Automation of Business Processes in the IT Sector: From Robotization to Intelligent Ecosystems

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Abstract: ***In the context of the rapid deepening of digital transformation, business process automation (BPA) acts as one of the fundamental determinants of the competitiveness of companies in the IT sector. The study is aimed at the development and theoretical and methodological substantiation of a conceptual model for the strategic implementation of BPA in IT organizations, which synthesizes technological, organizational, and strictly strategic dimensions. The methodological basis of the work includes a systematic literature review using data sets from Scopus, Web of Science, IEEE, and ACM, as well as a qualitative analysis of relevant case studies. The results obtained indicate that the development of BPA follows a trajectory from the robotization of routine operations to intellectualized systems based on artificial intelligence (AI) and machine learning (ML); this trend is empirically confirmed by an increase in the level of AI adoption from 55% in 2023 to 72% in 2024. The paper presents a conceptual maturity model structured around five key domains: strategic alignment, governance system, technological infrastructure, human capital, and organizational culture. Case analysis demonstrates that a highly mature, systematically structured approach to automation makes it possible to ensure productivity gains at the level of 300–375%. The conclusion substantiates that the long-term sustainability and effectiveness of BPA are determined predominantly not by the degree of technological sophistication of solutions, but by the level of organizational maturity, while the prospective development trajectory is associated with the transition to hyperautomation and the formation of hybrid ecosystems of the human-in-the-loop format. The results obtained have practical and scholarly value for executives of IT companies, project managers, and researchers in the field of technology management and digital transformation process management.***

Keywords: business process automation, IT sector, process robotization, artificial intelligence, maturity model, digital transformation, hyperautomation, project management, operational efficiency, case studies

1. Introduction

The global business environment is currently in a phase of profound structural transformation, the key driver of which is pervasive digitalization and the implementation of end-to-end information and communication technologies. Under these conditions, business process automation (BPA) appears not merely as another technological trend, but as the strategic core of policies aimed at increasing operational efficiency and strengthening companies' competitive positions. A special place in this dynamic is occupied by the IT sector, which plays a dual role: on the one hand, it is the main provider of automation solutions, and on the other, an intensive user of these same technologies for optimizing its own highly complex processes of software product development, information systems maintenance, and project portfolio management. The relevance of studying BPA in the context of the IT industry is confirmed by empirical data: as of 2024, 66% of organizations worldwide have automated at least one business process, and the global BPA market is projected to grow from 13 billion US dollars in 2024 to 23.9 billion dollars by 2029 [1]. An additional accelerator of these processes was the COVID-19 pandemic, which prompted more than 80% of companies to accelerate the implementation of BPA in order to ensure sustainable remote work and enhance overall operational resilience [1].

At the same time, despite the scale of dissemination and the significant volume of investments, BPA implementation practices are accompanied by high risks and systemic difficulties. Analytical reports point to an evident paradox: given the consistently high interest in automation, from 30% to 50% of initial projects on process robotization (RPA) end in failure [2, 3]. This fact signals the existence of a theoretical and methodological gap. Existing academic research predominantly focuses on individual classes of technologies (such as RPA, artificial intelligence, Low-Code/No-Code platforms) or on the assessment of their economic effects, while the technological component, implementation strategies, level of organizational readiness, and risk management systems are analyzed in a fragmented manner. There is no holistic integrative model that would make it possible to link the technological evolution of BPA with the concept of organizational maturity and simultaneously confirm this relationship with empirical data obtained from IT companies.

The aim of the study is to develop and provide theoretical and methodological substantiation for a conceptual model of the strategic implementation of business process automation in IT companies that takes into account the interrelation of technological, organizational, and strategic dimensions.

The author's hypothesis proceeds from the assumption that the success, sustainability, and scalability of BPA implementation in the IT sector are determined to a decisive extent not by the level of technological sophistication of the tools used, but by the degree of organizational maturity in key competence areas, such as strategic alignment of automation initiatives with business goals, quality of corporate governance, development of human capital, and characteristics of organizational culture. It is assumed that a higher level of maturity in these areas is in direct correlation with an increase in return on investment (ROI) from BPA projects and with a decrease in the likelihood of their failure.

The scientific novelty of the study lies in the construction and substantiation of an integrative model that combines a multidimensional approach to assessing the maturity of organizational competences with an analysis of current technological trends and empirical case studies. Such a synthesis makes it possible to propose a comprehensive, end-to-end view of the issues related to BPA implementation. The work overcomes the fragmentation of the existing literature by forming a practice-oriented framework intended to support managerial decision-making in the field of automation in the IT industry and to ensure a more systematic approach to planning, implementing, and scaling BPA initiatives.

2. Materials and Methods

To achieve the stated research objective and to test the proposed hypothesis, a combined methodological strategy was employed, integrating the rigor of systematic scientific analysis with the explanatory potential of in-depth qualitative research. This design made it possible to simultaneously ensure the reproducibility and transparency of data processing procedures, as well as the depth of interpretation of the obtained results.

The methodological framework of the study was a systematic literature review. Its application was determined by the need for a structured, formalized, and verifiable analysis of the existing body of scholarly work in the field of business process automation. The SLR procedure included the formulation of research questions; clarification of inclusion and exclusion criteria for sources; targeted searches in key scientometric databases; and subsequent qualitative synthesis of relevant publications. As a substantive extension, a qualitative case analysis was applied. This method provided the possibility of empirical verification and visual illustration of the theoretical provisions and concepts identified in the course of the literature review, using practical anonymized data on automation projects implemented in the IT sector.

The formation of the source base was carried out on the basis of strictly defined selection criteria. Primary attention was given to peer-reviewed scientific articles published in the period from 2019 to 2024 and indexed in the Scopus and Web of Science databases, as well as in the digital libraries of leading professional communities such as IEEE Xplore and ACM Digital Library. As a methodological reference point in the selection and filtering of publications, approaches implemented in comparable SLR studies were used, in which the initial pool comprising several thousand titles was reduced, through successive exclusion criteria, to about 100 of the most relevant works. To ensure a stable connection between academic knowledge and current market practice, analytical reports and forecasts of leading consulting companies, including Gartner, McKinsey & Company, and Deloitte, were used.

3. Results and discussion

The modern market for business process automation solutions demonstrates extremely high volatility and a stable trend toward exponential expansion. The projected increase in its volume from 13.7 billion dollars in 2023 to 41.8 billion dollars by 2033 indicates the transformation of BPA into one of the key strategic factors in the development of global business [6]. The acceleration of growth is explained not only by the objective of cost optimization, but also by the increasing need of organizations to enhance the adaptability of operational activities, the accuracy of procedure execution, and the ability to scale processes without disruption. The technological environment of BPA in recent years has undergone a qualitative transformation, evolving from primitive script-based tools to complex intelligent systems (see Fig. 1).

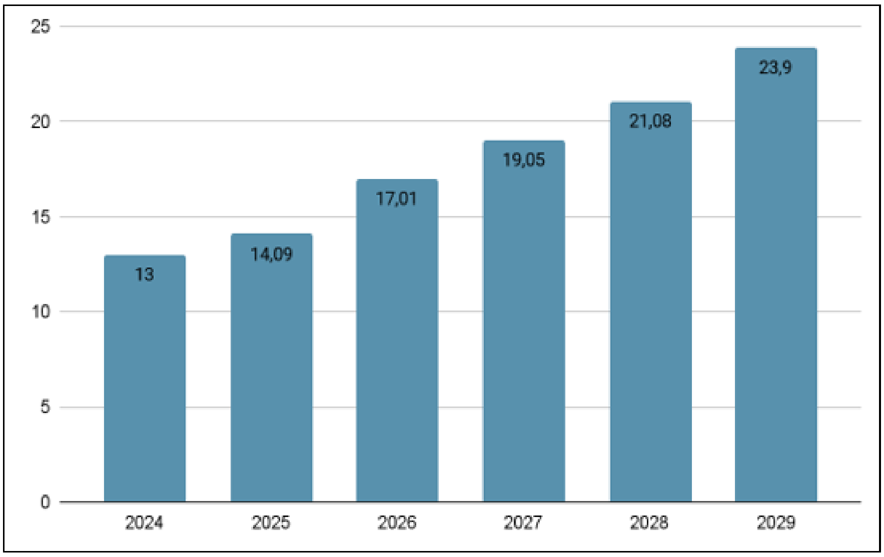

Figure 1: Global Business Process Automation (BPA) Market Growth Forecast, 2024–2029 (US$ billion) (compiled by the author based on [1]).

Key technological directions that determine the current configuration of BPA include:

1) Robotic Process Automation (RPA): RPA represents a fundamental layer of automation focused on reproducing user actions when working with graphical user interfaces of applications. In essence, it is a technology that is optimally suited for automating strictly regulated, structured, and frequently repeated operations based on formalized business rules, such as data entry and validation, invoice processing, and preparation of

standard reports. A significant advantage of RPA is its ability to function as an intermediary layer between modern systems and legacy infrastructure lacking fully featured API interfaces [6]. The scale of diffusion of this technology is confirmed by empirical studies: according to Deloitte, 53% of surveyed organizations have already implemented RPA-based solutions, and over the next two years this figure is expected to increase to 72% [6].

2) Integration of artificial intelligence (AI) and machine learning (ML): While RPA primarily automates the action component, AI and ML technologies introduce a thinking component into the system, that is, the ability to interpret, generalize, and make decisions. Embedding AI and ML into the BPA contour broadens the range of automatable tasks by incorporating weakly structured and non-routine operations that require elementary cognitive functions: from pattern recognition (for example, interpreting invoices using OCR) to natural language processing (NLP) for analyzing customer inquiries and predictive analytics for forecasting demand or identifying fraudulent schemes [10]. The transition from strictly deterministic automation to intelligent automation is the dominant trend: according to McKinsey estimates, the level of adoption of AI-based solutions in business processes increased from 55% in 2023 to 72% in 2024, which demonstrates an accelerating shift toward more intelligent forms of automation [6].
3) Low-Code/No-Code (LCNC) platforms: LCNC platforms act as a specific factor of democratization of automation, expanding the pool of active participants in the development of digital solutions. They provide visual design environments and a set of preconfigured modules that enable users without deep programming competencies (citizen developers) to independently create and deploy applications and workflows. As a result, business dependence on IT department resources decreases, development cycles are shortened (in a number of cases, implementation time is reduced by 50–90%), and the organization's ability to adapt promptly to changing requirements of the external and internal environment increases [6]. According to Salesforce, 24% of companies already use LCNC approaches for automation tasks, and another 29% plan to implement them in the foreseeable future [1].

An analysis of the causes of failure in business process automation projects shows that technological components only in exceptional cases constitute the root of the problems. Much more often, the sources of failure are organizational unpreparedness, the absence of an integrated and formalized strategy, as well as underestimation of cultural and behavioral factors. To structure these non-technological dimensions and to form a practice-oriented roadmap for IT companies, a conceptual maturity model is proposed, adapted on the basis of the Business Process Automation Capability Maturity Model (BPACMM) [4, 5]. This model distinguishes five key competence domains within which an organization must consistently build maturity in order to ensure sustainable and reproducible results when implementing automation initiatives (see Fig. 2).

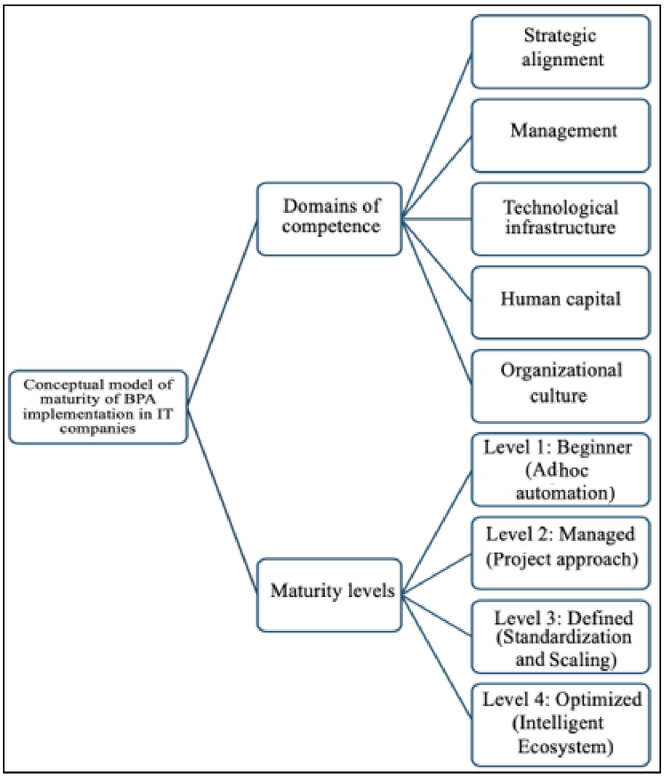

Figure 2: Conceptual model of BPA implementation maturity in IT companies (compiled by the author based on [5, 9, 11, 20]).

Strategic alignment: At the initial stages of maturity, automation is implemented episodically and is predominantly operational and tactical in nature: individual units launch initiatives aimed at solving specific, localized tasks, without alignment with corporate-wide priorities. As the organization develops, BPA becomes an integral element of corporate strategy. Automation initiatives are structurally embedded into the system of strategic objectives: reduction of time-to-market for new products and services, increase in the customer satisfaction index (CSAT), reduction of total costs for solution development and maintenance, and others. In other words, automation ceases to be an auxiliary tool and becomes one of the key mechanisms for achieving competitive advantages.

Governance: The governance framework evolves from an almost complete absence of formalized rules and criteria to the creation of a specialized center of excellence (CoE) that coordinates all activities in the field of BPA. At high levels of maturity, a formally established system for selecting processes for automation operates, the roles and areas of responsibility of participants (from business owners to solution architects and process owners) are detailed, and a system of metrics and KPIs is implemented to assess the effectiveness and efficiency of digital workers. In addition, procedures for managing operational, technological, and regulatory risks associated with the scaling of automation are formalized [18, 19].

Technological infrastructure: The technological landscape evolves from a fragmented set of isolated tools to the formation of a holistic, scalable, and secure automation platform. At a mature stage, the organization relies on a unified infrastructure that ensures seamless integration of heterogeneous technologies- robotic process automation (RPA), artificial intelligence (AI), low-code and no-code platforms (LCNC)- both among themselves and with existing corporate systems (ERP, CRM, CI/CD platforms, etc.). This makes it possible to build end-to-end, change-resilient business processes and accelerates the deployment of new solutions without significant architectural conflicts.

Human capital: The perception of automation gradually transforms from its interpretation as a threat to employment to an understanding of it as a tool for enhancing human potential and redistributing types of activities. In mature organizations, a long-term policy of investment in human capital is formed: structured reskilling and upskilling programs are implemented, aimed at developing competencies in the areas of data analysis, end-to-end process management, and the design and improvement of automated solutions. Employees are prepared for the transition from predominantly routine operations to more complex, cognitively intensive roles.

Organizational culture: The cultural context evolves from dominant resistance to change and preservation of the status quo to the entrenchment of a paradigm of continuous improvement and data-driven decision-making. Under conditions of high maturity, an environment is formed in which employee initiative is purposefully supported: experimentation, independent identification of candidates for automation, and critical revision of established practices are encouraged. Errors and unsuccessful pilots are interpreted not as grounds for sanctions but as a source of organizational learning and an empirical basis for subsequent, more successful iterations of BPA development.

The analysis of practice-oriented cases makes it possible to empirically confirm the proposed model and to demonstrate the presence of a direct, causally determined relationship between the strategic nature of automation initiatives and the achievement of tangible, quantitatively measurable business results.

Case 1. Optimization of operational efficiency in e-commerce. As part of cooperation with a client in the field of electronic commerce, an IT agency designed and implemented an integrated solution that included a customized CRM system and end-to-end automation of the order processing workflow. The automation covered a number of critical elements of the operational cycle: synchronization of data on warehouse stock levels, interaction and data exchange with logistics operators, as well as automated generation of accompanying documentation.

The impact of the project on performance indicators proved to be significant: the individual output of a single employee responsible for order processing increased from 30–40 to 120–150 orders per day, which is equivalent to an increase in personal productivity of 300–375%. At the same time, the elimination of the need for part of the staff performing primarily routine operations led to a reduction in the number of administrative and operational employees and, consequently, to a direct decrease in total operating costs.

The effects obtained are consistent with the results of industry studies and external cases. Thus, in one of the projects, the implementation of an order management system made it possible to reduce the time of manual processing by 89% and decrease the number of errors by 94% [13]. In another example, the use of the Deck Commerce OMS platform ensured the automation of 98% of all orders and resulted in savings of more than 1000 man-hours per year [14]. The presented case demonstrates that, with targeted automation of a key business process, an organization obtains not merely a linear improvement of individual metrics, but a multiplicative increase in efficiency, manifested simultaneously in higher labor productivity, reduced costs, and a lower share of manual labor in the operating model (see Table 1).

Table 1: Comparative analysis of operational efficiency indicators before and after the implementation of automation in e-commerce (compiled by the author based on [13, 14]).

Metric	Before automation implementation	After automation implementation	Change
Number of orders per employee per day	30–40	120–150	Increase by 300–375%
Manual processing time per order (estimate)	10–15 minutes	2–3 minutes	Reduction by ~80%
Error rate (estimate)	5–7%	< 1%	Reduction > 85%
Staffing requirement (per 1,000 orders)	25–33 people	7–8 people	Reduction by ~70%

Case 2. Improving the quality of customer experience through the redesign of CRM systems. For a company operating in the IP telephony market, a long-term project was implemented by an IT agency, the focus of which shifted from increasing functional capabilities to a radical improvement of the user experience (UX) of the internal CRM system. The key objective was not to complicate the product with new modules but, on the contrary, to transform an initially overloaded and multi-component system into a tool that is as transparent, predictable, and convenient as possible for the everyday work of sales managers and customer support specialists. In other words, the aim was to reduce the cognitive load on users while preserving (or even enhancing) the functional richness of the system.

Despite the absence of detailed quantitative before and after metrics for this specific project, its success (confirmed by industry awards and a noticeable increase in the client's business activity) can be interpreted through the lens of comparable empirical studies. In one of the documented cases of CRM system redesign, the method of the so-called UX calorie calculator was applied, which makes it possible to objectify the complexity of user interaction with the interface and to assess the cost of performing a given operation in clicks and time spent [15]. As a result of the project, it was possible to reduce the number of redundant clicks by 18%, decrease the duration of performing a typical action by 2 minutes 15 seconds, which was accompanied by an increase in user satisfaction of 19% and an increase in conversion of 10% [15].

With a high degree of justification, it can be assumed that the success of the case under consideration is driven by analogous mechanisms [16]. Systematic simplification of work scenarios, removal of non-functional or rarely used interface noise, and bringing the most in-demand functions to the forefront lead to a reduction in users' operational costs, a decrease in the number of errors, and an acceleration of task execution. Taken together, this translates into increased efficiency of front-office operations and a direct improvement in the quality of customer service, since more convenient and logically structured tools allow employees to respond more quickly and accurately to the requests of end customers [16] (see Fig. 3).

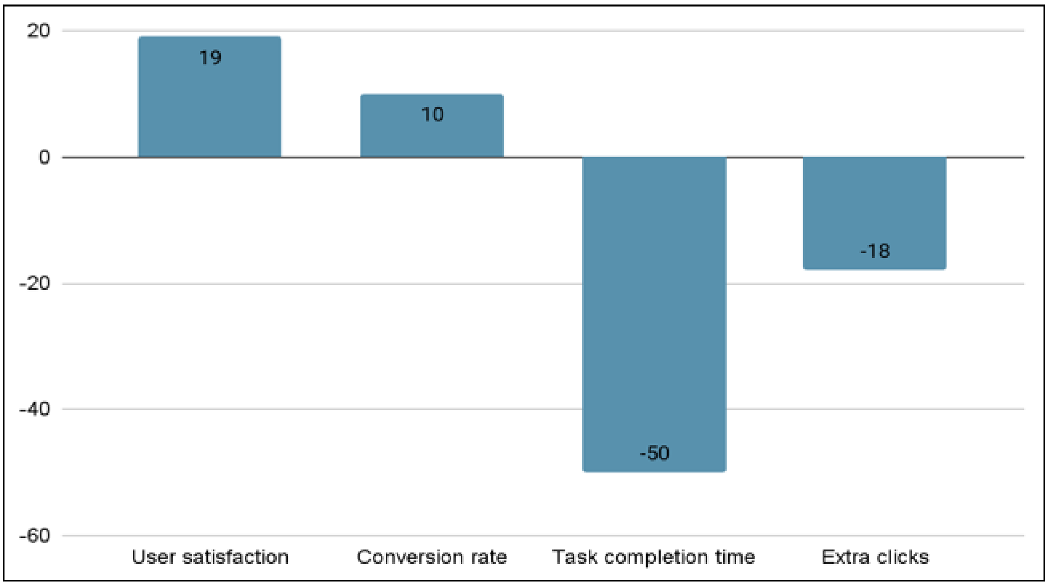

Figure 3: Correlation between UX improvement in CRM and business metrics (compiled by the author based on [15, 16])

Case 3. Standardization and scaling through internal platform solutions. In the course of its operational activities, the IT agency has developed a set of internal software modules designed for data synchronization with inventory management systems. These solutions are not brought to the external market as standalone products, but exist in the form of standardized, repeatedly reusable assets stored in an internal repository. Owing to their standardized architecture, such packages can be rapidly connected to new projects by effectively invoking a single command, which dramatically reduces labor costs, implementation timeframes, and the total development cost for clients with similar needs.

This practice demonstrates a high level of organizational maturity (Level 3: Defined). It is no longer a matter of ad hoc automation of individual client cases, but of a holistic, strategically structured approach to knowledge management and the organization's technology stack. The creation of internal platforms directly addresses one of the fundamental problems of automation, namely the need for integration with fragmented and legacy accounting systems, and also reduces the rate of accumulation of technical debt [8]. This trajectory of development is consistent with Deloitte's forecasts for 2025, according to which AI-based solutions will be increasingly used to modernize and simplify the evolution of corporate systems [10]. As a result, the agency effectively goes beyond the traditional model of selling automation services and develops scalable technological assets that simultaneously enhance its own operational efficiency and increase the value of its offering for clients (see Fig. 4).

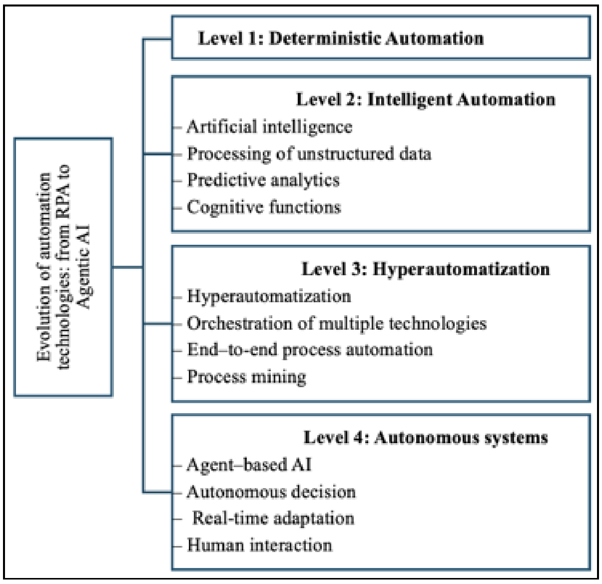

Figure 4: Evolution of automation technologies: from RPA to Agentic AI (compiled by the author based on [6]).

At the same time, despite the aforementioned advantages, the move toward effective automation is accompanied by significant barriers and risks, which largely accounts for the high share of projects that end in failure. Below, Table 2 presents a classification of BPA project risks and the recommended mitigation strategies.

Table 2: Classification of BPA project risks and recommended mitigation strategies (compiled by the author based on [2, 8, 9, 19]).

Risk category	Specific risk	Potential impact	Mitigation strategy
Strategic	Automation of a non-optimized process (automation of chaos)	Amplification of existing problems, zero or negative ROI, discrediting the technology.	Implementation of a mandatory stage of analysis, reengineering, and standardization of the process before the start of automation.
Organizational	Employee resistance to change (fear of job loss)	Sabotage, low adoption rate, loss of qualified personnel.	Transparent communication strategy, involvement of employees at early stages, investment in reskilling programs (reskilling).
Technological	Complexity of integration with legacy systems	High development costs, solution instability, project delays.	Use of RPA as an intermediate solution, use of middleware platforms (Zapier, Make), phased modernization of the IT landscape.
Project	Project scope creep	Budget and schedule overruns, creation of an excessively complex product.	In-depth requirements analysis at the initial stage (discovery phase), fixing the scope in the technical specification, flexible project management (Agile).
Security	Unauthorized access to data through automated systems	Leakage of confidential information, financial and reputational losses, violation of regulatory requirements (GDPR).	Implementation of a role-based access model, data encryption, regular security audits, monitoring of bot actions in real time.

The statistics themselves underscore the scale of these risks. According to EY estimates, from 30% to 50% of pilot projects in the field of RPA fail to achieve their stated objectives. At the practical level, this is manifested, in particular, in cases where errors in the code of a software robot processing customer complaints have led to their massive accumulation, and incorrectly specified rules in a bot for calculating charges have caused significant financial distortions in the company's reporting [2] (see Fig.5).

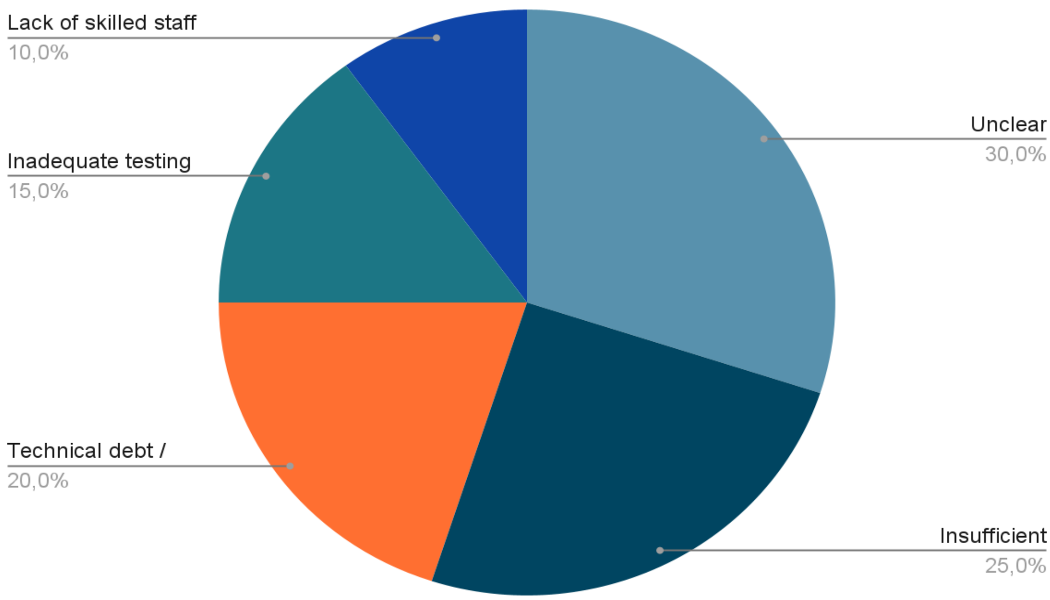

Figure 5: Key reasons for failure of business process automation projects (compiled by the author based on [2]).

The future of business process automation is associated not so much with the pointwise implementation of individual digital solutions as with the formation of holistic, intellectually rich, and dynamically reconfigurable organizational systems. A comparison of long-term forecasts from leading analytical centers, primarily Gartner, makes it possible to identify several strategic directions in the evolution of such systems.

Hyperautomation: This concept, introduced by Gartner analysts, is understood not as a single technology but as the orchestration of the entire spectrum of available automation tools in line with business strategy, guided by the principle of automating everything that can and should be automated [6]. Hyperautomation relies on the coordinated use of RPA, artificial intelligence and machine learning methods, business process management systems (BPMS), process mining tools, and advanced analytics to achieve end-to-end automation of complex, multi-stage processes [12]. The key target construct here is the digital twin of the organization, which makes it possible, in a mode close to real time, to reproduce, model, and analyze the operational contours of the business, as well as to experiment with options for their optimization without interfering in the live system [6].

Agentic AI: The logical continuation of AI development is the transition from static, strictly regulated scenarios to autonomous intelligent agents. In contrast to classical RPA bots, which operate strictly within predefined algorithms, AI agents possess the ability to interpret context, independently formulate and revise action strategies, and adapt to external

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changes in real time [17]. Hybrid human-in-the-loop model: Further development of automation is unlikely to lead to a scenario of complete replacement of humans by machines; a more probable configuration is one in which the decisive factor becomes the productive distribution of roles between humans and AI systems. The most pragmatic and sustainable is the hybrid model that presupposes close cooperation between people and AI agents within a single management framework [7]. In such an architecture, AI components take over routine, high-frequency, and computationally intensive operations, while humans retain responsibility for oversight, handling atypical and creative situations, solving strategically significant tasks, and intervening at critical points in the decision-making process [21]. This human-centered format serves as a key condition for the controllability and accountability of complex intelligent systems, as well as for increasing the level of trust in them, especially in the context of the probabilistic and not fully deterministic nature of the behavior of modern AI models.

4. Conclusion

The study conducted makes it possible to formulate a number of final propositions that are simultaneously of theoretical and practical significance for the field of information technology.

First, the evolution of business process automation in the IT sector demonstrates a shift from narrowly instrumental, tactical use of tools for the robotization of routine operations (RPA) to strategically structured solutions based on intelligent technologies (AI/ML) and integrated platforms. In the current BPA paradigm, the focus shifts from simple cost optimization to a profound transformation of the operating model: enhancing organizational adaptability, accelerating the development life cycle, and significantly improving the customer experience become the key target effects.

Second, empirical and theoretical analysis has confirmed the central idea of the study: the long-term effectiveness and scalability of automation programs correlate primarily with the level of organizational maturity rather than with the sophistication of the technology stack as such. The conceptual model developed, which includes five domains of competencies (strategic alignment, governance, technological infrastructure, human capital, and organizational culture), serves as an effective tool for self-diagnosis and strategic design of transformation initiatives. Organizations that demonstrate a high level of maturity across all five dimensions significantly reduce the risk of unsuccessful automation and maximize the return on investment.

Third, the analysis of case studies has convincingly shown that well-designed, strategically integrated automation leads to statistically significant and measurable effects. Examples demonstrating multiple increases in productivity (up to 300–375%) and a radical improvement in user experience empirically support the hypothesis of a direct relationship between the maturity of the approach to BPA and the degree of achievement of key business outcomes.

Finally, the trajectory of further development is unequivocally shifting towards hyperautomation and the formation of hybrid, collaborative ecosystems in which humans and intelligent AI agents function as complementary elements of a single sociotechnical system. This imposes on IT leaders the requirement to proactively rethink not only the technology stack, but also organizational design, corporate values, and the model for developing employee competencies.

Taken together, this allows it to be stated that the objective set in the study has been achieved through the development and theoretical and methodological substantiation of the maturity model, and the proposed hypothesis has been confirmed both on the basis of the analysis of scientific sources and as a result of the consideration of practical cases. The practical significance of the work lies in providing executives of IT companies and project managers with a structured roadmap that makes it possible to assess the level of readiness for automation, determine priority development trajectories, build a risk management system, and ensure strategic preparation for subsequent waves of intelligent and autonomous technologies that are shaping the future contours of the IT industry.

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