Krakow Review of Economics and Management
Zeszyty Naukowe Uniwersytet Ekonomiczny w Krakowie
4 (1006)
2024

KREM, 2024, 4(1006): 135–152
ISSN 1898-6447
e-ISSN 2545-3238
https://doi.org/10.15678/krem.18100

Innovation in Decision-making Models Applied by Enterprises: Determinants of Organisational Innovation

Beata Skowron-Grabowska

Czestochowa University of Technology, Faculty of Management, Department of Management and Entrepreneurship, Armii Krajowej 19b, 42-200 Częstochowa, Poland,
e-mail: b.skowron-grabowska@pcz.pl, ORCID: https://orcid.org/0000-0003-4845-4717

Suggested citation: Skowron-Grabowska, B. (2024). Innovation in Decision-making Models Applied by Enterprises: Determinants of Organisational Innovation. *Krakow Review of Economics and Management / Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie*, 4(1006), 135–152. https://doi.org/10.15678/krem.18100

ABSTRACT

Objective: The paper addresses innovation as a vital issue in management. The meaning of innovation is analysed in knowledge management and business strategy. The intention of the article is to present the innovation issue from the model perspective and to illustrate the mentioned matters based on research results.
Research Design & Methods: The research problem was how to apply innovation in a decision-making model and describing the determinants of its implementation.
Findings: The findings help address a number of results. The study tests a decision-making model, collaboration between managers in enterprises, and their support for innovation.
Implications/Recommendations: When making decisions, enterprises must account for problems brought about by innovation in their current operations and strategy. Unfortunately, upwards of 40% of enterprises do not cooperate with research and development organisations. Further research will be required to understand why not.
Contribution: This study has a range of implications for innovation researchers. It argues for increased attention to the decision-making process in the context of organisational innovation.

Article type: original article.

Keywords: innovation in decision-making models, organisational innovation, determinants, enterprise.

JEL Classification: O30.

1. Introduction

In the study of management theory, innovation is approached from multiple perspectives. One of the most important is the model-based analysis of innovation, which is the foundation for the growth of every business. Growth is assured by the right decisions which, considering their complexity derived from multiple structural variants, require a definition of innovation and the structuring of the aspects of innovation in business enterprises. With a conference being held jointly with the 50th anniversary of Professor Janusz Czekaj's academic career, organisational innovation became the central matter.

The starting point is the area of knowledge management that is needed to create new products and technologies (Morawski, 2014). Knowledge of the potential of consumers' information requirements defined in market challenges is equally important (Kieżel, 2018). Most advanced technology innovation, targeted at the growth and modern transformation of businesses as well as collaboration with the research and development (R&D) sector, rises to such challenges (Jasińska-Biliczak, 2017). A strategic perspective needs to be included in the analysis of the the impact of these areas of innovation. The primary objectives of innovation and the boundary conditions for its implementation are of particular importance (Mielcarek, 2017). Setting up the goal of innovation properly within the area defined by the boundary conditions enables business performance to grow through innovation.

While innovation enables an increase in enterprise performance and is in itself complex and multifaceted, it requires certain generalisation and simplification processes (Garud, Tuertscher & Van de Ven, 2013). These can be achieved through the model presentation of innovation, based on unique decision identifiers that support the integration of distributed heterogeneous data into management processes (Szpitter, 2020). The base of those processes is the product of diverse impact factors and conditions, providing grounds for a model-based presentation of innovation decisions. The innovation-oriented competing values framework should be specifically emphasised here (Czekaj & Ziębicki, 2013).

In model-based perspectives, organisational innovation should be highlighted. Organisational innovation is defined as action that enables the adaptation of anything new within an organisation. Professor Janusz Czekaj has analysed organisational

innovation from two perspectives. One identifies organisational innovation with an idea, practice, or material artefact recognised as new by the implementing organisation. The other identifies organisational innovation as a multiple-aspect presentation of new products, methods, combinations, or synthetic knowledge launches (Czekaj & Ćwiklicki, 2014). The outputs of such measures, adopted in original products or services, create new values for the customer, who takes advantage of the value innovation in this way (Skowron-Grabowska, 2021). Taking these aspects of innovation into account, modelling of decision-making processes at an enterprise is key, as are innovation conditions in the context of knowledge management.

2. The Conditions and Essence of Innovation from the Perspective of Knowledge Management

The conference entitled "Managing organisations in the digital age. Challenges, trends, concepts" is a special challenge for the academic staff. The conference is being held to commemorate the 50th anniversary of Professor Janusz Czekaj's academic career.

Professor Czekaj's anniversary and the subject matter to be covered at the conference encourages reflection on his highly creative work. While Professor Czekaj has covered a broad spectrum of thought in his myriad papers, further analysis here will be limited to organisational innovation as a fundamental research problem in the discipline of management studies.

Organisation management largely applies to the processes of creating and developing new methods in response to the challenges faced by enterprises operating in competitive markets. Professors Czekaj and Ćwiklicki have pointed out that the above processes can be viewed from two perspectives: conceptual and utilitarian. The conceptual focuses on effective and smooth management concepts, driving changes in objectives, value creation, and the systems in which enterprises operate. The second concerns enterprise growth and the specification of enterprise operations in the form of practical solutions integrating various concepts and paradigms (Czekaj & Ćwiklicki, 2014). The integration processes enable the implementation of innovation at enterprises. For innovation to be brought into existence, adequate actions, relationships, and conditions need to occur (Table 1).

The below presentation considers the perspective of an enterprise – with its resources, creativity, entrepreneurial skills, and orientation – on innovation. Resources may help to create key competences which help determine a strategy (Kaczmarek, 2022). Types of innovation are further indicated in terms of fundamental prerequisites for the incubation and transformation of management processes (Czekaj & Ćwiklicki, 2014).

Transformation processes largely define the innovation at enterprises that are launching a new or significantly modified product, new marketing (Wiktor, 2016) or organisational methods, new workplace organisation, or a change in external relations. Innovation is viewed as the key to growth, which creates elements of an organisation's strategy. The above-mentioned innovation measures are analysed in the context of functional strategy, and incorporated into the organisation's overall innovation strategy (Sołtysik, 2020). Innovation undertaken upon the initiative of consumer organisations has also proven important (Kaplan, 1998). Ultimately, innovation is embedded in strategic management (Zakrzewska-Bielawska, 2014).

Table 1. Resources and Relationships in Enterprise Management from the Innovation Perspective*

Enterprises	Customer	Market
– Resources/knowledge – Creativity – Entrepreneurship – Innovativeness – Key Enabling Technologies – Concepts, methods, strategies	– New needs creation processes – Value innovation	– Relationships between organisations – Value resource transfer – Networked structure – Evolutionary trend

* Due to the subject matter of the analysis, types of innovation are not specified in detail. They have been classified by Hintze (2015), among others.

Source: the author, based on (Czekaj & Ćwiklicki, 2014).

In order to relate innovation to management studies, including strategic management, the context of knowledge management needs to be understood (Michna, 2017). Knowledge management is identified with the targeted designing of processes, methods, and structures in order to enhance, renew, share, or improve the use of knowledge (Hamid, Mahmood & Khalaf, 2021). Two types of knowledge are at work in knowledge management – the knowledge necessary to create new products and technologies, and knowledge of the potential needs of innovation consumers (Pichlak, 2020). For instance, implementing innovation in photovoltaics has garnered a great deal of consumer interest over the past decade (Buła, Schroeder & Ziółko, 2020). International collaboration is an important source of knowledge acquisition (Mesjasz, 2017). Selected aspects of knowledge management and innovation point to the need for organisations to collaborate in this area. Collaboration in innovation processes can take the following forms (Pittino & Visintin, 2009):

– defensive, with companies primarily using their own knowledge resources and undertaking incremental innovation,

– exploratory, arising from a radical innovator attitude, focused on the broad use of external sources of knowledge,

– analytic, as the outcome of choosing partners to implement innovation in response to new market trends; particularly digital technologies (Buarque *et al*., 2020),

– reactive, focusing on setting up collaboration based on the need to use external knowledge, aiming at improving proposals or implementing innovation internally.

Innovation characterised by the most advanced technologies drives pro-growth actions at enterprises engaged in modern transformation. Such innovation has the R&D sector's activity at the source, delivering innovative projects for enterprises as complete solutions or in coordination with business operators (Głód & Swałek, 2021). This collaboration is based primarily on the transfer of knowledge and support of innovation activities of undertakings (Knop, Szczepanik & Olko, 2014). An enterprise collaboration may have negative or positive effects, of course, but it could become a chance for development (Kaczmarek *et al*., 2021). A strategic approach is an important aspect of innovation in enterprises, where innovation strategy is used to translate the primary goal into specific innovation objectives. It also defines the boundary conditions for innovation, specifying the fundamental assumptions to enable the effective implementation of innovative solutions (Malara, 2013).

A number of requirements should be addressed in implementing an innovation strategy (Sosnowska, 2013):

– achieving cohesion of the innovation framework and the competition strategy adopted,

– ensuring the right relationships within the innovation subsystem and other subsystems in the organisation to deliver the synergy effects,

– improving the organisation's performance driven by innovation.

These conditions form a decision-making base for initiating and implementing innovation. With an understanding of the overall complexity of innovation and the issues surrounding it, we now turn to the model approach as it pertains to organisational innovation.

3. Model Approach to Decision-making Conditions versus Organisational Innovation

Model approaches play an important role in decision-making at enterprises. In these approaches, unique decision identifiers support the integration of distributed, non-uniform, heterogeneous data, creating a base in the management process (Szpitter, 2020). At that point, it is important to analyse the conditions in the mobile environment in order to create interactions in models used in the enterprise's decision-making processes.

Decisions are the function of multiple different factors (Sopińska & Dziurski, 2018), including (Szymura-Tyc, 2011):

– globalisation,

– lowering the risks at a single enterprise, balanced by a network,

– creating new concepts that improve the utilisation of knowledge resources through advanced IT systems.

Each of these factors provides grounds for a model-based presentation of the matters of knowledge- and innovation-oriented management (Hisrich & Ramadani, 2017). Among multiple diverse perspectives in the model approach, the concentration value model, which, due to its character, is based on integration, can be distinguished. Integration involves four management models: rational goal, internal process, interpersonal relationship, and open systems. Which model is adopted depends on the development phase of the specific organisation. The first, initial phase should be based on the rational goal model. The subsequent phases, corresponding to the organisation's growth, should focus on the internal process model, followed by the interpersonal relationship model and the open system model (Czekaj & Zięb icki, 2013).

Model architectures can be viewed from various perspectives, including the characteristics of the goals, tasks, contacts, relationships, and technologies. All together, these form the qualitatively unique internal workings of an enterprise with a large number of linked tasks (Tubielewicz, 2013). Discussion of the integration and variable character of innovation at organisations tends to focus mainly on the model approach (Brzeziński, 2015). The following models can be distinguished in one of the approaches, which are essential for innovation (Brzeziński, 2015):

– supply-based, where the basis is defined by the linear model of innovation,

– demand-based, also relying on the linear model of innovation,

– interactive, including a mixed demand and supply model involving feedback relationships,

– interactive, including a mixed demand and supply model involving chain link relationships,

– networked,

– open innovation.

Considering the diversity of the model approaches and the objective of this paper, the emphasis here shall be placed on the importance of organisational innovation in an enterprise. Broadly speaking, organisational innovation means that the enterprise is oriented toward the creation and implementation of various types of innovation. The model perspective justifies the emphasis of the multidimensional character of innovation as a part of demonstrating the innovation potential of the enterprise. However, determining an enterprise's innovation level can be identified with the

general ability to develop and adapt new projects, whether material (technology) or intangible (such as organisational innovation).

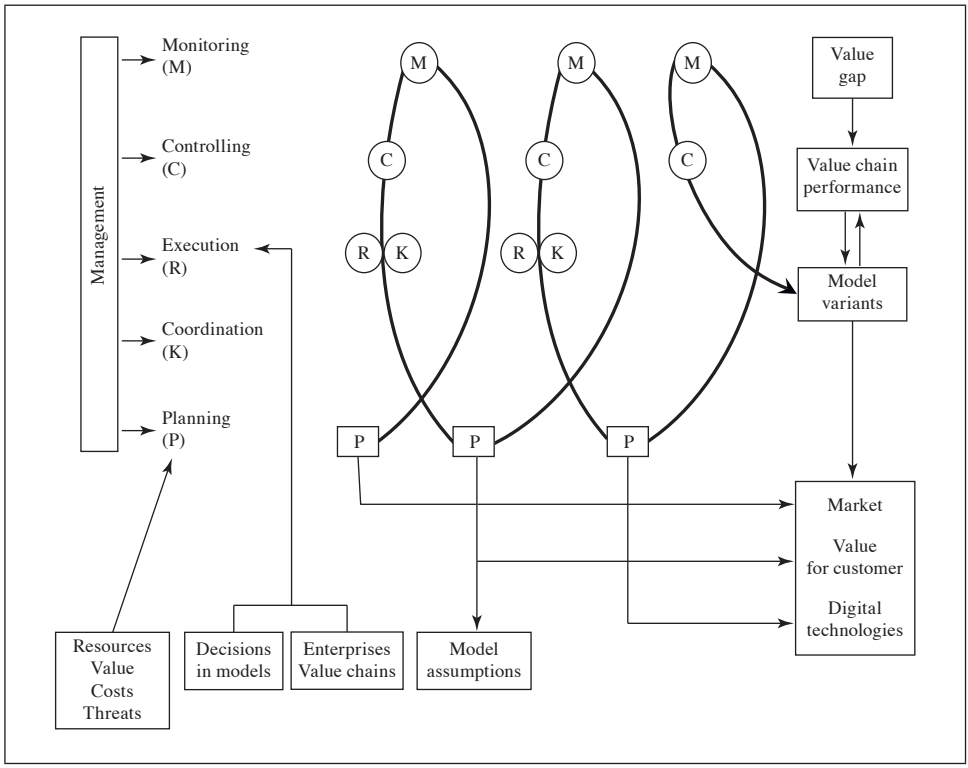

Fig. 1. Modelling Decision-making Processes within Value Chains
Source: (Skowron-Grabowska, 2021, p. 157).

This type of activity is also distinguished in the interpretation of organisational innovation as an adaptation of anything new in the organisation. Then, organisational innovation can be analysed in its two meanings – either as an idea, practice, or material artefact considered to be new by the implementing organisation; or as a broad perspective on the process of launching a new item, method, combination, or synthetic knowledge adopted in original products or services that create new value (Czekaj & Ćwiklicki, 2014). Organisational innovation-oriented processes are of special importance. The process approach will then translate into "lean management, new approaches to work organisation (5S programme), new strategic management methodologies (Balanced Scorecard)" (Czekaj & Ćwiklicki, 2014). Strategic

management, in which the logic of an enterprise's actions in the model perspective focuses on implementing innovation projects, is particularly important. According to Krupski (2014), innovation inspires new strategic management paradigms. The model approach to decision-making instruments leads to the creation of innovation, with value innovation being particularly important (Skowron-Grabowska, 2021). Value innovation starts with the enterprise's attitude toward shareholders and its willingness to collaborate in different areas to create value for customers through innovation (Klimek & Żelazko, 2020).

Modelling decision-making processes at enterprises is a final important issue (Fig. 1). The idea of the analysis was transposed to management, from planning through coordination and ultimately the accomplishment of targets and objectives.

4. Analysis of Innovation Activity Based on Empirical Studies

Taking into account the prior theoretical discussion, particularly the context of Professor Czekaj's creative accomplishments, I have used my own empirical/pilot studies to verify the importance of organisational innovation for 107 manufacturing businesses. The management of these enterprise first described their collaboration with the R&D sector (Table 2).

Table 2. Answers to Question 1 (Number of Enterprises)

Are the enterprises engaged in research and development collaboration with R&D sector organisations?	
Yes	61
No	28
Don't know	18
Total	107

Source: the author, based on a survey questionnaire.

Table 3. Answers to Question 3 (Number of Enterprises)

Do decision-making models enable management to develop innovation at the enterprises?	
Yes	75
No	11
Don't know	21
Total	107

Source: the author, based on a survey questionnaire.

The central research question were whether the enterprises collaborated on research and development with R&D sector organisations, and what the criteria for implementing such organisational innovation were.

Question 2 refers to the issue of the development and usability of decision--making models in the field of innovation activities (Table 3). 70% of the surveyed enterprises stated that the models were reasonable and useful.

Question 3 focused on the determination of the percentage of organisational innovation within the overall quantity of innovation implemented at an enterprise (Table 4). The responses show that 35% of all the implemented innovation is represented by organisational innovation.

A general conclusion is that notwithstanding the low level of interest in collaboration with the R&D sector among enterprises, organisational innovation is important for staff.

Table 4. Proportion of Organisational Innovation in the Innovation Activities (Number of Enterprises)

What is the proportion of organisational innovation in the enterprises' innovation activities?	
Organisation innovation	38
Other types of innovation	69

Source: the author, based on a survey questionnaire.

The chi-square statistic can be used to measure the degree of dependence between the qualitative characteristics corresponding to the questions in the survey questionnaire. In the chi-square test of independence, the null hypothesis of the lack of correlation between the tested variables is verified against the alternative hypothesis of the existence of a significant relationship between the analysed features. The test of the hypothesis is the chi-square statistic:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{k} \frac{(n_{ij} - \hat{n}_{ij})^2}{\hat{n}_{ij}}, \tag{1}$$

where:

n_{ij} – empirical numbers presented in a contingency table with r rows and k columns,

$\hat{n}_{ij}$ – theoretical (expected) numbers estimated based on the following formula:

$$\hat{n}_{ij} = \frac{n_{i.} \cdot n_{.j}}{n}, \tag{2}$$

where:

$n_{i.}$ – the number of observations in the i-th row of the contingency table,

$n_{.j}$ – the number of observations in the j-th column of the contingency table,

n – statistical sample size.

Assuming the null hypothesis is true, the test statistic has a chi-square distribution with $(r-1)(k-1)$ degrees of freedom.

The chi-square test can be used in empirical studies if the counts of individual cells in the contingency table are not less than 5. If the empirical counts in the contingency table are relatively small, the chi-square statistic revised by Yates's correction for continuity can be determined:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{k} \frac{\left(n_{ij} - \hat{n}_{ij} - 0.5\right)^2}{\hat{n}_{ij}}. \tag{3}$$

In this paper, the chi-square test of independence was used to identify significant relationships between organisational innovation and other types of innovation.

At the significance level of 0.05, there is no grounds to reject the null hypothesis that there is no relationship between the distribution of answers to question 3 and the classification (grouping) of the surveyed enterprises based on demographic characteristics 1 and 2. This means that characteristic 1 did not differentiate production enterprises due to the choice of innovation type (organisational or other). Similarly, the chi-square statistic values (0.09; 0.01) indicate no significant links between the choice of innovation type by enterprises and characteristic 2 (Tables 5–7). That is, this characteristic did not differentiate enterprises in terms of the type of innovations they implemented.

Table 5. Distribution of Answers to Question 3 by Variants of Demographic Characteristic 1

Demographic Characteristic 1	Question 3		
	organisational innovation	other types of innovation	total
Variant 1	7	17	24
Variant 2	31	52	83
Total	38	69	107

Source: the author, based on a survey questionnaire.

Table 6. Distribution of Answers to Question 3 by Variants of Demographic Characteristic 2

Demographic Characteristic 2	Question 3		
	organisational innovation	other types of innovation	total
Variant 1	17	33	50
Variant 2	21	36	57
Total	38	69	107

Source: the author, based on a survey questionnaire.

Table 7. Chi-square Statistic (Is There a Relationship between Demographic Characteristics 1, 2, 3 and the Distribution of Answers to Question 3?)

Specification	Question 3		
	characteristic 1	characteristic 2	characteristic 3
Chi-square statistic	0.54 [0.4607]	0.09 [0.7592]	35.87 [0.0000]
Yates's correction for continuity	0.25 [0.6202]	0.01 [0.9171]	33.49 [0.0000]

Notes: *p*-values are given in parentheses.

Source: the author, calculations done in Statistica 13.3.

Table 8. Distribution of Answers to Question 3 by Variants of Demographic Characteristic 3

Demographic Characteristic 3	Question 3		
	organisational innovation	other types of innovation	total
Variant 1	4	49	53
Variant 2	34	20	54
Total	38	69	107

Source: the author, based on a survey questionnaire.

Based on the estimated value of the chi-square statistic – 35.87 [0.0000] (corrected for Yates continuity to 33.49 [0.0000]) – the null hypothesis must be rejected in favour of the alternative hypothesis at a significance level of 0.05. This means that characteristic 3 significantly differentiates enterprises by innovation type. The data in Table 8 show that enterprises with variant 1 of characteristic 3 tend to create other innovations, whereas enterprises with variant 2 of characteristic 3 more frequently create organisational innovations.

Based on a significance level of 0.05, there is no evidence to reject the null hypothesis that there is no correlation between the distribution of answers to question 1 and the classification of enterprises according to characteristic 1. This indicates that characteristic 1 does not distinguish manufacturing companies in terms of engagement in research and development collaboration with R&D sector organisations. However, in two subsequent cases, the null hypothesis should be rejected in favour of the alternative hypothesis at a significance level of 0.05. This suggests that characteristics 2 and 3 had a significant impact on the engagement of enterprises in research and development collaboration with R&D sector organisations (Table 9). Upon analysing Table 10, it is evident that enterprises with variant 1 of characteristic 2 were more likely to be involved in R&D. Meanwhile, enterprises with variant 2 of characteristic 2 were not involved in R&D or the respondents had no knowledge of the topic. Additionally, from Table 11, it can be seen that enter-

prises with variant 2 of characteristic 3 were often involved in R&D, while enterprises with variant 1 of characteristic 3 did not engage in R&D or the respondents were not aware of such activities (Table 12).

Table 9. Distribution of Answers to Question 1 by Variants of Demographic Characteristic 1

Demographic Characteristic 1	Question 1			
	yes	no	don't know	total
Variant 1	20	9	8	37
Variant 2	41	19	10	70
Total	61	28	18	107

Source: the author, based on a survey questionnaire.

Table 10. Distribution of Answers to Question 1 by Variants of Demographic Characteristic 2

Demographic Characteristic 2	Question 1			
	yes	no	don't know	total
Variant 1	43	11	11	65
Variant 2	18	17	7	42
Total	61	28	18	107

Source: the author, based on a survey questionnaire.

Table 11. Distribution of Answers to Question 1 by Variants of Demographic Characteristic 3

Demographic Characteristic 3	Question 1			
	yes	no	don't know	total
Variant 1	9	22	13	44
Variant 2	52	6	5	63
Total	61	28	18	107

Source: the author, based on a survey questionnaire.

Table 12. Chi-square Statistic (Is There a Relationship between Demographic Characteristics 1, 2, 3 and the Distribution of Answers to Question 1?)

Specification	Question 1		
	characteristic 1	characteristic 2	characteristic 3
Chi-square statistic	0.934 [0.6267]	7.839 [0.0198]	40.927 [0.0000]
Yates's correction for continuity	0.977 [0.6137]	7.849 [0.0197]	40.728 [0.0000]

Notes: *p*-values are given in parentheses.

Source: the author, calculations done in Statistica 13.3.

Based on the significance level of 0.05, there is no evidence to reject the null hypothesis that there is no correlation between the distribution of answers to question 2 and the demographic characteristic 1 of the surveyed manufacturing enterprises. This suggests that characteristic 1 did not differentiate these enterprises in terms of decision-making models for developing innovation concepts. However, the null hypothesis should be rejected in favour of the alternative hypothesis for characteristics 2 and 3, indicating that they significantly impact decision-making models for developing innovation (Table 13). The results in Table 14 show that enterprises with variant 2 of characteristic 2 more often confirmed the existence of decision-making models that enabled management to develop innovation (79%) than those with variant 1 (57%). Similar observations were made for characteristics 3 and 2 in Table 15, where enterprises with variant 2 of characteristic 3 more often confirmed the existence of decision-making models that enabled management to develop innovation at the enterprises (84%) than those with variant 1 (48%). The data presented in Table 16 confirms that there is a relationship between demographic characteristics 1, 2, 3 and the distribution of the answers to question.

Table 13. Distribution of Answers to Question 2 by Variants of Demographic Characteristic 1

Demographic Characteristic 1	Question 2			
	yes	no	cannot say	total
Variant 1	29	5	8	42
Variant 2	46	8	11	65
Total	75	13	19	107

Source: the author, based on a survey questionnaire.

Table 14. Distribution of Answers to Question 2 by Variants of Demographic Characteristic 2

Demographic Characteristic 2	Question 2			
	yes	no	cannot say	total
Variant 1	25	8	11	44
Variant 2	50	5	8	63
Total	75	13	19	107

Source: the author, based on a survey questionnaire.

The support and engagement of management are required for the design and implementation of innovation because implemented innovation usually leads to multiple significant changes in the organisation's operations. Changes in the model apply to the organisational structure, formation of project teams, and acceptance of innovation (Skowron-Grabowska & Jasińska, 2019). The broad spectrum of activi-

ties poses a challenge to managers who support the implementation of innovation, including organisational innovation (Wuttke, Blome & Protopappa-Sieke, 2012).

Table 15. Distribution of Answers to Question 2 by Variants of Demographic Characteristic 3

Demographic Characteristic 3	Question 2			
	yes	no	cannot say	total
Variant 1	19	8	13	40
Variant 2	56	5	6	67
Total	75	13	19	107

Source: the author, based on a survey questionnaire.

Table 16. Chi-square Statistic (Is There a Relationship between Demographic Characteristics 1, 2, 3 and the Distribution of Answers to Question 2?)

Specification	Question 2		
	characteristic 1	characteristic 2	characteristic 3
Chi-square statistic	0.079 [0.9612]	6.325 [0.0423]	15.712 [0.0004]
Yates's correction for consistency	0.2156 [0.8978]	6.257 [0.0438]	15.399 [0.0005]

Notes: *p*-values are given in parentheses.

Source: the author, calculations done in Statistica 13.3.

Hatcher and team emphasise that workers follow diverse motives when participating in decision-making processes (Hatcher, Ross & Collins, 1991). The prevailing motivation is to help improve individual and organisational performance and to make work easier (Biłyk, 2020). Other studies of American workers indicate that they "expect to have a greater influence on decisions taken in areas related to the planning and organising of their own work and to working methods. Decisions about company policy or staffing policy were less popular" (Biłyk, 2020).

These results suggest that workers are largely interested in organisational innovation. The need for innovation-related patents should be emphasised. High technology innovation creates areas where performance improvement occurs as a result of patent implementation projects (Wanzenböck, Neuländtner & Scherngell, 2020). The report, "Capital of Intangible Goods within Global Value Chains" (Lisowska-Bilińska, 2017) was among the first to discuss the value of intangible goods, which represented almost one-third of the global sum of goods produced and sold worldwide during 2010–2014. Their input largely increased the value of products and was primarily focused on the broadly defined telecommunication and IT sectors (Lisowska-Bilińska, 2017). "Key Enabling Technologies (KETs) are a significant extension of

the research. KETs are knowledge-intensive and associated with high R&D intensity, rapid innovation cycles, largescale capital expenditures, and highly-skilled employment. They enable processes, goods, and service innovation through the economy. They are multidisciplinary, cutting across many areas of technology with a trend toward convergence and integration" (European Commission, 2009).

For example, knowledge management models in the context of patent operations in German regions were identified in KET research. Five types of models were distinguished in the innovation area in the regions, mainly emphasising the number of patents per region, their structure, and sources of knowledge creation. The importance of nanotechnologies with interactive knowledge deliverables in the region was likewise underscored (Wessendorf, Kopka & Fornahl, 2021).

The conclusions of the empirical studies are as follows:

– enterprises do engage in innovation activities, yet only 57% of them collaborate with the R&D sector,

– management and personnel implement organisational innovation as it has an immediate effect on how the workplace is organised,

– patents play an important role in innovation activities, as they are based on knowledge management processes.

5. Recommendations

As the review of the literature and empirical research suggests, innovation, particularly organisational innovations play a crucial role in decision-making processes. My finding also suggest it would be beneficial to conduct further research on guiding managerial staff toward an innovative approach in enterprises. The study revealed that the implementation of innovations has a similar structure, with a low percentage of organsational innovations. The reasons for this trend, along with ways to increase organisational innovation in enterprises, remains a topic for investigation. The present research provides a basis for further and independent analyses of enterprises.

6. Summary

A general analysis of innovation and knowledge management in enterprises reveals the importance of these matters, both in the day-to-day operations and in strategy. Of the selected range of activities, implemented innovation needs to be emphasised, yet it seems reasonable to expand still further the collaboration between businesses and the R&D sector. As a result, a major extension of innovation activities at enterprises will become a realistic prospect.

Particular attention should be given to organisational innovation, the importance of which is based on the immediate interest among the workforce seeking

to implement multiple organisational improvements at their workplaces. Bottom-up workforce initiatives, in coordination with management, are ripe grounds for implementing organisational innovation.

Conflict of Interest

The author declares no conflict of interest.

References

Biłyk, A. (2020). Partycypacja decyzyjna we współczesnym kontekście pracy – ograniczenia koncepcji i nowa perspektywa badawcza. In: A. Sopińska, A. Modliński (Eds), *Współczesne zarządzanie – koncepcje i wyzwania* (pp. 261–274). Oficyna Wydawnicza SGH – Szkoła Główna Handlowa w Warszawie.

Brzeziński, S. (2015). *Outsourcing Idea in the Contemporary Management*. Vysoka skola banska – Technicka univerzita Ostrava.

Buarque, B. S., Davies, R. B., Hynes, R. M., & Kogler, D. F. (2020). OK Computer: The Creation and Integration of AI in Europe. *Cambridge Journal of Regions, Economy and Society*, *13*(1), 175–192. https://doi.org/10.1093/cjres/rsz023

Buła, P., Schroeder, T., & Ziółko, M. (2020). Renewable Energy through Industry 4.0 on the Example of Photovoltaic Development in Selected European Counties. In: P. Buła, B. Nogalski (Eds), *The Future of Management: Industry 4.0 and Digitalization* (pp. 92–107). Jagiellonian University Press.

Czekaj, J., & Ćwiklicki, M. (2014). Uwarunkowania tworzenia innowacji organizacyjnych. *Studia Ekonomiczne*, 183, 22–31.

Czekaj, J., & Zięb icki, B. (2013). Pozytywna nauka o organizacji na tle ewolucji teorii i koncepcji zarządzania. *Organizacja i Kierowanie*, *3*(156), 45–57.

European Commission. (2009). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Preparing for our future: Developing a common strategy for key enabling technologies in the EU (COM(2009)512).

Garud, R., Tuertscher, P., & Van de Ven, A. H. (2013). Perspectives on Innovation Processes. *Academy of Management Annals*, *7*(1), 775–819. https://doi.org/10.5465/19416520.2013.791066

Głód, G., & Swałek, A. (2021). Pro-innovative Perception of Environment in Family Businesses. *Organizacja i Zarządzanie: Kwartalnik Naukowy*, 1, 5–16.

Hamid, M. Q., Mahmood S. A., & Khalaf, B. M. (2021). The Role of Knowledge Management Strategies in Improving the Quality Of Educational Service – University Of Anbar as a Model. *Materials Today: Proceedings*. https://doi.org/10.1016/j.matpr.2021.04.525

Hatcher, L., Ross, T. L., & Collins, D. (1991). Attributions for Participation and Nonparticipation in Gainsharing – Plan Involvement Systems. *Group & Organization Studies*, *16*(1), 25–43. https://doi.org/10.1177/105960119101600103

Hintze, S. (2015). *Value Chain Marketing. A Marketing Strategy to Overcome Immediate Customer Innovation Resistance*. Springer International Publishing Switzerland.

Hisrich, R. D., & Ramadani, V. (2017). *Effective Entrepreneurial Management. Strategy, Planning, Risk Management, and Organization*. Springer. https://doi.org/10.1007/978-3-319-50467-4

Jasińska-Biliczak, A. (2017). Endogeniczne uwarunkowania innowacyjności sektora małych i średnich przedsiębiorstw w regionie – ujęcie teoretyczne i praktyczne. *Studia KPZK PAN*, 181.

Kaczmarek, J. (2022). The Stance, Factors, and Composition of Competitiveness of SMEs in Poland. *Sustainability*, *14*(3), 1788. https://doi.org/10.3390/su14031788

Kaczmarek, J., Alonso, S. L. N., Sokołowski, A., Fijorek, K., & Denkowska, S. (2021). Financial Threat Profiles of Industrial Enterprises in Poland. *Oeconomia Copernicana*, *12*(2), 463–498. https://doi.org/10.24136/oc.2021.016

Kaplan, R. S. (1998). Innovation Action Research: Creating New Management Theory and Practice. *Journal of Management Accounting Research*, *10*, 89–118.

Kieżel, E. (2018). Wiedza ekonomiczna polskich konsumentów jako podstawa innowacyjnej konsumpcji. *Handel Wewnętrzny*, *3*(374), 219–230.

Klimek, J., & Żelazko, B. (2020). Otwarte innowacje w sektorze producentów kosmetyków – uwarunkowania i sposoby wdrażania. In: K. Poznańska (Ed.), *Modele i formy innowacji*. Oficyna Wydawnicza SGH.

Knop, L., Szczepanik, M., & Olko, S. (2014). Innowacje społeczne w kreatywnej Europie w perspektywie strategii Europa 2020. *Zeszyty Naukowe Politechniki Śląskiej. Organizacja i Zarządzanie*, 73, 239–253.

Krupski, R. (2014). Innowacje wartości i innowacje otwarte w kontekstach odpowiednich dla nich strategii. *Prace Naukowe Wałbrzyskiej Wyższej Szkoły Zarządzania i Przedsiębiorczości*, *30*, 7–16.

Lisowska-Bilińska, E. (2017). Raport WPIO. Dobra niematerialne podnoszą wartość towarów i zwiększają zyski. *Kwartalnik Urzędu Patentowego*, 4(34), 6–8.

Malara, Z. (2013). Innowacje i przedsiębiorczość – spojrzenie wstecz, teraźniejszość i perspektywy. In: I. Dudzik-Lewicka, H. Howaniec, W. Waszkielicz (Eds), *Przedsiębiorczość, innowacje i wiedza w zarządzaniu przedsiębiorstwem*. Wydawnictwo Naukowe Akademii Techniczno-Humanistycznej w Bielsku-Białej.

Mesjasz, C. (2017). Przedsiębiorstwo międzynarodowe – rozwój, strategie i struktury. In: J. Wiktor (Ed.), *Zarządzanie przedsiębiorstwem międzynarodowym. Integracja różnorodności* (pp. 75–106). Wydawnictwo C.H. Beck.

Michna, A. (2017). *Orientacja na zarządzanie wiedzą w kontekście innowacyjności małych i średnich przedsiębiorstw*. Wydawnictwo Politechniki Śląskiej.

Mielcarek, P. (2017). Doskonalenie procesu innowacji w przedsiębiorstwach przemysłowych – wyniki badań. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 463, 216–224. https://doi.org/10.15611/pn.2017.463.18

Morawski, M. (2014). Zarządzanie wiedzą, kapitałem intelektualnym, talentami – wzajemne relacje. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 340, 747–758. https://doi.org/10.15611/pn.2014.340.66

Pichlak, M. (2020). *Innowacje ekologiczne, zdolności dynamiczne i efektywność organizacji*. CeDeWu.

Pittino, D., & Visintin, F. (2009). Innovation and Strategic Types of Family SMEs: A Test and Extension of Miles and Snow's Configurational Model. *Journal of Enterprising Culture*, *17*(3), 257–295. https://doi.org/10.1142/s0218495809000382

Skowron-Grabowska, B. (2021). *Łańcuchy wartości w zarządzaniu organizacjami. Wyzwania innowacyjno-kryzysowe*. PWE.

Skowron-Grabowska, B., & Jasińska, K. (2019). *Zarządzanie wiedzą w projektach organizacji oświatowych w województwie śląskim*. Wydawnictwo Politechniki Częstochowskiej.

Sołtysik, M. (2020). *Projektowanie strategii innowacji*. PWE.

Sopińska, A., & Dziurski, P. (2018). Postawy wobec zarządzania wiedzą w otwartych innowacjach. *Przegląd Organizacji*, 7, 25–30. https://doi.org/10.33141/po.2018.07.04

Sosnowska, A. (2013). Podejście projektowe w tworzeniu i realizacji strategii innowacji w przedsiębiorstwie. *Zarządzanie. Teoria i Praktyka*, 1(7), 13–28.

Szpitter, A. (2020). *Architektura zarządzania procesami i projektami*. CeDeWu.

Szymura-Tyc, M. (2011). Międzynarodowe sieci innowacyjne – geneza i funkcjonowanie. *International Journal of Management and Economics*, *32*, 420–438.

Tubielewicz, A. (2013). Koncepcja tworzenia organizacji sieciowej. In: R. Knosala (Ed.), *Innowacje w zarządzaniu i inżynierii produkcji. Tom 1* (pp. 387–397). Oficyna Wydawnicza Polskiego Towarzystwa Zarządzania Produkcją.

Wanzenböck, I., Neuländtner, M., & Scherngell, T. (2020). Impacts of EU Funded R&D Networks on the Generation of Key Enabling Technologies: Empirical Evidence from a Regional Perspective. *Papers in Regional Science*, *99*(1), 3–25. https://doi.org/10.1111/pirs.12473

Wessendorf, C., Kopka, A., & Fornahl, D. (2021). *The Impact of the Six European Key Enabling Technologies (KETs) on Regional Knowledge Creation* (Papers in Evolutionary Economic Geography No. 21.27). Utrecht University, Human Geography and Planning.

Wiktor, J. W. (2016). System komunikacji marketingowej w perspektywie produktu systemowego. *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, 262, 47–56.

Wuttke, D., Blome, C., & Protopappa-Sieke, M. (2012). *Optimal Decisions in the Innovation Adoption and Diffusion of Supply Chain Finance*. 23rd Annual Conference of the Production and Operations Management Society, Chicago. https://hdl.handle.net/2078.1/118583

Zakrzewska-Bielawska, A. (2014). Ewolucja szkół strategii: przegląd głównych podejść i koncepcji. *Prace Naukowe Wałbrzyskiej Wyższej Szkoły Zarządzania i Przedsiębiorczości*, *27*, 9–29.