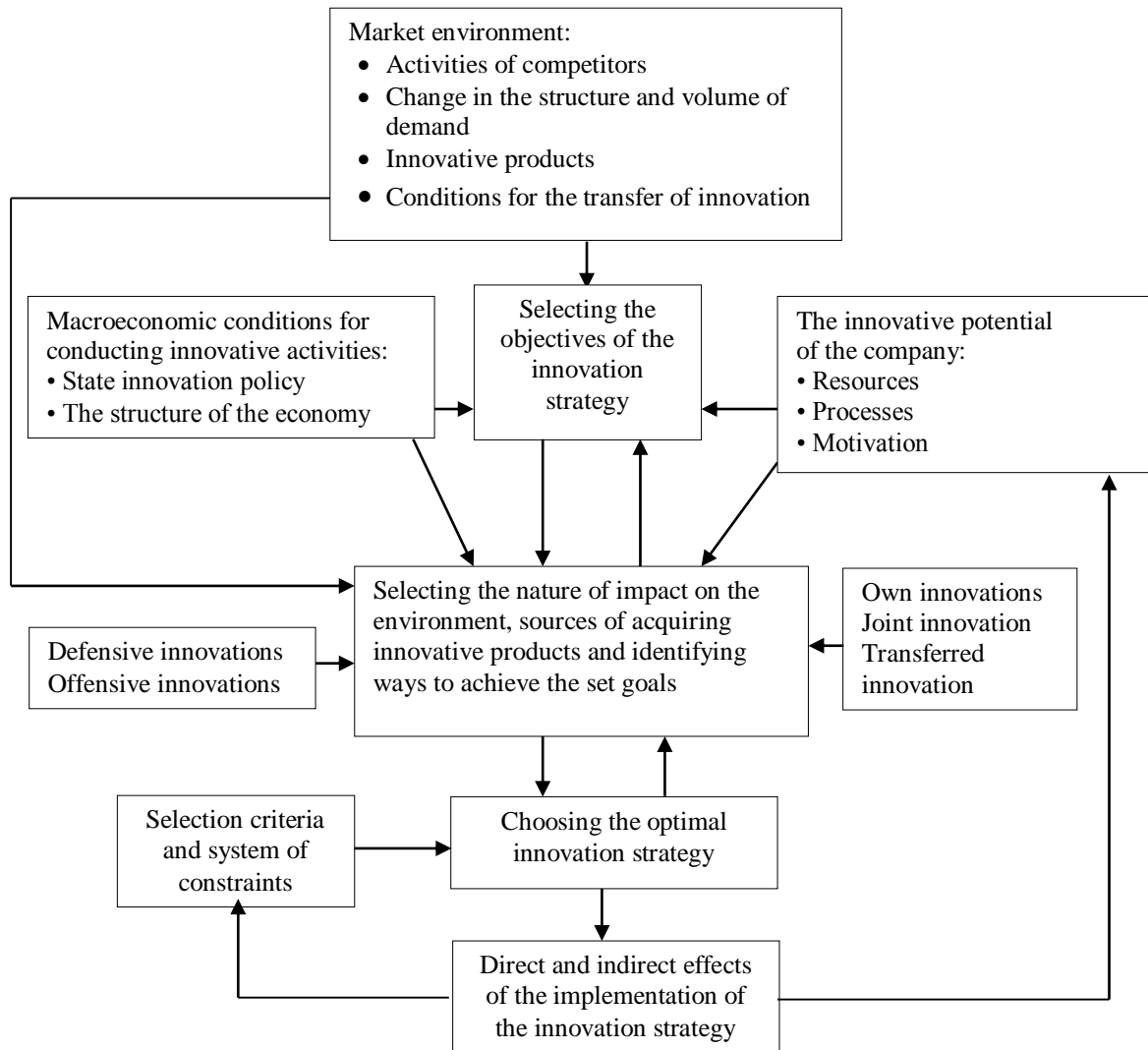


Figure 2. A simplified scheme for creating an enterprise innovation strategy. Source: Author's elaboration.

Based on the results of the environment analysis and the assessment of the company's own capacity of innovative potential, it becomes possible to set the goals of the innovation strategy. Goals should be seen as a system integrating goals at different levels of the management hierarchy, goals of different functional areas and goals of different time horizons.

One of the most responsible stages of creating an innovation strategy is the choice of the nature of the impact on the environment, sources of obtaining innovative products and identification of ways to achieve the set goals. The result of this stage will be a "bank of ideas", which consists of all possible ways, techniques and methods of achieving goals.

The next step is to choose the optimal strategy, based on certain selection criteria and a system of constraints.

The important elements of the presented scheme represent the feedback ensuring flexibility in managing creation and implementation of the innovation strategies.

These elements include:

- possibility of adjusting the strategy goals after identifying possible ways of achieving them,
- possibility to return to work on finding possible ways to achieve the goals in the event of non-compliance with their selection criteria and constraints,
- impact of the effects of the innovation strategy implementation on the innovative potential of the enterprise (mainly indirect effects).

Of course, the presented diagram reflects a general approach to the process of creating a company's innovation strategy. Depending on the specific external and internal business conditions, each of the processes and activities indicated in the drawing needs to be detailed.

4. Direct and indirect effects of innovative activities and their impact on the company's competitiveness

Most managers consider maximization of sales and profit the most important result of the innovative activity. The results of the surveys show that 69% of companies announce an increase in sales as the most important indicator of innovation. 43% of respondents believe that customer satisfaction is that measure (Staack, and Cole, 2017). However, from a strategic point of view, no less important are its other effects, which determine the nature and scope of the company's innovative capacity in the long term. Therefore, despite the direct results of the innovative activity, company managers should carefully analyze its indirect effects.

In the process of innovative activity, new knowledge is created – explicit and implicit. Its assimilation by staff means the development of the company's innovative potential, as the learning of the organization is one of the key factors of its success (Saadat, and Saadat, 2016). The implementation of each innovative project helps to verify the assumptions of the adopted innovation strategy, the correctness of the decisions made and the solutions used. This allows to obtain the effect of experience, which has a significant impact on the level of innovation of the enterprise (Daveri, and Parisy, 2015). Each innovative project should be seen as a cycle of acquiring new knowledge and gaining new experience. This allows you to optimize the formal procedures, algorithms, protocols of proceedings, information and knowledge flows, etc. in the company in the field of innovative activities, develops informal relations and forms of cooperation both within the company and in relations with its environment, but also becomes one of the key factors in creating an innovative organizational culture. The direct and indirect effects of innovative activities and their cause and effect relationships are presented in more detail in Fig. 3.

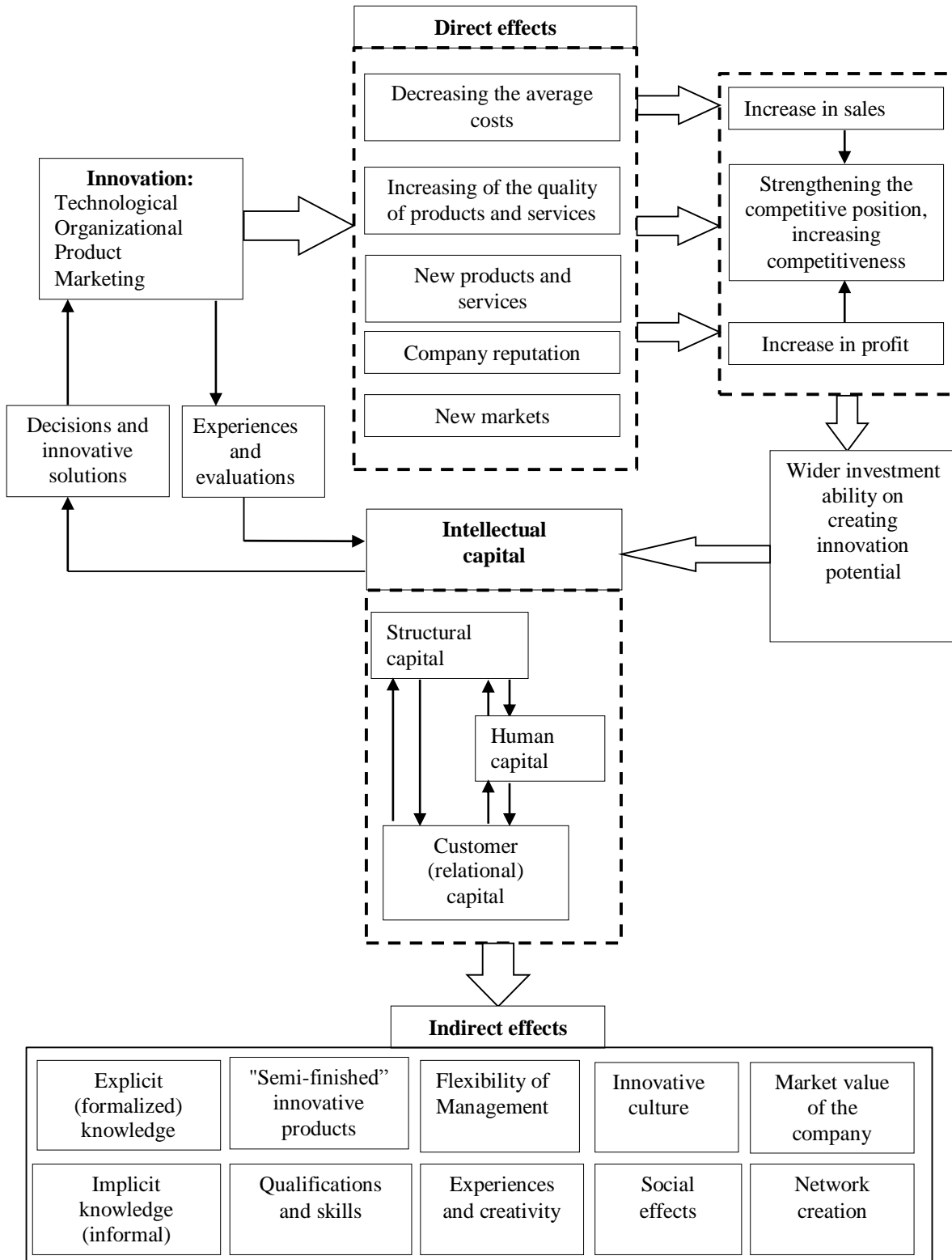


Figure 3. The direct and indirect effects of the innovative activity and their cause-effect relationships. Source: author's elaboration.

The most common direct effects of innovation are:

- lowering the average production costs resulting from the use of a new technological system, organizational and marketing innovations,
- new products and an increase in the quality of products and services resulting from technological and product innovations
- entering new markets, expectedly due to marketing and product innovations,
- improvement of the company's image, which includes the results of each type of the innovative activity.

In the final analysis, these effects ensure an increase in profits and sales volume, which prove the competitive position of the enterprise and allow funding innovative projects to a greater extent.

Generating greater profits creates wider opportunities of creating and developing the intellectual capital of the enterprise based on human capital. The closely related components of intellectual capital are the source of indirect effects of the innovative activity. These effects include:

- receiving new knowledge,
- upgrading qualifications, skills, experience of the staff and management,
- increased management flexibility,
- creating an innovative organizational culture
- social effects reflected in the creation of new jobs, growing motivation of the public to learn, strengthening the innovative culture of the economy,
- creating a database that contains information on ongoing and "frozen" innovative projects, achievements in the area of innovation, test results, expert opinions, experiments, indirect results of R&D works,
- "semi-finished products" of the innovative products are prototypes and concepts of new technologies, products, organizational and marketing models,
- increase in the market value of the company,
- creating a cooperation network in the innovation area with other enterprises, organizations and institutions.

The scope and scale of indirect effects depend on the following factors.

1. The nature of innovative activity in relation to the source of innovation. Transferred innovations translate into indirect effects to a much lesser extent than own innovations generated within the company or in cooperation with other entities. Transferred innovations affect:

- formal knowledge (in the form of instructions, regulations, norms, standards and other carriers of formalized knowledge, provided with the purchase of an innovative product),

- qualifications and skills of employees (as a result of training and apprenticeship of employees servicing the purchased innovative product).

The competitive advantage obtained through transferable innovations is short-term, as competitors also have access to these innovations.

However own innovations, in addition to the indirect effects mentioned above, cause qualitative changes in the nature of the company's innovative activity, which can be defined as creating an innovative culture.

2. The nature of the innovative activity in relation to the area of changes. The implementation of insufficiently coordinated individual innovative projects brings much smaller indirect effects in comparison with consistent innovative activity performed within the selected innovation strategy. An effective innovation strategy should not only include coordinated goals and visions of their implementation, but also provide for the involvement of all structural units in the innovative activities. Innovations to one degree or another require changes in all spheres of the company's activity. Therefore, understanding and accepting the nature of the anticipated changes, their goals and expected results create the basis for the effective implementation of not only current but also future innovative projects.
3. The nature of innovative activity in its relations with the environment. Defensive innovation is 'compulsory action', inspired by the market environment. The company should innovate otherwise it will suffer losses, reduction of its market share, loss of e-buyers' loyalty and its image. Usually, this is a transfer of innovative products, which is perceived as inevitable evil and implemented to maintain the existing market share or minimize its reduction. This type of innovation strategy does not bring visible positive indirect effects, while offensive innovations are implemented in order to increase market share and profits, enter new markets and create a new product market. Offensive innovation strategies not only provide real financial results, but also bring significant indirect effects, because in the process of implementing these investments, the company uses its entire innovative potential, which in practice means accumulating new knowledge, skills, qualifications, experience, creating and developing culture of innovation.
4. The degree of integration within the network of cooperation with others.

Most of the indirect effects to one degree or another contribute to creation of the enterprise innovative culture. In scientific publications, the innovative culture of an organization is presented as a set of certain characteristics that determine its ability to innovate.

J. Spacey (2016) defines a culture of innovation as the idea that "values, norms, symbols, mission, habits, language and history of an organization play a role in its ability to innovate". According to the definition of M. Rouse (2015), the culture of innovation

"is a working environment that leaders create to cultivate unconventional thinking and its application".

The innovative culture of an enterprise can be defined as a certain philosophy of running a business, based on creating an environment that encourages all personnel to engage in innovative activities. The core of this environment is not only the knowledge, qualifications and skills of employees, but also their motivation and attitudes towards innovative activities. Innovative culture allows combining "open" and "hidden" knowledge (Nonaka, Takeuchi, 2000, pp. 20-25), creating and effectively using the intellectual capital of an organization. Each particular success of the company in the innovation is translated into an increase in knowledge, experience and skills of employees, strengthening commitment in their capacities. It allows the managers to assess the effectiveness of human capital management methods, improve and develop personnel policy, especially focusing on behavioral and motivational aspects. Some companies make special efforts to design a highly motivating role. Toyota encourages play by giving factory workers the opportunity to come up with and test new tools and ideas on the assembly line. W.L. Gore & Associates gives people free time and resources to develop new ideas. And Southwest Airlines encourages their people to treat each customer interaction as play (McGregor, Doshi, 2015).

The indirect effects of an enterprise's innovative activity create its innovative potential and provide for building a long-term competitive advantage. Therefore, the company's success on the market largely depends on the selection of an innovation strategy that would be oriented not only to maximizing profits in the short term, but also would take into account the indirect effects of the innovative activity, its impact on creating the innovative organizational culture and effective use of human capital, which would ensure company's strong competitive position in the market and high profits in the long term.

5. Conclusions

Contemporary concepts of economic development perceive innovation as the basic factor in building a competitive advantage. Enterprises that focus on pro-innovative development are usually market leaders. However, innovation becomes a success factor in the market only if the company has the appropriate innovative potential and is able to use it effectively. This determines the scope of key contemporary innovation management problems in the company.

It is anticipated that scientists and business representatives will be increasingly interested in the behavioral aspects of managing innovation processes, issues on the methodology of creating and implementing innovation strategies, developing and using human capital

effectively. These areas are closely related to each other, which requires the managers of the company to employ a systemic approach to management and involvement in the innovative activities not of individual groups of employees, but of the entire staff of the company.

It is important that the company's development strategy and innovation strategy form an integrated whole focusing not only to high profits, but also to development of innovative potential. It is crucial not only to expect the direct results of the innovation, but also to welcome the side effects that will determine your company's competitive position in the market in the future.

The indirect effects of innovative activity contribute to the creation of an innovative corporate culture. This not only allows innovation to be a key factor in its development and market success, but also to create the external image of the company and provide opportunities to build a cooperation network. In this way, the multiplier effect of innovative activity is achieved, the essence of which is that each of its results should be perceived as an explicit or implicit investment in the future of the enterprise.

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THE ROLE OF DESIGN MANAGEMENT IN AN ORGANISATION IN A TURBULENT ENVIRONMENT

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Introduction/background: One of the strategic tools used by organisations is design management. In this approach, user needs are the major focus, which helps organisation face the changes resulting from turbulent conditions. In this article, the role of a conscious design perspective in a sample organisation was identified with regard to management, work model, and cooperation with end users.

Aim of the paper: The aim of the paper is to identify and define the role of design management in a selected organisation which adapts to changes resulting from turbulent circumstances.

Materials and methods: The paper has been prepared based on relevant literature and empirical research. The method of an individual case study has been applied.

Results and conclusions: Design management is still at the development stage. It fulfils various roles in organisations, depending on the implementation level. The research results suggest that the most important method of tackling challenges, whether those typical of turbulent environments or the so-called black swans (e.g. the Covid-19 pandemic), is to validate the company's vision in the light of user needs by means of user research. The influence of particular elements of design management on the organisation has been analysed as well. The example presented in the analysis confirms the results of the study, which indicates that the use of design enables companies to change limitations into opportunities.

Keywords: design management, user research, turbulent environment, design thinking.

Introduction

The times of social and economic instability trigger the search for non-standard solutions and innovations that allow companies to survive on the market. Challenges of particular significance occur as a result of the emergence of “black swans”, i.e., events based on unpredictability (Taleb, 2014), which require people to think outside the box and find quick ways of overcoming the crisis. One of the strategic tools to achieve that, used by organisation with growing confidence and commitment, is design management. Design offers specific tools and makes organisations focus on the users' needs. As such, it is a good method of coping with

turbulent circumstances characterised by frequent and non-linear changes, which are difficult to predict (Masłyk-Musiał, Rakowska, & Krajewska-Bińczyk, 2012).

In the present article, the subject of design management in the situation of change is analysed. The goal of the analysis is to identify the role of design management in companies in turbulent times and to present the benefits of implementing design-oriented approach. The analysis is based on a case study. The study should possibly serve as a contribution to further research on design management in business.

The power of design in organisations

Competitive strategies based on price or even quality of the offered products and services are no longer relevant (Chen, 2019). Owing to the wide range of choices for consumers, companies need to predict, respond to, and even go beyond the consumers' expectations (Hands, 2018). Companies are becoming increasingly aware of the fact that to succeed, they need to implement a user-oriented approach. In this approach, it is essential to know the needs of product or service target users and to bear in mind that these needs undergo constant changes depending on the socio-economic situation.

The ability of interpreting social and consumer needs is a feature of management processes based on know-why rather than know-how (Celaschi, Celi, & García, 2011). This ability gives competitive advantage to companies, as it allows them to see the big image of the situation and to seek the most appropriate solutions in given circumstances, which is particularly important in the times of crisis. Forecasting upcoming turbulences is difficult and – as we have all learned through the Covid-19 pandemic – change is likely to surprise us. This is why detecting weak warning signals as early as possible is one of the crucial aspects of running a business (Sajdak, 2014). Design is a particularly useful tool when it comes to understanding the users' needs and finding innovative solutions. Long before the outbreak of Covid-19 and the subsequent global crisis, Rodriguez and Jacoby pointed out that the comprehensive search for innovation with the use of design is the best way for companies to be protected against “black swans” (Rodriguez, & Jacoby, 2007). The term “design” must be understood as a process here, in line with the concept of the Design Council, which defines “design” as a set of skills and a mindset combining critical thinking with creativity (Design Council, 2020). Nowadays, more and more organisations develop methods of operation aimed at including design and design tools in their management processes. The moment when a company shifts attention from their own vision and concentrates on the clients' needs is highlighted as a starting point in the process of design implementation and management (Tomczyk, & Spsychalska-Wojtkiewicz, 2018).

The roles, functions, and benefits of implementing design in an organisation has been characterised in the following way by Borja de Mozota (2006):

1. Design as differentiator – design is a source of competitive advantage on the market through building the brand value, customer loyalty, prices, and customer-orientation.
2. Design as integrator – design facilitates the processes of developing new products and project management and it introduces user-oriented innovation models.
3. Design as transformer – design enables the creation of new business opportunities, improves the company's ability to cope with changes, and helps understand the circumstances and the market better.
4. Design as good business – design ensures increased sales and better margins and it makes it possible to enhance the brand value, reach further markets, and obtain better ROI.

The tasks of designers, traditionally understood as product and graphic design, have been supplemented with new competencies as a result of the decreasing importance of industrial production. Thanks to design, companies are able to implement innovative processes concerning new products, technologies, and workspaces as well as services, interactions, communications, and business models (Beckman & Barry, 2007). The designers' primary task is also to address the challenges related to sustainable development and climate change (Rojek-Adamek, 2016).

Designers are able to fulfil a variety of tasks thanks to working together in interdisciplinary teams and taking actual user needs into consideration in their design processes. Currently, carrying out research to analyse the needs of users of particular solutions, including employees in the design process, and creating adequate relationships between design and all the levels of an organisation have become the main tasks in organisations. This is the essence of design management, which is sometimes referred to as the missing link between management and design (Dziadkiewicz, 2012).

Design management – why is it necessary in turbulent times?

Nowadays, organisations function in typically turbulent environments. In such environments, changes are frequent, chaotic, tumultuous, and non-linear, which is why their course is difficult to foresee (Masłyk-Musiał, Rakowska, & Krajewska-Bińczyk, 2012). Globalisation, new groundbreaking technologies and forms of communication, disproportions in the distribution of goods, and exceeded limits of growth are the key factors which influence the constant changes (Ansell, Sørensen, & Torfing, 2020). Terrorist attacks, global warming, mass protests, political disturbances, and the Covid-19 pandemic which broke out in 2020 are all world-wide phenomena destabilising the existing systems and making it impossible to adopt universal, all-purpose solutions.

In these unstable times, only the enterprises which base their operation on innovation can thrive (Dziadkiewicz, 2012). This belief is often accentuated as the reason for design management success in Western Europe and in the US (Dziadkiewicz, 2012). Thanks to skilful design management, companies are able to manage their activities so that they not only survive in the changed circumstances but also stand out on the market and encourage the customers to buy a given product or service.

The notion of design management was first introduced in the 1960s in Great Britain. It was then used to define the cooperation between design studios and their clients, where the role of a design manager was to coordinate projects and take care of the relations with clients. The connection between the existence of the position of a design manager in a company and the company's benefits in a given sector was quickly noticeable. Currently, the position has evolved and the demand for design managers in companies has grown. The role of a design manager is primarily to create an environment which supports innovation and finding new solutions in the company. Today, design management means consistent, visionary leadership and communicating the company's vision in all its expressions: its actions, behaviours, identity, promotion, structure, and the ways in which it reacts to external factors.

Nowadays, the main emphasis in design management is placed on changing Taylor's hierarchical management model into a flat and flexible organisational structure, which favours creativity, independence, and risk-taking (Dziadkiewicz, & Maśloch, 2013). According to Kathryn Best, the author of numerous books and publications on design management, „[d]esign is a people-centred transformational process”. She claims that the point of design management is to make use of design at all levels of a company and to include designers in various processes, from developing new products and services, to corporate identity, to defining the business goal tactics, business models, strategies, and the company's mission and vision (Best, 2015). The efficiency of design management can be measured both in financial and non-financial terms, accounting for the company's sales, costs of product modernisation, customer satisfaction, creativity, and innovation (Baran, & Bąk, 2017).

Design management understood this way will reinforce the organisation's potential. In a turbulent environment, it does not play a major part but it organises and harmonises the processes which are aimed at supporting development (including the processes of project management, designing as such, supply chain management, building the company's strategy, and decision-making). What is more, this is how the Design Management Institute understands its role, embracing current processes, decisions, and strategies which enable innovation and effective product, service, communication, environment, and brand design to improve the quality of people's lives and guarantee organisational success (DMI: Design Management Institute, 2017). In this understanding, both the successful effect of applying design management in an organisation and the social goals (improving the quality of life) are emphasised, the latter being especially important in the situation of crisis.

Multiple sources highlight the role of design in the creation of innovative solutions, while design management is frequently perceived as a process which effectively controls and exploits changes to transform them into opportunities (Best, 2015; Brown, 2013; PARP, 2015; Wicher-Baluta, 2013; Dziadkiewicz, & Maśloch, 2013). The design methods used in design management are focused on observing and discovering the needs of users. Hence, in crisis situations, the ability to instantly leave the previously applied methods and to quickly determine the variables facilitates the search for new opportunities, market outlets, and sales leads.

Method

In the current paper, the use of design management in turbulent environments is discussed. The study was focused on identifying the areas where design management could be applied and assessing its role in a selected organisation in a situation of turbulent changes. The following research questions were formed:

- What are the features of the design management process in the analysed organisation?
- In what areas of the organisation functioning is design management used and what is its role?
- What are the factors of successful design management in a turbulent environment?

In order to answer the above-mentioned questions, a literature review and empirical research was conducted. The method of a single case study, i.e., the basic qualitative research method, used mainly for descriptive research subjects, was applied. Thanks to the use of the case study method, it was possible to gather detailed information and to respond to the question of the origin of the studied phenomenon. As far as management science is concerned, a case study is a detailed description of an existing economic phenomenon, e.g. an organisation, its environment, a management process, or its elements, in order to formulate conclusions regarding its causes, effects, and course (Grzegorzczuk, 2015). A case study includes a description of the subject and the process of problem-solving. It should help in understanding the situation and its stages in given conditions and explain the outcomes of particular decisions. It may be based on applied research (Czakoń, 2011). In this method, various sources of data are used, such as interviews, observations, surveys, documents, online sources, and press sources.

The description of the functioning of a given organisation (or its elements) and of the objectives it has met may be used as a practical model for other organisations (Grzegorzczuk, 2015). This was the basic premise of the research, taking various factors into account: the internal characteristics of the organisation, its environment, and the context. In the study, the assumption was made that a single case reflects a single set of circumstances and that the conclusions based on this case may be generalised and applied to other cases displaying similar characteristics and circumstances (Lee, 1989).

The case study was carried out based on a number of research tools. External sources were used, such as press releases concerning the industry and the analysed company, online articles and videos, and participant observation. The unstructured interviews, which provide the researcher with a free form of conversation, were conducted. The information collected via the interviews was qualitative in nature and provided insights concerning the attitudes and motivations of the respondents (Sztumski, 1999). In the interviews, the following themes were specified: the character of the organisation, the key elements of design management applied in the organisation, and the role of design management in a situation of change.

The choice of the organisation was arbitrary, resulting from its willingness to take part in the research and based on its core values.

Results

The case study presented here concerns the issue of design management in a social cooperative: Dinksy, a design and illustration studio founded in 2013. At the moment of the study, seven people were employed there. Dinksy create corporate identity systems for brands and products, illustrations, infographics, and storyboards, specialising in the visualisation of data, processes, and instructions. They also provide the services of visual thinking and visual notetaking. What is more, they have developed their own product: a tool aimed at improving communication in teams – “Otwarte Karty” [“Cards on the Table”]. Their studio is based in Cieszyn, Poland. They offer their services across the country and their clients usually come from large Polish cities.

According to Dinksy, they explain difficult content using simple illustrations. The idea behind starting their company was not to maximise financial profits but to create a workplace where each member could find an interesting position for themselves. They function as a teal organisation whose core values are time, care, communication, and openness to other people as well as focusing on the local, exerting influence on the social community, and taking care of the natural environment. The company is not based on a hierarchical structure: the main model is self-management and synergy.

The enterprise opened in 2013 under the name of Parostatek Social Cooperative, as part of a project of the Social Economy Support Centre (OWES) for the region of Bielsko-Biała, co-financed by the European Union (within the European Social Fund – Regional Operational Programme of the Voivodeship of Silesia 2014-2020). Initially, the activities of Parostatek comprised four areas: skills workshops, willow constructions, urban games and tours, and graphic design.

Since the very beginning, the members of the interdisciplinary team that concentrate on versatile activities have been the strongest asset of the company. The employees' openness to unconventional methods of operation has always been one of their main qualities. The design-related activities have invariably been a chief asset of the enterprise as well. One of the founding team members is a graphic designer, so design services were meant to function as a key component of their offer.

As a result of my research, it may be concluded that for Dinksy, design management is an internalised process. Several milestones related to the implementation of design management in the organisation were identified. The first milestone was inspiration: a meeting with a trendwatcher who spoke about management methods involving design tools, service design, and organisational life cycle. The team followed up the idea of design thinking as a tool of product and value delivery on the market. The team manager defines design as a way of thinking, a mindset whose essence lies in the correct reading and responding to clients' needs.

Parostatek's services used to be wide-ranging and non-specialised, therefore, they did not bring the desired results. The team's assumptions were verified by the business environment and they had to be modified. At that point, the company applied design methods. As a result, they entered into cooperation with an external expert, who ran a design thinking workshop for them. The design thinking methods encouraged the organisation to set their priorities, make use of their competitive advantage, and find their own niche on the market. That was the second milestone, which helped them organise their service offer and narrow it down to specialised graphic design under the banner of Dinksy.

Dinksy specialise in the visual thinking approach. The team members tested the functions of this type of designing on their own. In the times of turbulent changes, which forced them to develop new strategies and scenarios, the created plan, written down in charts, turned out to be difficult to understand and arrange for them. Thus, they turned it into an illustration – that form of visual thinking made the communication flow easier. That was the third milestone, which resulted in the use of the visual thinking technique as one of the company's key products and a crucial element of communication with clients.

Facilitating communication was an essential factor which had a considerable impact on the way the team worked. The process took two years and it involved a number of workshops and collaboration with a supervisor. As a consequence, the team members are now able to communicate in precise ways as well as to settle conflicts, find common values, make quick decisions, and face challenges together. The emphasis they have placed on good communication complies with the results of the study run by Knotten, Lædre, & Hansen (2017), according to which the most important success factors in design management implementation are a good design team and good communication.

Presently, various innovative management tools are used by Dinksy, including design, which is applied at various levels: offer, activities, structure, and strategy. Originally, the design-oriented approach was introduced in the company by external experts, but at the

moment, it is their main focus and the main tool of working and ideating, used and internalised by the team and the manager, although not always strictly defined.

According to the team manager, the greatest value of design is the focus on the users' needs. The continuing close relations with their clients and the regular monitoring of their needs are particularly important in the times of crisis. This approach is in accordance with the research results by Tomczyk, & Spsychalska-Wojtkiewicz (2018), which show that user research is the beginning of conscious design management processes.

The emergence of a "black swan" in the form of the Covid-19 pandemic resulted in a crisis in the organisation. They lost access to direct contact with the clients and direct sales leads. In those circumstances, they promptly set to create a new vision, strategy, and remedy. They were able to diagnose their competencies immediately and to make a decision to cooperate with external experts who had necessary qualifications. Thanks to that, their activities take place online at present. Their offer was adapted and moved online alongside their distribution network and interactions with the clients. In their mindset, obtaining insights from their target groups is a fundamental element of work, which is why they decided to cooperate with an agency which specialises in such online processes. Based on the data they collected, the studio introduced modifications their flagship product – "Otwarte Karty" – and minimised the time of its implementation and launch. The product has been redesigned to respond to user needs, which has its direct effects in sales.

Table 1.

Elements of design management in an organisation and their impact on the organisation

Element of design management used in the organisation development	Impact on the organisation
Expert knowledge – expert designers	Inspiration Change in thinking about organisation and product management
Design thinking workshops	Introducing a user-oriented approach Narrowing the offer down Finding a niche on the market
Implementing user research	Designing a new offer Creating the need for the company's product on the market
Introducing design as a mindset at the process level and in the organisational structure	Introducing the teal organisation model Acquiring clients in the whole country, not only local ones Maintaining the office in a small town
Communication workshops for the team	An integrated, mutually understanding team, quickly reacting to changes
Testing their own products	Confirmation of the effectiveness of their own solutions Improving their products
Checking their own visions against the clients' vision	Minimising the risk of failure Creating products which respond to user needs
Building relationships with clients	Loyal clients who appreciate the company's core values and products
Comprehensive design of all the parameters of the product/service	Loyal clients who appreciate the company's core values and products

The author's own analysis based on the research results.

In the course of the study, the team manager compared design in a turbulent environment to a compass and a template for quick reactions. Thanks to having introduced design management in their organisation, Dinksy know what tools to use and what steps to take to adapt to the changing conditions. The most important aspect of their activities is listening to people and their needs, which is not always equivalent to simply responding to the needs people talk about.

Implementing design at all levels of an organisation requires a lot of courage. Dinksy believe that design is a compass which shows them the right direction in their path of development. Only strategies based on design provide them with access to loyal and satisfied clients from entire Poland and allow them to implement top-quality products and services. The design-oriented approach guarantees profits and helps Dinksy run an office in a small town and keep enjoying their work.

Discussion and conclusions

The main assumption behind the research was Hands's statement that design management is still developing and that we must all keep asking ourselves in what ways it can best serve organisations (Hands, 2018). The goal of the study was to find out what role design management and its elements play in organisations in the situation of change, in turbulent circumstances which require quick adaptation. Design management processes in a selected organisation and the areas in which the organisation applies them were analysed.

According to the research results, which conform to the model of Best (2015), design management in the analysed organisation is applied at the following levels:

1. Operational – designing new products, services, and communication.
2. Tactical – building systems and coherence for the company in various areas of its operation.
3. Strategic – appointing values and business strategies based on design.

The organisation has gone through various stages of design implementation, marked by several milestones. The first impulse which provoked the change in thinking about managing their own processes and organisation originated at a meeting with an expert designer. The growth of their knowledge about design and their firm resolution to implement it, accompanied by the belief in the efficacy of this tool, which grew alongside their first experiences with it, helped the organisation get through diverse turbulences unscathed. The problems they encountered were related to the confrontation of their offer with market demands, the need to find a niche for them, and their location in a small town with a low number of potential clients. The analysis of user needs was indicated as the most significant element of design management, which makes it possible to transform limitations into opportunities.

In fact, this is often underscored as a starting point for implementing design in companies, as confirmed by Tomczyk and Spsychalska-Wojtkiewicz (2018).

Dinksy's experience suggests that adapting the company's services to user needs helps in surviving a crisis caused by changing conditions, even if they are as unpredictable as a pandemic outbreak. The example of Dinksy proves that factors such as the openness of managers, knowledge and skills connected with design thinking, and good communication among the team members determine the successful implementation of design management and lead to gaining a competitive advantage. The results of my study correspond with those described in relevant literature.

In the processes related to the use of design in companies, it is exceptionally important to translate the observed insights into a design vision and strategy. This can be understood as an extension of the language which reflects the company's business strategy. In the case of the analysed organisation, design has not become a part of a formal strategy, but it has been applied in the form of conscious values and the operational framework. The organisation is determined to use design management tools in the future. The research problem that arises here is the issue of maintaining balance between the organisation's business objectives and their willingness to fulfil the needs of the clients. The research results presented in this paper serve to provide insight into the process of design management implementation and its role in a turbulent environment. However, the study is restricted by the narrow spectrum of an individual case study. Further research should be conducted to embrace a larger number of companies, which could provide data for a comparison of various results and extend the scope of research questions, including those concerning the risk of delivering unique solutions on the market, resulting from the voiced and observed user needs but going beyond the company's potential. This study should be treated as a starting point for a further debate on the function of design management in turbulent environments.

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EVALUATION OF INTERNAL COMMUNICATION TOOLS IN A BANK

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Purpose: The purpose of the article was to identify and analyse internal communication tools used at the Bank and to learn employees' opinions regarding their effectiveness in providing information.

Design/methodology/approach: The article uses literature on communication and results of a survey conducted among the Bank's employees.

Findings: Based on an analysis of research results, e-mail can be indicated as the dominant tool in the effective transmission of information at the Bank. In the opinion of employees, the Newsletter was deemed the least effective electronic tool.

Research limitations/implications: In the presented literature review, the author used selected databases (Ebsco, CeON). The articles contained there do not exhaust the subject. Analyses were performed on a limited sample, using one diagnostic tool. It should be noted that for internal communication to be effective, the forms and tools existing in organisations need to be examined not so much with the aim of replacing them with others, but to verify the scope, legitimacy and frequency of their use by employees. Considering the growing importance of internal communication in the organisation and the evolution of tools available to organisations, the field for further research is limitless.

Originality/value This article contributes to the scientific discussion on the effectiveness of providing information by traditional and electronic means, and verifies their usefulness in financial institutions.

Keywords: internal communication, internal communication tools, effectiveness of information transfer, Bank.

1. Introduction

As a management function, internal communication has been under development for over twenty years. Its main task is to integrate employees around the company's strategy, create an organisational culture based on trust, shape positive relations between employees and management, and through that shape a positive image of the company (Wawer, 2014; Białas, and Litwin, 2016; Walasek, 2016; Winkler, 2018; Jaska, 2018b). Communication tools and

means play an important role in the communication process. In an era of development of new technologies, traditional forms of communication are slowly becoming obsolete, as digital solutions offer great opportunities, providing access from anywhere and at any time.

Internal communication is an interesting issue, because the process plays out in a different way and using distinct tools in every organisation. Effective internal communication unites the company, allowing people and teams to function properly and with maximum effectiveness, increases the sense of belonging within the company and provides work motivation (Selwant-Różycka, 2016). Meanwhile, one of the conditions for effective communication is efficient conveying of information – developing the most effective communication system (Kozula, 2016). The purpose of the article was to identify and analyse internal communication tools used at the Bank and to learn employees' opinions regarding their effectiveness in providing information.

The first stage of considerations in this article was based on a review of literature on the subject within the scope of research on the role of communication and the tools used in organisations. Next, a critical assessment of the communication solutions used at the Bank was performed. Finally, in the last part of the article, the results of the research assessing the said solutions' effectiveness in conveying information were discussed and conclusions drawn on that basis.

2. Role and tools of internal communication – review of selected studies

Communication and the process of conveying information are subjects of scientific research that constantly intertwine and relate to each other, and are also explained by various researchers. In numerous cases, it is assumed that communication and information processes are either identical or inextricably linked. However, the significant number and variety of communication activities do not allow their interpretation to be reduced to just one function, e.g. the informative function (Wendland, 2012).

That is why it has been assumed in the study that conveying information is one of the elements of the communication process that determines its effectiveness. Effective communication requires: the right skills, knowledge of communication forms, understanding the barriers to information flow, determinants of communication processes and, above all, tools enabling the exchange of messages (Smoląg, and Ślusarczyk, 2018; Jaska, 2018a).

Four types of communication shown in Figure 1 can be observed in modern organisations.

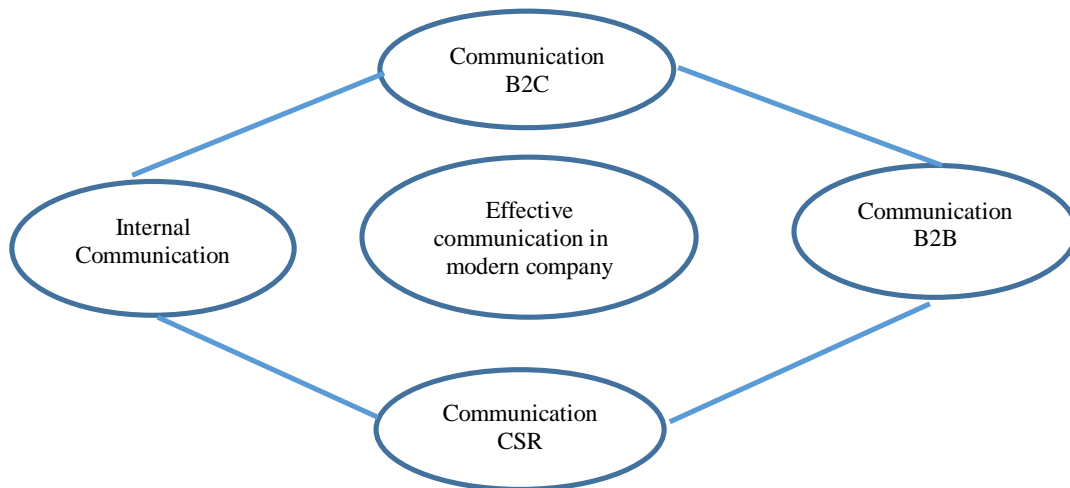


Figure 1. Strategic groups in company communication. Source: own study.

B2C (Business to Customer) communication relates to the integrated relationship of a company with its individual customers. The company uses this channel to provide the recipient with information on products and services available for purchase. Orders, deliveries and payments for purchases are processed electronically.

B2B (Business to Business) communication is a relationship between enterprises. Inter-company contracts relate to product and service transactions, exchange of trade information and building co-operation networks.

CSR (corporate social responsibility) is communication based on corporate social responsibility. Companies take responsibility for the impact their activities have on the environment. They undertake various initiatives, for example related to environmental protection, human rights, etc.

Internal communication, which borders marketing, Public Relations, Human Resource and employer branding. It gains particular importance as the organisation grows, when traditional communication channels become insufficient. The primary strategic goals of internal communication are identical in each company and include (www.brandnewportal.pl):

- Providing information on the strategy and development of the company and product;
- Communicating key issues related to legal and personnel changes;
- Communicating ongoing HR activities;
- Informing of current marketing activities;
- Streamlining communication channels between employees;
- Providing a knowledge base and training tools;
- Building employee engagement;
- Collecting comments and suggestions;
- Efficient onboarding, i.e. facilitating adaptation and induction of new employees;
- Greater independence of employees, their better motivation;
- Retaining valuable employees in the company.

Internal communication is an organisation's everyday business activity and includes e-mails, newsletters, messages on the Intranet, but also meetings with superiors, status of project groups or presentations during which management speaks (Verghese, 2012). Internal communication applies to all relations between employees within the company. It strengthens employee bonds, builds mutual respect and trust, and ensures proper information flow necessary for the company's appropriate functioning (Hamilton, 2011; Gatehouse, 2017).

It can be defined in various ways depending on the adopted scientific perspective and its role in the information flow process. In a narrow sense, internal communication pertains only to the transfer of knowledge and messages within an organisation. However, due to its role in the management process, many authors do not limit it to the technical aspect exclusively (Gryfin, 2006; Wendland, 2012; Jaworowicz, M., and Jaworowicz, P., 2017; Smoląg, and Ślusarczyk, 2018). The article takes a broader perspective and recognises that internal communication consists of establishing and maintaining relationships between the organisation, supervisory bodies and employees in order to develop a sense of community (Johnston et al., 2015). Providing information and assuring communication between members of the organisation builds relationships between stakeholders (Grabosz, 2014; Sypniewska, 2015).

Research on internal communication covers two of its key aspects. The first refers to the impact of internal communication on the organisation's functioning, the second to the use of communication tools, including social media.

The impact of internal communication on an organisation's functioning is presented in the report: "Efficiency begins with internal communication. Report for managers based on an employee survey", which contains the results of a survey conducted in May 2017 on a group of over 500 respondents working in companies employing over 50 people. Research has shown that communication based on partnership and an open approach between all employees, the managers' responsibility for efficient information flow, as well as the use of on-line tools are all extremely important. These tools are social media – their use leads to increased employee involvement in performing tasks and achieving goals (Emplo, 2017).

Research by Korzyński and Mazurek (2016) was conducted between 2013 and 2015 among 190 leaders of Fortune 500 companies. Their goal was to determine factors influencing the effective use of social platforms in internal communication. As a result, the following were included among the aforementioned factors: open communication, an existing code for using platforms and a participative leadership style.

Sievert and Scholz (2017) conducted a study on the impact of internal social media on employee engagement. The research has shown that social media are a significant tool for stimulating activity among employees.

Efficient internal communication occurs through to the use of appropriate communication tools. Their selection and use determine the development of IT and communication technologies, especially within the scope of social media. Organisations require a variety of communication channels, each of which used to convey a different type of information

(Juchnowicz, 2014). However, the use of social media in internal communication is crucial for modern organisations (Emplo, 2017). Social media is a heterogeneous group of Internet and mobile technologies, which allows users to remain in contact, as well as create and distribute user-generated content (Kaplan, and Haenlein, 2010). Social media is included among modern forms of social contact, thanks to which open, multidirectional and democratic communication is possible, reflecting company social networks. The key benefit of their use is the possibility to accumulate the organisation's know-how in one place, which is of paramount importance in knowledge-based organisations (Wojtaś-Jakubowska, 2017).

The biggest advantage of such a tool is the possibility of extensive dialogue between users. In addition, social media is characterised by its scope, availability, intuitive operation and expanding usability. Organisations use their potential to increase efficiency in internal communication, as well as to stimulate employee commitment (Badea, 2014). Additionally, social media use can bring specific benefits in leadership, building organisational culture or as a motivational tool (Sievert, and Scholz, 2017). It is also used in advertising, marketing, recruitment and educational activities (Chomiak-Orsa, and Buryn, 2017).

In addition to social media, the most popular internal communication tool, there are other proven tools, such as: meetings with superiors, inter-departmental meetings, training sessions, e-mail, intranet, blogs and employee brochures (Grabowska-Pantol, 2015). Social media is an area seeing strong development and even newer trends in internal communication can be observed in organisations. Management video blogs have been gaining prominence for a long time, offering an innovative way of communicating with employees (Tajchman, 2018). Given the recent increase in the number of live video broadcasts on social media, from Facebook to Instagram, a whole new dimension of communication is being discovered – video.

The growing popularity of social media has not eliminated traditional, well-known forms of information exchange and creating interpersonal relationships, but it has an impact on users' behaviour and their widespread acceptance. According to M. Badea (Badea, 2014), classic communication through traditional channels (bulletin boards, newsletters, company newsletters) does not fulfil employee needs or create a sense of belonging to a group.

3. Methodology

The article uses literature on communication and results of a survey conducted among the Bank's employees. The literature review included books and articles published in 2013-2020, with the EBSCO and CeON databases referenced. Searches for articles were based on the following keywords: internal communication, internal communication tools.

The Bank specialises in providing services to investment funds and settlements of securities transactions, and in addition provides custodian services for brokerage companies, global custodian banks, investment banks and insurance companies. It operates in thirty-four countries on five continents and is one of the five largest custodian banks in the world. Its headquarters are in Paris and one of the branches has been operating in Warsaw since 2008. About 10,000 employees are employed there, of which over 15% are foreigners. There are two types of employee positions at the Bank – Functional and Professional (Figure 2).

	Position level	Managerial	Expert	Analytical	Trainer	Project	Client	
PROFESSIONAL	Level III	Manager	Senior Expert	Senior Analyst	Senior Business Trainer	Senior Project Manager	Senior Client Account Manager	
	Level II	Team Leader	Expert	Analyst	Business Trainer	Project Manager	Client Account Manager	
	Level I	Deputy Team Leader	Senior Specialist	Junior Analyst	Business Training Coordinator	Junior Project Manager	Junior Client Account Manager	
FUNCTIONAL	Specialist Level	Specialists						
	Junior Specialist Level	Junior Specialists						
	Entry Level	Interns / Assistants						

Figure 2. Types of positions in the Bank. Source: Own study based on data from the Bank.

The careers of most recruited employees start at lower-level positions, i.e. functional. These include: trainees, assistants, junior specialists and specialists. Then, selected employees are promoted to senior positions, i.e. professional. These include managerial, expert, analytical, coaching, design and customer service positions. Each of these positions is divided into three levels with level 1 being the lowest and level 3 the highest.

The empirical studies used the diagnostic survey method. The diagnostic survey was conducted among employees in the Warsaw branch, was voluntary and anonymous. The research material was collected in March 2019 on a sample of 60 people. Sampling was random. Due to the unrepresentative research group, the results of the study cannot be generalised. The conducted survey has been used to select communication tools that are – according to employees – the most effective.

The respondents included employees at various levels and positions. The majority of respondents (80%) were women, with the share of men being only 20%. They were divided into three age groups. The largest was made up of respondents under the age of 30 (67%). The study featured 29% of people aged 30-40 and only 4% were over 40 years of age.

Most of the people (33%) have worked for 1 to 2 years. The second group have been employed for less than 1 year (29%) and 3-5 years (27%). The lowest number of answers was obtained from employees working for more than 6 years (11%). The biggest group in the study held the position of specialist (38%) or junior specialist (20%).

4. Opinions of employees on the effectiveness of conveying information using various tools – research results

Technology is gaining increasing importance in modern enterprises. Digitisation includes the use of internal social media, intranet, mobile applications and even artificial intelligence. Mobile applications are used not only for communication, but also solve many complicated tasks more effectively and faster than traditional forms (Biesaga-Słomczewska, 2015). Digitisation is a strategy aimed at assuring the best use of IT solutions for optimal use of the potential of the organisation's digital resources.

Activities in the banking sector and a developed enterprise organisational structure induce employees to communicate using various communication tools. At the Bank, communication occurs mainly through electronic tools, but traditional tools and face-to-face meetings remain widely used.

The research was used to look for answers to questions about the volume of information provided via internal communication tools used at the Bank. Respondents were asked which methods of communication provide employees with the most information. The vast majority (89%) of respondents said that most information reaches employees through electronic tools, with only 11% indicating direct meetings and no one mentioning traditional tools. The survey also included questions aimed at assessing the effectiveness of information transmission via the following tools: electronic, traditional and direct meetings. A rating scale with the range of effectiveness, according to employees, from 1 (least) to 5 (most) was adopted. The respondents' answers to this question are presented in the following charts.

Efficient exchange of acquired information is an effective element of the communication process (Potocki, 2016; Mazur-Wierzbicka, 2017). Modern electronic communication tools used at the Bank proved to be supportive (Grębosz, and Mikulska, 2013; Werenowska, 2014, Wiśniewska, 2015). In addition to face-to-face meetings, employees had many electronic tools at their disposal, including: e-mail, intranet, discussion forum, bulletin boards, etc. Figure 3 shows the results of the assessment of information transfer effectiveness via electronic tools.

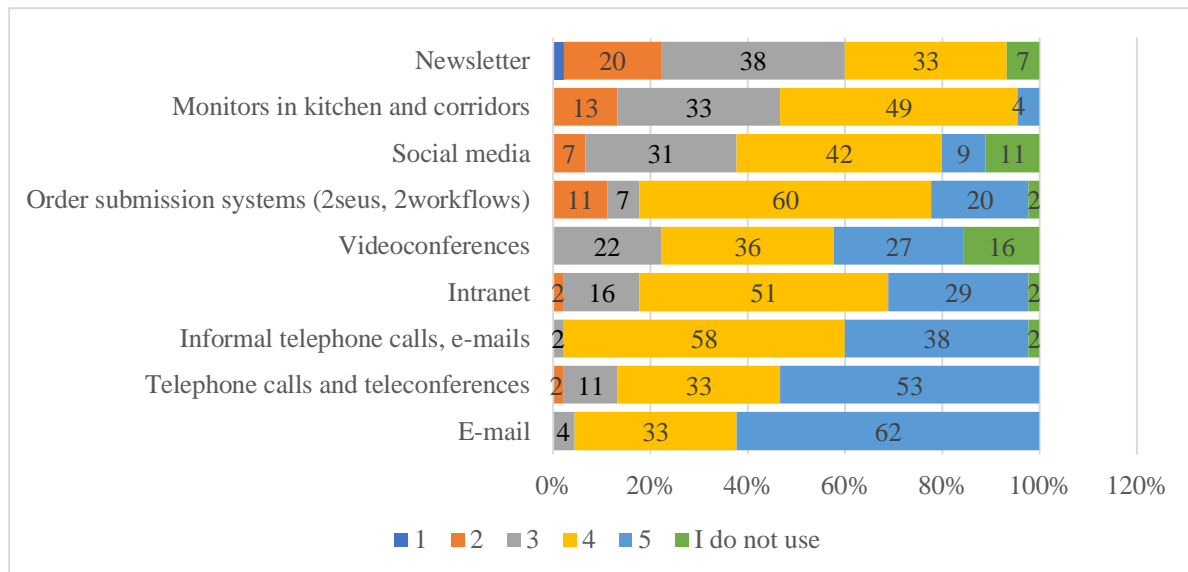


Figure 3. Assessment of information transfer effectiveness via electronic tools. Source: own study.

The respondents perceive e-mail as the most effective communication tool (62% of respondents rated it as very good and 33% as good). Telephone calls and teleconferences were second - (53% of respondents rated them as very good and 33% as good). The newsletter was deemed the least effective tool for providing information (20% of respondents rated it poorly and 7% do not use information provided this way). It is surprising that many respondents do not use videoconferencing (16%) and social media (11%).

Figure 4 shows the results of the assessment of information transfer effectiveness via traditional tools.

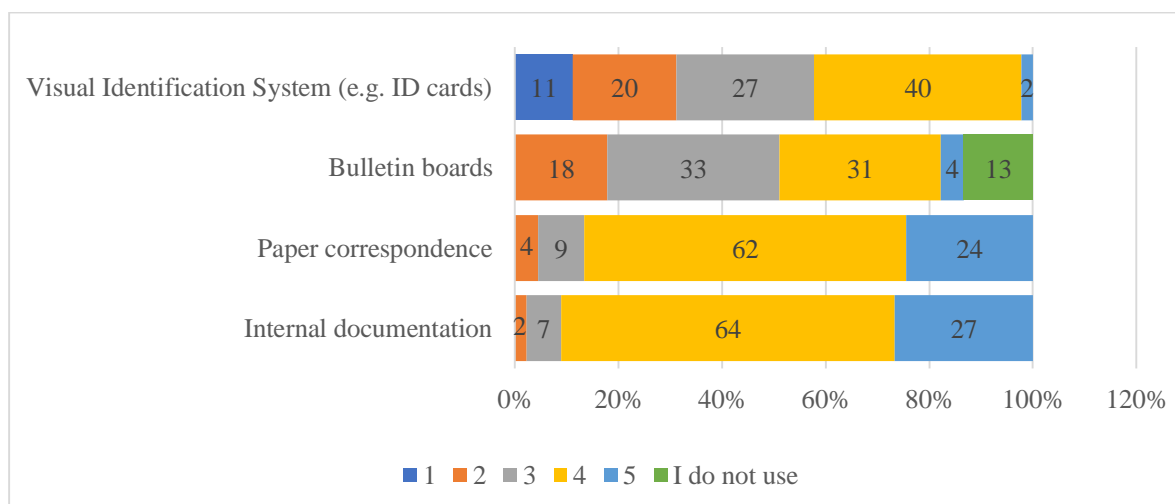


Figure 4. Assessment of information transfer effectiveness via traditional tools. Source: own study.

The most effective tool among the traditional methods of providing information turned out to be internal documentation – (64% of respondents rated it as good and 27% as very good). Paper correspondence came second (62% of respondents rated it good and 24% very good), the Visual Identification System third – 40% of respondents rated it good, only a few (2%) as very good and 11% as very bad. Bulletin boards proved to be the least effective, with as many as 13% of respondents not using information provided this way.

Performance of tasks entrusted to each employee requires circulation of information and communication with other members of the unit. Creating conditions conducive to open communication brings many benefits to the organisation. A. Žur (2013) believes that the degree of openness in information flows shapes the conditions for involving people in the organisational process of seeking opportunities and solving problems. An analysis of the effectiveness of direct information transfer – "face-to-face" is presented in figure 5.

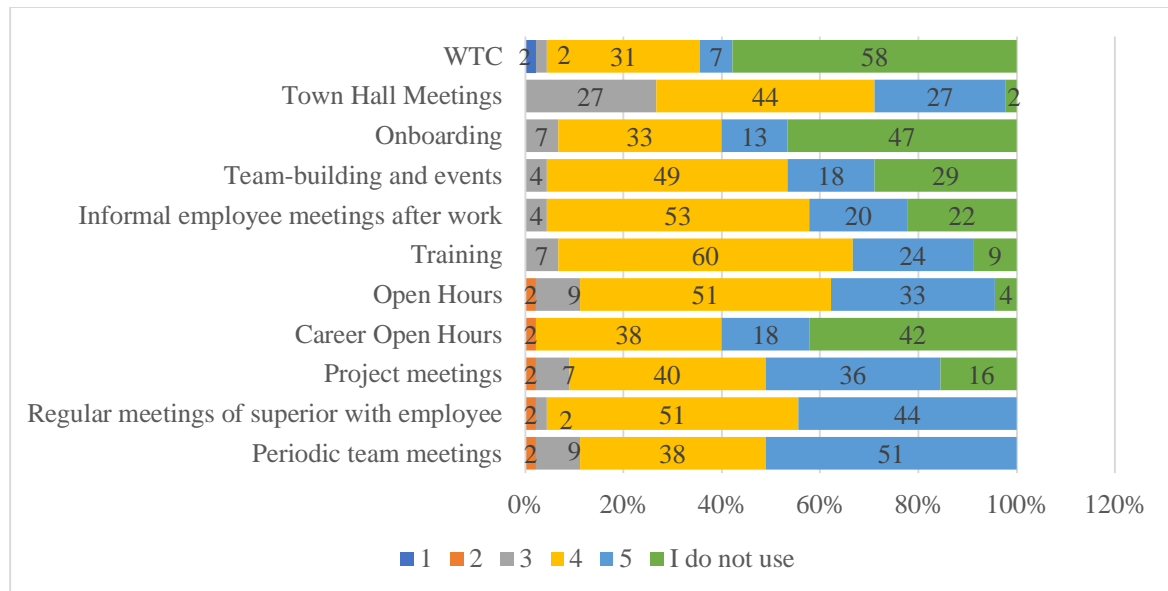


Figure 5. Assessment of information transfer effectiveness in direct communication¹. Source: own study.

According to respondents, the most effective method of providing information among direct communication tools are periodic department meetings (89% rated them as very good and good). Employees also positively assessed periodic meetings between superiors and employees (95% of respondents rated them as very good and good). From among the surveyed employees, more than half (58%) do not take advantage of the WTC, less than half (47%) of Onboarding and (42%) of Career Open Hours.

Electronic tools are the main source from which employees want to receive information (71% of respondents). Almost one in three respondents (29%) wants to obtain information directly from their superior in the form of messages or during meetings with the management board. None of the respondents indicated traditional means – documentation and paper correspondence.

5. Limitations of test results

This study is not devoid of limitations. The shortcomings of this chapter include the research method adopted by the author. In the presented literature review, the author used selected databases (Ebsco, CeON). The articles contained there do not exhaust the subject.

The research conducted by the author confirms many areas for improvement of internal communication tools exist. It should be remembered that the above analyses were performed on a limited sample, using one diagnostic tool. Therefore, the obtained results may not constitute the basis for general assumptions, but could contribute to the creation of a database of appropriate diagnostic questions and the development of universal principles in internal communication.

6. Suggestions for future research

Theoretical considerations and literature review-based empirical research indicates that internal communication plays a growing role in managing organisations. Conducted research, the number of scientific studies and many scientific conferences devoted to the issue confirm this. Considering the growing importance of internal communication in the organisation and the evolution of tools available to organisations, the field for further research is limitless.

It should be noted that for internal communication to be effective, the forms and tools existing in organisations need to be examined not so much with the aim of replacing them with others, but to verify the scope, legitimacy and frequency of their use by employees. Research shows that each of the solutions has its reason for existence in the communication processes in the organisation. The only issue is the legitimacy of their use from the point of view of the message sender's goal.

7. Summary and conclusions

Although internal communication has now become one of the important elements of an organisation's proper functioning, the selection of forms and tools is still the subject of many academic discussions. Currently, digital (electronic) tools that improve communication and the transmission of valuable content are becoming increasingly more popular.

Based on an analysis of research results, e-mail can be indicated as the dominant tool in the effective transmission of information at the Bank. In the opinion of employees, the Newsletter was deemed the least effective electronic tool. It is surprising that many respondents do not use social media. Despite the rapid development of electronic communication tools and the steady increase in their usage, employees rated videoconferencing very low.

Among traditional methods of providing information, internal documentation and paper correspondence were seen as the most effective. Bulletin boards have been shown to be the least effective, as it turned out that many employees do not use the information provided in this

manner at all. Research shows that meetings with the management board, team-building trips or team meetings are still an important form of communication. Meanwhile, Onboarding and Career Open Hours were rated very low.

Research has confirmed (71% of respondents) that electronic tools are the main source from which employees want to receive information.

The selection of tools used in internal communication depends on the size of the enterprise, its business operations and financial capabilities. They should be chosen according to the information meant to be conveyed and tailored to specific recipient groups. This article contributes to the scientific discussion on the effectiveness of providing information by traditional and electronic means, and verifies their usefulness in financial institutions.

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