

---

# Artificial Intelligence in Economic Relations in the Small and Medium-Sized Enterprise Sector

**Jacek Piotr Kwaśniewski**

Doctoral Studies, MBA, University of Business in Bydgoszcz, Poland

ORCID: 0000-0001-6041-4094

Corresponding Author Email:

[jacek.piotr.kwasniewski@wp.pl](mailto:jacek.piotr.kwasniewski@wp.pl)

## Abstract

This article analyses the impact of artificial intelligence on economic relationships in the small and medium-sized enterprise sector, based on empirical research conducted among companies in the Wielkopolska region. The aim of the study was to assess the extent to which implementing AI tools influences inter-organizational collaboration, process automation, operational efficiency, and the level of trust and satisfaction of business partners. The study utilized a diagnostic survey (CAWI) method and analysed 620 companies using digital solutions, including AI systems. The results indicate that AI has become a significant factor in the transformation of economic relationships – particularly in the areas of process automation, streamlined communication, improved financial performance, and increased innovation. Barriers related to limited system interoperability, a lack of digital skills, and regulatory uncertainty were also identified. The research confirms the existence of a statistically significant relationship between the level of AI use and the quality of economic relationships. The conclusions indicate that the development of AI in the SME sector requires not only technological investments but also educational, organizational, and regulatory activities supporting responsible and effective digital transformation.

**Keywords:** Artificial Intelligence, SMEs, Economic Relations, Digital Transformation, B2B Cooperation

## 1. Introduction

The modern economy is undergoing a dynamic technological transformation known as the Fourth Industrial Revolution. One of its key pillars is artificial intelligence (AI), which is transforming the functioning of businesses, market structures, and relationships between economic actors. The development of AI is leading to the emergence of new business models based on data, automation, and predictive analytics, which is particularly important for the small and medium-sized enterprise (SME) sector, the foundation of the European and global economy. These technologies enable companies to increase operational efficiency, reduce transaction costs, and create more flexible forms of collaboration.



At the same time, the implementation of AI raises a number of challenges, such as the need to improve employees' digital competences, ensure data security, integrate technological systems, and adapt legal regulations to new economic realities.

The aim of this article is to analyze the impact of artificial intelligence on economic relations in the SME sector, understood as trade, information, investment, and organizational cooperation between enterprises. Particular attention is paid to identifying the benefits, barriers, and directions for further development of AI technology in business practice.

The article consists of six parts. The introduction provides a review of the literature on the nature and types of artificial intelligence and economic relations. The second part is devoted to the research methodology. It defines the research procedure, research goals and problems, methods, techniques, and research tools, as well as selected statistical methods. The third part discusses the empirical research results, and the fourth part provides a discussion of the obtained results. Recommendations and conclusions drawn from the presented article are then presented. The primary research method was a diagnostic survey (CAWI) method, followed by statistical and graphical methods.

The issues raised have both cognitive and applied significance – they allow us to determine how enterprises can effectively use the potential of AI to build competitive advantage and lasting business relationships in a knowledge-based economy.

Some of the conceptual elements of this study echo the author's earlier work. However, this article introduces new data and an extended time horizon.

## **2. Literature Review**

Artificial intelligence (AI) today constitutes a broad field of scientific, engineering, and philosophical research. Its development has transformed the perception of technology and opened new perspectives in areas such as industry, education, medicine, and entertainment. The literature review focused on defining the essence of AI, its types, and its differentiation based on the level of advancement and functions.

### **2.1. The Essence and Types of Artificial Intelligence**

The most frequently cited definition of artificial intelligence is the one derived from Turing's analyses, which states: “Artificial intelligence is the ability of a device or machine to imitate or mimic human intelligence” (as cited in Stunža et al., 2017, p. 11). Artificial intelligence (AI) is also defined as: a branch of computer science that creates programs and computer systems that have the ability to simulate human thoughts (as cited in Zalewski, 2020, p. 28). Artificial intelligence can therefore be understood as a technical solution (computer program) that performs actions that are typically the domain of humans, primarily in the intellect. Such a machine can be called intelligent if an observer cannot distinguish its response or conversation from a conversation with a human (Turing, 1950, p. 441).

In a document prepared by the European Commission, the term artificial intelligence can be referred to systems that demonstrate intelligent behaviour through automatic actions aimed at achieving human-defined goals (Artificial Intelligence for Europe, 2018). Another definition, developed by a similar, although



independent group (HLEG group of independent experts), is as follows: AI refers to computer programs that can operate in the digital or physical world by perceiving their environment, analysing collected data, and drawing conclusions from the acquired knowledge, while selecting the best actions to perform to achieve the set goal. These systems can also adapt their behaviours to future behaviours based on previous actions. The disadvantage of the presented definitions is the frequent reference to intelligent behaviours, which are not precisely defined (Gumkowska et al., 2024, p. 12).

For the purposes of further discussion, the following definition of artificial intelligence is adopted: it is a field of computer science that deals with the creation of systems and programs capable of performing tasks requiring a degree of human intelligence. These include computer systems that can simulate or replicate human cognitive functions, such as learning, problem-solving, and linguistic communication (interacting with humans or the environment).

The ability to learn can be implemented by using appropriate programming techniques in the form of so-called machine learning, which involves processing large amounts of data from a previously prepared set or from processing a data stream in real time (Kueh et al., 2018, pp. 35-37).

The goal of machine learning is to reduce the complexity of data sets and detect patterns that can be used to explain or predict events or to trigger specific actions. This type of learning allows a standard computer program to function without programming code. As a result, it will autonomously find the right solution to the problem described in the processed data (Esposito, 2020, p. 180).

Within machine learning, the following four techniques can be distinguished: supervised, semi-supervised, unsupervised, reinforced, and deep learning (Jakubiak & Stacewicz, 2023, p. 17). Supervised learning involves encoding examples as input and output data, which create relationships. These are patterns used in similar situations, such as speech, text, or image recognition. Semi-supervised learning involves providing the system with structured data or data requiring structure. In this case, the system itself creates general patterns, for example, classifying webpage content or identifying searched content. Unsupervised learning involves feeding the system only unlabelled data, which the program then analyzes for desired relationships. As the dataset grows, the detected relationships become increasingly precise, which has been used in recognizing similar objects. Reinforced learning involves providing the system with a ready-made set of action rules. The computer analyses them, tests them through trial and error, and then uses them to achieve the desired effect, for example, during navigation, selecting the optimal route based on information about road conditions. Deep learning is a type of machine learning that uses networks of algorithms modelled on the structure of the brain. This involves a deep neural network containing nested neural nodes from which related questions and answers radiate. Training deep learning requires a large dataset (millions of data points). Once trained, such a network can better handle ambiguity than other networks (Mitchell, 2019, pp. 27-29).

The literature divides artificial intelligence into weak, strong, and super intelligence (Płocha, 2020, pp. 277-278). Each type has a different level of sophistication, capabilities, and goals. Weak (narrow) artificial intelligence encompasses systems designed to perform limited tasks that lack the ability to generalize



knowledge, except within a specific range of functions. However, it is powerful enough to have a significant impact on society or the economy (Jakubiak & Stacewicz, 2023, pp. 15 –16).

Weak artificial intelligence applies to programs such as (Płocha, 2020, p. 278):

- voice assistants (Siri, Google Assistant, Alexa),
- recommendation systems in online stores, image or speech recognition programs,
- vehicle control systems in the autonomous procedure.

AI refers to systems with the ability to understand, “learn”, and solve problems at a level similar to humans. They perform a wide range of tasks, adapt to new situations, and exhibit some self-awareness. This type of AI is characterized by the following features: universality in operation, the ability for abstract reasoning, self-awareness and understanding of its own states, and the ability to transfer knowledge between domains. It should be added that currently, no system exists that meets all of these criteria (Tegmark, 2019, p. 58).

A system based on super intelligence is a level of artificial intelligence that could surpass human capabilities in both knowledge and the ability to optimally solve problems. Such a system would operate not only at a general level but would also develop at a pace inaccessible to the human mind. Super-intelligence is characterized by the following characteristics: limitless self-improvement, surpassing human intelligence, creating its own goals and development strategies, and making decisions of global significance (Gumkowska et al., 2024, p. 11). This type of artificial intelligence remains exclusively in the realm of futuristic visions.

According to function and application, the following types of artificial intelligence can be mentioned (Jakubiak & Stacewicz, 2023, pp. 17 –18):

- Rule-based systems, which rely on solving problems with precisely defined rules, have very limited flexibility. These will be expert systems with programmed decision rules using a specific knowledge base,
- Machine learning, which involves software self-rewriting based on data growth. This category includes machine learning and deep learning. These can include image recognition, text translation, and recommendation systems.
- perception systems for recognizing and processing sensory data (sounds, images, touch),
- Robotic systems that integrate AI with mechanics and electronics to create autonomous machines capable of performing tasks in real space. These can include industrial robots, autonomous vehicles, and drones.

In summary, artificial intelligence is a broad and multifaceted field of study, the development of which determines the levels and types of systems. Understanding these levels is crucial for responsible technological development, ethical considerations, and, in some respects, for preparing humanity for future challenges related to increasingly advanced artificial intelligence systems.

## **2.2. Economic Relations in the World of Artificial Intelligence**

The aim of this section is to present the most important research directions, theoretical models, and empirical results regarding the impact of AI on economic relations at the national and international level.

As AI's importance grows, important questions arise for both the domestic and global economies, such as the extent to which it will impact consumers, businesses, and the economy as a whole. According to Growiec (2025, pp. 28–29), employees are increasingly eager to acquire knowledge in the field of artificial



intelligence—essential for professional development. Companies, on the other hand, are seeking ways to leverage the opportunities offered by this software. The OECD and the European Commission confirm that AI technologies can revolutionize all types of manufacturing and contribute to addressing global challenges (Mosbah, 2020, p. 4). Growing computing power and connectivity have enabled the connection of large amounts of data, which are becoming more accessible than ever. The number of AI patents is also growing—approximately 6% annually (Stefanowicz, 2021, p. 143).

Moreover, the literature often emphasizes that automation associated with artificial intelligence can lead to increased productivity but also to job losses in some sectors, which has a significant impact on employer-employee relations. Acemoglu and Restrepo (2018, pp. 1488–1542) demonstrate the need to adapt the labor market to the growing role of AI systems, as well as the creation of new jobs related to the development and maintenance of these systems.

Among the economic aspects of AI development, AI's impact on the economy, both macroeconomic and microeconomic, is prominent, with particular attention paid to the risk of deepening social inequalities. Brynjolfsson and McAfee (2014, pp. 54–56) analysed the impact of automation and AI systems on increasing economic efficiency. They also pointed out that AI-based machines could replace many traditional jobs, leading to changes in the labor market. In their opinion, a significant challenge is ensuring a balance between automation and employment to avoid deep social inequalities.

A slightly different approach was taken by Arntz, Gregory, and Zierahn (2016, pp. 18–21), who conducted an analysis of the risk of automation in OECD countries. Their research showed that professions with low levels of knowledge or skills will be most vulnerable to automation, which could lead to increased unemployment and social exclusion. Therefore, increased funding for social and educational policies is necessary.

Another significant issue is the changing business models and market structures influenced by AI. The literature notes that AI enables the creation of innovative products and services, as well as optimized operational processes. Brynjolfsson and McAfee (2014, pp. 58–59) demonstrated that companies that have implemented AI achieve a significant competitive advantage in industries such as e-commerce recommendation systems, customer service automation, and intelligent logistics systems. The authors also noted that implementing AI requires changes in the organizational structure of companies, their corporate culture, and significant investments in improving employee competencies.

Kumar (2021, pp. 111–112) analysed how AI development impacts enterprise competitiveness and the labour market. He demonstrated that companies investing in AI often achieve higher profitability and greater market share. However, he also noted that AI development necessitates redefining business strategies and profit models, which may lead to market concentration around large business players.

Choi et al. (2018, pp. 133–134), analysing the role of AI in managing global supply chains in international trade, concluded that it enables better demand forecasting, inventory optimization, and automation of logistics processes, minimizing costs and order fulfilment times. The authors emphasized that automation and real-time data analytics allow enterprises to respond more quickly to market changes.



Nguyen (2020, p. 84), in turn, highlighted the challenges related to legal regulations, data security, and ethics in the context of using AI in international trade. The author pointed out that the growing integration of artificial intelligence systems requires international cooperation and harmonization of standards to minimize the risk of abuse and the exclusion of certain countries from global markets. Frey and Osborne (2017, pp. 267–268) estimated that by 2030, up to 47% of jobs in the US could be subject to automation. They demonstrated that low-skilled professions are particularly at risk, which requires educational and social interventions. Similar results were obtained by Crawford (2022, pp. 199–202), who emphasized the need to consider ethical aspects of AI development, such as privacy, social justice, and security. The author calls for the development of a regulatory framework that will protect citizens' rights and minimize negative social impacts.

The ethical and legal aspects of AI development are increasingly being discussed. For economic relations in the AI world to be beneficial and fair, appropriate regulations are necessary. Calo (2019, p. 132) analyzed the legal challenges related to accountability for decisions made by AI systems, data protection, and intellectual property rights. He pointed out that the lack of a clear legal framework can lead to abuses and a lack of public trust in this technology.

The presented literature review highlights a wide range of topics related to economic relations in the world of artificial intelligence, pointing to the need for a comprehensive approach encompassing economic, social, ethical, and legal aspects. As technology advances, the importance of these issues will grow, and science and policy will play a crucial role in shaping solutions that benefit society.

### **3. Own Research Methodology**

The empirical study was conducted in 2025 on a sample of 800 entities representing the small and medium-sized enterprise (SME) sector from the Wielkopolska Voivodeship in Poland. Only those survey questionnaires that met the requirement “uses the latest digital technology, including artificial intelligence” (N = 620) were accepted for further research. Respondents included business owners, managers, and digital technology implementation specialists. Only those survey questionnaires that met the requirement “uses the latest digital technology, including artificial intelligence” were accepted for further research.

#### **3.1. The Course of the Research Procedure**

The study was carried out in the following five stages: literature analysis, formulation of objectives and problems, research design, implementation of field research using the CAWI method – a survey method in which the respondent fills out the questionnaire independently in electronic form (Malinowski, 2015, p. 406), and statistical analysis of the results.

#### **3.2. Research Goals and Problems**

The aim of the research, according to Stachak, is to strive to achieve relevant, true knowledge and to use science in practice (Stachak, 2006, p. 32). The main aim of the research included in this study was to empirically assess the impact of artificial intelligence on economic relations in the SME sector, understood as: economic, trade, investment, and financial cooperation.

The main research problem, understood as a question or set of questions that the author should answer (Kucinski, 2010, p. 84), is as follows: Is there a statistically positive relationship between the level of AI use and economic relations in the SME sector?

The scope of the analysis covers one empirical aspect: the state of economic relations, measured by the values of selected indicators.

### 3.3. Research Methods, Techniques and Tools

The article uses a quantitative method (Krzechewski, 2015, p. 93) in the form of a diagnostic survey. The research technique was an online survey (CAWI), which refers to the method of data collection within the chosen method: survey technique (Gruszczyński, 2003, p. 9). The research tool was a survey questionnaire (Appendix No. 1), which was based on a five-point Likert scale (after: Tarka, 2015, p. 290): definitely not, rather not, no opinion, rather yes, definitely yes.

### 3.4. Selected Statistical Methods

The statistical analysis used descriptive statistics (percentage structure), structure indicators, and weighted averages for the Likert scale.

The final number of surveyed companies was 620. The representative sample was determined using the following formula (Jabłońska & Sobieraj, 2013, p. 45):

$$N_{min} = \frac{N}{1 + \frac{4 \cdot d^2 \cdot (N-1)}{Z^2}} = \frac{400000}{1 + \frac{0,0064 \cdot 399000}{3,8416}} = 600,85$$

where:

$N_{min}$  – minimum sample size,

$N$  – population size (400,000), number of SMEs in the Wielkopolska region, according to data from the REGON register.

$Z = 1.96$  – value for the significance level  $p = 0.05$ ,

$d_{max} = 4\%$  – assumed estimation error ( $d=0.04$ ).

The null hypothesis was accepted:  $H_0: E(n_{ij}) = E(\hat{n}_{ij})$  and the alternative hypothesis was accepted:

$H_1: E(n_{ij}) \neq E(\hat{n}_{ij})$ ,

where (Sobczyk, 2007, p. 214):

$\hat{n}_{ij}$  – theoretical numbers,

$E$  – expected value operator.

Theoretical numbers (Greń, 1978, p. 131):

$$\hat{n}_{ij} = \frac{n_i \cdot n_j}{n},$$

where:

$n_i, n_j$  – marginal numbers.

The test statistic  $\chi^2$  has the following form [Sobczyk, 2001, pp. 213-214]:

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

To test the significance of differences, the Student's t-test for homogeneous variances was chosen, where the value of the statistic is determined by the following formula (Greń, 1972, p. 66):

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2} \cdot \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

where:

$S_1^2, S_2^2$  – sample variances,

$(\bar{x}_1 - \bar{x}_2)$  – difference in mean values,

$\sqrt{\frac{n_1 \cdot S_1^2 + n_2 \cdot S_2^2}{n_1 + n_2 - 2} \cdot \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$  – standard error of the difference  $(\bar{x}_1 - \bar{x}_2)$ ,

$n_1, n_2$  – sample sizes.

At  $(n_1 + n_2 - 2)$  degrees of freedom.

For non-homogeneous variances, the Student's t-test takes the following form (Greń, 1972, p. 65):

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}; \text{ with } \left(\frac{1}{2} + \frac{S_1^2 \cdot S_2^2}{S_1^2 + S_2^2}\right) \cdot (n_1 + n_2 - 2) \text{ degrees of freedom.}$$

To investigate the quantitative correlation of features  $X$  and  $Y$ , the linear correlation coefficient should be calculated according to the following formula:

$$r(X, Y) = \frac{\sum_{t=1}^n (x_t - \bar{x}) \cdot (y_t - \bar{y})}{\sqrt{\sum_{t=1}^n (x_t - \bar{x})^2 \cdot \sum_{t=1}^n (y_t - \bar{y})^2}}$$

where:

$n$  – feature values,  $x_t; y_t = 1, 2, \dots, n$ ,  $\bar{x}, \bar{y}$  – arithmetic means of features  $X$  and  $Y$ .

#### 4. Research Results

As part of the established research scheme regarding artificial intelligence in economic relations in the small and medium-sized enterprise sector in Greater Poland, the following indicators were analyzed:

- economic relations between enterprises in the context of the use of artificial intelligence,
- process automation,
- data exchange and information sharing,
- improving efficiency and financial results,
- innovation in economic relations,
- satisfaction and trust of partners.

The first three of the above-mentioned indicators were subjected to graphical or descriptive analysis, while the remaining ones were subjected to statistical and graphical analysis.

The degree of integration of artificial intelligence in business relations with other companies (common platforms, data exchange, process automation), examined within the framework of economic relations between enterprises in the context of the use of artificial intelligence, turned out to be mostly rather high (48.32%) and definitely high (21.67%) – Figure 1.

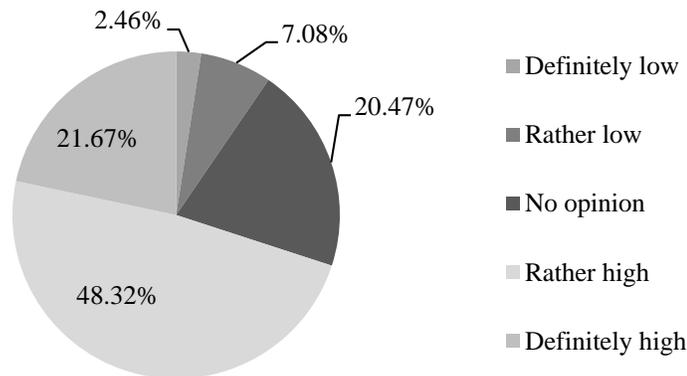


Figure 1. The Degree of Integration of Artificial Intelligence in Business Relationships with Other Companies (Own study based on Appendix 1)

The high level of integration indicates that a majority of the surveyed companies are actively developing and applying AI tools in their relationships with other companies. This includes the use of shared platforms, data exchange, and process automation, demonstrating the growing recognition of AI as an important element of modern economic relations.

The low level of integration (very low 2.46%, rather low 7.08%) means that many surveyed companies are not yet fully utilizing the potential of AI in their business relationships. The lack of, or limited use of, shared platforms, data exchange, and process automation indicates that they are not yet fully familiar with the technology or lack the appropriate infrastructure foundations.

No opinion (20.47%) – suggests that a significant group of respondents does not have a clear opinion on the level of AI integration, which may result from lack of knowledge, limited contact with this issue or lack of clear experience in this field.

The results show that while a significant percentage of companies are still at the beginning of their AI integration journey, a growing number of businesses are recognizing its potential and actively implementing AI-based solutions in their business relationships. This may indicate a growing trend toward automation and streamlining collaboration between businesses, which is crucial for economic competitiveness and innovation.

As part of the indicator of business relations between enterprises in the context of the use of artificial intelligence, the percentage of compatible AI systems used in relationships with other companies (B2B) was

also examined. It turned out that most of the surveyed entities use compatible AI systems to a small extent in relationships with other companies (56.94%).

The process automation index, based on: orders, invoicing, customer service using AI, shows that almost all surveyed entities use this type of solutions (89.23%).

The results of the study on the process automation indicator, based on: orders, invoicing, and customer service using AI, indicate that 89.23% of surveyed entities use this type of solutions, which may be significant for understanding the level of technological advancement and digital transformation of companies in the Greater Poland region. Above all, this high percentage demonstrates the widespread adoption of modern technologies, which can translate into: increased operational efficiency – automation allows for faster and more precise processing of orders, invoices, and customer service, reducing errors and lead times; market competitiveness – companies using AI can better respond to customer needs and adapt more quickly to market changes; acceleration of digital transformation – the high level of technology used indicates that companies are aware of the benefits of automation and are investing in modern solutions; potential for innovation – the widespread use of AI in important processes can open up opportunities for implementing new, innovative services and business models. The result obtained in this area in empirical research highlights that process automation using artificial intelligence has become a common and important element of the development strategy of the surveyed enterprises, which may have long-term positive effects on the efficiency and competitiveness of the Greater Poland economy.

The indicator of the volume of data exchanged or systems integrated using AI was of less importance for the surveyed entities – below 50%.

The increase in financial and other indicators, including trust in relations with business partners as a result of the use of AI techniques, turned out to be rather high (31.79%) and definitely high (27.98%) for financial indicators, similarly for the remaining ones, respectively: 27.86% and 23.47% – Figure 2.

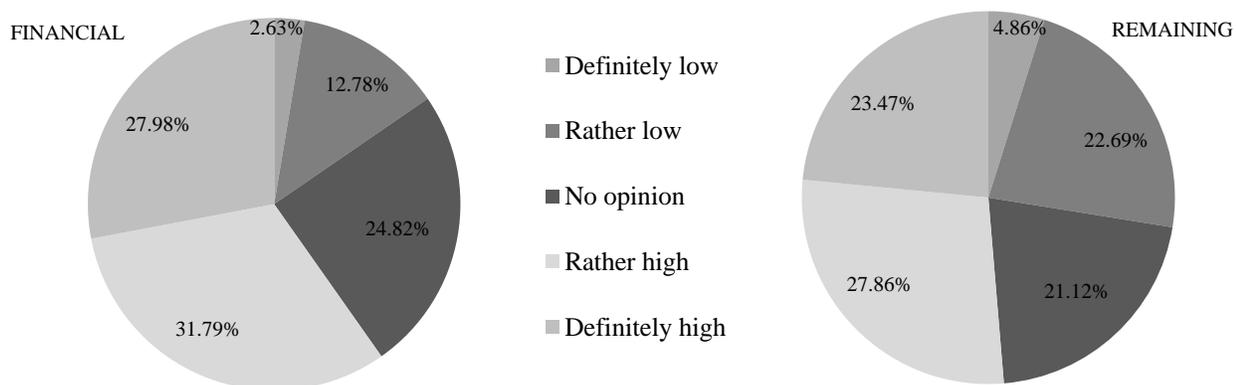


Figure 2. Increased Financial and Other Indicators in Relationships with Business Partners as a Result of Using AI Technology  
(Own study based on Appendix 1)

There is therefore a dominant positive perception of the impact of these technologies. This suggests that most respondents perceive a significant or very significant positive impact of AI on the financial aspects of their business.

The most sceptical opinions are expressed by companies that indicate low (2.63% for financial and 4.86% for other) or rather low (12.78% and 22.69%) indicators, indicating a smaller group of respondents perceiving negative or insignificant effects of AI in these areas. A significant number of respondents (approximately 24.82% for financial and 21.12% for other) express no clear opinion, which may indicate a need for increased employee education or incomplete management knowledge of AI's impact.

The increase in new AI solutions and other solutions implemented in relations with business partners turned out to be mostly rather high (29.92%) and definitely high (27.87%) for new AI solutions, similarly for the others, 23.73% and 21.98%, respectively – Figure 3.

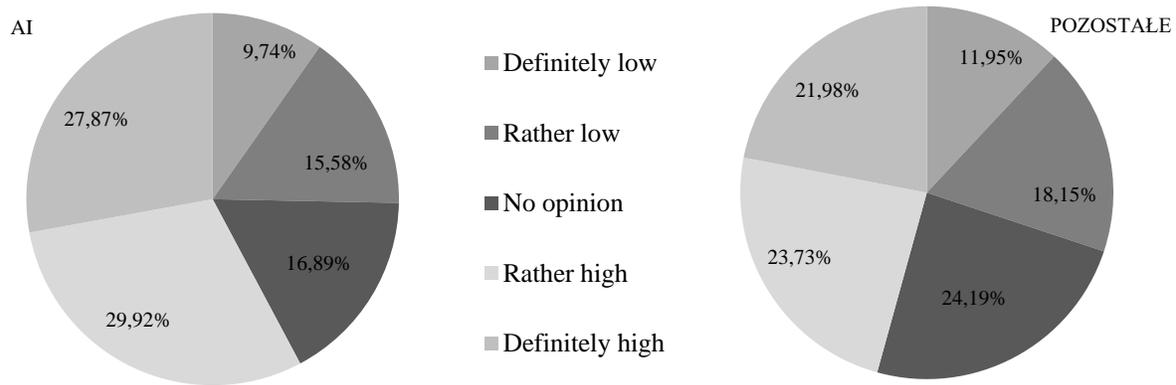


Figure 3. Growth in New AI and Other Solutions Implemented in Relationships with Business Partners (Own study based on Appendix 1)

The growth of new AI solutions indicates the growing involvement and development of AI technologies in business relationships. At the same time, a significant group of surveyed entities (16.89% – no opinion) suggests that they do not have a clear opinion or that management is not fully aware of the changes, which may indicate a need for better information or education regarding new AI solutions. Low ratings (very low – 9.74%, rather low – 15.58%) are relatively smaller, suggesting that most companies are recognizing progress in this area.

As with AI, a significant portion of surveyed companies (24.19%) have no opinion, which may reflect a lack of full knowledge or difficulty assessing the effects of these implementations. The significantly low (11.95%) and rather low (18.15%) ratings suggest that some companies may not yet be seeing significant changes or that implementations are at an earlier stage. This suggests the need for further education and information on the effects of AI and other digital technology implementations to fully leverage the potential of modern solutions in business relationships.

The increase in the level of satisfaction and other elements of trust resulting from the use of AI in economic relations turned out to be mostly rather high (42.50%) and definitely high (20.24%) for satisfaction, similarly for the remaining ones, 16.07% and 27.35%, respectively – Figure 4.

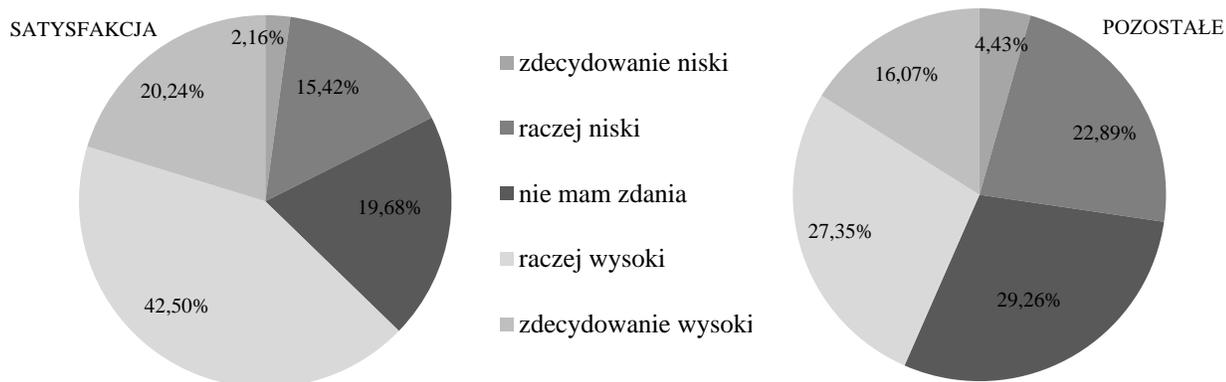


Figure 4. Increased Levels of Satisfaction and Other Elements of Trust Resulting from the Use of AI in Economic Relations (Own study based on Appendix 1)

The survey results regarding the increased levels of satisfaction and trust in business relationships resulting from the use of AI reflect a positive perception of the impact of these technologies on business relationships. For the satisfaction element, over 62% of respondents rated their level as rather high (42.5%) or very high (20.24%), suggesting that most study participants perceive significant benefits and positive effects resulting from the use of AI in business relationships. Only a small percentage (2.16%) indicated a very low level of satisfaction, and 15.42% indicated a rather low level of satisfaction, indicating limited instances of dissatisfaction or skepticism. For the remaining trust elements, the situation is equally positive, although with a slightly different distribution. Most respondents expressed a rather high (27.35%) or very high (16.07%) level of trust, confirming that AI is perceived as a tool supporting credibility and building business relationships. Slightly more respondents chose the “no opinion” option (29.26%), which may indicate a certain level of uncertainty or lack of sufficient knowledge about the impact of AI on trust, but despite this, the percentage of people assessing trust as low is significantly smaller.

These results suggest that the use of AI in business relationships is perceived as beneficial, increasing satisfaction and trust, although there is also a group of respondents who remain undecided or skeptical. The frequency distribution for the assessment of generating growth of the assumed indicators, according to finance, new AI solutions and satisfaction in economic relations is presented in Table 1. Actual numbers – Table 2, theoretical numbers – Table 3.

**Table 1. Frequency Distribution for Assessing the Generation of Growth of Assumed Indicators According to Finances, New AI Solutions, and Satisfaction in Economic Relations**  
(Own study based on own research – Appendix No. 1)

Generating Growth in the Assumed Indicators	Increase in Financial and Other Indicators in Relations with Business Partners as a Result of the Use of AI Technology				Growth in New AI and Other Solutions Implemented in Relationships with Business Partners				Increased Levels of Satisfaction and Other Elements of Trust Resulting from the Use of AI in Economic Relations			
	Financial	%	The remaining	%	AI	%	The remaining	%	Satisfaction	%	The remaining	%
Definitely low	11	2.63	9	4.86	29	9.74	38	11.95	11	2.16	6	4.43
Rather low	56	12.78	44	22.69	47	15.58	59	18.15	75	15.42	29	22.89
No opinion	106	24.82	40	21.12	50	16.89	78	24.19	97	19.68	37	29.26
Rather high	136	31.79	53	27.86	89	29.92	76	23.73	210	42.5	35	27.35
Definitely high	120	27.98	45	23.47	83	27.87	71	21.98	100	20.24	20	16.07
Total	429	100	191	100	298	100	322	100	493	100	127	100
Number of Entities Surveyed:	620				620				620			

**Table 2. Actual Numbers**  
(Own elaboration based on Table 1)

Generating Growth in the Assumed Indicators	Increase in Financial and Other Indicators in Relations with business partners as a result of the use of AI technology			Growth in New AI and Other Solutions Implemented in Relationships with Business Partners			Increased Levels of Satisfaction and Other Elements of Trust Resulting from the Use of AI in Economic Relations		
	Financial	The remaining	SUM	AI	The remaining	SUM	Satisfaction	The remaining	SUM
Definitely low	11	9	20	29	38	67	11	6	17
Rather low	56	44	100	47	59	106	75	29	104

No opinion	106	40	146	50	78	128	97	37	134
Rather high	136	53	189	89	76	165	210	35	245
Definitely high	120	45	165	83	71	154	100	20	120
Total	429	191	620	298	322	620	493	127	620

Table 3. Theoretical Numbers  
(Own elaboration based on Table 2)

Generating Growth in the Assumed indicators	Increase in Financial and Other Indicators in Relations with Business Partners as a Result of the Use of AI Technology		Growth in New AI and Other Solutions Implemented in Relationships with Business Partners		Increased Levels of Satisfaction and Other Elements of Trust Resulting from the Use of AI in Economic Relations	
	Financial	The remaining	AI	The remaining	Satisfaction	The remaining
Definitely low	14	6	32	35	13	3
Rather low	68	31	50	54	83	22
No opinion	102	45	62	67	107	27
Rather high	131	58	80	86	194	50
Definitely high	114	51	74	80	96	25
Total	429	191	298	322	493	127

**Statistical relationships:**

Generating an increase in the assumed indicators and an increase in financial indicators in relations with business partners as a result of using the AI technique – show a statistically significant relationship, because:  $p = 0.0133 < 0.05$ , at  $\chi^2 = 12,62$ .

Generating an increase in the assumed indicators and an increase in new AI solutions and other solutions implemented in relations with business partners – show a statistically significant relationship, because:  $p = 0.0463 < 0.05$ , at  $\chi^2 = 9,67$ .

Generating an increase in the assumed indicators and an increase in the level of satisfaction and other elements of trust resulting from the use of AI in economic relations show a statistically significant relationship, because  $p = 0.0025 < 0.01$ , at  $\chi^2 = 16,38$ .

Generating an increase in the assumed indicators in the assessment of the surveyed companies in relations with business partners as a result of the use of AI techniques – was indicated most highly as an increase in

the level of satisfaction (62.74% – definitely high and rather high), followed by an increase in financial indicators (59.77%) and an increase in new AI solutions (57.79%) – Figure 5.

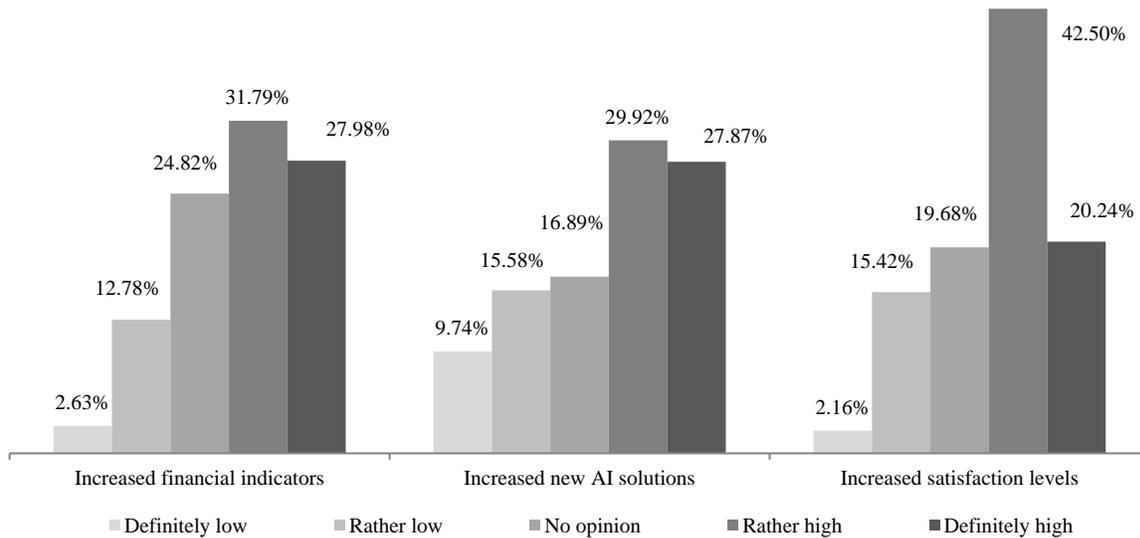


Figure 5. Generating Growth in Target Indicators in Relationships with Business Partners Through the Use of AI Techniques

(Own study based on Appendix 1)

The results of the conducted research indicate a high level of AI integration in business relationships, demonstrating the growing importance of new technologies in inter-organizational cooperation. Widespread process automation in enterprises using AI in order automation, invoicing, and customer service translates into increased operational efficiency and a reduction in errors that may have previously occurred in the surveyed entities. However, more than half of the companies use compatible AI systems in B2B relationships to a limited extent, indicating the need for further technological integration. Similarly, the moderate level of data exchange suggests infrastructural or organizational barriers within the surveyed companies. The positive impact of AI on financial performance, increased innovation, and increased satisfaction and trust in the economic relationships of the surveyed entities demonstrate the development of new technological solutions and models of cooperation with business partners as a result of AI implementation.

Statistical analyses revealed significant correlations between the level of AI use and the growth of financial indicators, the development of new technological solutions, and the level of satisfaction and trust in economic relationships ( $p < 0.05$ ). This indicates a positive impact of AI on the quality of economic relationships in the SME sector. The research results confirm that implementing AI-based solutions is a key development direction for the SME sector and a key element of digital transformation in the modern economy.



## 5. Discussion

The results confirm the findings of the literature indicating that AI promotes increased efficiency and competitiveness of SMEs, while simultaneously generating organizational and social challenges. The obtained results are consistent with the research by Brynjolfsson and McAfee (2014, pp. 89–112), who examined interest in the use of AI in autonomous vehicles, concluding that the development of new technological solutions in this area may be an opportunity for both large and small enterprises.

Schwab (2018, pp. 55–78) emphasizes the need to shape digital and technological progress in every field. This progress, according to the author, will result in a gigantic civilizational revolution, and technological development will increase at an exponential rate, especially among SMEs. This revolution will bring global and local financial benefits.

Davenport and Ronanki (2018, pp. 108–116) point to an increase in efficiency, trust and innovation thanks to AI, which confirms the results of their own research.

The final report from a market study on the readiness to implement, knowledge level, and use of new digital technologies in small and medium-sized enterprises, prepared by the Ministry of Digital Affairs (Świętochowska et al., 2023, p. 15), states that important sectors where AI will be rapidly adopted include SMEs in the areas of construction, cybersecurity, energy, trade and marketing, medicine, agriculture, transport, and logistics. These sectors have the potential to increase financial benefits by 2.65% of GDP after implementing AI-based solutions.

The largest share of entities using AI achievements is still constituted by large enterprises (17.5%), related to information and communication (16.3%), while SMEs recorded 6.9%, but due to their number, innovative activities, flexibility in operation and the desire to win the competition on the market, it can be expected that in the coming years they may even overtake the dominant entities (Świętochowska et al., 2023, p. 16).

Szumowska and Bagieńska (2024, p. 344) conducted research showing that the use of AI solutions contributes to the optimization of business processes, decision support, cost optimization, organizational efficiency, and increased competitiveness, which also confirms the results obtained in their own research. The authors also noted that the implementation of AI systems increases the level of innovation in enterprises, which translates into increased customer satisfaction.

Doligalski and Kaszyński (2024, pp. 84–85) examined quantitative changes in the use of AI tools in SMEs. Among AI leaders in 2023, the average use of AI tools decreased, which resulted from a decrease in the number of such enterprises. In the remaining SMEs, the average use of AI tools increased, which translated into improved financial results.

Szuszakiewicz-Idziaszek (2025, p. 55) researched the use of AI in enterprises. The author concluded that artificial intelligence helps companies make better strategic decisions, support innovation processes, and gain a competitive advantage.

## 6. Recommendations

Based on the research conducted, recommendations were formulated for SMEs, business environment institutions and public decision-makers.

First, companies should develop AI implementation strategies systemically, combining technological investments with employee competency development. Effective AI implementation requires not only tools but also an organizational culture based on data and innovation.



Secondly, it is advisable to increase the interoperability of IT systems between business partners, which will enable more effective data exchange and fuller use of the potential of B2B process automation.

Thirdly, it is necessary to develop training programmes in the field of data analytics, cybersecurity and AI technology management to reduce competence barriers visible in some of the surveyed enterprises.

Fourth, public institutions should support the digitalization of SMEs through financial, advisory and regulatory instruments that facilitate the safe and responsible implementation of artificial intelligence.

Fifthly, it is recommended to build cooperation ecosystems between business, science and administration in order to transfer knowledge and disseminate good implementation practices.

## **7. Conclusions**

The analyses conducted confirm that artificial intelligence is becoming one of the most important factors shaping contemporary economic relations. In the SME sector, its application translates primarily into process automation, improved operational efficiency, and increased competitiveness. The research also indicates that AI is changing the nature of cooperation between enterprises – these relationships are becoming more digitally integrated, based on real-time data exchange and the use of common technological platforms. At the same time, the AI adoption process is uneven. Some enterprises are at an advanced stage of digital transformation, while others are just beginning to implement new technologies. This variation is primarily due to financial, competency, and organizational barriers.

From a macroeconomic perspective, AI development can contribute to increased economic productivity, but it requires parallel adaptations in education systems, labour market policies, and legal regulations. Ensuring a balance between technological progress and social responsibility is crucial.

In light of the results obtained, it can be concluded that artificial intelligence is not merely a technological tool, but also a factor redefining business models, methods of value creation, and mechanisms of economic cooperation. The future of economic relations will increasingly be determined by companies' ability to integrate AI technologies with knowledge management, innovation, and human capital processes. This implies the need to treat digital transformation as a long-term strategic process.

The research conducted directly shows that there is a positive correlation between the use of AI and the quality of economic relations; AI promotes automation, efficiency and increased satisfaction and trust among entrepreneurs; the SME sector shows a high level of readiness for technological changes.

The widespread automation of AI-based processes in order automation, customer service, and invoicing translates into increased operational efficiency and reduced errors. The study also noted that half of the surveyed entities use compatible AI systems in B2B relationships to a limited extent, indicating the need for further technological integration. Similarly, the moderate level of data exchange suggests infrastructural or organizational barriers within the surveyed companies. Statistical analyses revealed significant correlations between the level of AI use and the growth of financial indicators, the development of new technological solutions, and the level of satisfaction and trust in business relationships. The study results confirm that



implementing AI-based solutions is a key development direction for the small and medium-sized enterprise sector and a key element of digital transformation in the modern economy.

The main research problem was addressed as follows: There is a statistically positive correlation between the level of AI use and economic relations in the SME sector. The research objective was therefore achieved by assessing the impact of AI on economic relations in the SME sector (economic, trade, investment, and financial cooperation).

## References

- Acemoglu, D., & Restrepo, P. (2018). The race between man and machine: Implications for employment and growth. *American Economic Review*, 108(5), 1488–1542.
- Arntz, M., Gregory, T., & Zierahn, U. (2016). The risk of automation for jobs in OECD countries. *OECD Social, Employment and Migration Working Papers*, 189.
- Brynjolfsson, E., & McAfee, A. (2014). *The second machine age*. W. W. Norton & Company.
- Calo, R. (2019). Legal and ethical challenges of AI. *Harvard Law Review*, 123–147.
- Choi, T. M., Wallace, S. W., & Wang, Y. (2018). The impact of artificial intelligence on supply chain management. *International Journal of Production Economics*, 205, 131–139.
- Crawford, K. (2022). *Societal impacts of artificial intelligence*. Cambridge University Press.
- Davenport, T. H., & Ronanki, R. (2018, January 9). Artificial intelligence for the real world. *Harvard Business Review*. <https://www.bizjournals.com/boston/news/2018/01/09/hbr-artificial-intelligence-for-the-real-world.html>
- Doligalski, T., & Kaszyński, D. (2024). *Artificial intelligence in enterprises and the economy*. SGH.
- Esposito, D., & Esposito, F. (2020). *Introduction to machine learning*. APN Promise.
- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerization? *Technological Forecasting and Social Change*, 114, 254–280.
- Greń, J. (1978). *Mathematical statistics*. PWN.
- Growiec, J. (2025). Artificial intelligence and economic growth in the perspective of technological singularity. In T. Doligalski & D. Kaszyński (Eds.), *Artificial intelligence in enterprises and economy*. SGH.
- Gruszczyński, L. A. (2003). *Questionnaires in sociology*. UŚ.
- Gumkowska, A., Żybula, M. L., & Kaczkowski, A. (2024). *A guide to artificial intelligence*. IAB.
- Jabłońska, K., & Sobieraj, A. (2013). Selection of the research sample as a success factor in empirical research. AON.
- Jakubiak, M., & Stacewicz, P. (Eds.). (2023). *Trust in artificial intelligence systems*. PW.
- Krzeczewski, B. (2015). Selected research procedures. *Economic Studies*, 6(78), 85–98.
- Kueh, V., Wang, D., Madigan, M. C., Oppermann, I., Wie, S., & Thonet, G. (2018). *Artificial intelligence across industries*. IEC.
- Kucinski, K. (2010). *Methodology of economic sciences*. Difin.



- Kumar, S. (2021). *Artificial intelligence and the future of business*. Routledge.
- Malinowski, S. (2015). CAWI as a research method. In *Metody badań społecznych* (pp. 403–409). Akademia Obrony Narodowej.
- Mitchell, M. (2019). *Artificial intelligence: A guide for thinking humans*. Farrar, Straus and Giroux.
- Mosbah, M. (2020). The role of knowledge-based economy in the development of artificial intelligence and the impact of business process automation on the competitiveness of organizations. University of Lublin.
- Płocha, E. A. (2020). On the concept of artificial intelligence and the possibilities of its application in civil proceedings. *Law in Action*, 44, 273–291.
- Schwab, K. (2018). *The fourth industrial revolution*. Studio EMKA.
- Sobczyk, M. (2007). *Statistics*. PWN.
- Stachak, S. (2006). *Basics of methodology of economic sciences*. Book and Knowledge.
- Stefanowicz, B. (2021). *Artificial intelligence methods and expert systems*. SGH.
- Stunża, G., Działoszewski, A., Martynow, D., Mroziński, A., & Zagórski, K. (2017). *Artificial intelligence: Hopes, challenges, prospects*. Bernardinum.
- Szumowska, P., & Bagieńska, A. (2024). Assessment of the use of artificial intelligence in the activities of companies from the IT industry. *Akademia Zarządzania*, 8(3), 332–347. <https://doi.org/10.24427/az-2024-0051>
- Szuszakiewicz-Idziaszek, A. (2025). Artificial intelligence in the development of small and medium-sized enterprises. *Studia Administracji i Bezpieczeństwa*, 18, 45–56
- Świętochowska, E., Giera, K., & Suszek-Borowska, H. (2023). *On the way to digital perfection: Final report on the market research on the readiness to implement, the level of knowledge and the use of new digital technologies in small and medium-sized enterprises*. Ministry of Digital Affairs.
- Tarka, P. (2015). Likert scale and change in range of response categories vs. the factors extraction in EFA model. *Folia Oeconomica*, 314(4), 37–52. <https://doi.org/10.18778/0208-6018.314.03>
- Tegmark, M. (2019). *Life 3.0: Human in the era of artificial intelligence*. Prószyński i S-ka.
- Turing, A. M. (1950). Computing machinery and intelligence. *Mind*, 49, 433–460.
- Zalewski, T. (2020). Definition of artificial intelligence. In T. Zalewski (Ed.), *Artificial intelligence law* (pp. 25–30).
- European Commission. (2018). *Artificial intelligence for Europe* (COM(2018) 237 final).

**Appendix No. 1**

Survey Results (Survey: 620 Surveyed Entities)

No.	Questions	Variables	Respondents		
			Number	%	
1.	Does the company use the latest digital technology, including artificial intelligence?	Yes	620	100.00	
		NO	0	0	
<b>Indicators of Economic Relations Between Enterprises in the Context of the Use of Artificial Intelligence</b>					
2.	The degree of integration of artificial intelligence (AI) in business relations with other companies (common platforms, data exchange, process automation)	Definitely low	15	2.46	
		Rather low	44	7.08	
		No opinion	127	20.47	
		Rather tall	300	48.32	
		Definitely high	134	21.67	
3.	Percentage of use of compatible AI systems in relationships with other companies (B2B)	Up to 50%	353	56.94	
		Over 50%	267	43.06	
<b>Process Automation Index</b>					
4.	Number of automated processes (orders, invoicing, customer service) using AI	Up to 50%	67	10.77	
		Over 50%	553	89.23	
<b>Data Exchange and Information Sharing Indicator</b>					
5.	Percentage of data exchanged or systems integrated using AI	Up to 50%	383	61.76	
		Over 50%	237	38.24	
<b>Efficiency and Financial Result Improvement Indicator</b>					
6.	Increase in financial and other indicators in relations with business partners as a result of the	Financial	Definitely low	11	2.63
			Rather low	56	12.78
			No opinion	N	24.82
			Rather high	136	31.79
			Definitely high	120	27.98

	use of AI technology	The remaining	Definitely low	9	4.86
			Rather low	44	22.69
			No opinion	40	21.12
			Rather high	53	27.86
			Definitely high	45	23.47
<b>Index of Innovation in Economic Relations</b>					
7.	Growth in new AI and other solutions implemented in relationships with business partners	AI	Definitely low	29	9.74
			Rather low	47	15.58
			No opinion	50	16.89
			Rather high	89	29.92
			Definitely high	83	27.87
		The remaining	Definitely low	38	11.95
			Rather low	59	18.15
			No opinion	78	24.19
			Rather high	76	23.73
			Definitely high	71	21.98
<b>Partner Satisfaction and Trust Index</b>					
8.	Increased levels of satisfaction and other elements of trust resulting from the use of AI in economic relations	Satisfaction	Definitely low	11	2.16
			Rather low	75	15.42
			No opinion	97	19.68
			Rather high	210	42.5
			Definitely high	100	20.24
		The remaining	Definitely low	6	4.43
			Rather low	29	22.89
			No opinion	37	29.26
			Rather high	35	27.35



JNGR 5.0

# Journal of Next-Generation Research 5.0 (JNGR 5.0)

E-ISSN: 3075-2868

Website: [www.jngr5.com](http://www.jngr5.com)

Email: [editor@jngr5.com](mailto:editor@jngr5.com)

---

			Definitely high	20	16.07
--	--	--	-----------------	----	-------