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Automation of Office Work: Key Challenges and Limitations

Abstract

Research background and purpose: The Automation of Office Work finds extensive application in enterprise management and support areas, including finance, sales and customer service, accounting, warehouse operations, logistics, and more. However, implementing automation is not solely about improving efficiency or enhancing working conditions. Many enterprises encounter challenges related to investment and start-up costs, ongoing automation management expenses, and opportunity costs such as changes in employee behaviour and their approach to work.

The aim of this article is to identify and assess the key challenges that enterprises may face when implementing Automation of Office Work.

Design/methodology/approach: To achieve the aim, survey research was conducted in the first quarter of 2024 with a sample of 109 enterprises. A statistical analysis of the collected data was performed using Statistica software.

Findings: The study confirmed the stated hypotheses. Regarding H1, implementation costs represent a particularly significant challenge in automation. These costs encompass initial investments, ongoing expenses for maintenance, employee training, and the adaptation of business processes, all of which significantly impede the efficient utilization of Robotic Process Automation platforms. H2 was also confirmed, indicating a direct impact of automation on human factors such as job satisfaction, engagement, and creativity.

Value added and limitations: The study revealed that automation can reduce interpersonal interactions among employees, weakening social bonds and potentially leading to burnout. To mitigate these negative effects, a balanced approach that prioritizes employee development and satisfaction is essential. The study is subject to several significant limitations that may influence its results and interpretations: (1) selection bias –purposive selection of financially stable companies; (2) Exclusion of MicroEnterprises; (3) Overemphasis on Certain Legal Forms; (4) Focus on Established Markets.

Keywords: *Automation of Office Work, Robotic Process Automation, Challenges of Process Automation, cost of automation, impact of automation on human factors*

JEL Classification: M15, M21, M41

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1. Introduction

Rapid technological advancement, the emergence of new technologies, and demographic and social changes are increasingly driving enterprises to replace live labour with automated processes through the adoption of efficient, and often automated technologies. These advancements impact nearly every aspect of a company's operations, including office work, human resource management, production processes, and marketing and sales strategies (Bumann, Peter, 2019). The primary objectives of these changes are to enhance operational efficiency, improve service quality, and increase flexibility and responsiveness to market dynamics. One of the most prominent trends in optimizing business operations is the automation of business processes, commonly referred to as Robotic Process Automation (RPA) (Doguc, 2020).

Automation is widely applied in enterprise management and support areas such as finance, sales and customer service, accounting, warehouse operations, logistics, and more (Kroll et al., 2016; Borowiec, 2022; Remlein et al., 2022). By automating routine tasks like document processing, correspondence management, and data analysis, enterprises can achieve faster execution with a reduced risk of errors. Moreover, automation allows employees to focus on more creative and strategic aspects of their roles, fostering innovation and enhancing overall organizational efficiency.

Automated business processes also seamlessly integrate with management systems, offering improved control and operational transparency. Consequently, companies that invest in automation gain a competitive edge by adapting more quickly to shifting market conditions and better addressing customer needs.

However, implementing automation is not solely about improving efficiency or enhancing working conditions. Many enterprises encounter challenges when adopting innovative solutions without conducting a thorough cost-benefit analysis. Such an analysis should account for various aspects of current operations, including investment and startup costs, ongoing management expenses, and opportunity costs, such as shifts in workforce behaviour and attitudes toward work.

The adoption of automation often entails significant financial outlays, including expenses for purchasing equipment, licenses, software, training employees, and implementing specific solutions. Many automation tools also incur high costs for configuration and specialized technical support. Additionally, the ongoing maintenance of systems - including updates, monitoring, and ensuring cybersecurity – can be equally costly.

Another critical factor is the cost of adapting the work environment to automation. Companies must often redesign existing business processes to accommodate new solutions, which can involve redefining procedures, restructuring capabilities, and, in some cases, hiring employees with specialized skills. These changes can also impact the

workforce, as employees may develop negative attitudes towards automation due to fears of job loss or increased workload.

Given the significance of automation in the operational activities of modern enterprises and its influence on the competitive position of companies, this article aims to identify and assess the key challenges that enterprises may face when implementing Automation of Office Work. The discussion is structured into two main sections. The first section presents theoretical considerations regarding the challenges of process automation. The second section focuses on the findings of empirical research, detailing the methodology, the research sample, as well as the conclusions and recommendations.

2. Problems and Challenges of Office Work Process Automation – A Theoretical Approach

Work automation refers to the process of replacing human labour with machines and technology, a trend that has been reshaping numerous industries and economic sectors for years. While automation offers significant benefits, such as increased efficiency, cost reduction, and improved product quality, it also introduces various challenges (Nesterak, Gąsiorek, 2020). These challenges span economic, social, and technological domains, making it essential to understand them for the successful implementation of automation. It is worth noting that the literature lacks a clear and universally accepted definition of business process automation (Siderska, 2020). Siderska defines the term from the researcher's perspective and the context in which it is applied. It is generally understood as:

- modern technology that introduces innovations and enhances company operations by automating repetitive tasks,
- a suite of software tools designed to mimic human actions, enabling the execution of simple, repetitive tasks such as copying, pasting, extracting, combining, and transferring data,
- a systematic approach to process automation that minimizes the scope of routine tasks, empowering employees to focus on more complex, creative tasks that generate greater value for the organization.

Despite differing approaches, all definitions highlight the primary goal of automation: replacing repetitive and routine tasks performed by humans with a virtual workforce. This shift enables employees to concentrate on higher-value tasks and solving complex problems (Choi, R'bigui, & Cho, 2021). However, implementing such automation in operational activities presents numerous challenges, which can be grouped into three categories: structural, technical, and financial-regulatory.

Structural challenges include an inability to effectively assess process priorities, making it difficult to determine which processes should be automated first. This often leads to inefficient resource allocation. Robotic Process Automation is suitable only for specific

types of tasks and processes that are rule-based, straightforward, standardized, and performed in large volumes (Lahtinen, Mahlamäki, & Myllärniemi, 2023). Successfully implementing RPA requires specialized skills and an appropriate approach, which can be difficult to maintain consistently. Moreover, tasks that involve complex decision-making or human judgment are not suitable for automation and instead require the use of more advanced cognitive tools.

Technical challenges primarily revolve around information and data security. Process automation often involves handling large volumes of data, which raises significant concerns about safeguarding this information. Ensuring the ethical and secure use of all data - whether internal to the organization or sourced from counterparties – is essential. The absence of robust risk management tools increases an organization's vulnerability to various threats, particularly cyberattacks (Zorooni, Khatib, 2023). Additionally, another major challenge lies in protecting against malicious use of automation technologies and addressing potential errors in algorithms (McKinsey Global Institute, 2018).

Based on a literature review, Algrmen (2021) identified several key challenges associated with automation, particularly Robotic Process Automation. These challenges include difficulties with RPA software installation, process identification and documentation, accurate risk assessment and error handling, resource constraints, unclear ownership and accountability for processes post-automation, workforce engagement and training, as well as scepticism and resistance to change.

While RPA is generally more cost-effective than traditional automation methods, the initial investment and ongoing maintenance costs can be substantial, often exceeding the capabilities of businesses, particularly small and medium-sized enterprises (SMEs). Ensuring scalability and adapting to evolving business requirements demand careful planning and resource allocation. Financial and regulatory challenges include implementation costs, which pose a significant barrier for many companies. Improper use cases are a concern: applying RPA to unsuitable processes or contexts can lead to resource wastage and limited benefits. External regulatory requirements further complicate deployment, as compliance with such rules can impose additional constraints on RPA implementation.

Another significant challenge is achieving scalability, as deploying RPA on a large scale can be complex, resource-intensive, and subject to integration issues with existing systems (Radke, Dang, & Tan, 2020). Furthermore, selecting an appropriate application is often difficult due to the wide range of RPA platforms available on the market, complicating the process of choosing a solution that aligns with the organization's specific requirements. According to Lahtinen, Mahlamäki, and Myllärniemi (2023), RPA is most effective when applied to structured data, meaning which refers to data organized in a consistent and predefined format. However, RPA is unable to process unstructured data, such as images or emotions, which represent a substantial portion of organizational data. Consequently, companies must ensure

that their process data is adequately structured, while reserving low-value tasks for human employees.

RPA relies on structured data and cannot process unstructured data, such as scanned documents or images, which comprise a significant portion of existing documentation (Aguirre & Rodriguez, 2017; da Silva Costa, Mamede, da Silva, 2022). In practice, not all operational tasks are suitable for automation. RPA is most effective for large-scale, standardized, and rule-based processes that do not require human judgment (Dhawan et al., 2022). Moreover, Dhawan et al. highlight the potential for failures, which may arise from performance issues, configuration errors, external factors, or human mistakes. Despite successful testing in non-production environments, systems may still fail during actual implementation. Work stoppages caused by technical issues can be costly and difficult to address. Additionally, cyberattacks and data security concerns are increasingly significant challenges in automated work environments (Brynjolfsson & McAfee, 2014).

Another significant challenge is the insufficient competencies of internal staff, particularly when they lack the necessary skills and knowledge, complicating the implementation and effective utilization of RPA (da Silva Costa, Mamede, da Silva, 2022). Furthermore, the absence of a sense of urgency – manifested as a low prioritization of RPA-related projects – can delay implementation and limit the potential benefits of automation.

Automation also brings profound changes to the structure of the job market structure. Automation technologies, particularly Robotic Process Automation, can lead to substantial job displacement, as machines increasingly replace humans in performing repetitive tasks that require minimal cognitive effort.

One of the most evident challenges associated with workplace automation is the risk of technological unemployment. Automation has the potential to displace jobs, particularly in industries where tasks are routine and repetitive (Frey & Osborne, 2017). The increase in technological unemployment may exacerbate income and social inequality, which in turn can undermine both economic and social stability.

New technologies necessitate new skills, creating a growing demand for workers to develop competencies that complement automation technologies. These include technical skills related to the operation and maintenance of automated systems. However, access to the necessary training and education is often limited, resulting in significant skill gaps (Guznajeva et al., 2022). This transition is neither simple nor swift. Arntz, Gregory, and Zierahn (2016) emphasize that education and vocational training are essential for equipping the workforce to handle automation-related changes. Older workers, particularly those from the Baby Boomer and Generation X cohorts, may face difficulties in adapting to new technologies, which could ultimately lead to their exclusion from the labor market.

The McKinsey Global Institute report (2018) highlights that automation increases the demand for advanced technological skills, such as programming. Additionally, it emphasizes the growing importance of social, emotional, and higher cognitive skills, including creativity and critical thinking. Conversely, the demand for physical and manual skills traditionally used in work processes is expected to decline. This shift necessitates substantial changes in education systems and workplace training programs to adequately prepare the workforce for emerging skill requirements.

The identified issue is closely linked to another challenge related to working conditions, which, as noted to Pham et al. (2018), is multifaceted. Firstly, automation frequently results in the dismissal of workers previously responsible for tasks that are now automated, thereby increasing job insecurity and reducing workforce engagement (Guznajeva et al., 2022). Furthermore, employees who retain their positions may face deteriorating working conditions, particularly in environments where robots impose relentless work rhythms that humans are expected to match. The adoption of robots and automation also significantly reduces wages for low and medium-skilled workers, exacerbating the divide between high-paying, high-skilled positions and low-paying, low-skilled rples (Aghion et al., 2022). Although automation leads to increased productivity, the resulting benefits are often unevenly distributed, contributing to economic disparities and placing additional pressure on the remaining workforce (Arntz et al., 2016; McKinsey Global Institute, 2018). Companies automating processes involving confidential customer data may face resistance from customers due to concerns about data security. This poses a significant barrier, particularly in industries such as accounting, where trust in data processing is paramount (Lahtinen, Mahlamäki, & Myllärniemi, 2023). Addressing the challenges associated with automation will require coordinated efforts from both the public and private sectors. Governments and businesses must invest in human capital, redesign education systems, and provide comprehensive support for workers transitioning between jobs. Additionally, policies that promote economic growth, business dynamism, and effective functioning of labour markets will be essential (McKinsey Global Institute, 2018). The presented literature review has identified a research gap namely the lack of consensus in both scientific discourse and business practice regarding the key challenges of office automation and its associated limitations. The diversity of research perspectives and inconsistencies in the analysed aspects of automation hinder the development of a coherent theoretical and practical framework. Furthermore, there is a noticeable scarcity of empirical studies that comprehensively examine the scale and impacts of automation. This gap complicates efforts to fully understand the issue and to formulate effective recommendations for organizations. The literature review, survey research, and personal considerations have led to the formulation of two research hypotheses:

H1: High implementation costs pose a significant challenge to automating office processes in enterprises, thereby limiting the effective utilization of RPA.
H1: The implementation of automation in enterprises directly impacts the human factor, including job satisfaction, engagement, and creativity.

3. The Research Method and The Research Sample

Contemporary businesses regard office automation as both a significant challenge and an essential necessity driven by technological advancements and socio-economic factors. Accurately identifying organizational needs and implementing innovative solutions can yield numerous benefits, positively influencing operational efficiency, corporate reputation and competitive positioning. However, it is crucial to recognize that implementing such solutions does not always deliver the expected outcomes. This is particularly true when considering the diverse costs associated with these changes, ranging from financial investments and usability concerns to the impact on employees and their attitudes toward work. The issue of costs associated with modernization and improvements, including alternative solutions, was analysed as part of broader research on the impact of automation on office work: transformations, challenges, and opportunities in the digital era. The study was conducted in the first quarter of 2024 with a sample of 109 enterprises, encompassing large, medium, and small companies. Micro-enterprises were excluded from the sample based on the assumption that their limited potential, needs, and financial capabilities represent significant barrier to the implementation of automation processes. Microenterprises are often constrained by limited financial resources, making it challenging for them to invest in advanced automation technologies and cover the associated implementation and maintenance costs. Another significant obstacle is the lack of adequate technological competencies among employees, which complicates the effective planning and execution of automation processes. Furthermore, microenterprises may face resistance to change, driven by a fear of new solutions and a lack of awareness regarding the potential benefits that automation can bring to their business. Within the analysed sample, 25 large entities (22.9%), 36 medium-sized (33.0%), and 48 small businesses employing between 10 and 49 people (44.0%) were identified, ensuring the sample's representativeness. All participating companies demonstrated a stable financial-operational situation, supported by their relatively long-standing presence in the market. Nearly half of entities (54) were established before the year 2000, with 23 boasting a several decades of history. These entities emphasized their long-standing tradition, underscoring their strong market ties and established position. Additionally, the sample included 19 entities (17.4%) that commenced their operations before 2010. In the examined sample, 26 companies (23.9%) are engaged in production, 58 (53.2%) provide various services,

including manufacturing, and 21 (19.3%) focus on material and technical supply. A small margin of the sample consisted of four institutions (3.6%) operating in science, administration, or finance. The research sample was also analysed based on legal form. Limited liability companies predominated, comprising 75 firms (68.8%). Sole proprietorships were the second most common, accounting for 17 entities (15.6%). Other forms were less frequent, including 7 limited partnerships (6.4%), 4 joint-stock companies (3.7%), 2 civil partnerships (1.8%), and 1 general partnership (0.9%). Three entities (2.8%) indicated another legal form. The analysed units were further characterized by the market generating their highest revenues, as illustrated in Fig. 1.

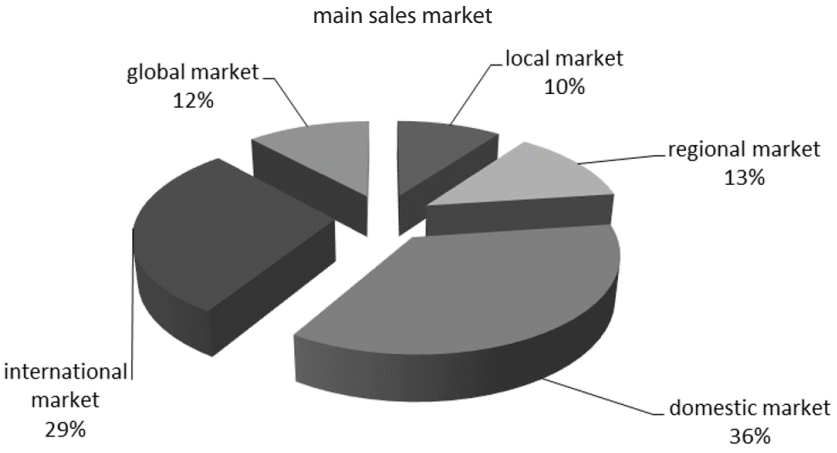

Figure 1. **Markets of the surveyed entities**
Source: own elaboration based on empirical research results

The study on the impact of automation on office work - encompassing transformations, challenges, and opportunities in the digital era - was conducted using a non-random, purposive sampling method, targeting representative units. Respondents came from various hierarchical levels within the companies, including owners and co-owners, directors and managers, as well as specialists and end-users responsible for implementing, utilizing, and developing specific applications. These individuals were characterized by a high level of expertise, extensive experience in automation, and the ability to accurately assess the costs and benefits associated with the implemented improvements.

A questionnaire served as the primary research tool, comprising several sections: a metric section for detailed sample characterization, a substantive section addressing key automation issues, and a section allowing the respondents to freely share their perspectives on office work improvements.

The analysis of the results was conducted in two stages.

In the first stage, a five-point Likert scale was employed to quantify subjective perceptions by calculating the significance coefficient N, defined as the arithmetic mean of the collected ratings. The variables for analysis were identified through a combination of literature research, direct discussions with industrial company representatives involved in automation within their responsibilities, and the authors' critical reflections. The process led to the identification of over 30 variables. Of these, 22 were selected for further analysis, as the remaining variables provided redundant or overlapping information. The collected data were coded and transformed into numerical format to facilitate a detailed analysis of the research dataset. Factor analysis was employed as the primary method for in-depth studies, enabling the identification of relationships and patterns within the analysed data. The principal component analysis method was used, based on the assumption that all data variance is partially shared among variables, disregarding specific factor effects. The analysis was conducted on the original correlation matrix, resulting in a matrix of factor loadings, which constituted the key output of this procedure. To refine the results, the Varimax rotation method was applied, maximizing the variance of the raw factor loadings for each factor to enhance interpretability. Calculations were performed using the Statistica software. Factor analysis is a technique that reduces numerous primary variables into a smaller number of main factors, minimizing information redundancy and synthesizing the data. It employs orthogonalization and rotation of the coordinate system to reduce the dimensionality of the space. It also aids in the elimination of less significant primary variables, allowing for the identification of key dimensions that describe the phenomenon under investigation. This approach is particularly advantageous in studies on the automation of office work processes, where a large number of correlated variables often exist. Factor analysis simplifies the complexity of these processes by condensing the variables into a few main factors that effectively characterize the phenomenon.

4. The research findings

The study facilitated the creation of a hierarchy of variables that entrepreneurs associate with costs related to the implementation of automation in the workplace. These variables vary in terms of impact strength, scope, and significance, as reflected in the significance coefficient N values, which range from 2.29 to 3.76, with a median value of 3.17.

From the perspective of the surveyed companies, one of the primary challenges in implementing automation is ensuring compatibility between new tools and existing IT systems (N-3.76).

Many firms rely on a variety of applications and platforms that are often not designed to integrate seamlessly with modern automation solutions. For instance, transferring data between systems can be both time-consuming and risky, particularly with respect to potential data loss or inaccuracies during migration. Additionally, updating or modifying existing systems is frequently required to enhance their efficiency and compatibility with new technologies. Of particular note is the need to review and modify existing procedures, which, in some cases, may necessitate a complete restructuring of tasks to align with automation requirements .

Table 1. Challenges of Process Automation - Research Results

No.	Factor	Basic Parameters			Percentage of Indications				
		N	Me	M	1	2	3	4	5
1	High implementation costs	3.72	4	4	0.9	7.3	28.4	44.9	17.4
2	Integration of automation with existing systems	3.76	4	4	1.8	11.9	21.1	38.5	26.6
3	High maintenance and update expenses	3.35	3	3	0	21.1	39.4	22.9	16.5
4	Limitation to programmable processes only	3.19	3	3	5.5	11.9	50.5	22.0	10.1
5	Difficulties in change management	2.9	3	3	9.1	26.6	38.5	16.5	9.1
6	Ethical and social concerns	2.37	2	2	26.6	33.9	22.9	9.1	7.3
7	Dependence on RPA software vendors	3.28	3	4	7.3	17.4	30.7	30.7	14.7
8	Security threats and vulnerabilities	3.1	3	3	10.1	18.3	33.0	28.4	10.1
9	Employee resistance to organizational change	3.24	3	5	10.1	25.7	20.2	18.3	25.7
10	Loss of process control	3.19	3	4	4.6	21.1	32.1	34.9	7.3
11	Constraints on creativity and innovation	3.24	3	4	8.2	20.2	24.8	33.0	13.8
12	High maintenance costs	3.31	3	3	0.9	19.3	36.7	33.9	9.2
13	Cyberattacks risks	3.42	4	4	6.4	12.8	30.3	33.0	17.4
14	Need for monitoring and supervision	3.38	3	4	2.8	11.9	35.8	44.0	5.5

15	Potential negative impact on company culture	2.29	2	2	26.6	34.9	25.7	0.8	4.6
16	Rapid obsolescence of RPA systems	2.91	3	3	7.3	31.1	32.1	22.0	7.3
17	Job reduction and workforce displacement	3.06	3	2	11.9	24.7	23.9	23.9	15.6
18	Reduced interpersonal relationships	3.18	3	3	11.0	19.3	29.4	21.1	19.3
19	Overreliance on automation	3.49	4	4	4.5	21.1	18.3	33.0	22.9
20	Risk of error propagation	3.44	3	4	2.8	19.3	28.4	30.3	19.2
21	Decline in job satisfaction	2.88	3	2	13.8	28.4	25.7	19.3	11.9
22	Strained relationships with contractors	3.06	3	3	11.0	21.1	33.9	19.2	14.7

N- Significance Coefficient, Me – Median, M - Mode 1 - No significance, 2 - Minor significance, 3 - Moderate significance, 4 - Major significance, 5 - Very significant.

Source: own elaboration based on empirical research results

From the perspective of the surveyed enterprises, another significant challenge is the costs of implementing RPA in operational activities (N-3.72). Automation often necessitates the purchase of technologically advanced equipment, which can be expensive, and its installation and configuration require specialized expertise.

Another critical factor limiting office automation, according to respondents, is the concern about excessive reliance on new applications (N-3.49). This dependency can result in both management and employees relying unquestioningly on systems to perform individual tasks, rather than developing their own skills and taking the initiative. Over time, this reliance may lead to reduced creativity and innovation, technological stagnation, greater dependency on technology providers, difficulties integrating new solutions, and concerns about losing control over processes. Additionally, there is uncertainty about the future employment landscape, further contributing to resistance to automation.

When analysing individual factors, it is also important to highlight those that surveyed businesses consider less significant. Practically negligible factors the negative impact on company culture (N-2.29), ethical and social concerns (N-2.37), and decrease in job satisfaction (N-2.88). However, it is worth noting that the differences in the significance coefficient values between certain variables are minimal. This can lead to interpretational challenges and make it difficult to identify which factors constitute genuine obstacles to implementing automation in office work processes. The significance coefficients of the individual costs, along with the distribution of responses, are presented in Table 2 and illustrated in Figure 2.

Table 2. **Correlation Matrix of Input Variables of Automation Work Challenges**

Challenges	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.
1.	1.00																					
2.	0.53	1.00																				
3.	0.51	0.41	1.00																			
4.	0.13	0.16	0.31	1.00																		
5.	0.27	0.28	0.27	0.29	1.00																	
6.	-0.01	0.15	0.11	0.11	0.31	1.00																
7.	0.25	0.41	0.25	0.29	0.29	0.18	1.00															
8.	0.21	0.35	0.07	0.10	0.28	0.30	0.54	1.00														
9.	0.16	0.27	0.21	0.09	0.33	0.36	0.34	0.26	1.00													
10.	0.15	0.28	0.28	0.29	0.28	0.34	0.22	0.32	0.44	1.00												
11.	0.09	0.09	0.17	0.22	0.14	0.24	0.31	0.28	0.41	0.46	1.00											
12.	0.45	0.32	0.37	0.26	0.14	0.07	0.22	0.11	0.14	0.18	0.10	1.00										
13.	0.06	0.31	0.26	0.21	0.15	0.13	0.27	0.38	0.14	0.14	0.22	0.12	1.00									
14.	0.17	0.11	0.14	0.21	0.28	0.10	0.06	0.05	0.06	0.06	0.02	0.28	0.29	1.00								
15.	0.14	0.06	0.15	0.22	0.21	0.40	0.21	0.23	0.18	0.29	0.31	0.27	0.18	0.19	1.00							
16.	0.36	0.27	0.29	0.20	0.30	0.24	0.27	0.30	0.15	0.23	0.20	0.42	0.29	0.29	0.53	1.00						
17.	0.20	0.31	0.20	0.13	0.07	0.29	0.19	0.15	0.06	0.21	0.13	0.17	0.28	0.08	0.17	0.25	1.00					
18.	0.26	0.27	0.16	0.23	0.33	0.22	0.18	0.23	0.19	0.40	0.35	0.21	0.24	0.17	0.28	0.36	0.50	1.00				
19.	0.23	0.28	0.16	0.05	0.28	0.12	0.19	0.25	0.04	0.26	0.21	0.20	0.30	0.25	0.15	0.29	0.41	0.64	1.00			
20.	0.18	0.24	0.21	0.18	0.20	0.05	0.24	0.21	-0.03	0.19	0.19	0.10	0.31	0.18	0.18	0.40	0.35	0.38	0.52	1.00		
21.	0.29	0.19	0.30	0.14	0.19	0.25	0.17	0.24	0.16	0.29	0.17	0.15	0.14	0.06	0.43	0.40	0.42	0.48	0.42	0.36	1.00	
22.	0.28	0.16	0.34	0.17	0.23	0.12	0.23	0.17	0.10	0.22	0.20	0.13	0.25	0.25	0.32	0.46	0.32	0.54	0.40	0.42	0.59	1.00

Variables were numbered according to Table 1
Correlation coefficients marked are significant at $p \leq 0.300$

Source: own elaboration based on empirical research results

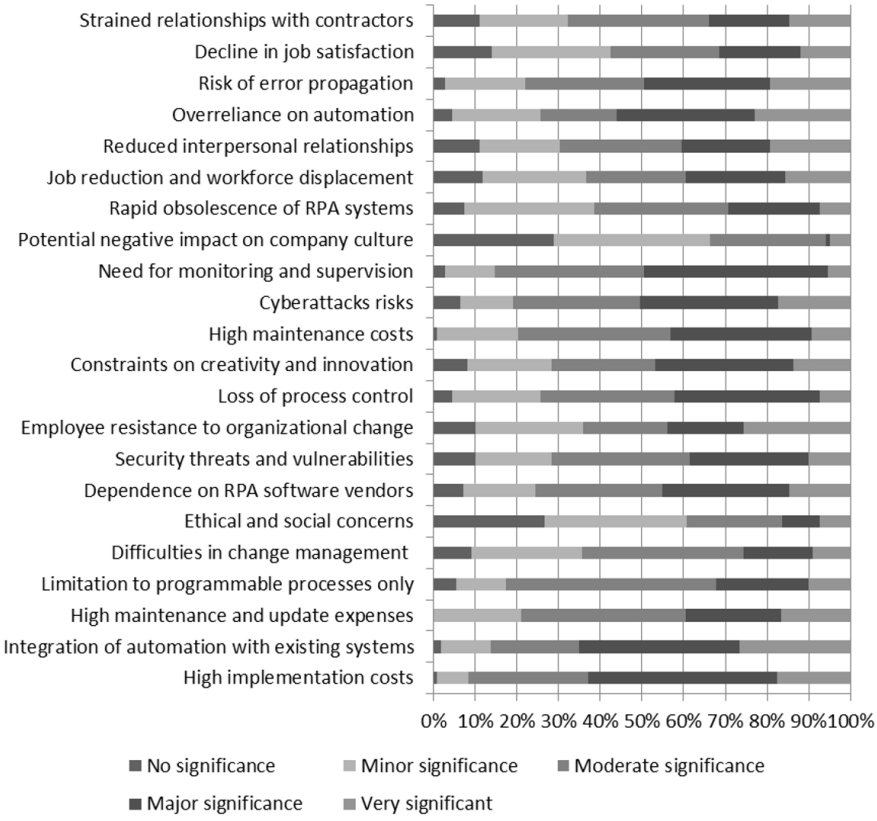

Figure 2. **Distribution of responses regarding issues with office automation**

Source: own elaboration based on empirical research results

To further investigate the factors that pose challenges to the automation of office work processes, factor analysis was conducted. This method facilitates the reduction of numerous primary variables by consolidating them into several groups of factors containing synthetic information derived from the variables within each group. The outcome is a higher-order variable, referred to as a key factor, which encapsulates a significant amount of information from the original variables while also introducing new substantive insights. Factor analysis, therefore, transforms a multidimensional space of primary features into a space with significantly fewer dimensions through orthogonalization and rotation of the coordinate system. This reduction simplifies the complexity of the data while preserving its essential characteristics. As part of the

procedure, the first step involved constructing a correlation matrix. Observations from this matrix indicated that a significant portion of the variables exhibited relatively high interdependence. The high and moderate levels of interdependence among the primary variables suggest an underlying structure within this matrix that influences a range of variables.

In practice, the correlation between two variables is classified as weak if rxy ≤ 0.3, moderate if 0.3 < rxy ≤ 0,5, and strong if rxy >0.5 (Ignatczyk, Chromińska 2004, p. 170). For example:

- High implementation costs of automation correlate with compatibility with existing systems and processes (0.53), high maintenance and update costs (0.51), elevated application maintenance costs (0.45), and the rapid obsolescence of automation technology (0.36).
- Integration issues of automation with existing systems and processes are associated with six variables: high maintenance and update costs (0.41), dependence on RPA software providers for updates, support, and maintenance (0.41), security threats (0.35), elevated application maintenance costs (0.32), potential cyberattacks (0.31), and job reduction (0.31).
- High maintenance and update costs are linked to the limited use of RPA for programmable processes (0.31), elevated application maintenance costs (0.37), decreased job satisfaction (0.3), and their impact on relationships with suppliers and customers (0.34).
- Change management difficulties correlate with employee resistance to change (0.33), the rapid obsolescence of automation technology (0.3), and the limitation of interpersonal relationships (0.33).
- Ethical and social concerns correlate with security threats (0.3) and employee resistance to change (0.36).
- Dependency on RPA software providers for updates, support, and maintenance is associated with security threats (0.54), employee resistance to change (0.34), and a lack of human creativity and intuition (0.31).
- Security threats are associated with the potential loss of human oversight in processes (0.32), the risk of cyberattacks (0.38), and the rapid obsolescence of automation technology (0.3).
- Employee resistance to change correlates with the potential loss of human oversight in processes (0.44) and the absence of human creativity and intuition (0.41).
- The loss of human oversight in processes is linked to a lack of human creativity and intuition (0.46) and the limitation of interpersonal relationships (0.4).
- Constraints on creativity correlate with a negative impact on the company culture (0.31) and the restriction of interpersonal relationships (0.35).
- Security limitations are associated with the risk of over-reliance on automation (0.3) and the replication of errors due to incorrect configuration (0.31).

- A negative impact on company culture is correlated with the rapid obsolescence of automation technology (0.53), reduced job satisfaction (0.43), and its influence on relationships with suppliers and customers (0.32).
- The rapid obsolescence of automation technology is associated with the limitation of interpersonal relationships (0.36), the replication of errors due to incorrect configuration (0.4), decreased job satisfaction (0.4), and its influence on relationships with suppliers and customers (0.46).
- Job reduction correlates with the limitation of interpersonal relationships (0.5), the risk of over-reliance on automation (0.41), the replication of errors due to incorrect configuration (0.35), decreased job satisfaction (0.42), and its influence on relationships with suppliers and customers (0.32).
- The limitation of interpersonal relationships is linked to the risk of over-reliance on automation (0.64), the replication of errors due to incorrect configuration (0.38), decreased job satisfaction (0.48), and its influence on relationships with suppliers and customers (0.54).
- The risk of over-reliance on automation is linked to the replication of errors due to incorrect configuration (0.52), decreased job satisfaction (0.42), and its influence on relationships with suppliers and customers (0.4).
- The replication of errors due to incorrect configuration is correlated with decreased job satisfaction (0.36) and its influence on relationships with suppliers and customers (0.42).
- Decreased job satisfaction is linked to its influence on relationships with suppliers and customers (0.59).

As a result of further calculations conducted during the factor analysis procedure, a matrix of raw loadings was obtained and subsequently rotated using the Varimax method[1]. This process identified seven key factors that significantly explain the analysed phenomenon. Each successive factor accounts for a progressively smaller proportion of the variance. The first factor is the most significant, characterized by both a high eigenvalue (6.17) and a substantial percentage of explained variance (28%). In contrast, the second factor has a considerably lower eigenvalue (1.93) and explains a smaller percentage of variance (8.79%).

1 The Varimax method is used to maximize the variance of raw factor loadings for each selected factor. This process, known as factor purification, enhancing the variance in the columns of the raw factor loading matrix. Varimax rotation is first applied to the raw factor loadings and subsequently to the normalized factor loadings (referred to as the normalized Varimax method).

Table 3. **Eigenvalues of Synthetic Factors Obtained from Factor Analysis**

Synthetic Factor	F_1	F_2	F_3	F_4	F_5	F_6	F_7	…	F_n
Eigenvalue	6.17	1.93	1.74	1.38	1.25	1.09	1.01	…	22
% of Explained Variance	28.06	8.79	7.91	6.28	5.69	4.96	4.6	…	100
Cumulative Eigenvalue	6.17	8.1	9.85	11.23	12.48	13.57	14.58	…	22
Cumulative % of Variance	28.06	36.85	44.77	51.05	56.74	61.71	66.31	…	100

Source: own elaboration based on empirical research results

The selection of factors was validated through scree plot analysis[2]. Examination of the plot reveals a gradual decline in eigenvalues starting at the sixth factor. Consequently,, it was determined that further analysis would focus on five factors, which collectively account for over 56% of the variance.

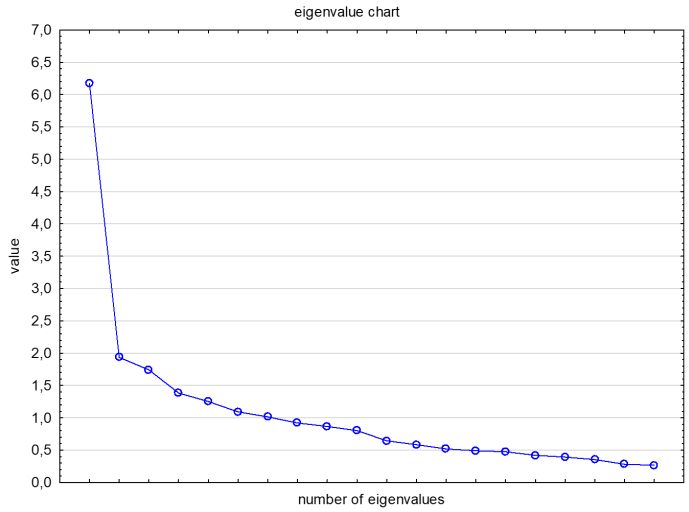

Chart 1. **Cattell's Scree Plot for Factors Constituting Challenges in Office Automation**

Source: own elaboration based on empirical research results

2 The scree plot, a graphical technique introduced by Cattell in 1966, involves plotting eigenvalues on a line graph. The key is to identify the point at which the eigenvalues exhibit a marked decrease, followed by a more gradual decline to the right. Cattell referred to the region beyond this point lies the "factorial scree." The term "scree" borrowed from geology describes the accumulation of loose debris at the base of a cliff.

Table 4. **Raw Factor Loadings Matrix and Factor Loadings after Rotation for Factors Constituting Challenges in Office Automation**

	Raw Factor Loadings (without rotation)					Factor Loadings after Varimax Rotation (Normalized)				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
High implementation costs	-0.52	-0.04	0.59	-0.04	-0.34	0.06	0.02	0.88	0.03	0.08
Integration with existing systems	-0.56	0.14	0.42	-0.42	-0.13	0.06	-0.01	0.23	-0.02	0.13
High maintenance and update expenses	-0.53	0.06	0.48	0.07	-0.25	-0.01	0.05	0.22	0.02	-0.04
Limitation to programmable processes only	-0.41	0.17	0.17	0.23	0.23	0.06	0.08	0.02	0.07	0.01
Difficulties in change management	-0.52	0.23	0.08	0.08	0.14	0.09	0.02	0.09	0.06	0.09
Ethical and social concerns	-0.42	0.35	-0.39	0.20	-0.02	0.04	0.07	-0.05	0.17	0.11
Dependence on RPA software vendors	-0.54	0.36	0.10	-0.33	0.18	0.01	0.12	0.07	0.06	0.24
Security threats and vulnerabilities	-0.52	0.32	-0.13	-0.38	0.24	0.03	0.09	0.08	0.07	0.90
Employee resistance to organizational change	-0.41	0.62	-0.12	-0.02	-0.19	0.04	0.19	0.05	0.04	0.07
Loss of process control	-0.56	0.34	-0.24	0.02	-0.23	0.11	0.20	0.02	0.09	0.11
Constraints on creativity and innovation	-0.47	0.34	-0.35	0.00	-0.05	0.10	0.93	0.01	0.12	0.09
High maintenance costs	-0.45	0.04	0.52	0.28	-0.05	0.04	0.02	0.17	0.10	0.02

Cyberattacks risks	-0.48	-0.03	0.01	-0.26	0.54	0.04	0.08	-0.03	0.05	0.16
Need for monitoring and supervision	-0.34	-0.15	0.23	0.32	0.53	0.03	-0.02	0.05	0.06	-0.01
Potential negative impact on company culture	-0.53	0.08	-0.23	0.55	0.07	0.05	0.13	0.03	0.91	0.06
Rapid obsolescence of RPA systems	-0.66	-0.13	0.09	0.32	0.14	0.08	0.05	0.13	0.25	0.10
Job reduction and workforce displacement	-0.52	-0.32	-0.17	-0.21	-0.17	0.15	0.02	0.06	0.04	0.02
Reduced interpersonal relationships	-0.69	-0.30	-0.27	-0.06	-0.15	0.78	0.16	0.08	0.08	0.05
Overreliance on automation	-0.60	-0.44	-0.16	-0.26	0.04	0.22	0.07	0.06	0.01	0.08
Risk of error propagation	-0.54	-0.42	-0.08	-0.20	0.19	0.07	0.07	0.04	0.04	0.06
Decline in job satisfaction	-0.62	-0.31	-0.23	0.13	-0.33	0.06	0.02	0.88	0.03	0.08
Strained relationships with contractors	-0.62	-0.40	-0.12	0.13	-0.08	0.06	-0.01	0.23	-0.02	0.13

Loadings above 0.70 are marked in red

Source: own elaboration based on empirical research results

The analysis of factor loadings for the five variables revealed that, in all cases, the loading values exceed 0.7, indicating a significant impact on explaining the challenges associated with automation in contemporary enterprises. Figure 3 provides a graphical representation of both raw and Varimax rotated factor loadings. The graph clearly illustrates that the Varimax rotation effectively consolidated variables, reducing redundancy in the information contained in the original data.

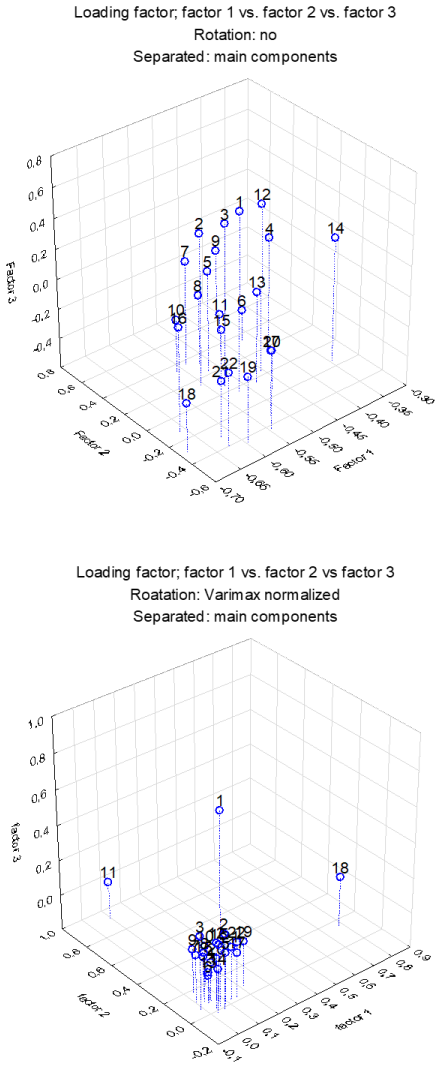

Figure 3. **3D Plot of Factor Loadings Before and After Varimax Normalized Rotation**

Source: own elaboration based on empirical research results

Table 5. **Key Factors That Represent Challenges and Issues in Office Automation**

Key variable/ Crucial factor		Characteristic	% of variance	Cumulative % of variance
K1	Reduced interpersonal relationships (including with clients)	Reduced interpersonal interactions, replacement of decision-making processes, limited client relationships, lack of personalization in services, employee burnout, erosion of trust and loyalty, decreased employee engagement and productivity, increased dissatisfaction and frustration among employees.	28.6	28.6
K2	Constraints on creativity - lack of human creativity and innovation	Risk of burnout, monotony, uniformity, and routine in work, lack of intellectual challenges, physical and emotional exhaustion, decreased efficiency and employee engagement, lack of new idea generation, lack of initiative, increased absenteeism, and higher employee turnover.	8.79	36.85
K3	High implementation costs of automation	Cost of purchasing equipment and software, implementation and launch costs, maintenance costs including system monitoring, adaptation and training costs, restructuring costs, ongoing engagement costs, opportunity costs, including burnout, resistance to change, retraining, and loss of intellectual capital.	7.91	44.77
K4	Potential negative impact on company culture	Weakened interpersonal relationships, lack of shared goals, negative workplace atmosphere, mechanical and routine tasks, stress and uncertainty, reduced motivation, and lack of open communication.	6.28	51.05
K5	Security threats - automation of processes can introduce security vulnerabilities	Risk of data loss or leakage, unauthorized access, cyberattacks, data protection, data encryption, security audits, vulnerability mitigation, and intrusion detection.	5.69	56.74

Source: own elaboration based on empirical research results

5, Discussion

The analysis revealed that the primary challenge facing the company in implementing office automation is the reduction of interpersonal relationships, both internally among

employees, and externally with contractors. The eigenvalue of the factor is 6.17, accounting for over 28% of the identified issue. According to respondents, the implementation of automation may result in fewer interactions among employees. Traditional processes that necessitate collaboration, communication, and joint problem-solving could be replaced by automated systems designed to simplify and streamline decision-making. This transition may lead to weakened interpersonal bonds, feelings of isolation, and increased risk of burnout. Additionally, automation may impact relationships with contractors, particularly when automated customer service solutions, such as chatbots or standardized responses are implemented. These measures often result in a lack of personalization in customer service. Reducing direct contact with clients and business partners, combined with formulaic responses, frequently fails to address specific and individualized needs. This can lead to a loss of trust, dissatisfaction, frustration, and consequently, a decline in loyalty. It is important to emphasize that customers highly value a personalized approach and direct interaction—elements that are largely absent in a fully automated environment.

Another significant challenge related to office automation is the potential for occupational burnout, which can result in reduced creativity, innovation, and employee engagement. The eigenvalue of this factor is 1.93, accounting for nearly 9% of the identified issue. Respondents indicated that the implementation of modern solutions aimed at facilitating work often leads to the simplification and mechanization of tasks, making work monotonous, repetitive, and routine. Employees performing such tasks may experience a lack of intellectual stimulation, which can lead to discouragement, boredom, and diminished job satisfaction. Over time, this may result in burnout, characterized by physical and emotional exhaustion. Excessive monotonous and routine work significantly impairs employees' ability to generate new ideas, rationalize initiatives, and engage in innovative projects. Creativity and innovation thrive in environments that provide appropriate stimuli, motivation, and opportunities for experimentation and risk-taking. Automation, by design, focuses on simplifying tasks and increasing efficiency, but it does not inherently foster these factors. When employees lack the necessary conditions to thrive, they often refrain from showing initiative. In extreme cases, this can hinder their adaptability to a rapidly changing business environment. Additionally, occupational burnout has a detrimental impact on employee engagement, manifesting in decreased productivity, higher absenteeism, and elevated turnover rates. To address these challenges, it is essential to implement initiatives that strike a balance between the benefits of automation and the expectations and capabilities of the workforce.

The third significant challenge related to the implementation of office automation is its cost. This factor has an eigenvalue of 1.74, accounting for nearly 8% of the issue. Costs extend beyond the initial investment required for acquiring equipment and software. They also encompass implementation, deployment,

maintenance, adaptation, employee training, management, and opportunity costs such as those arising from occupational burnout and diminished creativity. The adoption of modern equipment and software necessitates system adjustments and configurations to ensure compatibility. This process often requires significant time and the involvement of specialists with appropriate experience and expertise. Additionally, automation systems demand regular software updates and ongoing monitoring to ensure optimal performance, which typically results in relatively high operational costs. Another significant expense associated with automation is the need for employee training, workshops, and seminars to help staff familiarize themselves with and effectively utilize the new solutions. Furthermore, adapting existing business processes to automated systems may require procedural restructuring and modifications to roles and responsibilities, further driving up costs. Effective communication and workforce engagement are also critical when introducing automation. This necessitates the development of new communication strategies, methods for disseminating information, and measures to maintain strong relationships with employees throughout the transition.

Opportunity costs associated with automation are also significant, particularly in terms of shifts in the workforce's approach to work. A critical challenge is resistance to change, often stemming from concerns about potential job losses or the need for retraining. Automation is frequently perceived as a threat to employment, potentially leading to workforce reductions and, consequently, the loss of valuable intellectual capital. Two additional factors pose relatively smaller challenges for entrepreneurs considering automation. The first involves its potential negative impact on company culture. The second pertains to security threats, particularly the risk of data loss or leakage. The implementation of new systems and tools often necessitates the transmission and storage of large volumes of sensitive data, increasing the likelihood of unauthorized access. This is particularly concerning for information related to customers, inventory, pricing, payment terms. To address these risks, investments in advanced security measures including data encryption, regular audits, and intrusion detection systems, are essential. The automation of office processes can negatively impact a company's organizational culture. The implementation of automated systems often reduces interpersonal interactions, weakening bonds among employees and diminishing the sense of community. As work becomes more mechanical, employees may find their role less satisfying, leading to decreased engagement and motivation. Moreover, an overreliance on technology can exacerbate fears of jobs displacement by creating stress and uncertainty within the workforce. To counteract these challenges, companies should prioritize cultivating an organizational culture that emphasizes open communication, collaboration, and employee engagement. Initiatives that encourage employees to participate in innovative projects and enhance their interpersonal

skills can help preserve a positive work atmosphere, even in the face of increasing automation.

6. Conclusion

The automation of office work offers numerous benefits for companies, such as reducing errors and increasing productivity. However, the uncritical implementation of various improvements may not always produce the desired outcome. Research highlights significant concerns about the potential disruption or limitation of interpersonal relationships, both within the organization and in dealings with external contractors. Automated systems can reduce interactions among employees, weakening workplace bonds and contributing to burnout. Humans in the workplace require meaningful stimuli that automation or artificial intelligence cannot provide. Consequently, creativity, innovation, and employee engagement may suffer. Another significant challenge associated with automation is the costs, which extends beyond initial investments. Companies must also account for ongoing maintenance expenses, employee training and retraining, and the adaptation of existing business processes. Furthermore, investing in advanced security measures to protect resources from cyber threats is essential. Automation can also have a negative impact on organizational culture, potentially making the workplace less welcoming. The introduction of automated systems may generate anxiety and fuel fears about the replacement of human labour by machines, leading to increased stress and uncertainty among employees.

The study confirmed the stated hypotheses. Regarding H1, implementation costs emerged as a critical challenge in automation. These costs encompass both initial investments and ongoing expenses, such a maintenance, employee training, and the adaptation of business processes. Together, these factors significantly hinder the efficient utilization of RPA platforms.

H2 was also confirmed, indicating that automation directly impacts human factors such as job satisfaction, engagement, and creativity. The findings revealed that automation can reduce interactions among employees, weakening social bonds and potentially leading to burnout. To mitigate these negative effects, organizations must adopt a balanced approach that prioritizes employee development and satisfaction alongside automation efforts. Nevertheless, the excessive focus on financially stable companies with an established market position may fail to capture the full spectrum of challenges faced by less established entities.

Effectively managing the challenges of office automation requires a balanced approach that integrates the expected benefits with a focus on employee development, satisfaction, and overall well-being.

Companies should prioritize open communication, actively involve employees in new tasks, and foster a positive work atmosphere by clearly explaining all intentions and strategic plans.

Based on the findings of the study, several proactive measures are recommended:

1. Implement automation in a way that complements and supports human work than replacing it.
2. Provide regular training to ensure employees to maintain high levels of competence and adaptability to new technologies.
3. Encourage and reward innovation, creativity, and employee-driven improvements through initiatives that recognize human capital contributions.
4. Maintain an open dialog between management and employees to discuss the goals of automation and its implications for the company's future.
5. Continuously evaluate the effectiveness of automated systems and introduce necessary adjustments and corrective actions as needed.

The study is subject to several significant limitations that may influence its results and interpretations. Firstly, selection bias, resulting from the deliberate choice of financially stable companies with a long-standing market presence, may lead to an overrepresentation of positive experiences related to automation while disregarding the challenges faced by less stable or newer entities. Secondly, micro-enterprises were excluded from the study, meaning that the specific challenges and constraints faced by these businesses are not considered. This exclusion may result in a distorted representation of the impact of automation across companies of different sizes. Furthermore, the excessive focus on specific legal forms, primarily limited liability companies, restricts the ability to generalize the findings to other types of enterprises that may approach the implementation of automation differently. Finally, it should be noted that the focus on established markets and companies with strong market connections may bias the results toward enterprises that have already adapted to technological changes, while overlooking the challenges and resistance associated with automation in less established organizations.

Authors' contribution

All authors participated in: article conception, theoretical content of the article, research methods applied, conducting the research, data collection, analysis and interpretation of results, draft manuscript preparation

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