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Developing an Integrated Enterprise Management Technology Based on a Meta-Management and Risk-Oriented Approach

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Abstract

In today's dynamic global business environment, the successful management of enterprises is crucial for their sustainability, growth, and, most importantly, their competitiveness. This article addresses the challenge of enhancing enterprise competitiveness by developing and evaluating an integrated enterprise management technology. The study's main aim is to create a cohesive system by amalgamating specialized management technologies through the principles of meta-management and a risk-oriented approach, thereby aligning organizational activities with stakeholder interests and sustainable development goals. Methodologically, the research adopts a comprehensive approach, analyzing ISO certification trends and data from a survey of 115 Chinese enterprises, with 32 responses from senior and mid-level managers. The results underscore the critical role of integrated management technologies in augmenting organizational efficiency and sustainability. Key findings indicate that 80% of surveyed enterprises require quality management technology, and 68% see high relevance in risk management, knowledge management, and CSR. The study validates a model that enhances risk management strategies and boosts organizational performance. Ultimately, this research provides a procedural framework for implementing an integrated technology that directly contributes to strengthening an enterprise's competitive position in the market.

Keywords: *integrated management technologies, competitiveness, complex management system, risk-oriented approach, meta-management, enterprise*

JEL Classification: O32, M21, L25

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1 INTRODUCTION

The achievement of sustainable development necessitates the adoption of modern technologies in response to the unpredictable external environment and limited resources (Carfora et al., 2021). Enterprises are compelled to foster innovation, particularly within their management practices, to effectively adapt and progress, and maintain their competitiveness (Shao et al., 2020). Considering the escalating level of complexity in management processes and the swiftly evolving external landscape as described in the works of Benbya et al. (2020) or Cho (2024), there has been a discernible emergence of integrated management technologies aimed at addressing these challenges.

Integrated enterprise management technology (IEMT) is a bespoke system shaped by the operational activities, strategic pursuits, goals, and global experience of the enterprise (McDowall, 2019). International organizations have established standardized management systems to support businesses in attaining sustainable development objectives (Van Tulder et al., 2021). It is imperative to formalize the process of building integrated technology by identifying the most pertinent specialized technologies for integration. This endeavor can be

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accomplished through a comprehensive analysis of the application of certified management systems.

The process of integrating specialized enterprise management technologies into a comprehensive system comprises a series of interconnected actions designed to achieve specific objectives (Ershadi et al., 2021). The primary aim of this integration is to synchronize and harmonize activities, management functions, resources, and documentation to meet the demands of stakeholders and realize sustainable development goals (Guo et al., 2023). Integration ensures that the values and principles within the enterprise correspond with the operations, systems, and structures of the integrated management technology, facilitating increased efficiency and effectiveness (Ganbold et al., 2021), which are foundational pillars of a competitive enterprise.

While the concepts of meta-management and risk-oriented approaches are well-documented in management literature, their synergistic integration into a single, cohesive technological framework remains an underexplored area. Much of the existing research treats these domains as separate entities (e.g., Asif et al. (2010) on meta-management; Hristov et al. (2022) on risk management). This separation creates a significant research gap: there is a lack of a comprehensive, procedural framework that guides enterprises in developing an IEMT system that concurrently leverages meta-management for strategic alignment and a risk-oriented approach for resilience. Our study addresses this gap by proposing and validating a model that amalgamates these principles to enhance organizational performance and competitiveness.

The primary objective of this study is to conduct an analysis of the constituent elements of integrated enterprise management technology and to evaluate its degree of integration. The study endeavors to devise a procedure for the establishment of the IEMT system rooted in meta-management and a risk-oriented approach.

Through an exploration of the interplay between these methodologies, the study seeks to develop an integrated system capable of effectively addressing the challenges posed by the unpredictable external environment and limited resources prevalent in the current business landscape. Consequently, this study distinguishes itself through its comprehensive approach to the development of integrated enterprise management technology, with a particular focus on the integration of specialized enterprise management technologies into a unified system aimed at aligning activities, functions, and resources with stakeholder interests and sustainable development objectives.

In terms of its structure, this paper initially underscores the necessity of modern technologies for sustainable development and underscores the imperative for enterprises to innovate their management practices. It subsequently delves into the concept of integrated enterprise management technology, emphasizing the importance of aligning activities with organizational goals and aligning them with global best practices. Furthermore, the article outlines the process of integrating specialized management technologies and underscores the pivotal role of meta-management and risk-oriented approaches in this integration. The study culminates in an analysis of the components of integrated enterprise management technology, an assessment of the level of integration, and the proposal of a procedural framework for establishing an integrated management system rooted in meta-management and a risk-oriented approach.

This paper is structured as follows. Section 2 provides a review of the theoretical backgrounds of meta-management, risk-oriented approaches, and integrated management systems. Section 3 details the research objective, methodology, and data, outlining the model developed for IEMT formation and risk assessment. Section 4 presents the core results of our survey and the implementation of our model in two case-study enterprises, followed by a discussion that

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includes a comparative international analysis. Finally, section 5 concludes the paper by summarizing the key findings, discussing their implications for enhancing enterprise competitiveness, acknowledging limitations, and suggesting avenues for future research.

2 THEORETICAL BACKGROUNDS

Meta-management, a concept that focuses on managing the processes of management itself, has been recognized for its ability to enhance organizational effectiveness by optimizing decision-making structures and processes (Asif et al., 2010). Integrating these principles into enterprise management technology can lead to increased efficiency, coordination, and alignment across all levels of an organization (Beese, et al., 2023).

The incorporation of a risk-oriented approach in enterprise management is essential for identifying, assessing, and managing potential risks that could impact organizational performance (Hristov et al., 2022). By integrating risk management practices into the decision-making process, companies can proactively mitigate threats and capitalize on opportunities, ultimately leading to improved operational resilience and performance (Yankovyi et al., 2020). According to Intezari and Pauleen (2018) effective decision-making lies at the core of successful enterprise management. Thus, our hypothesis is that by combining meta-management principles with a risk-oriented approach, organizations can make informed decisions that consider both internal and external factors, leading to more strategic and adaptive responses to changing business environments.

The ultimate goal of developing an IEMT is to enhance overall operational performance (Munir et al., 2020). By streamlining management processes, aligning strategies with risk assessments, and fostering a culture of continuous improvement, companies can achieve greater efficiency, effectiveness, and competitiveness in the market (Johnson & Walker, 2023).

Meta-management in enterprise systems refers to the overarching coordination and harmonization of various management functions within an enterprise. According to Stiles et al. (2016), meta-management enables organizations to align their strategic objectives with operational activities, thereby enhancing overall performance. This concept is further explored by Hollen et al. (2022), who emphasize the importance of viewing organizations as complex, adaptive systems. The integration of meta-management principles into enterprise management systems has been shown to improve decision-making processes and resource allocation (Troisi et al., 2019).

According to Eichholz et al. (2024) the risk-oriented approach in enterprise management focuses on identifying, assessing, and mitigating risks to ensure the sustainability and resilience of business operations. Othman and Abdelwahab (2018) highlight in their study the critical role of risk management in achieving strategic objectives. This approach is supported by the work of Ganin et al. (2020), who provide a quantitative framework for risk assessment and management. The integration of risk management into enterprise systems is further elaborated by Settembre-Blundo et al. (2021), who argue that a holistic view of risks, encompassing both internal and external factors, is essential for effective management.

The concept of integrated management systems (IMS) involves the consolidation of various management systems, such as quality, environmental, and occupational health and safety, into a unified framework. Here, Shams et al. (2023) identify the benefits of IMS, including improved efficiency, reduced redundancy, and enhanced compliance with regulatory requirements. Similarly, de Nadae et al. (2021) discuss the challenges and best practices associated with IMS implementation, emphasizing the importance of stakeholder engagement and continuous improvement. The integration of meta-management and risk-oriented approaches into IMS represents a significant advancement in enterprise management technology.

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According to Duchek (2020), the incorporation of risk-based thinking into management systems facilitates proactive decision-making and enhances organizational resilience. The work of Sofranac et al. (2023) demonstrates that meta-management principles can effectively coordinate the diverse elements of IMS, ensuring that risk management practices are consistently applied across all functions.

Ronalter and Bernardo (2023) describe how companies in the manufacturing sector have leveraged IMS to achieve sustainability goals. Similarly, the research by Abisourour et al. (2020) highlights the application of IMS in various industries, demonstrating improved operational performance and risk mitigation. According to Rød et al. (2020) risk management is another critical component, as it addresses the identification, assessment, and mitigation of risks to ensure business sustainability and resilience. Crovin et al. (2021) elaborate on the necessity of a holistic risk management approach, considering both internal and external factors. Ren (2022) offers fundamental principles and general guidelines for risk management, which can be integrated into enterprise management systems. Renn et al. (2022) explore different levels of integration, providing insights into the complexity of merging various systems.

Integrating meta-management and risk-oriented approaches into management system represents a significant advancement. According to Ispas et al. (2023), incorporating risk-based thinking into management systems fosters proactive decision-making and organizational resilience. Nunhes and Oliveira (2020) discuss control processes for total quality management (TQM), which can be integral to IMS, enhancing overall management efficiency.

Case studies further illustrate the successful implementation of integrated management technologies. Wang and Liu (2023) and Zheng et al. (2023) present a synergetic model for IMS implementation based on empirical research in China, demonstrating practical benefits. Santos et al. (2013) discuss the advantages of health and safety management systems certification in small and medium enterprises, post quality management system certification, emphasizing enhanced safety and compliance. Choi et al. (2021) focus on the integration of management systems with an emphasis on safety in the nuclear industry, which provides beneficial findings in risk analysis and mitigation.

Vashishth et al. (2021) propose a taxonomy for integration levels of management systems based on empirical evidence, highlighting the derived corporate benefits. Jankalová and Jankal (2021) and Hutsaliuk et al. (2023) discuss the inclusion of sustainability in business excellence models, which is crucial for creating robust integrated management systems that address long-term environmental and social goals. Suresh et al. (2020) emphasize the relevance of the ISO 31000 risk management framework in managing risks within supply chains, providing a structured method to mitigate potential disruptions and ensure continuity.

The foundational principles laid out by Oliveira Júnior et al. (2024) underscore the importance of quality management, which can be seamlessly integrated into complex management systems (CMS) to enhance overall efficiency and effectiveness. Daoud Ben Arab (2022) highlights the positive relationship between ISO 9001:2000 certification and operational performance, demonstrating that standardized quality management practices lead to improved business outcomes. Similarly, Griffith and Bhutto (2008) show how integrated management systems (IMS) can lead to enhanced environmental performance in U.K. enterprises, supporting the notion that holistic management approaches yield significant ecological benefits.

Adama et al. (2024) offer insights into corporate strategy, essential for aligning management technologies with strategic objectives. Le (2023) explores corporate social responsibility within

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the TQM context, highlighting opportunities for sustainable growth that can be leveraged through integrated systems.

Furthermore, Shu et al. (2020) assess the impact of environmental management systems on corporate performance, indicating that proactive environmental strategies contribute to business success. Bravi et al. (2020) identify a clear connection between environmental management systems and environmental performance, reinforcing the need for integrated approaches to achieve sustainability goals. Toha et al. (2020) analyze the role of organizational design in environmental performance, suggesting that well-structured organizations are better equipped to implement integrated management technologies. Lastly, Mio et al. (2022) discuss methods for measuring enterprise sustainability, providing essential metrics for evaluating the effectiveness of integrated management systems in promoting sustainable development.

Developing an integrated enterprise management technology that incorporates meta-management principles and a risk-oriented approach is crucial for modern organizations seeking to enhance their operational efficiency and strategic decision-making processes. However, there is a need to highlight several key problems/challenges that organizations may encounter when implementing such a system. Thus, integrating various management technologies into a cohesive system can be complex and challenging (Berger et al., 2020). Organizations may face difficulties in harmonizing different tools, processes, and data sources to create a unified platform that supports meta-management principles and risk-oriented strategies.

According to Bousdekis and Mentzas (2021), ensuring the seamless integration of data from different sources and maintaining its quality throughout the process is a significant concern. Inaccurate or incomplete data can lead to flawed analyses and decision-making, undermining the effectiveness of the integrated technology. Moreover, implementing a new integrated management technology requires significant changes in organizational processes, workflows, and employee roles (Marion & Fixson, 2021). Resistance to change, lack of training, and inadequate communication about the benefits of the new system can hinder successful adoption and utilization.

Effectively identifying and mitigating risks within the integrated technology framework is essential. Hence, Landol (2021) states that organizations must develop robust risk assessment methodologies and response strategies to address potential threats to the system's functionality, data security, and overall performance. Also, ensuring that the integrated technology aligns with the organization's strategic objectives is critical (Mızrak, 2023). Failure to link the system’s functionalities and analytics with the company’s overarching goals may lead to misalignment, inefficiencies, and missed opportunities for growth and innovation.

As Langenwalter (2020) notes, developing and maintaining an integrated enterprise management technology requires significant resource allocation in terms of financial investment, skilled personnel, and time commitment.

Limited resources and budget constraints can impede the implementation and optimization of the system (Hutsaliuk et al., 2020). In addition, adhering to regulatory requirements and maintaining governance standards within the integrated technology framework is paramount (Palakurti, 2023). Organizations must navigate complex legal and compliance landscapes to ensure data privacy, security, and ethical use of information within the system. Addressing these challenges through comprehensive research, continuous monitoring and evaluation can enhance the successful development and implementation of an integrated enterprise management technology rooted in meta-management principles and a risk-oriented approach.

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2.1 Establishing the Components of Integrated Enterprise Management Technology and Evaluating its Integration Level

The IEMT is a system of specialized management technologies, the composition of which is determined by the sphere and scale of the enterprise's activities, its strategy and goals, as well as the accumulation of global experience in the use of specific technologies (Kwilinski & Kuzior, 2020). In order to facilitate the alignment of business towards achieving sustainable development goals, international organizations have developed various standardized management systems (Van Zanten & Van Tulder, 2018). To formalize the procedure of constructing a comprehensive technology, it is necessary to identify the most suitable specialized technologies for integration. This can be achieved based on an analysis of the application of certified management systems (Ronalter et al., 2023).

The international standardization organization conducts annual surveys of countries regarding the use of management standards:

- ISO 13485:2016 Medical devices. Quality management systems.
- ISO 14001:2015 Environmental management systems.
- ISO 20121:2012 Event sustainability management systems.
- ISO 22000:2018 Food safety management systems.
- ISO 22301:2012 Social security. Business continuity management systems.
- ISO 28000:2007 Specification for security management systems for the supply chain.
- ISO 29001:2020 Petroleum, petrochemical, and natural gas industries. Quality management systems for specific sectors.
- ISO 37001:2016 Anti-bribery management systems.
- ISO 39001:2012 Road traffic safety management systems.
- ISO 44001:2017 Collaborative business relationship management systems.
- ISO 45001:2018 Occupational health and safety management systems.
- ISO 50001:2011&2018 Energy management systems.
- ISO 55001:2014 Asset management.
- ISO 9001:2015 Quality management systems.
- ISO/IEC 20000-1:2018 Information technology. Service management.
- ISO/IEC 27001:2013 Information technology. Security techniques. Information security management systems.

According to the survey on the certification of management system standards (ISO, 2023), there is a significant increase in certification for most management systems (Table 1).

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Tab. 1 – The number of active certificates of management systems in the world. Source: based on ISO (2023)

Standard	2021		2022		Growth rate, %
	Number of certificates (in units)	%	Number of certificates (in units)	%	
ISO 28000:2007	488	0,025	521	0,022	6,762
ISO 39001:2012	1.285	0,066	1.550	0,064	20,623
ISO 20121:2012	253	0,013	247	0,010	-2,372
ISO 2301:2012&2019	2.559	0,131	3.200	0,133	25,049
ISO IEC 27001:2013	58.687	2,995	71.549	2,971	21,916
ISO 55001:2014	584	0,030	997	0,041	70,719
ISO 14001:2015	420.433	21,456	529.853	21,999	26,026
ISO 9001:2015	1.077.884	55,008	1.265.216	52,531	17,380
ISO 37001:2016	2.896	0,148	5.969	0,248	106,112
ISO 13485:2016	27.229	1,390	29.543	1,227	8,498
ISO 44001:2017	136	0,007	118	0,005	-13,235
ISO 50001:2018	22.575	1,152	27.765	1,153	22,990
ISO 20000-1:2018	11.769	0,601	27.009	1,121	129,493
ISO 45001:2018	294.420	15,025	397.339	16,497	34,957
ISO 22000:2018	36.124	1,844	45.459	1,887	25,842
ISO 29001:2020	157	0,008	177	0,007	12,739
Total:	1.959.500	100,00	2.408.534	100,00	22,916

The data provided shows that the number of certified management systems in 2022 increased by 22.9% compared to 2021. The most widely used system globally was the quality management system, accounting for 55% of all certified management systems in 2021 and 52.5% in 2022. Its usage increased by 17.4% over the year. In the second position was the environmental management system, at 21.5% and 22.9% in 2021 and 2022 respectively, with a growth rate of 26%. The third position belongs to the occupational health and safety management system, at 15% of the total number of certifications in 2021 and 16.5% in 2022, with a growth rate of 35%, higher than the first two systems. The "ISO/IEC 27001:2013 Information technology. Security techniques. Information security management systems" lags significantly behind the aforementioned systems, but the absolute number of certificates was 58,687 in 2021 and 71,549 in 2022, indicating its expansion. Noteworthy is the active development of the "ISO/IEC 20000-1:2018 Information technology. Service management" system, with a growth rate of 129.5%, and the "ISO 37001:2016 Anti-bribery management systems" with a growth rate of 106%. Based on the active global use of these management systems, we can assume that they will be included as potential elements of comprehensive technology in Chinese enterprises, on which this study is based. The dynamics of the utilization of these standards in China is on the rise (Table 2, Figure 1).

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Tab. 2 – Dynamics of development of certified management systems in China. Source: based on ISO (2023)

Standard	Number of certificates					Growth rate 2022/2018	Specific gravity in the world number of certificates in 2022
	2018	2019	2020	2021	2022		
ISO/IEC 27001:2013 Information technology. Security techniques. Information security management systems.	7199	8356	12403	18446	26301	265,34	36,76
ISO 14001:2015 Environmental Management Systems	136715	134926	168129	217592	295501	116,14	55,77
ISO 9001:2015 Quality Management Systems	295703	280386	324621	426716	551855	86,62	43,62
ISO 37001:2016 Anti-bribery management system.	1	7	5	15	23	2200,00	0,39
ISO 45001:2018 Occupational health and safety management systems	6443	10213	120134	188778	266898	4042,45	67,17

Fig. 1 – Development of quality, environmental and occupational health and safety management systems in China. Source: based on ISO (2023)

The quality management system has experienced the most significant growth in China. In 2022, the number of certificates reached 551,855, compared to 295,703 in 2018, representing an 86.62% increase over the past four years. The environmental management system is also important for Chinese enterprises, with the number of certifications increasing by 158,786 from 2018 to 2022, reflecting a growth rate of 116.14%. The most substantial growth, however, is in the occupational health and safety management system, which has expanded by over 40 times compared to 2018. In 2018, only 6,443 certificates were valid, but by 2022, this number reached 266,898, almost equaling the distribution of the Environmental management system. Additionally, the ISO/IEC 27001:2013 information technologies standard, particularly in

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security methods and information security management systems, has shown rapid growth, increasing 3.5 times compared to 2018.

3 RESEARCH OBJECTIVE, METHODOLOGY AND DATA

The process of integrating specialized enterprise management technologies into a complex system involves a series of interdependent actions aimed at achieving specific goals. The primary objective of integrating specialized management technologies is to synchronize and coordinate activities, management functions, resources, and documents to meet the interests of stakeholders and realize sustainable development goals. The integration should ensure that the values and beliefs within the enterprise align with the operations, systems, and structures of the integrated management technology to enhance efficiency and effectiveness. Drawing on the developed conceptual framework, a comprehensive model for the formation of an integrated enterprise management technology was devised, incorporating the principles of meta-management and a risk-oriented approach (Figure 2).

The concept of interested parties can be valuable if the stakeholders are accurately defined, their interests are clearly understood, and a system for measuring and evaluating their influence is established. This concept is particularly useful when setting strategic goals for a company, with a focus on ensuring sustainable development (Kharazishvili et al., 2023). Key tasks include (i) analyzing all interested parties, (ii) identifying relevant groups, (ii) researching the extent of their influence (positive or negative, explicit or latent), and (iv) organizing interaction with them. It is crucial to create a balanced system that considers conflicting interests, using the criterion of achieving sustainable development goals.

The company's management does not have direct control over the interests of stakeholders. However, it is important to establish strategic goals that consider their expectations to prevent conflicts between influential groups. Stakeholder support is crucial for implementing the strategy, and its effectiveness hinges on their satisfaction. Strategic goals must be specific, measurable, consistent, and interdependent. This balancing act is achieved by creating a hierarchy of goals, where lower-level goals serve as a means to achieve higher ones. This strategic approach fosters a synergistic effect, bolstering the overall results of the company's activities when the goals are aligned. Balancing the personal goals of employees with the overall goals of the enterprise is imperative for driving active employee engagement in company activities. This equilibrium is critical for ensuring the company effectively addresses socio-economic tasks. Understanding the values of each employee is paramount for achieving lasting organizational change and improvement. It is clear that linking remuneration for work to the strategic and tactical goals of the enterprise, especially for those involved in defining and executing goals, is essential. By aligning the enterprise's overall goals with the individual goals of the employee through rewards based on work results, we can expect to witness a significant improvement in work performance, customer service quality, and overall customer satisfaction.

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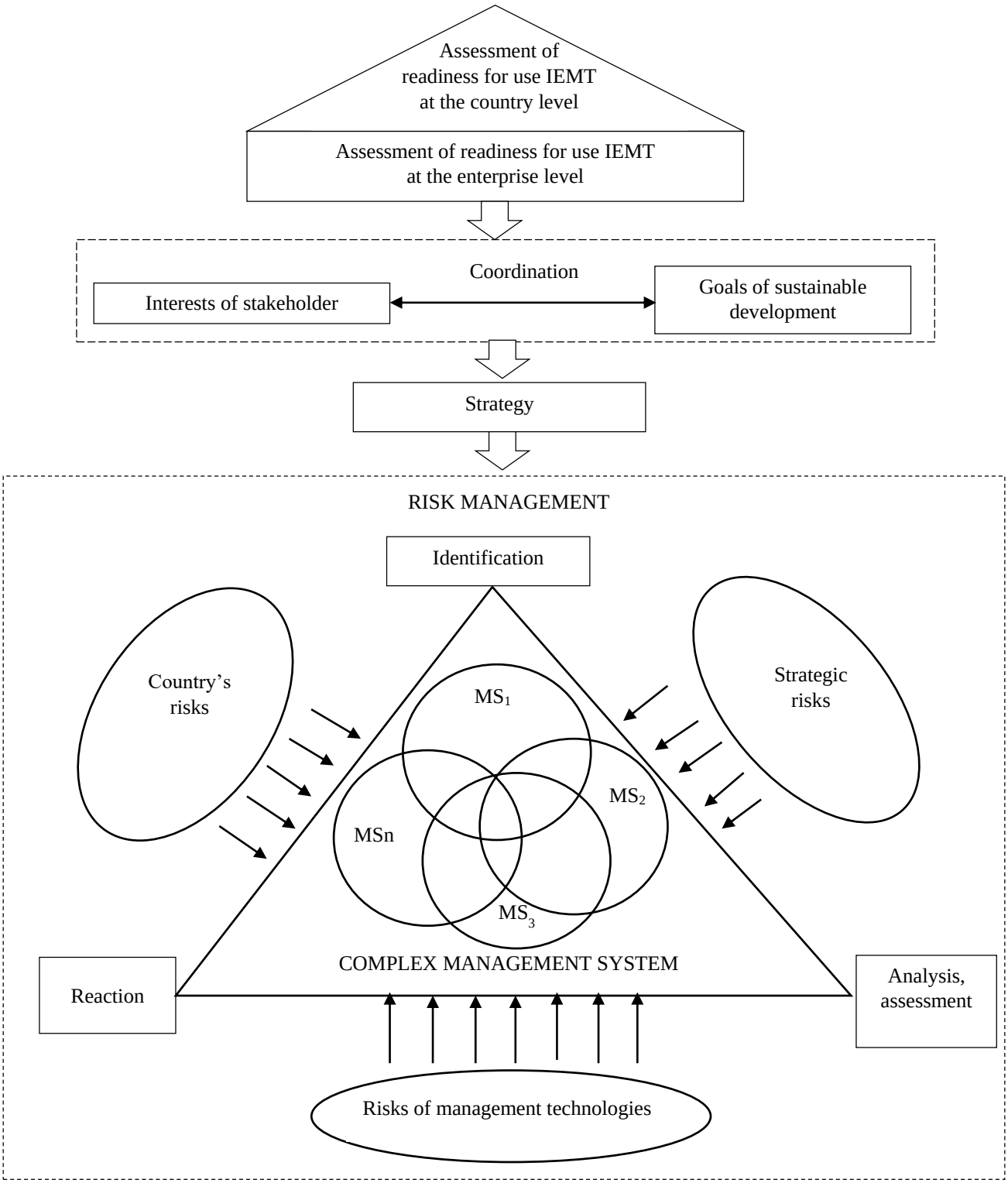

Fig. 2 – Formation of integrated enterprise management technology model. Legend: MS – management system; IEMT – integrated enterprise management technology. Source: own research

The identification, assessment, and management of risks in the formation of integrated enterprise management technology are rigorously carried out at three levels: (i) country risks; (ii) strategic risks; (iii) risks within each integrated technology (Guo & Kozhevnikova, 2022).
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The country's risks are evaluated using the *Global Risk Report* (World Economic Forum, 2023). This report relies on the *Global Risk Perception Survey*, which gathers original risk data from academics, businesses, government, civil society, and opinion leaders.

When measuring strategic risks, it is crucial to involve top managers in the process of identifying and assessing these risks, as they play a key role in developing the company's strategy. After identifying and measuring the risks, they should be placed in a consequence/probability matrix. A separate matrix can be created for each strategic objective, which will provide insight into the risk profile. The consequence/probability matrix combines qualitative assessments of consequences and probabilities to determine the level of risk. The format of the matrix and its parameters depend on the specific context in which it is utilized. This matrix can simultaneously display both negative and positive impacts, as well as potential risk management strategies (Figure 3).

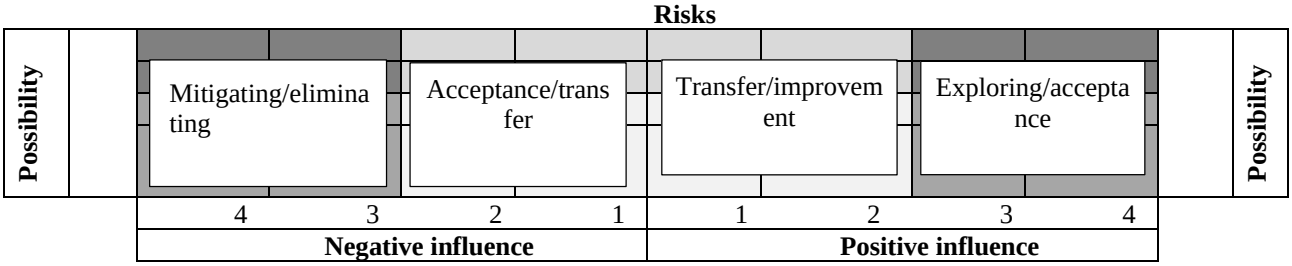

Fig. 3 – Double matrix for evaluation and management of strategic risks. Source: based on Maia & Chaves (2016).

The implementation of integrated enterprise management technology should consider the specific risks of each specialized management technology, along with a set of integration risks (Figure 4).

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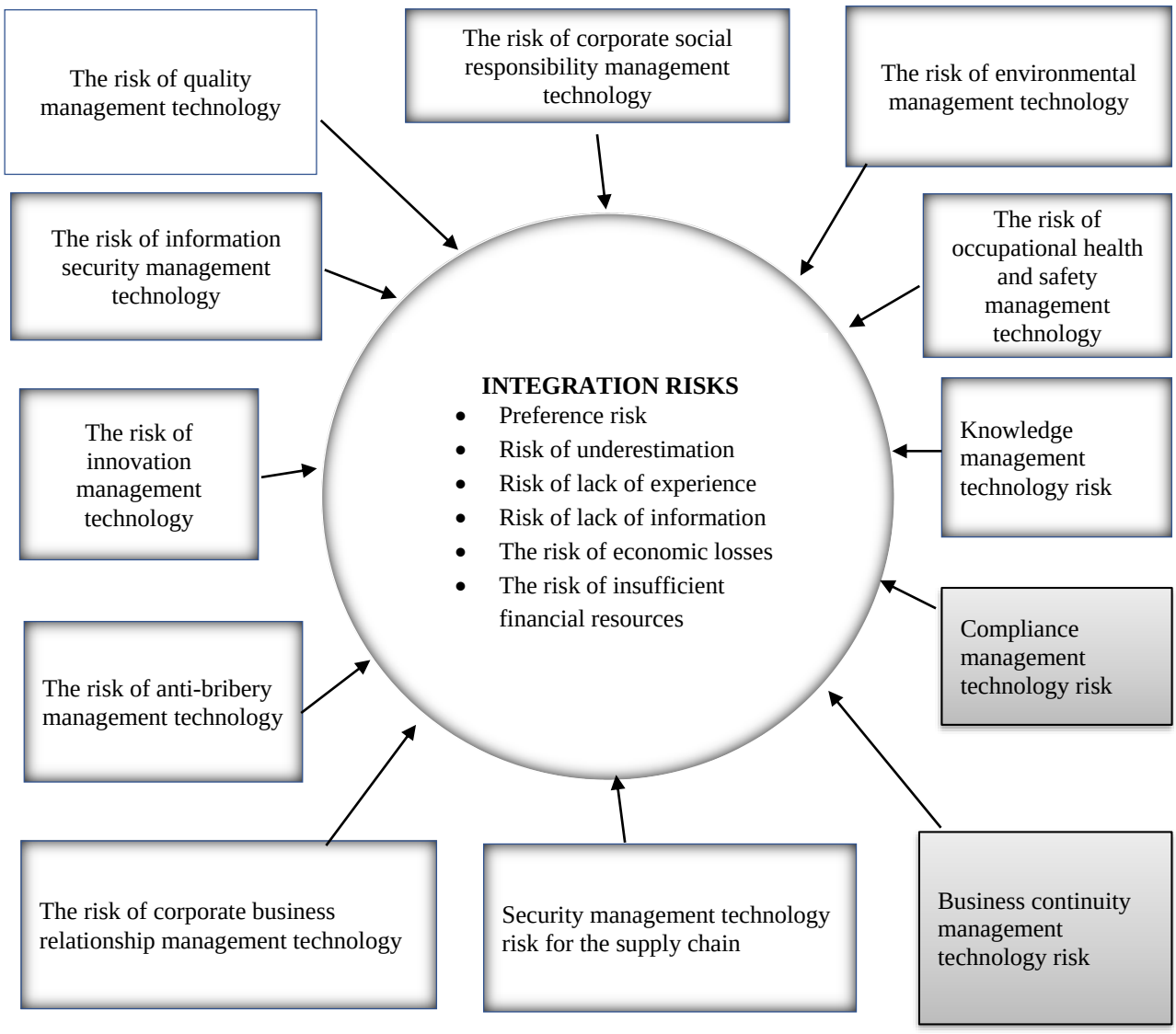

Fig. 4 – The risks associated with implementing integrated enterprise management technology. Source: own research

The main integration risks are the following: (i) the risk of favoring a specific management technology over integrated technologies within a complex system; (ii) the risk of underestimating the requirements (personnel, financial, organizational, information) of specialized management technologies in the integration process; (iii) the risk of lack of experience in implementing integrated management technology; (iv) the risk of lack of information on the regulatory provisions of the functioning of integrated management technology; (v) the risk of economic losses due to neglect of integration factors; (vi) the risk of insufficient financial resources for the implementation of integrated management technology.

The proposed methodical toolkit assesses the risks associated with implementing an integrated enterprise management technology based on selected risks (Figure 5).

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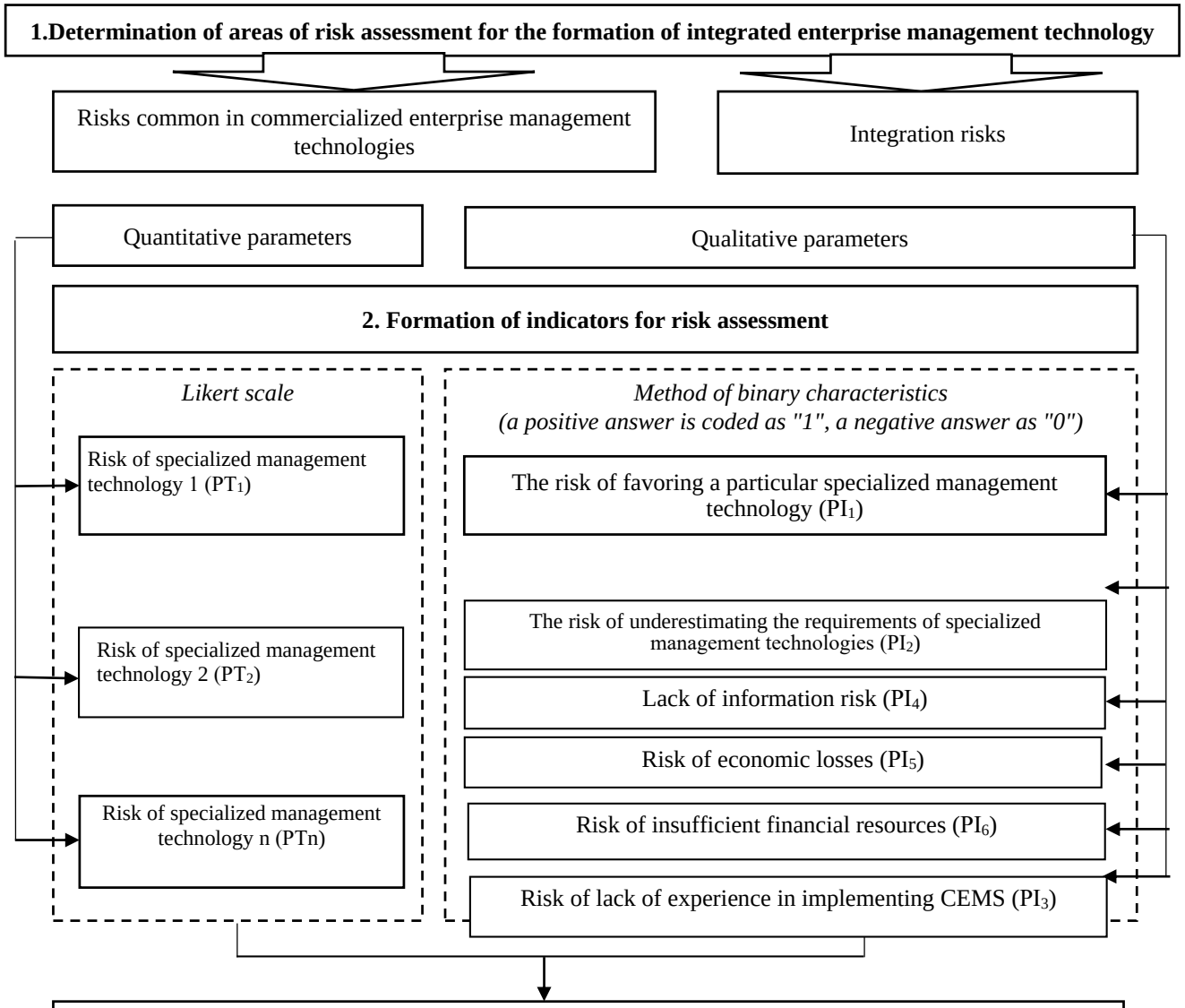

3. Consolidation of the calculations results for the calculation of the integral risk indicator of the formation of IEMT

3.1. Normalization of the values of partial risk indicators of specialized management technologies according to the "mini-max" criterion:

$$z_i = \begin{cases} \dfrac{\mathrm{PT}_i}{\mathrm{PT}_{max}}, & if\ the\ indicator\ is\ a\ stimulant \\ \dfrac{\mathrm{PT}_{min}}{\mathrm{PT}}, & if\ the\ indicator\ is\ a\ distimulant \end{cases}$$

where z_i – normalized values of risk indicators of specialized management technologies PT_i –the actual value of the *i*-th indicator; PT_{max} – is the maximum value of the *i*-th indicator; PT_{min} – is the minimum value of the *i*-th indicator.

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3.2. Evaluation of integration risks using the Rasch model:

$$\Pi_1(D) = \ln\left(\frac{p}{1-p}\right),$$

where p – the ratio of the total number of positive reviews (yes answers) according to the criteria for determining the level of risks (PI_1 – PI_6) to their maximum possible number;

3.3. Determination of weight coefficients for partial indicators (a_i) according to Fishburn criterion:

$$a_i = \frac{2\times(N-i+1)}{(N+1)\times N}$$

where N – number of indicators in total; i – ordinal number (rank) of the indicator.

3.4. Construction of an integral indicator by the method of weighted sums:

$$I = \sum_{i=1}^{n} a_i z_i, \sum a_i = 1, 0 \le a_i, z_i \le 1$$

Fig. 5 – Stages and methodical toolkit of IEMT risk assessment. Source: own research

To assess integration risks, the Rasch model is recommended (Rasch, 1968). This model serves as both a statistical tool for processing data and a criterion for evaluating answer structures, such as scales (Linacre, 1999). It enables the comparison of two objects and can be applied across various fields. In addition, the Rasch model, a type of item response theory (IRT) model, is commonly used to develop new scales or improve existing ones. It converts input data into a natural logarithm interval scale (Gordienko et al., 2019). This model standardizes the unit of measurement, allowing for objective comparison of results across different instruments and samples. It provides statistics on the relevance of each questionnaire item and the responses of each respondent. Rasch measurement is independent of the sample and specific set of questionnaire items, ensuring objective and high-quality research results. To assess enterprise management integration risks, a dichotomous scale using "yes" or "no" as 1 and 0, respectively, is suggested. The unit of measurement in the Rasch scale is "logit" (d)

$$d = \ln\left(\frac{P}{1-P}\right)$$, where P – the probability of positive answer.

The analysis of the results according to Rasch involves determining the levels of integration risks in the following way:

- Low level (D ∈ [0;1,1]) – 50.1% – 75% of positive answers from experts;
- Average level (D ∈ [1,11; 2,19]) – 75.1% – 90% of positive answers by experts;
- High level (D ∈ [2.2; 2.94]) – 90.1% – 95% of positive responses by experts.

If the value of the risk level (logit) is "0", it is considered that the probability (P) of a positive assessment by experts is 50%, indicating the absence of integration risks in the formation of an IEMT.

The risk-oriented model of IEMT system has been tested and implemented in two companies in China: enterprise 1 (E1) and enterprise 2 (E2). The use of generic names, E1 and E2, instead of the actual company names in this paper aims to uphold the anonymity and confidentiality of the companies involved in the study. This is done to safeguard the privacy of the organizations and their sensitive business information, as well as to prevent any biases or preconceived notions that may arise from knowing the identities of the specific enterprises. The research survey included a cover letter (Appendix 1) and questionnaire (Appendix 2). The cover letter outlined the study's purpose and assured respondents of the confidentiality of their responses.

The process of selecting specialized control technologies for integration into the comprehensive technology involved surveying of 115 enterprises. A questionnaire (Appendix 3), along with

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the previous questionnaire assessing enterprise readiness to adopt CEMS, was distributed, resulting in 32 responses from senior and mid-level managers. The survey comprised a cover letter (Appendix 4) and a questionnaire (Appendix 3). The cover letter provided an overview of the questionnaire and the study's purpose, ensuring respondents of the confidentiality and anonymity of their responses.

A five-point Likert scale was utilized for responses, where 5 corresponds to "strongly agree," 4 to "agree," 3 to "neutral," 2 to "disagree," and 1 to "strongly disagree."

4 RESULTS AND DISCUSSION

3.1. IEMT Implementation

Regarding the need for specialized management technologies, 80% of surveyed enterprises expressed a need for quality management technology (Figure 6).

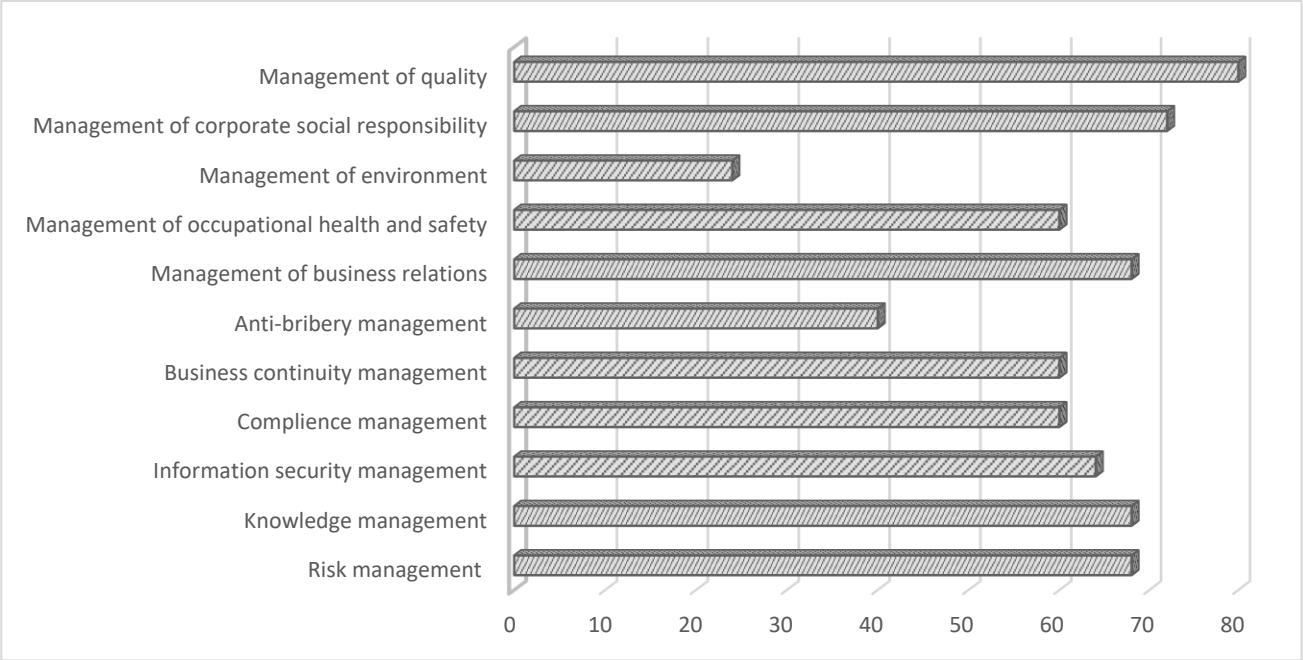

Fig. 6 – The results of the survey on the feasibility of using modern types of specialized management technologies at enterprises. Source: own research

Risk management technologies, knowledge, business relations, and corporate social responsibility (CSR) are also relevant, as noted by 68% of senior and middle managers. 64% of respondents noted the expediency of using information security management technology, labor protection, business continuity and compliance (60%). A slightly smaller percentage belongs to anti-bribery management technology (40%), as it is necessary only in some areas of activity, as well as environmental management technology (24%). This is due, for example, to the fact that the latter is less relevant for enterprises in the fields of consulting, finance, and marketing compared to manufacturing enterprises.

20% of surveyed enterprises reported no integration of specialized technologies into a complex one, while 80% have a certain configuration of integrated management technologies (Figure 7)

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Fig. 7 – Types of integration of management technologies at the studied enterprises, %. Source: own research

The most common combinations of integrated technologies included quality management with CSR management (15%) and quality management combined with risk management, information security, and compliance (10%). Subsequent questions aimed to assess the degree of integration of goals, policies, human resources, and documentation (Figures 8 – 11). The results indicated that the integration vision at enterprises is not sufficiently formed and proven by top management, and there is a need to define integration goals and establish key performance indicators for integrated management technology and specialized technologies.

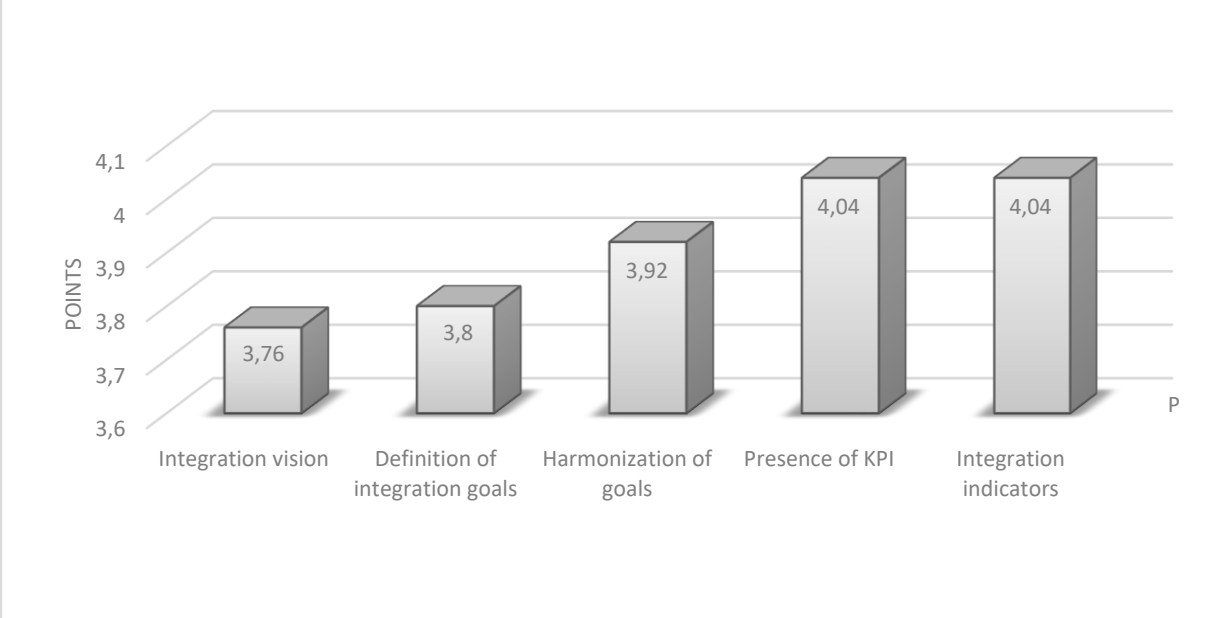

Fig. 8 – The degree of integration of goals in the integrated management technology at the studied enterprises, %. Source: own research

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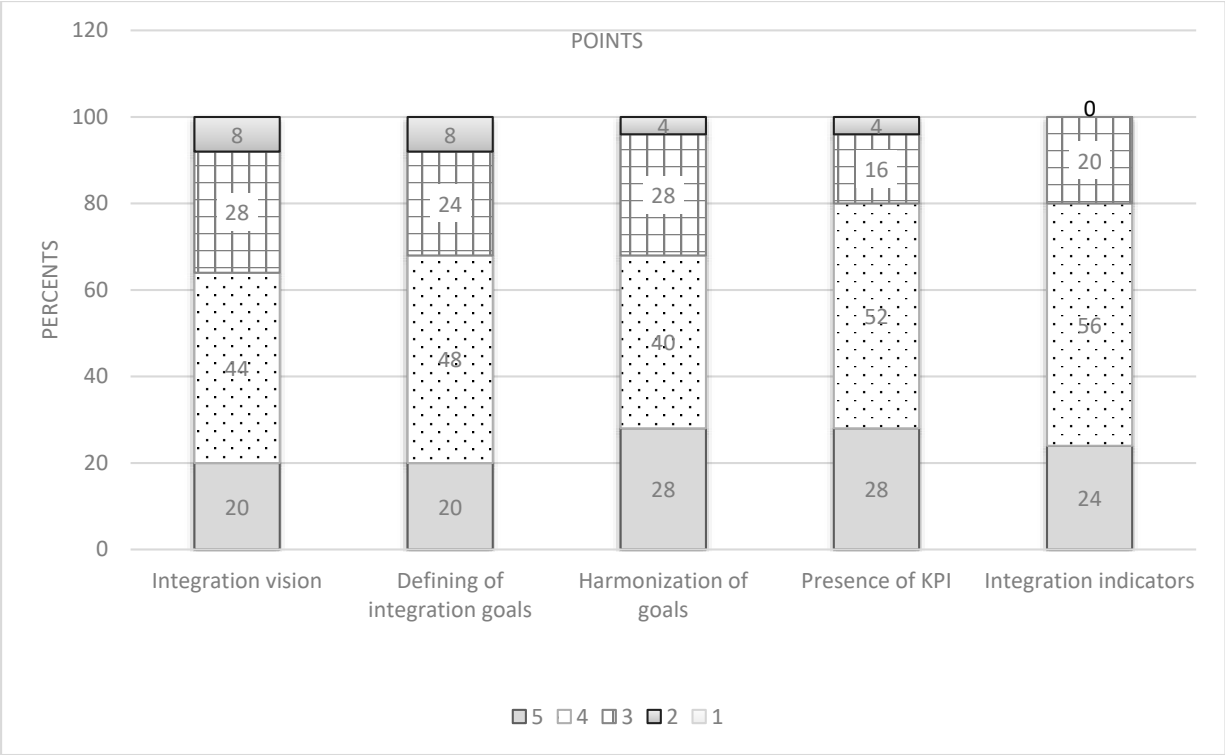

Fig. 9 – Distribution of evaluations of the integration of goals in integrated management technology at the surveyed enterprises. Source: own research

The survey results show that 20% of enterprises fully agree that they have an integrated vision, while 44% rather agree, and 8% rather disagree. 28% of enterprises are undecided on the presence of an integration vision. Similarly, 68% of enterprises recognize the need to harmonize specialized technologies, with 28% fully agreeing and 40% rather agreeing. 80% of enterprises monitor their activities based on KPIs, which helps them implement indicators of integration.

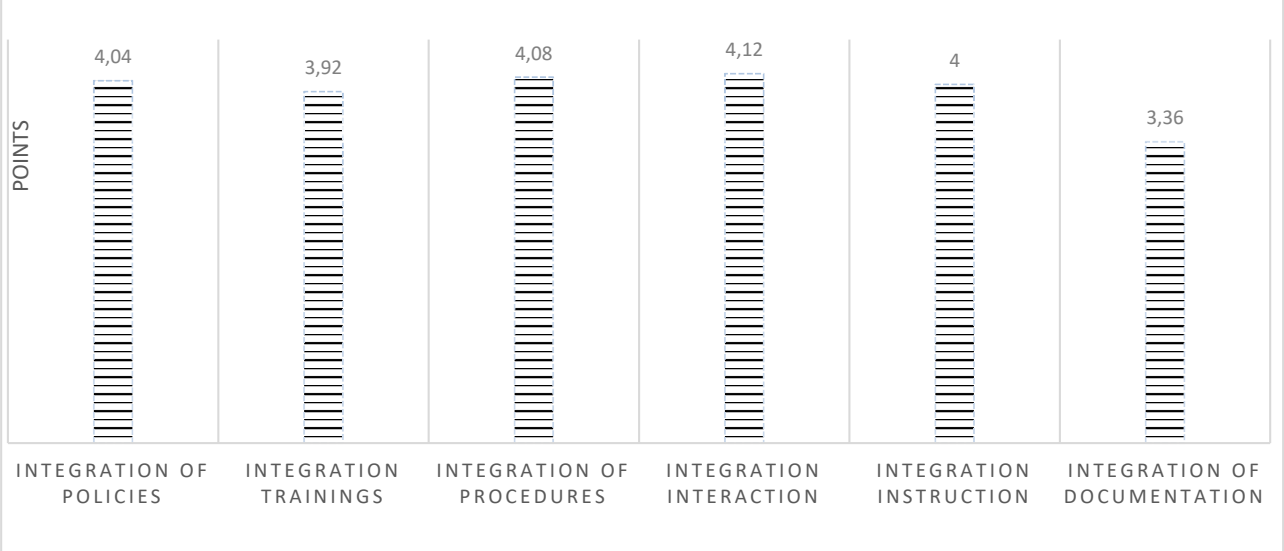

Fig. 10 – Evaluation distribution integration of policies, procedures and documentation in integrated management technology at the surveyed enterprises. Source: own research

Figure 10 indicates that incomplete integration of documents and insufficient training on management systems and technologies are the most problematic components. However,

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integrated policies, procedures, and instructions are generally developed, and there is interaction among responsible persons regarding the functioning of integrated management technology. Only 5% of enterprises believe that the integration of specialized management technologies covers the document level, while 16% deny the existence of document integration. On the other hand, 84% note the availability of instructions and guidelines for implementing and functioning of integrated enterprise management technology (68% – fully agree, 16% – rather agree). 84% also observe sufficient integration of management procedures, and 76% note integration of policies. 24% confirm the presence of interaction among responsible persons when integrating specialized management technologies into an integrated one, and 64% rather agree with this statement.

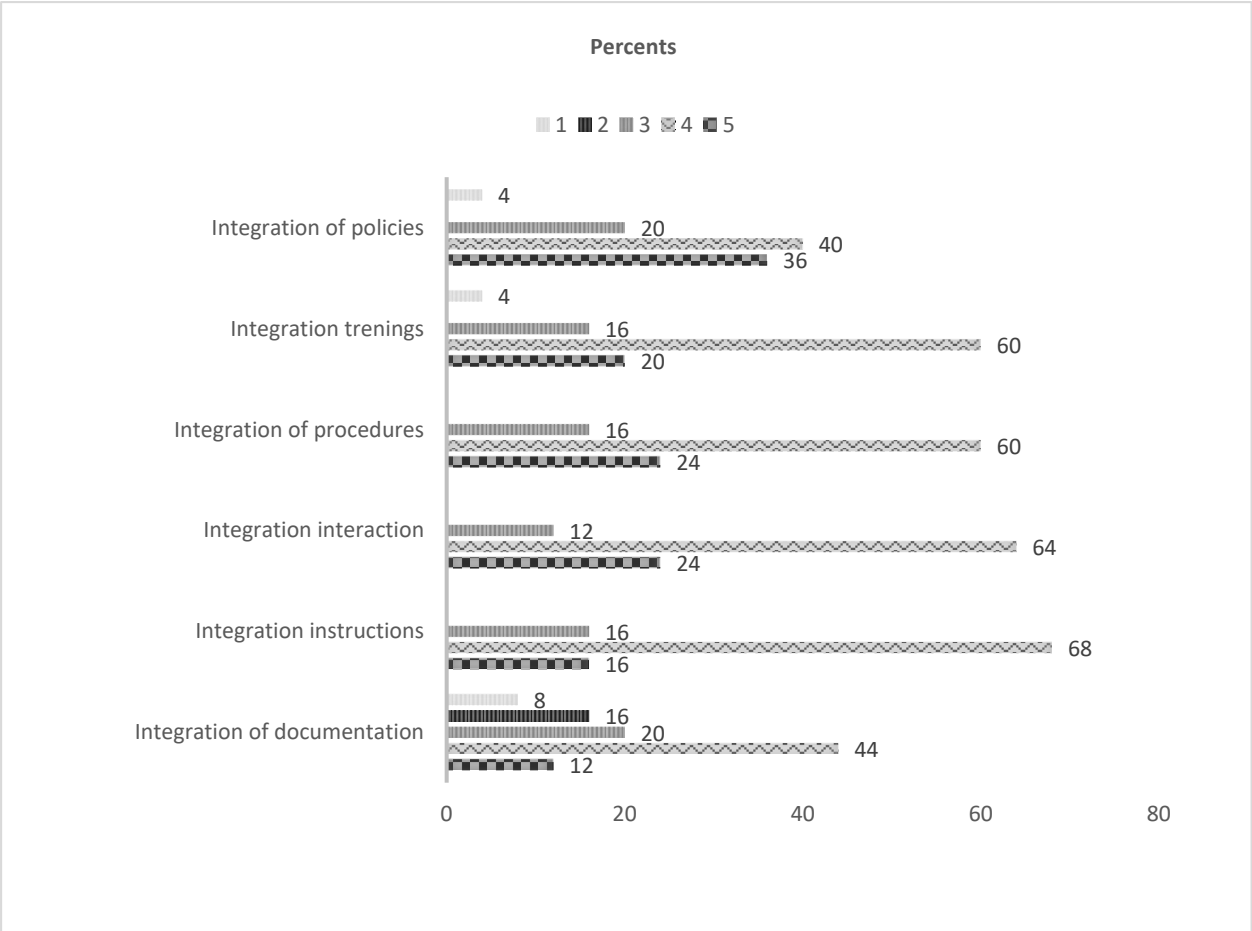

Fig. 11 – Evaluation distribution integration of policies, procedures and documentation in integrated management technology at the investigated enterprises. Source: own research

Next, Figure 12 presents the distribution of estimates of the degree of complexity of the integration of specialized management technologies at the surveyed enterprises.

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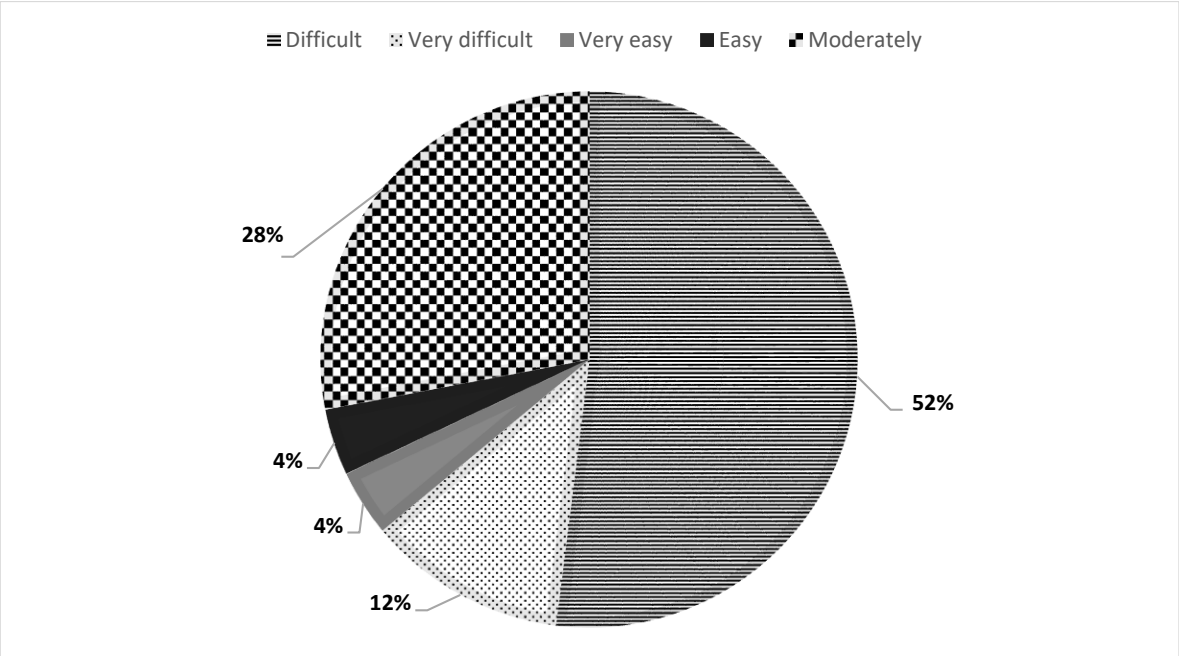

Fig. 12 – Distribution of evaluation based on the degree of complexity of the integration specialized management technologies at the investigated enterprises. Source: own research

12% of respondents consider the process of integration very difficult, 52% consider it difficult t, 28% note moderate complexity, and 8% classify the process as easy. The management of the investigated enterprises recognized the advantages of implementing integrated enterprise management technology (Figure 13).

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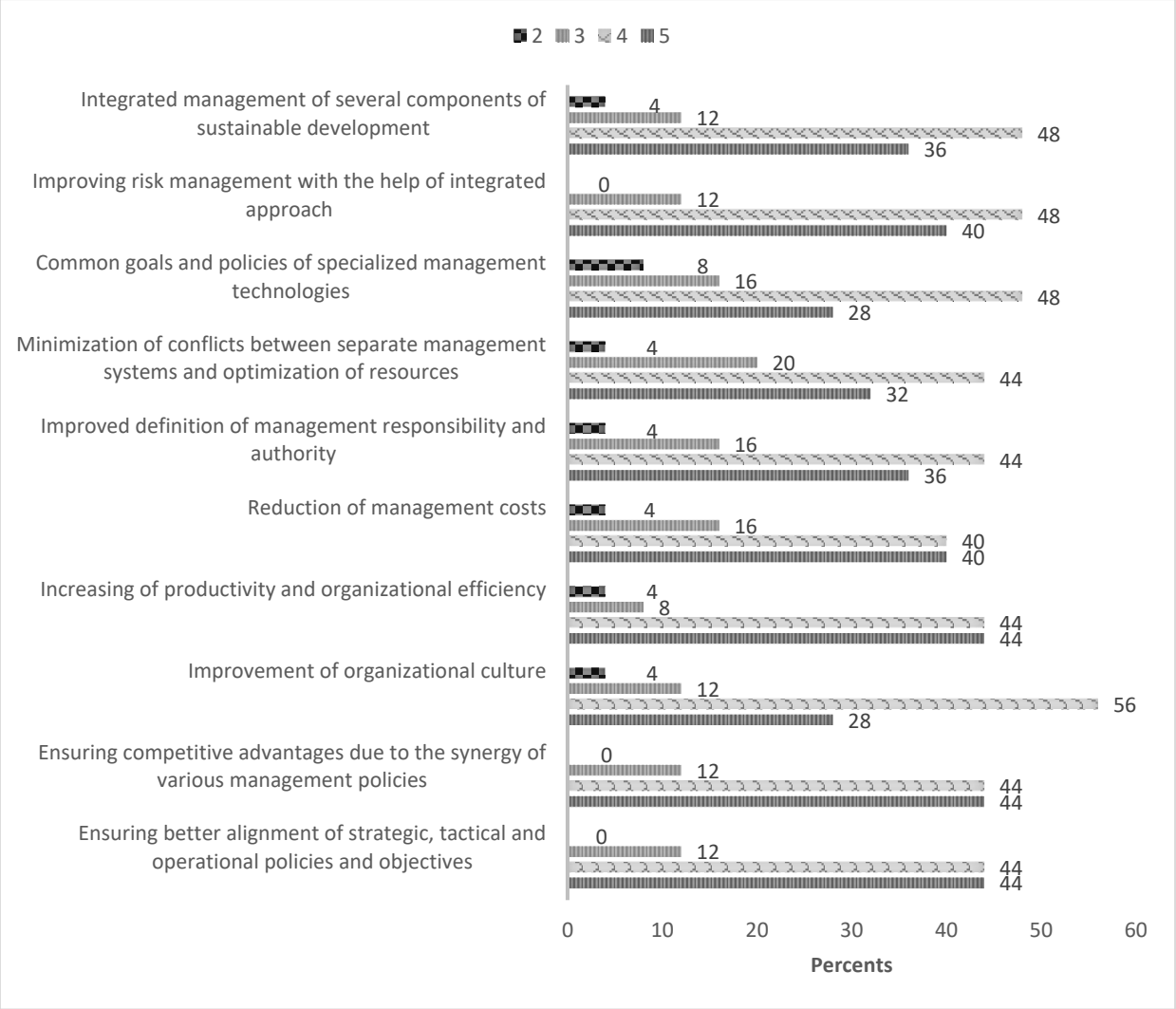

Fig. 13 – Advantages of implementing integrated enterprise management technology according to respondents' answers. Source: own research

At the same time, none of the respondents identified the extreme degree of disagreement with the presence of such advantages, i.e. the score "1 – strongly disagree" is absent in the answers of the interviewed managers. A remarkable 88% of managers confirmed that integration leads to better coordination of strategic, tactical, and operational goals, increases competitive advantages, and boosts productivity and organizational efficiency (44% fully agree, 44% rather agree). 12%, 12%, and 8% of managers noted the neutral impact of integrated technology on goal alignment, competitive advantages, and productivity, respectively. A slightly smaller but significant percentage of positive answers belong to the improvement of organizational culture (84%), better definition of management responsibility and authority (80%), and reduction of management costs (80%). The integration of separate management systems minimizes conflicts and optimizes resources, as noted by 32% of managers, with 44% more likely to agree than not. This contributes to the overall effectiveness of the management process, thanks to the presence of common goals and policies within specialized management technologies, which facilitates the coordination of management functions. 76% of respondents highlighted this advantage of integrated management technology (28% are completely sure and 48% rather agree). Another important advantage is the integrated management of social, economic, and environmental goals, achieved through the combination of quality management technologies, labor protection,

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safety, and environmental considerations, forming the basis of integrated management technology (36% fully agree and 48% rather agree).

To assess the impact of integrating specialized technologies into the complex on risk reduction, a relevant question was included in the questionnaire. A total of 88% of managers believe an integrated approach would improve risk management (40% of managers expressed confidence that an integrated approach would improve risk management, while 48% rather agreed than disagreed). This underscores the need to study the components of risk management in the integration and further functioning of integrated enterprise management technology, which is the focus of the last part of the questionnaire. 83.33% of managers responded positively to the question of whether the company's top management should establish and plan risk management policies within the framework of integrated enterprise management (Figure 14).

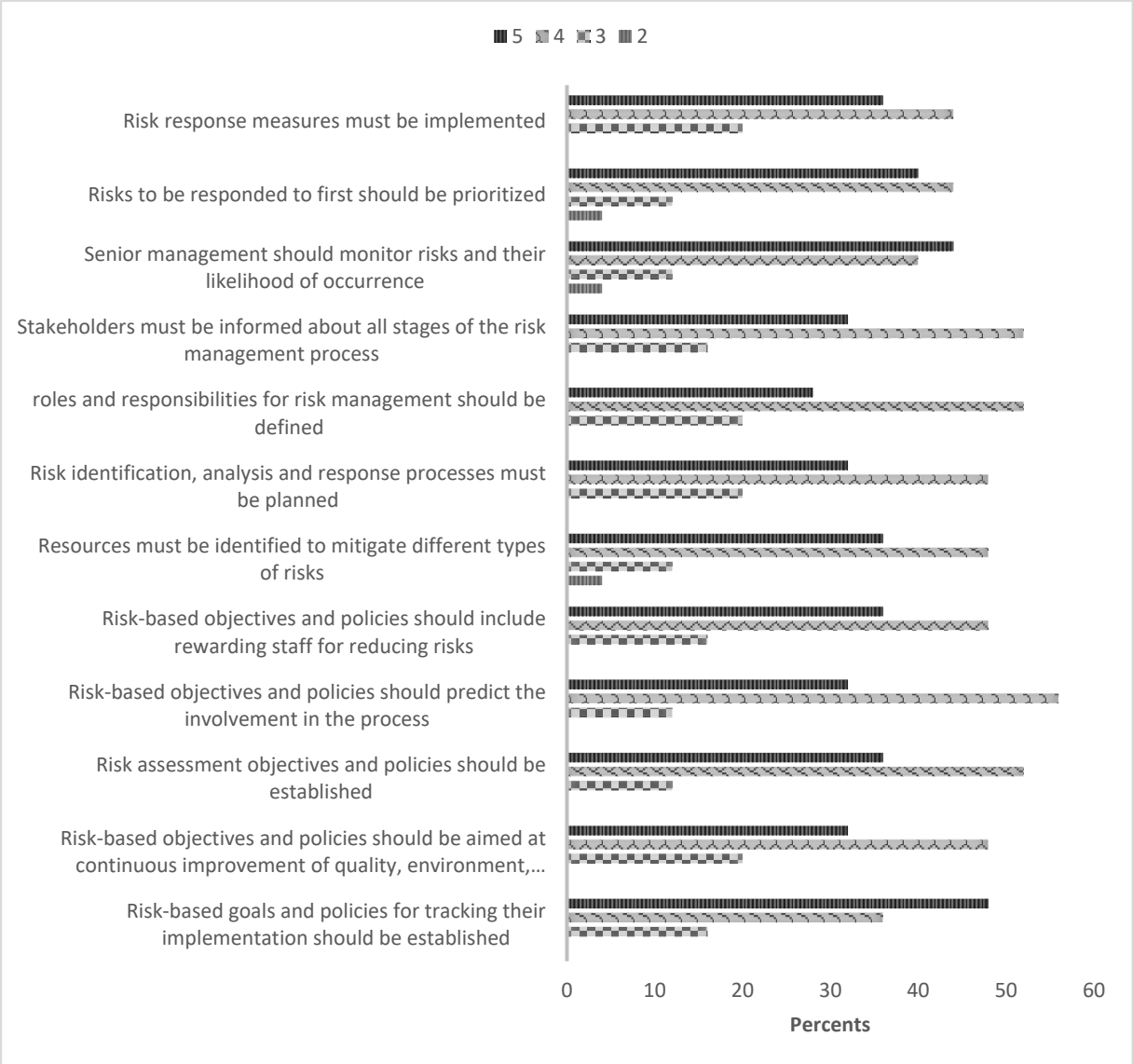

Fig. 14 – The advantages of implementing integrated enterprise management technology according to the answers of the interviewees. Source: own research

Almost half of the respondents (48%) are sure, and 36% agree that the company should establish risk-oriented goals and policies to track their implementation. 88% of managers emphasized the necessity of risk assessment goals and policies, as well as the involvement of employees in

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their development. Furthermore, 84% of respondents believe that risk-based policies should include rewarding staff for reducing risks and that resources for reducing different types of risks should be clearly defined. This also involves informing stakeholders about all stages of the risk management process and the need for senior management to monitor risks and their likelihood of occurrence. 80% of respondents agree that risk-oriented goals and policies are aimed at continuous improvement of quality, environment, health, and safety. The same percentage of positive answers relates to the necessity of planning the processes of identification, analysis, and response to risk, the definition of roles and responsibilities for risk management, as well as the obligation to implement risk response measures.

Based on a survey of 32 Chinese enterprises, it was determined that the main components of the integrated enterprise management technology include risk management, knowledge, business relations, corporate social responsibility, information security, labor protection, business continuity, and compliance. Risk management should serve as a superstructure of integrated management technology and permeate all integrated specialized management technologies. It was concluded that there is a sufficient level of integration of goals, procedures, operations, and documents when implementing integrated management technologies in the investigated enterprises. The focus should be on formulating a vision and establishing clear integration goals, developing integrated documentation, and conducting training on the integration of specialized management technologies into an integrated one.

3.2. Implementation of the Risk-Oriented Model of IEMT

The risk-oriented model of IEMT has been successfully tested and implemented in E1 and E2.

E1 primarily focuses on activities such as the import and export of technologies, technological services, consulting, technology exchange, technology transfer, technology promotion, artificial intelligence software development, sales of intelligent robots, industrial robots, portable intelligent devices, and information and consulting services.

E2 is involved in providing information and consulting services related to enterprise management, marketing planning, corporate image planning, educational consulting services, organization of cultural events, conferences, and exhibitions.

The survey highlighted the importance of creating a comprehensive technology by integrating specialized technologies for quality management, information security, and compliance for E1, and technologies for managing quality, knowledge, and business relations for E2. Following the developed risk-oriented model for forming a integrated enterprise management technology (refer to Figure 2), identification, assessment, and response to country risks, strategic risks, risks associated with specialized management technologies, and integration risks are anticipated.

As both companies operate in China, they face similar country risks, but their assessment of these risks may differ. According to the Risk Report of the World Economic Forum (2023), the main risks for China include geo-economic confrontation, natural disasters and extreme weather, inflation, infectious diseases, geopolitical competition for resources, asset bubbles, and concentration of digital power.

The risk of geo-economic confrontation is associated with the deployment of economic levers by states to disconnect economic interaction between nations, limit the exchange of goods, knowledge, services or technologies in order to obtain a geopolitical advantage and consolidate spheres of influence. The risk of natural disasters and extreme weather manifests itself in the possibility of loss of life, damage to ecosystems, destruction of property and financial losses on a global scale due to extreme weather events. Inflationary risk leads to the fact that the general

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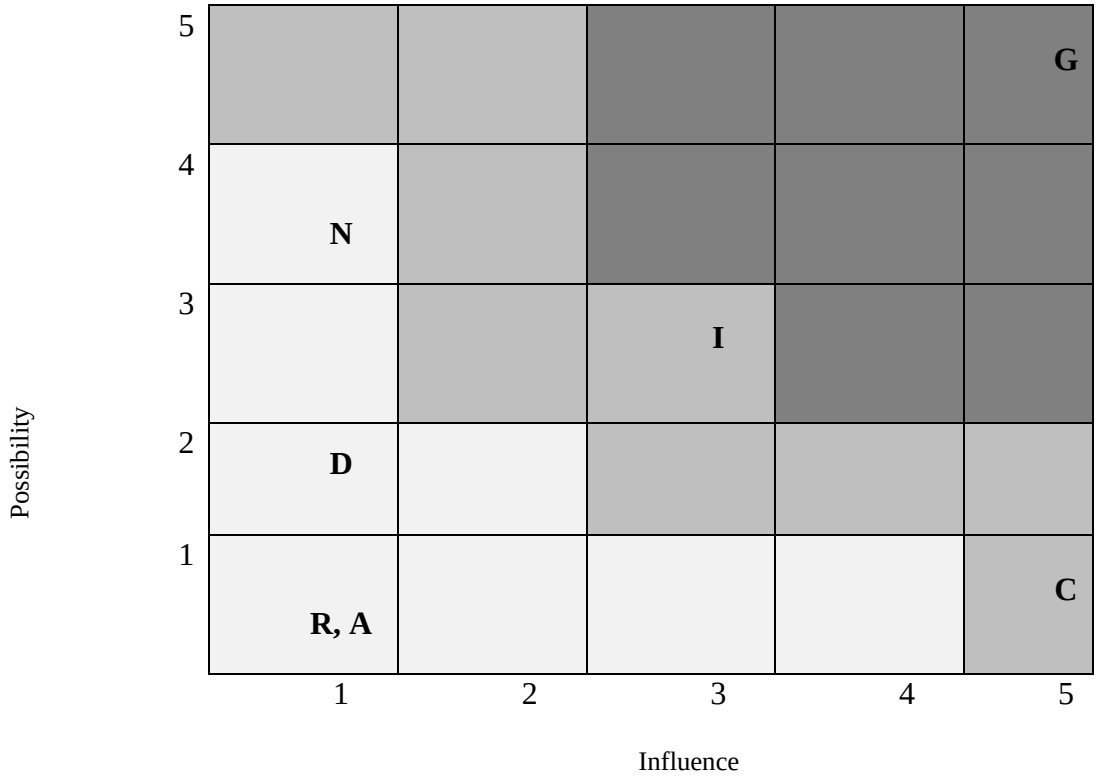
increase in prices over time reduces the purchasing power of consumers, which gradually reduces consumption. The manifestation of infectious disease risk is the massive and rapid spread of viruses, parasites, fungi, or bacteria that cause uncontrolled infection with infectious diseases, resulting in epidemics or pandemics with loss of life and economic disruption. The consequences of the risk of asset bubbles are that the prices of housing, investments, stocks and other assets diverge from the real economy, leading to a severe drop in demand and prices. The essence of the risk of concentration of digital power is the concentration of critical digital assets, capabilities or knowledge among a small number of individuals or businesses that can control access to digital technologies and demand discretionary pricing. The sources of this risk lie in insufficiently developed antitrust regulation, insufficient investment in the innovation ecosystem, and excessive government control over key technologies.

Despite the fact that the World Economic Forum (2023) has determined the ranks for the risks of China, it is necessary to assess how these risks of will affect the activities of specific enterprises. To do this, we will use the risk matrix (Figures 15 and 16), in which the probability and impact of the risk are assessed on a five-point scale



Legend: geoeconomic confrontation (G); natural disasters and extreme weather (N); inflation (I); infectious diseases (D); geopolitical competition for resources (R); asset bubbles (A); digital power concentration (C)

Fig. 15 – Country risk matrix for E1. Source: own research

The experts were top managers and middle managers of E1 and E2, who carry out management processes within the limits of the defined management technologies and whose activities are related to risk management. Ten experts were involved for each enterprise.

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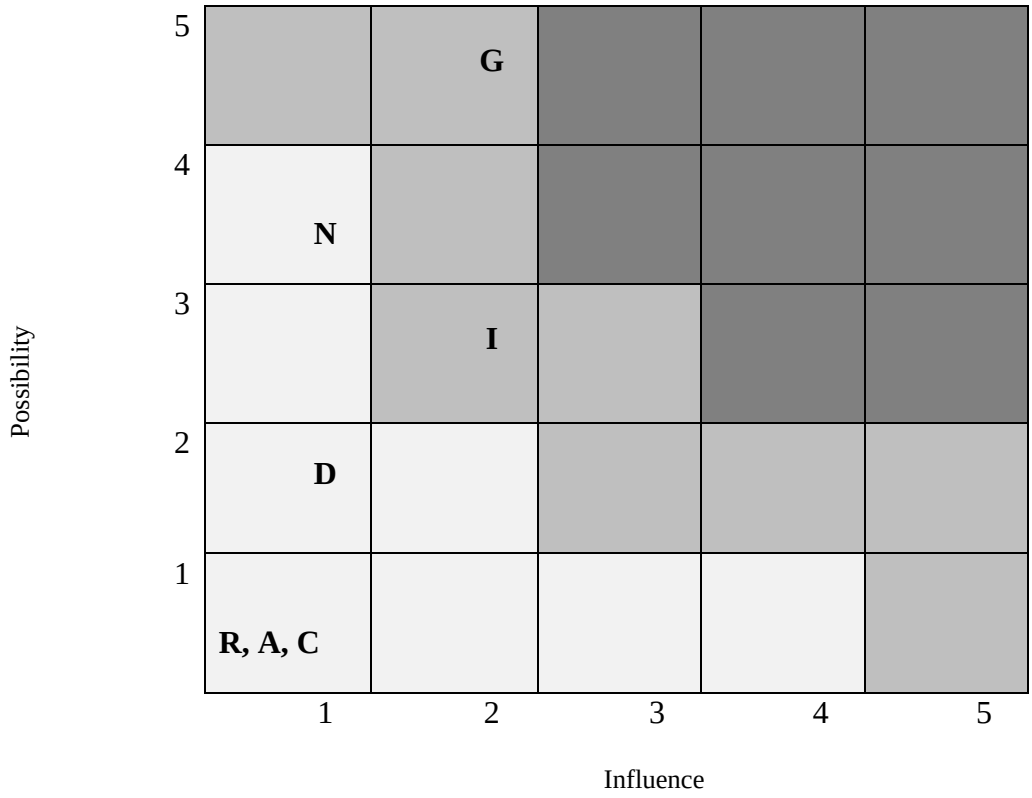

Legend: geoeconomic confrontation (G); natural disasters and extreme weather (N); inflation (I); infectious diseases (D); geopolitical competition for resources (R); asset bubbles (A); digital power concentration (C)

Fig. 16 – E2 country risk matrix. Source: own research

The acceptable risks of natural disasters and extreme weather (N), infectious diseases (D), geopolitical competition for resources (R), and asset bubbles (A) for E1 suggest the need for the enterprise to allocate a specific annual income to cover these risks in the event of their occurrence. In addressing the risks of inflation (I) and concentration of digital power (C), the enterprise should employ risk prevention methods. These methods involve implementing measures to enhance the enterprise's response to the external environment's impact and adjusting the parameters of such impact. Furthermore, the enterprise should consider the potential of exporting its developed technologies, as it is more advantageous to focus on exports rather than imports during inflationary processes.

It is imperative to emphasize that the risk of geoeconomic confrontation (G) is critical for E1, as it undermines economic interaction, particularly in the field of information technologies. To manage this risk, it is advisable to reduce its level by implementing preventive measures aimed at minimizing potential losses, such as risk limitation and the development of a corresponding risk-oriented organizational culture.

While the country risk map for E2 presents similarities, the risk of geo-economic confrontation (G) and the risk of concentration of digital power (C) are less significant for the enterprise due to its unrelated activities in the import-export of digital technologies. Given the shorter operating cycle of this company compared to the previous one, it faces lower exposure to inflation risk (I) and can adjust its pricing policy to mitigate its impact. The subsequent phase of risk assessment, as per the proposed risk-oriented model, entails the analysis of strategic risks.

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Experts from E1 have identified cyber security risks and economic downturn risks as the principal strategic risks for the enterprise. They have proposed the following measures in response (R):

R1: "*Staff training in risk management and coordination of corporate strategy*"
R2: "*Development of a risk and compliance culture as an integral part of the strategy*"

For E2, the strategic risks identified include information leakage and the risk of an imbalance between the pursuit of new customers and the retention of existing ones. Measures to address these strategic risks include a comprehensive review of counterparties' security protocols, staff training to appropriately handle access data, and continual monitoring of the dynamics of new and existing clients.

The developed risk-oriented model for the integration of enterprise management technology, coupled with the assessment and response to country risks and strategic risks, also encompasses the evaluation of the risks associated with the formation of IEMT. This entails an assessment of specialized management technologies and integration risks, culminating in the construction of an integrated indicator (Figure 5).

The results of the evaluation of the integration risks of the studied enterprises are presented in the Table 3.

Tab. 3 – The results of the evaluation of the levels of integration risks of the analyzed enterprises

Enterprise	S (total number of positive answers according to evaluation criteria)	P (ratio of the number of positive responses according to the criteria to their maximum possible number)	Quantitative level of the integration risk assessment indicator (D), logit	Qualitative level of the integration risk assessment indicator
E1	5	0,83	1,586	Average
E2	4	0,67	0,708	Low

According to the Rasch model, the integration risk for E1 is at an average level, for E2 – at a low level. At the next stage, in accordance with the methodical approach to the assessment of risks of integrated enterprise management technology (see Figure 5), the risks of specialized technologies should be assessed, and an integral indicator of risk assessment should be built. For the investigated enterprises, estimates are given in Tables 4 and 5.

Tab. 4 – The evaluation of risks of management technology for E1. Source: own research

Risk	Rating	Normalized rating	Rank	Weight factor
Risk of quality management technology	1,273	0,255	3	0,2
Risk of information security management	4,645	0,929	1	0,4

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Compliance management technology risk	2,878	0,576	4	0,1
Integration risk	1,586	0,558	2	0,3
An integral indicator of risk assessment				**0,648**

According to the "golden section" rule (Zhovnovach et al., 2023), the range [0; 0.382] corresponds to a low level, a range of [0.382; 0.618] to a medium level, and a range of [0.618; 1] to a high level. Therefore, E1 has a high risk of forming an integrated enterprise management technology, mainly due to the type of activity in the field of information technology and due to the significant risk of information security management technology.

Tab. 5 – The evaluation of risks of management technology for E2. Source: own research

Risk	Rating	Normalized rating	Rank	Weight factor
Risk of quality management technology	2,598	0,520	3	0,2
The risk of knowledge management technology	3,486	0,697	2	0,3
The risk of business relationship management technology	3,273	0,655	1	0,4
Integration risk	0,708	0,249	4	0,1
An integral indicator of risk assessment				**0,600**

For E2, the risk of forming an integrated enterprise management technology is average. The risk of managing business relations and knowledge, which is typical for enterprises in the field of consulting, is of the greatest importance for the enterprise. The enterprise should minimize such risks through the searching of new markets for their services, active marketing, formation of own consumer.

The study was designed to test the hypothesis that the integration of meta-management principles and a risk-oriented approach enables organizations to develop a resilient and adaptive management technology. This technology not only effectively aligns strategic goals but also proactively identifies and addresses potential risks. Our findings substantiate this hypothesis by illustrating the advantages of this integrated approach in enhancing operational efficiency, fostering sustainable development practices, and ultimately, strengthening the competitiveness of enterprises.

This study underscores the paramount importance of integrating meta-management principles with a risk-centric approach to fortify decision-making efficacy and bolster overall operational performance within enterprises. We identified several key insights that contribute to the advancement of organizational management practices and improve competitive standing:

1. *Scenario Planning*: By utilizing meta-management principles in conjunction with a risk-oriented approach, organizations can develop scenario planning techniques that help them anticipate and prepare for various potential risks and opportunities. This proactive approach enables businesses to make informed decisions that align with their strategic objectives and outmaneuver competitors.

2. *Risk Mitigation Strategies*: Integrating risk-oriented practices within meta-management frameworks allows organizations to identify, assess, and mitigate risks effectively. For instance,

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implementing robust risk assessment processes based on historical data and future projections can help companies proactively address potential threats, thereby safeguarding their operational performance and market position.

3. *Strategic Resource Allocation*: By blending meta-management principles with a risk-oriented perspective, enterprises can optimize their resource allocation strategies. Businesses can allocate resources based on risk priorities, ensuring that critical areas receive adequate attention and resources to minimize potential disruptions and maximize operational efficiency, a key driver of competitive advantage.

4.1. International Context and Comparative Analysis

To address the need for a broader international perspective, it is valuable to compare our findings from Chinese enterprises with studies from other regions. Our research revealed a strong emphasis in China on integrating quality management (ISO 9001), environmental management (ISO 14001), and occupational health and safety (ISO 45001), with a rapid growth in the latter. This reflects China's national policies focused on industrial upgrading and workplace safety.

In comparison, a study by Griffith and Bhutto (2008) in the United Kingdom found that enhanced environmental performance was a primary driver and benefit of implementing integrated management systems (IMS). While environmental management is also crucial in China (with 55.77% of the world's ISO 14001 certificates in 2022), our survey showed it was a priority for only 24% of respondents, suggesting that for many non-manufacturing firms (e.g., consulting, finance), its relevance is perceived as lower compared to quality or risk management. Besides, European-focused research, such as that by Sax and Andersen (2019), emphasizes the strategic integration of enterprise risk management with strategic planning to adapt to changing market conditions. Our findings align with this, as 88% of our surveyed managers confirmed that an integrated approach improves risk management. However, our study goes a step further by embedding this risk-oriented approach within a meta-management framework, creating a holistic technological system. This suggests a universal need for robust risk management, but the specific configuration of integrated technologies can vary based on regional economic priorities and business sectors.

This comparative lens suggests that while the foundational benefits of IMS—such as improved efficiency, risk mitigation, and strategic alignment—are globally recognized, the specific drivers and combinations of integrated technologies are context-dependent. Our focus on the Chinese context provides a valuable, empirically grounded perspective from a major global economy, contributing to a more nuanced international understanding of IEMT implementation.

When comparing our findings with existing research in the field, we observe several common themes and areas of convergence such as the significance of incorporating risk management strategies into overall management systems to mitigate potential threats and capitalize on opportunities. In this regard, Sax & Andersen (2019) demonstrated how companies that integrate risk management practices within their strategic decision-making processes are better equipped to adapt to changing market conditions and regulatory environments. Their research demonstrated that organizations that proactively assess and address risks tend to have greater resilience and agility in navigating challenges and seizing opportunities compared to those that do not prioritize risk management. Research conducted by Delise et al. (2023) emphasized how companies that embed risk management considerations into their project management frameworks experience fewer project delays and cost overruns. The integration of risk assessment techniques into project planning and execution enhances the organization's ability

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to identify potential obstacles early on and implement contingency measures to mitigate adverse impacts on project timelines and budgets. An article by Singh (2020) underscored the positive correlation between incorporating risk management practices into financial decision-making processes and long-term profitability. The findings indicated that businesses that take a proactive approach to assessing and managing financial risks are more likely to achieve sustainable growth and financial stability over time, compared to those that overlook risk considerations in their strategic planning.

Still, while the studies by Sax and Andersen (2019) and Delise et al. (2023) focus on the integration of risk management within strategic decision-making and project management frameworks specifically, our research centers on developing an integrated technology solution that combines meta-management principles with a risk-oriented approach. While Singh's study focuses more on the theoretical aspects of integrating risk management into strategic decision-making (Singh, 2020), our research delves deeper into practical implementation strategies for developing an IEMT that incorporates meta-management principles and a risk-oriented approach. Also, Singh's study concentrates on a specific sector – on the moderating role of supply chain risk management practices on managerial decision making within the context of environmental uncertainty for improved firm financial performance. His research specifically targets the logistics and supply chain industry when discussing the benefits of integrating risk management practices. In comparison, our study on developing an IEMT based on meta-management and a risk-oriented approach takes a more broad and generalized approach, aiming to offer insights applicable to a wide range of enterprises across various industries beyond just logistics and supply chain management.

Each study has a different contextual focus or industry application. For instance, Komarek et al. (2020) and Huy et al. (2021) focused on market conditions and regulatory impacts, while Smith and Merritt (2020) explored project management practices. Our study investigated the wider ramifications of incorporating meta-management and risk-based methodologies into enterprise technology solutions. The significance of our study resides in the seamless incorporation of meta-management principles within a risk-oriented approach custom-tailored for enterprise management technology. While prior research has traditionally treated meta-management and risk management as distinct entities, our innovative methodology amalgamates these concepts to construct a synergistic framework that effectively addresses strategic alignment and risk mitigation in tandem. By highlighting the interrelated nature of these principles within the sphere of technology development, our research offers a distinctive vantage point that distinguishes itself within the realm of organizational management studies, with direct implications for enhancing enterprise competitiveness.

5 CONCLUSION

This study set out to develop and evaluate an IEMT based on the principles of meta-management and a risk-oriented approach, with the ultimate goal of enhancing enterprise competitiveness. Our research has yielded several key conclusions. Firstly, there is a clear and high demand for specific management technologies; 80% of surveyed enterprises prioritize quality management, while 68% deem risk management, knowledge management, and CSR highly relevant. Secondly, while 80% of enterprises have some form of integrated system, there is a significant need for a more structured approach, particularly in formulating a clear integration vision and providing staff training. Our findings confirm that a successfully implemented IEMT delivers substantial benefits, including better coordination of goals, improved organizational efficiency, and stronger risk management, which are all critical components of a robust competitive strategy.

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The primary contribution of this work is the provision of a validated, procedural model for forming an IEMT. By integrating meta-management with a risk-oriented approach, our model allows enterprises to not only streamline operations but also to build resilience and adaptability. This holistic approach helps organizations proactively manage risks, align resources with strategic objectives, and foster a culture of continuous improvement. The implementation of this framework facilitates sustainable development practices and enhances an organization's ability to thrive in dynamic market conditions, thereby securing a long-term competitive advantage.

The study has limitations in its generalizability, data collection, and susceptibility to external factors. The findings and conclusions derived from the studied sample of Chinese enterprises may not universally apply to all industries or organizational contexts. Potential limitations in data collection methods, such as reliance on self-reported data or constraints in accessing certain information, could compromise the accuracy and reliability of the results. External variables, such as fluctuations in market conditions or changes in regulatory environments, could significantly influence the research outcomes and restrict the applicability of the proposed technology within dynamic business landscapes.

Following our current study, we have delineated a strategy for future research endeavors. Our primary focus will involve the implementation of longitudinal studies to assess the sustained effects of the deployment of IEMT over an extended duration. Furthermore, we will investigate the assimilation of emerging technologies such as AI and blockchain into the IEMT framework to enhance decision-making and risk mitigation capabilities. Lastly, our efforts will center on conducting cross-industry studies to appraise the applicability of the developed technology across diverse sectors, while identifying sector-specific challenges and opportunities.

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APPENDIX 1. COVER LETTER 1

Dear Recipient,

I am writing to inform you of a research survey that is being conducted to evaluate the implementation of the risk-oriented model of the Integrated Enterprise Management Technology in Chinese companies. No specific names will be included.

The purpose of this survey is to assess the effectiveness of integrated Enterprise Management Technology based on Meta-Management and a Risk-Oriented approach within organizations.

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We guarantee the privacy and anonymity of the companies involved to protect their private business information, which is imperative for organizations to implement robust security measures.

Your participation in this survey is highly valuable, and your feedback will contribute significantly to our research findings. Attached, please find the research survey for your review and completion. Your responses will be treated with the utmost confidentiality, and the results will be used solely for research purposes.

Should you have any questions or require further information, please do not hesitate to contact us at [Contact Information].

We appreciate your time and cooperation in this study and thank you in advance for participating.

Best regards,
[The Author]

APPENDIX 2. QUESTIONNAIRE 1

Research Survey Questionnaire: Evaluation of Integrated Enterprise Management Technology Implementation

Section 1: General Information
1. Company Name:
2. Department:
3. Position/Role:

Section 2: Perception of IEMT Implementation
4. To what extent do you believe that the IEMT system implementation has improved decision-making processes within your organization?
- Significantly Improved
- Moderately Improved
- Slightly Improved
- No Improvement

5. How effectively has the IEMT system implementation enhanced risk management strategies in your organization?
- Very Effective
- Effective
- Somewhat Effective
- Ineffective

Section 3: User Experience
6. How user-friendly do you find the IEMT platform/interface?
- Very User-Friendly
- User-Friendly
- Neutral
- Not User-Friendly

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7. Have you encountered any challenges or limitations while using the IEMT system? Please specify.

Section 4: Impact on Performance

8. In your opinion, has the IEMT system implementation positively impacted the overall performance of your department/organization?
- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

9. Have you noticed any specific improvements in operational efficiency since the implementation of IEMT? Please provide examples.

Section 5: Suggestions for Improvement

10. What additional features or functionalities would you like to see incorporated into the IEMT system?

11. Do you have any suggestions for enhancing the effectiveness of the IEMT system implementation in your organization?

Section 6: Additional Comments

12. Please share any additional comments or feedback regarding the IEMT system implementation that you believe are important for the research study.

APPENDIX 3. QUESTIONNAIRE 2

Section 1: General Information

1. Company Name:
2. Position/Role:
3. Department:

Section 2: Selection of Specialized Integrated Technologies

4. How familiar are you with the specialized integrated technologies available for integration into the comprehensive technology?
- Very Familiar
- Moderately Familiar
- Slightly Familiar
- Not Familiar

5. Have you actively participated in the selection process of specialized integrated technologies for integration into the comprehensive technology?
- Yes
- No

Section 3: Evaluation of Integrated Enterprise Management Technology

6. To what extent has the integrated technology improved decision-making processes within your organization?
- 5: Strongly Agree
- 4: Agree
- 3: Neutral

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- 2: Disagree
- 1: Strongly Disagree

7. How effectively has the integrated technology enhanced risk management strategies in your organization?
- 5: Strongly Agree
- 4: Agree
- 3: Neutral
- 2: Disagree
- 1: Strongly Disagree

8. Do you believe that the integrated technology has positively impacted the overall performance and efficiency of your organization?
- 5: Strongly Agree
- 4: Agree
- 3: Neutral
- 2: Disagree
- 1: Strongly Disagree

Section 4: Impact Assessment
9. How has the integration of specialized integrated technologies impacted the overall operational efficiency of your organization?
- Significantly Improved
- Moderately Improved
- Slightly Improved
- No Improvement
- Declined

Section 5: Additional Comments
10. Please provide any additional comments or suggestions regarding the implementation of the Integrated Enterprise Management Technology based on Meta-Management and a Risk-Oriented approach.

APPENDIX 4: COVER LETTER 2

Dear Participant,

We are conducting a survey to evaluate the process of selecting specialized integrated technologies for integration into the comprehensive technology, as part of our research on Developing an Integrated Enterprise Management Technology Based on Meta-Management and Risk-Oriented Approach. Your valuable insights as a senior or mid-level manager are crucial for our study.

Your participation is greatly appreciated, and your responses will remain confidential and anonymous. Please find the questionnaire attached, and we thank you in advance for your input.

Best regards,
[The Author]

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