




The role of innovative systems in a small and medium enterprise

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Abstract

Motivation: The considerations contained in the article concern the issues of innovation in information systems of small and medium-sized enterprises. The results of the research on barriers faced when introducing innovation in the surveyed economic entities were presented. The focus was on the analysis of internal financial barriers.

Aim: The purpose of the article is to identify and analyze the internal barriers resulting from the implementation of innovative information systems and their impact on the management of small and medium-sized enterprises.

Results: The results of the analysis indicate that the dominant innovations in information systems implemented in the surveyed enterprises are innovations in the area of information systems supporting finance and accounting.

Keywords: *innovation; information communication technology (ICT); small and medium enterprises; competitiveness; management*

JEL: O36; L25; L36

1. Introduction

The success of an enterprise in a competitive market depends on its ability to adapt to constant changes in the environment. It is precisely innovations that hold a special position among the enterprise success factors. The significance of innovation in this aspect is indicated by the authors of many theoretical and practical works (see: Boly et al., 2014, pp. 608–622; Castela et al., 2018, pp. 1365–1383; Dadfar et al., 2013, pp. 819–834) and others. Thus, the development of innovation is the basis for creating entrepreneurship as well as the highest quality products and services. The ongoing process of globalization, the financial crisis, and the technological revolution significantly impact the functioning of modern enterprises. In order to maintain their market advantage, they are forced to acquire adaptive skills, creativity and flexibility, and to actively implement the necessary changes. An important aspect of addressing the topic of managing small and medium-sized enterprises is the role of this sector of enterprises in the Polish economy. The activities of micro, small, and medium-sized enterprises from the SME sector, play a significant role in the structure of the modern economy and society. It has a direct impact on economic growth, creation of new jobs, while reducing unemployment and saturation of the market with high-quality goods and services. Small and medium-sized enterprises are a kind of simulator of economic development, and their number and potential can be one of the measures of economic growth assessment.

The proper functioning of the company is closely related to the effectiveness of its internal systems. Innovations and changes in the field of organization, management, motivation methods, or manners of solving problems, as well as technology, are necessary to survive and develop in a situation of constantly changing conditions and needs emerging on the market. Changes in managing an enterprise are very difficult areas. They concern people, they interfere with their habits, customs, or cooperation systems. Innovations and changes in terms of organizing, managing, methods of motivation, or manners of solving problems, as well as technologies, are necessary to survive and develop in a situation of constantly changing conditions and needs emerging on the market.

The basic criterion for building and maintaining a competitive advantage of an enterprise on the current global market is the ability to absorb innovation as well as generate innovation independently. The analysis of the benefits and risks arising from implementation of information system innovations may influence the entrepreneurs to make the right decisions regarding the introduction of changes. Thanks to innovations of information systems, the company will gain new development opportunities that will allow it to manage it in the global economy.

The above considerations constitute the main reason for choosing the subject of this article. The analysis of the benefits and threats resulting from the implementation of innovations in this area may influence the entrepreneurs to make the right decisions regarding the introduction of changes. Identifying barriers

will allow to determine the actions that should be undertaken at the level of both an enterprise and the economy in order to overcome them. Thanks to innovations of information systems, the company will gain new development opportunities that will allow it to manage it in the global economy. Due to the extensiveness of the issues, the authors decided to focus only on financial barriers.

The aim of the article is to identify and define internal financial barriers to the implementation of innovative information systems in small and medium-sized enterprises.

The main source of data on developing the article consisted in the results of empirical research conducted on a group of 160 enterprises. The research tool consisted in an original questionnaire. In the empirical analysis, the analysis of monotonic relationships with the Spearman's rank correlation coefficient was used between the assessments of internal barriers to the implementation of innovations in SME information systems and the assessments of SME innovation aspects and the size of the enterprise.

The first part of the article presents the theoretical foundations related to the concept of innovation and its significance in managing small and medium-sized enterprises. The following part describes the procedure for conducting empirical research, then presents the results of the obtained research, and indicates what internal barriers may occur in SMEs. Finally, analysis and discussions are presented, before conclusions and recommendations for future research are stated.

2. Literature review

Currently, one of the dominant determinants of maintaining the competitiveness and development of SMEs consists in the proper absorption of technological and organizational progress. Observing the inevitable technological progress, one should not forget that it brings benefits or opportunities for enterprises, as well as losses or threats. Development dictated by progress understood globally can be considered on various levels: technical, social, economic, organizational, or ecological. The aim of every progress, technical, technological, and scientific, is primarily to increase the reliability and efficiency of machinery and equipment, to increase and improve the quality of manufactured products or provided services, to improve the quality of life of the society and its development. Technological progress is (also) determined by innovations implemented by companies to improve or modernize their operations. The innovations for improving the entrepreneurial activity implemented by Polish enterprises in the recent research period (in the light of the PARP, 2020) include: the use of information and communication technologies (ICT) in Polish enterprises, especially access to the Internet, the participation of social media, the use of cloud computing, and broadly understood digitization. Broadly understood competition between companies, sectors, regions, and countries is considered to be a driver of innovation. And despite the fact that the analyses of the Polish Agency for Enterprise

Development (PARP, 2020) show that every fifth company in the country is innovative, the following edition of the *Report on small and medium-sized enterprises in Poland* indicates that for another year in a row companies are reducing their expenditures on innovative activities. Since 2015, this has been a decrease by almost PLN 8 billion to PLN 36.5 billion, despite the introduction of tax incentives in the form of the R&D relief or the IP Box. On the other hand, the power of micro, small and medium-sized enterprises, which already generate nearly every other Złoty of Polish GDP, is growing.

ICT includes a range of computerised technologies that facilitate communication and allow the collection, processing, and transmission of information (Benitez et al., 2018, pp. 131–143; Ongori & Migiro, 2010, pp. 93–104). Today, digitisation has a significant impact on the society and the digital economy is actively developing, and in the next few years it will be the most important engine of innovation, competitiveness and economic growth in the world, benefiting both individuals and businesses (Bahrini & Qaffas, 2019, pp. 1–13; Brzozowska & Kabus, 2018, pp. 7–22; Kwilinski & Kuzior, 2020, pp. 133–138; Virglerova et al., 2021, pp. 1011–1032). Within companies, information and communication technologies have changed the character of goods and services focused on the market, as well as production procedures, the flow of employee work, and management techniques (Ritchie & Brindley, 2005, pp. 205–217). In particular, the Internet has changed the way people do business (Grebski, 2021, pp. 272–276). Information and communication technologies currently constitute a powerful tool for monitoring, promoting, communicating, and measuring the social and financial objectives of enterprises. The manner in which a company addresses social issues, sustainable production, and safer products can be communicated over the Internet at a lower cost (Castaneda & Cruellar, 2020, pp. 159–173), strengthening relations and collaboration (Benitez et al., 2018, pp. 131–143).

The benefits of implementing ICT in SMEs have been widely studied in the available literature. There are many articles and books indicating the significant impact of ICT on the development and operation of businesses, and it is particularly evident in small and medium-sized enterprises, but also concerns micro-enterprises. As it is pointed out by Krawczyk (2021, pp. 19–36), and Sołek-Borowska (2018, pp. 211–225) small and medium-sized companies are crucial to the development of a stable global economy because of the improvements they provide in the field of technological capabilities and the spread of innovations. SMEs work in favour of creating new jobs and thus raising the standards of living (Afolayan et al., 2015, pp. 483–498), as well as reducing poverty (Afolayan et al., 2015, pp. 483–498; Harindranath et al., 2008, pp. 91–96).

The use of information and communication technologies provides companies with significant opportunities to reduce costs and increase production, improve profitability, and succeed in today's dynamic market (Stanimirovic, 2015, pp. 29–47). The possibility of using information and communication technologies

to facilitate and report on the practices of corporate social responsibility (CSR) practices implemented by small and medium-sized enterprises is also emphasized (Chege & Wang, 2020, pp. 101210; Reverte et al., 2016, pp. 2870–2884; Streimikiene & Ahmed, 2021, pp. 125–157).

Cost reduction and marketing improvement (Ashrafi & Murtaza, 2008, pp. 125–138), more efficient and effective communication (Benitez et al., 2018, pp. 131–143) as well as better procurement and distribution methods (Hong & Jeong, 2006, pp. 292–302) are emphasized in terms of implementing innovation into ICT. As it is emphasized by the authors, the factors determining the financial performance of SMEs consist in using ICT (Marei et al., 2023, pp. 339–350). Information technology has a positive impact on both entrepreneurial competence and business success (Marei et al., 2023, pp. 339–350), as well as on improving performance (Aydiner, 2020, pp. 149–163; Benitez et al., 2018, pp. 131–143).

Barriers are all limitations, features that hinder the effective of the transfer and commercialization system, and consequently block the cooperation of scientific institutions with enterprises and broadly understood entrepreneurship (Kapurubandara & Lawson, 2006). Barriers to the implementation of innovations occur both on the side of the company's environment and inside it (Chau & Turner, 2001). There are barriers for implementing ICT in SMEs, relating especially to limited financial and human resources (Ashrafi & Murtaza, 2008, pp. 125–138). However, it has been argued that SMEs are sometimes able to take advantage of ICT capabilities and implement ICT more easily than larger organisations, simply because of the advantage of flexibility, which makes decision-making faster (Krawczyk, 2021, pp. 19–36). The barriers for using and adopting ICT in SMEs can be broadly categorised as internal and external ones (Kapler, 2021, pp. 156–162). Internal barriers exist within an organisation and can also be addressed within the organisation. These usually include organisational culture, lack of resources, the attitude of owners/managers towards ICT and the level of staff training. External barriers are those that are outside the direct control of the organisation and include a lack of infrastructure facilities and limited funding from banks and other government bodies. It has been suggested that SMEs need to work together to overcome these obstacles (Hoque et al., 2016, pp. 986–1000). Perhaps one of the most surprising barriers for adopting ICT consists in the lack of knowledge concerning ICT solutions, how they work and how they are implemented, as well as their perceived benefits for the SME sector (Ashrafi & Murtaza, 2008, pp. 125–138).

3. Methods

The research was carried out in business entities belonging to the SME sector, with particular emphasis on enterprises from the Silesian Voivodeship. The research group consisted of owners managing their enterprises and the managerial staff, especially managers of sales, finance, and accounting departments.

A pilot test of the questionnaire was carried out to refine it. A total of 250 questionnaires were sent to owners/managers of SMEs in the Silesian Voivodeship (due to the place of residence of the authors and direct access to representatives of the SME sector in the region). The questionnaire included a cover letter stating the purpose of the survey and ensuring the anonymity of the respondents and their organisation. A total of 190 questionnaires were returned, of which 160 were complete, corresponding to a response rate of 64% . This sample size is taken into account and sufficient for analysis.

The dominant innovations in information systems implemented in the researched enterprises consist in innovations in the field of information systems supporting finance and accounting. These are hybrid accounting platforms, that enable direct contact and the function of monitoring the work of the accounting office in real time, from anywhere in the world with access to the Internet, as well as e-invoice handling systems, innovative solutions concerning the organization of document flow, enabling tracking the path of documents by assigning them bar codes, as well as other innovations in information systems in the field of finance and accounting.

The selection of the research sample was random, while the snowball method was used to obtain respondents. However, this selection was made based on the following premises:

- the research entity consists of enterprises from the SME sector of the Silesian Voivodeship;
- the research subject is innovations in information systems concerning company management;
- the research group includes all employees of enterprises.

In view of the above, the question arises: what barriers limit the development of innovation in these companies and what needs to be changed in order to increase the innovativeness of small and medium-sized companies? At the same time, it is widely known that the innovativeness of these companies is the basic condition for obtaining a sustainable competitive advantage of these entities. Based on the literature review, a research gap was identified, which is the identification of barriers to the implementation of innovations in small and medium-sized enterprises. The following research hypothesis was put forward: Barriers to the implementation of innovations in information systems determine the level of innovation of small and medium-sized enterprises.

In the procedure of statistical testing of correlation significance, a level of significance equal to $\alpha=0.05$ was adopted. The calculations were made using the PQStat program. Due to the regional nature of the research, the results presenting the scale of the researched phenomenon cannot be generalized for the general population.

In the article, the adopted goal and hypothesis were tested using an original research tool — a survey questionnaire. It consists of two parts — a metric that characterizes the respondents and the researched enterprise, and questions that test the adopted goal of the work and verify the research hypothesis. Gener-



ally, the questionnaire consists of questions or statements, that the respondent is supposed to evaluate on a 5-point scale. The questionnaire also includes questions that do not require valuation, but only selecting a specific answer. Question No. 1 was an open-ended question, in which the respondents were asked to express their opinion on the term “innovation” (question 1: “What is innovation for you?”). In reference to questions 2–5 and 8–10, a five-point Likert scale was used in the survey, expressed numerically (questions with numbers 1–5) with verbal expressions defining the extreme values of the scale. Respondents were asked to specify the extent to which they agree with a given statement with regard to the above-mentioned number of questions, having the following answer options and their verbal descriptions to select from: 1 — disagree, (2 — slightly disagree, 3 — neither agree nor disagree, 4 — disagree agree), 5 — agree). (In the case of the 5-point Likert scale, two labels from the scale were used (on the extreme left and on the extreme right) / in order to measure the intensity of “agreement” with the statements, a 5-point scale was used, and the values were described verbally and numerically: 5 — I agree; 4 — I slightly agree; 3 — I neither agree nor disagree; 2 — I slightly disagree; 1 — I disagree). The logic of questions 2–5 and 8–10 and the rules for answering referred to the degree of acceptance, so the purpose of the procedure was to provide the respondents with a coherent verbal and numerical description, which was conducive to communication and standardization of the measurement. A version of the 5-point Likert scale with a midpoint (“neither agree nor disagree”) was chosen, due to the fact that a respondent should be able to select the middle (neutral) option when he does not have an opinion on a given topic. It was assumed that the 5-point assessment scale provides sufficient choice options and, what is important, is easily understood by respondents. It did not stop at a verbal description of the values, which would raise doubts regarding the level of measurement.

4. Results

The characteristics of the enterprises participating in the research were analyzed based on the results from the metric part of the survey concerning the characteristics of enterprises. Chart 1 presents the structure of the researched enterprises in terms of size (number of employees). The research group consisted mostly of small enterprises (almost half of all researched companies), while every third economic entity belonged to the group of medium-sized enterprises. Chart 2 presents the structure of the researched enterprises in terms of type of activity. The largest research group were service enterprises. Every fourth business entity dealt with production. Slightly more than 15% were trading companies. They were followed by transport companies and construction companies. Chart 3 shows the structure of the researched enterprises in terms of legal form. Most of the surveyed business entities belonged to the group of civil partnerships, partnerships, and limited liability companies. The structure of the researched

business entities in terms of their period of operation is presented in Chart 4. The largest group of enterprises consisted in companies active on the market for more than 5 years but not more than 10. The second group consisted of rather young companies, whose activity was up to 5 years on the market.

An analysis of the characteristics of people who are direct respondents participating in the research was also carried out, based on the results from the metric part of the survey regarding the characteristics of the respondents. A typical respondent participating in the research is usually the owner of the enterprise or a person who performs managerial functions in the company. More often it is a man. Every fifth respondent was a woman. The surveyed respondents were most often aged 35–44, and their work experience was between 5 and 10 years.

When analyzing the answers to the question “What is innovation for you?” the definitions provided by respondents in the survey regarding the term “innovation” were grouped in accordance with common meaning groups. The respondents formulated a total of 16 definitions of the term “innovation”. Groups of terms similar in meaning were marked with colours, as shown in the Scheme 1. Respondents equate innovation with new a technology and new/modern solutions at work, with creating something new in the company (6 indications), also with a change in: technology, procedures, the work process (4 indications), which is to give specific results: improve work, raise its level, reduce costs (5 indications). According to the respondents, innovation is also an expense (1 indication).

In the next step, respondents were asked to respond to several statements concerning the innovativeness of their companies. The most frequently indicated assessments for the surveyed statements regarding the manner of perceiving a company as innovative consist in assessments such as: “I neither agree nor disagree”. Respondents most often did not have an opinion regarding statements such as: “my company is an innovative company” (59.33%), “my company works in partnership with customers, trying to develop solutions for them” (59.33%), “leaders provide a safe space for making mistakes when employees and teams are looking for new, important solutions for the company” (59.33%). Respondents never once agreed with the statements that: “my company is open to new solutions and changes”, “my company works in partnership with clients, trying to develop solutions for them” and “leaders provide a safe space for making mistakes when employees and teams are looking for new, relevant solutions for the company”. Respondents also never once agreed with the statement that “leaders provide a safe space for making mistakes as employees and teams look for new, relevant solutions for the company”. The smallest discrepancy in the rating scale used concerned the statement marked as “leaders provide a safe space for making mistakes when employees and teams are looking for new, significant solutions for the company”. In this case, the respondents used only three ratings from the scale out of five possible options, which ratings indicated the lack of their unambiguous opinion as to the agreement or lack thereof with a given statement. The most dispersed assessments concerned statements

marked as “my company is an innovative company” and “the company’s values are conducive to policy based on innovation”. For these statements, respondents used the entire rating scale. The median rating for all statements was 3, which means that 50% of the ratings were less than or equal to this value, while 50% were greater than or equal to this value.

Another research area was the identification of innovations in information systems supporting important areas of small and medium-sized enterprise management. Respondents indicated which innovations in information systems were implemented in their enterprises in order to support specific areas of company management. The list of innovations implemented in information systems in the researched enterprises was sorted from the most common to the least common and presented in the form of a Pareto diagram in the Chart 5. The innovations implemented most frequently in information systems in the researched enterprises are: e-invoices (97.3%), accounting platforms (92.0%), and hybrid accounting (90.7%). Among the 22 analyzed innovations, 14 of them (i.e. 63.63%) were implemented in more than 50% of the surveyed enterprises. Only innovations such as: Cognos Controller and Robotics Process Automation (RPA) did not obtain the status of “implemented” in the surveyed enterprises. Then, the implemented innovations in information systems supporting important areas of SME management were divided into the total number of possible implementations, depending on the analyzed area of enterprise management. The areas of enterprise management with the largest number of cases of implemented types of innovation are such areas as: “controlling and finance” (92.0%), “finance and accounting” (88.0%), “knowledge and skills of employee capital” and “tools for managing the month-end closing process” (86.0% each). The fewest cases of implemented types of innovations were recorded in the area of “management reporting and consolidation” (18.7%).

An analysis of the correlation between the assessments of internal barriers in the implementation of innovations in information systems and the assessments of the perception of various aspects of SME innovation was also carried out. The research shows that in the case of fourteen internal threats out of 24 (58.33%), “slightly agree” assessments dominated, in nine cases out of 24 (37.5%) “neither agree nor disagree” assessments dominated, in one case out of 24 (4.17%), the most common assessment was “slightly disagree”. For five of the 24 benefits, the variability of ratings expressed by the range was the highest, i.e. equal to 3. For these benefits, respondents used four ratings from a five-point rating scale (i.e. ratings from 2–5). Such variability of assessments was noted in the case of benefits, respectively: “lack of own financial resources”, “internal organizational barriers”, “small housing base” and “lack of strategic plans of the company”. The most consistent assessments were reported for the benefit “no market information”. For this benefit, the assessments used by the respondents are only those of the type: “slightly disagree” or “neither agree nor disagree”. Most often, the “slightly agree” assessments concerned the category of financial barriers (73.1%), legal and tax barriers (68.0%), and resource

barriers (51.3%). Most often, the “neither agree nor disagree” assessments concerned the categories of behavioural barriers (70.0%), technological barriers (56.0%), and those related to human resources (53.6%). The most frequently indicated assessments for the analyzed categories of internal barriers are “slightly agree or agree”. Most often, such assessments concerned the categories of internal barriers, such as: financial (75.8%), legal and tax (68.0%), and resources (53.3%). The largest share of “disagree or slightly disagree” assessments concerned the category of internal barriers related to human resources (21.3%).

Then, an analysis of the correlation between the assessments of financial barriers in the implementation of innovations in information systems and the assessments of the perception of various aspects of SME innovation was carried out. The results of correlation relationships in the case of the analysis of internal financial barriers are presented in the Table 1. The results of the analysis of monotonic dependencies using the Spearman rank correlation coefficient between the assessments of internal barriers to the implementation of innovations in SME information systems and the assessments of SME innovation aspects show that the more respondents agreed with the statement that the limitation of own funds for other investments is a significant barrier to the implementation of innovations in information systems, the less they agreed with the statement that the values professed by their company are conducive to innovation-based policy ($r = -0.458$). Relatively the strongest correlation of all (negative, of moderate strength) occurred in the case of financial barriers, between the barrier of the type “limitation of own funds for other investments” and the statement regarding innovation, such as: “values adhered to by the company are conducive to policy based on innovation”.

Correlation criteria between the size of the enterprise were analyzed with the assessment of internal financial barriers in the implementation of innovations in information systems (see Table 2). All found dependencies were negative dependences with the strength of dependence ranging from weak to high. Comparatively, the strongest negative correlation was found between the size of the enterprise and the financial barrier of the type: “limitation of own funds for other investments” ($r_s = -0.792$). This dependence shows that the larger was the enterprise from the SME category, the less the respondents agreed with the fact that the limitation of own funds for other investments is a significant internal barrier to the implementation of innovations in information systems.

5. Discussion

Summing up, a typical company participating in the research is: a small company, with a regional reach, operating in services, whose organizational and legal form is a civil law partnership, existing on the market for between 5 and 10 years.

A question should be posed whether there is a direct cause and effect relation between the assessments of financial barriers in the implementation of innova-



tions in information systems and the assessments of the perception of various aspects of SME innovation was carried out or whether there is some other moderating factor (determining) the occurrence of this relation. This relation may indicate the respondents' awareness that money and own funds for investments constitute an important barrier for implementing innovation, and to a lesser extent the values of the company and the organizational culture promoting the implementation of innovation in the company.

Larger enterprises from the SME group often generate higher profits, have a more stable capital situation and are relatively less sensitive to changes in the external environment, hence they may also have more own funds for investment in innovation. For such enterprises, own funds may not be such a significant barrier to the implementation of innovations in information systems.

The flexibility of operation and new management solutions, and above all innovations, are essential for maintaining and improving the competitive position of enterprises. The higher the possibilities of internal change of systems, the greater the chances of adapting to the constantly changing environment. An enterprise is precisely such a system, while its organizational structure constitutes one of the elements that should be the most susceptible to changes.

The modern SME sector has a chance to develop only through implementing technological innovations, especially in the field of digital technologies, which will allow to maintain a competitive position on the market in the era of industry 4.0. With the increasing use of new technologies, the business environment is becoming more and more competitive. Therefore, organizations are constantly working to improve their production processes, maintain market shares and survive the competition in a cost-effective way.

6. Conclusions

The article presents the characteristics of the concept of innovation as a factor of a company's success and its impact on information and technological technologies. It also presents the results of research concerning the internal barriers faced by enterprises when introducing innovative solutions.

The aim of the article was to identify financial barriers in implementing innovative information systems. The hypothesis concerned all barriers (external and internal) in the implementation of innovations in information systems. It was partially confirmed during the research procedure. Taking into account all groups of internal barriers and the significant correlation relationships found for them in connection with the aspects of innovation, on average, the relatively strongest correlation relationship (i.e. of moderate strength) occurred for resource barriers. Resource barriers are a set of negative factors coming from the external environment of the company or having their source inside the company. Relatively the strongest correlation (moderate) was found in the case of legal and tax barriers, the need to meet certain formal and legal conditions in order to obtain adequate funding for the implementation of innovations with

no margin for errors on the part of employees is certainly a factor that hinders and limits attempts to implement innovations in SMEs. Among the internal resource barriers, financial barriers (budget for financing changes) turned out to be the most important. The results of the conducted analyses indicate that in the field of implementing innovations, a significant barrier consists in money and own funds for investments, and to a lesser extent the values of the company and organizational culture promoting the implementation of innovation in the company.

Recent years have created great opportunities for small and medium-sized enterprises support in the field of financing innovative activities intended to serve improving their competitive position and increasing the competitiveness of tribraches. Implementation of innovative solutions in the realities of the global market becomes a necessity that determines the company's survival on the market and its development. Innovativeness determines the level and direction of development of a contemporary enterprise, determining the progress, development, and competitive advantage.

The conducted quantitative research is not free from research limitations. First, the size of the study sample indicates that the studies were not fully representative. Therefore, it does not allow to generalize the research results to the entire population. The authors point out, however, that although the limited group of respondents does not allow for generalization, the obtained results can be used as guidelines for the next research process. In addition, the study uses a sample formed exclusively by the Polish SME sector. The authors see the potential of the topic and the directions of future research. Particularly interesting seems to be the analysis of a wider range of determinants of implementing innovations in enterprise information systems. The impact of the human factor on the process of implementing technological innovations seems worthy of further analysis, as this factor is sometimes at odds with the planned changes (organizational resistance). Further research could be extended to include comparisons of data from different countries or an industry analysis.

Considering the scope and nature of the research, the authors believe that the work may bring specific benefits and guidelines for management practitioners implementing innovations in the information systems of their companies, using and developing IT resources. Trying to summarize the recommendations for people managing an enterprise from the SME sector, one can indicate the need to approach the innovation process in a strategic way, taking into account the long-term perspective and planning. It is also important to reduce the conservative approach in company management in favor of an approach focused on the future determined by constant change

References

- Afolayan, A., Plant, E., White, G.R.T., Jones, P. & Beynon-Davies, P. (2015). Information technology usage in SMEs in a developing economy. *Strategic Change*, 24(5), 483–498. <https://doi.org/10.1002/jsc.2023>.
- Ashrafi, R., & Murtaza, M. (2008). Use and impact of ICT on SMEs in Oman. *Electronic Journal Information Systems Evaluation*, 11(3), 125–138.
- Aydiner, A.S. (2020). A model for digital business governance for strategic growth and innovation with dynamic capabilities. In H. Dincer, & S. Yüksel (Eds.), *Strategic outlook for innovative work behaviours: contributions to management science* (pp. 149–163). Springer. https://doi.org/10.1007/978-3-030-50131-0_8.
- Bahrini, R., & Qaffas, A.A. (2019). Impact of information and communication technology on economic growth: evidence from developing countries. *Economies*, 7(1), 21. <https://doi.org/10.3390/economies7010021>.
- Benitez, J., Castillo, A., Llorens, J., & Braojos, J. (2018). IT-enabled knowledge ambidexterity and innovation performance in small US firms: the moderator role of social media capability. *Information and Management*, 55(1), 131–143. <https://doi.org/10.1016/j.im.2017.09.004>.
- Boly, V., Morel, L., & Camargo, M. (2014). Evaluating innovative processes in French firms: methodological proposition for firm innovation capacity evaluation. *Research Policy*, 43 (3), 608–622. <https://doi.org/10.1016/j.respol.2013.09.005>.
- Brzozowska, A., & Kabus, J. (2018). Determinants of enterprises' innovativeness in the light of empirical studies: case studies of Austria and Poland. *Zeszyty Naukowe: Organizacja i Zarządzanie: Politechnika Śląska*. 116, 7–22.
- Castaneda, D.I., & Cuellar, S. (2020). Knowledge sharing and innovation: a systematic review. *Knowledge and Process Management: The Journal of Corporate Transformation*, 27(3), 159–173. <https://doi.org/10.1002/kpm.1637>.
- Castela, B.M., Ferreira, F.A., Ferreira, J.J., & Marques, C.S. (2018). Assessing the innovation capability of small-and medium-sized enterprises using a non-parametric and integrative approach. *Management Decision*, 56(6), 1365–1383. <http://dx.doi.org/10.1108/MD-02-2017-0156>.
- Chau, S.B. & Turner, P. (2001). A four phase model of EC business transformation amongst small to medium sized enterprises. In *Proceedings of the 12th Australasian Conference on Information Systems*. AIS.
- Chege, S.M., & Wang, D. (2020). The influence of technology innovation on SME performance through environmental sustainability practices in Kenya. *Technology in Society*, 60, 101210. <https://doi.org/10.1016/j.techsoc.2019.101210>.

- Dadfar, H., Dahlgaard, J.J., Brege, S., & Alamirhoor, A. (2013). Linkage between organisational innovation capability, product platform development and performance: the case of pharmaceutical small and medium enterprises in Iran. *Total Quality Management and Business Excellence*, 24(7-8), 819-834. <https://doi.org/10.1080/14783363.2013.791102>.
- Grebski, M. (2021). Mobility of the workforce and its influence on innovativeness: comparative analysis of the United States and Poland. *Production Engineering Archives*, 27(4), 272-276. <https://doi.org/10.30657/pea.2021.27.36>.
- Harindranath, G., Dyerson, R., & Barnes, D. (2008). ICT adoption and use in UK SMEs: a failure of initiatives. *Electronic Journal Information Systems Evaluation*, 11(2), 91-96.
- Hong, P., Jeong, J. (2006). Supply chain management practices of SMEs: from a business growth perspective. *Journal of Enterprise Information Management*, 19(3), 292-302. <https://doi.org/10.1108/17410390610658478>.
- Hoque, M.R., Saif, A.N.M., AlBar, A.M., & Bao, Y. (2016). Adoption of information and communication technology for development: a case study of small and medium enterprises in Bangladesh. *Information Development*, 32(4), 986-1000. <https://doi.org/10.1177/0266666915578202>.
- Kapler, M. (2021). Barriers to the implementation of innovations in information systems in SMEs. *Production Engineering Archives*, 27(2), 156-162. <https://doi.org/10.30657/pea.2021.27.20>.
- Kapurubandara, M., & Lawson, R. (2006). Barriers to adopting ICT and e-commerce with SMEs in developing countries: an exploratory study in Sri Lanka. In *Proceedings of the 2006 Collector Conference on Electronic Commerce*. Collector Group.
- Krawczyk, P. (2021). The use of information and communication technologies in small and medium-sized enterprises in Poland. In K. Szymczyk, & I.M.M. El Emary (Eds.), *Advanced trends in ict for innovative business management* (pp. 19-35). CRC Press. <https://doi.org/10.1201/9781003028932>.
- Kwilinski, A., & Kuzior, A. (2020). Cognitive technologies in the management and formation of directions of the priority development of industrial enterprises. *Management Systems in Production Engineering*, 2(28), 133-138. <http://dx.doi.org/10.2478/mspe-2020-0020>.
- Marei, A., Abou-Moghli, A., Shehadeh, M., Salhab, H.A., & Othman, M.D. (2023). Entrepreneurial competence and information technology capability as indicators of business success. *Uncertain Supply Chain Management*, 11(1), 339-350.
- Ongori, H., & Migiro, S.O. (2010). Information and communication technologies adoption in SMEs: literature review. *Journal of Chinese Entrepreneurship*, 2(1), 93-104. <https://doi.org/10.1108/17561391011019041>.
- PARP. (2020). *Report on the condition of the small and medium-sized enterprise sector in Poland*. Retrieved 08.06.2023 from https://www.parp.gov.pl/storage/publications/pdf/06-ROSS-2020_20210624.pdf.

- Reverte, C., Gómez-Melero, E., & Cegarra-Navarro, J.G. (2016). The influence of corporate social responsibility practices on organizational performance: evidence from Eco-Responsible Spanish firms. *Journal of Cleaner Production*, 112(4), 2870–2884. <https://doi.org/10.1016/j.jclepro.2015.09.128>.
- Ritchie, B., & Brindley, C. (2005). ICT adoption by SMEs: implications for relationships and management. *New Technology, Work and Employment*, 20(3), 205–217. <https://doi.org/10.1111/j.1468-005X.2005.00154.x>.
- Sołek-Borowska, C. (2018). The use and benefits of information communication technology by Polish small and medium sized enterprises. *Online Journal of Applied Knowledge Management*, 6(1), 211–225. [https://doi.org/10.36965/OJAKM.2018.6\(1\)211-225](https://doi.org/10.36965/OJAKM.2018.6(1)211-225).
- Stanimirovic, D. (2015). A framework for information and communication technology induced transformation of the healthcare business model in Slovenia. *Journal of Global Information Technology Management*, 18(1), 29–47. <https://doi.org/10.1080/1097198X.2015.1015826>.
- Streimikiene, D., & Ahmed, R.R. (2021). The integration of corporate social responsibility and marketing concepts as a business strategy: evidence from SEM-based multivariate and Toda-Yamamoto causality models. *Oeconomia Copernicana*, 12(1), 125–157. <https://doi.org/10.24136/oc.2021.006>.
- Virglerova, Z., Ivanova, E., Dvorsky, J., Belas, J., & Krulický, T. (2021). Selected factors of internationalisation and their impact on the SME perception of the market risk. *Oeconomia Copernicana*, 12(4), 1011–1032. <https://doi.org/10.24136/oc.2021.033>.

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Appendix

Table 1.

The results of the analysis of monotonic dependencies using the Spearman rank correlation coefficient between the assessments of internal barriers to the implementation of innovations in SME information systems and the assessments of SME innovation aspects

Internal financial barriers	Innovation aspects					Average correlation
	X1	X2	X3	X4	X5	
limited access to external funding sources	-0.183	-	-	-0.172	-	0.261
difficulties in obtaining external financing	0.217	-	-	-	-	
lack of funding to maintain innovation	-	-	-0.367	-0.306	-0.380	
limiting own funds for other investments	-0.277	-0.271	-0.458	-0.245	-0.431	

Notes:

X1 — my company is open to new solutions and changes; X2 — my company is an innovative company; X3 — the company's values work in favour of an innovation-based policy; X4 – my company works in partnership with clients, trying to develop solutions for them; X5 – leaders provide a safe space for making mistakes when employees and teams are looking for new, relevant solutions for the company.

Source: Own preparation.

Table 2.

The results of the analysis of monotonic dependencies using the Spearman rank correlation coefficient between the size of the enterprise with the assessment of internal barriers in the implementation of innovations in information systems

Internal financial barriers	The size of the enterprise	Average correlation
high costs	-0.281	-0.430
lack of own funds	-0.186	
lack of sufficient own funds	-0.263	
limited access to external funding sources	-0.495	
difficulties in obtaining external financing	-0.319	
lack of funding to maintain innovation	-0.678	
limiting own funds for other investments	-0.792	

Source: Own preparation.



Scheme 1.

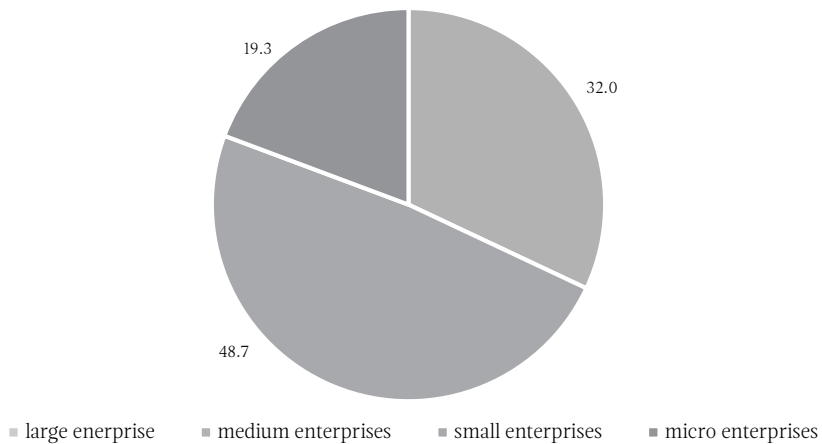
Definitions of “innovation” according to respondents and their division into common areas of meaning

a major change in a company, which is to increase the level of work, and minimize, for example, costs	something that facilitates and improves the work in the company	a change in the work process that improves it	it's a workflow solution
increasing the level of work by implementing new solutions	application of new technology, e.g. in production	application of new solutions in professional work	new developments usually involve technology
modern solutions	new technologies	creating something new in the company	changing procedures by implementing something new
innovation is a change in, for example, technology	technological changes	change in the work process	it's an expense

Source: Own preparation.

Chart 1.

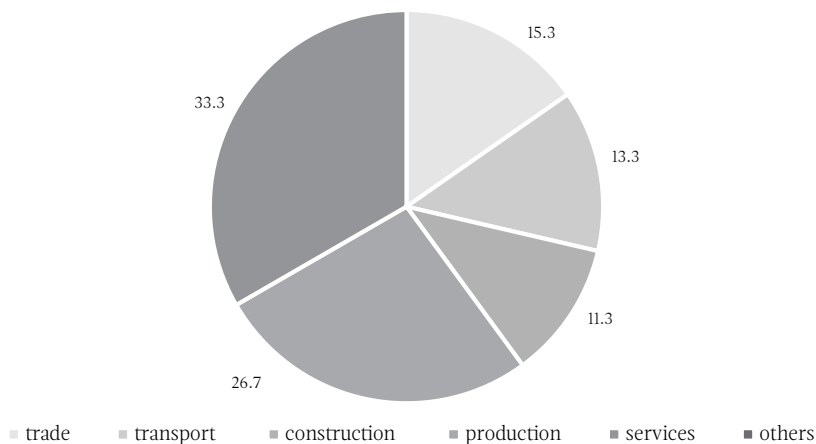
Structure of the researched enterprises in terms of size (%)



Source: Own preparation.

Chart 2.

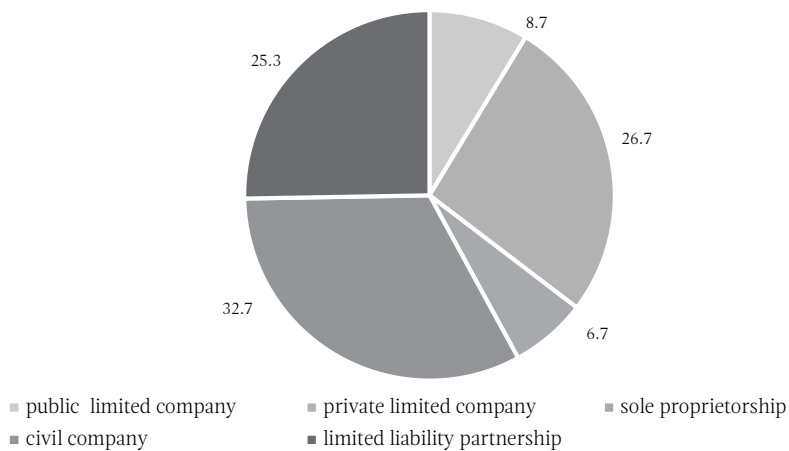
Structure of the researched enterprises in terms of type of activity (%)



Source: Own preparation.

Chart 3.

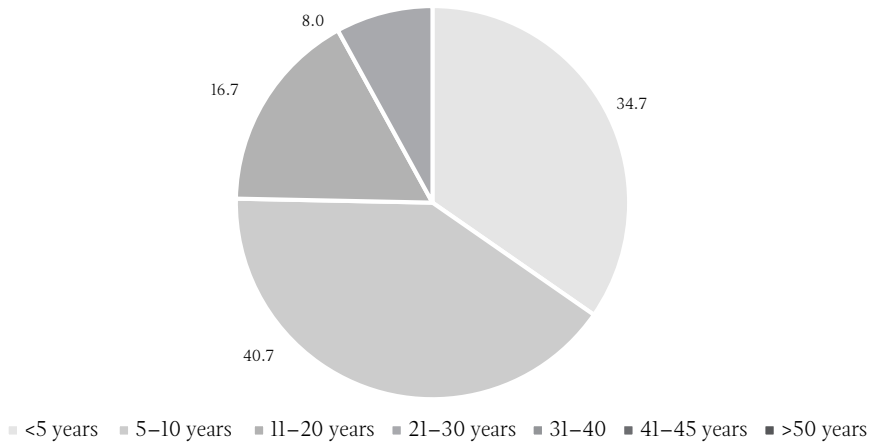
Structure of the researched enterprises in terms of legal form (%)



Source: Own preparation.

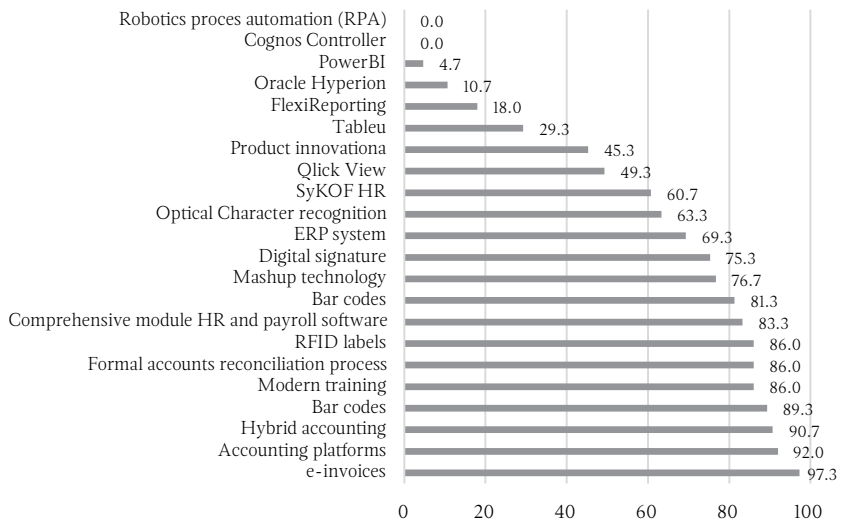


Chart 4.
Structure of the researched enterprises in terms of period of operation (%)



Source: Own preparation.

Chart 5.
Pareto diagram of implemented innovations in information systems supporting important areas of SME management (%)



Source: Own preparation.

