

DIGITAL TRANSFORMATION OF QUALITY MANAGEMENT: THEORETICAL ASPECTS

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Abstract. With the rapid development of the digital economy and digital technologies, the significance of digital transformation for high-quality enterprise development has been growing. The conditions of the Fourth Industrial Revolution (Industry 4.0) are fundamentally changing the requirements for quality management. Research indicates that the integration of digital technologies with quality management practices is essential for companies to remain competitive. The COVID-19 pandemic, among other factors, accelerated this transformation, emphasizing the need for real-time quality monitoring, remote process auditing, and predictive defect analysis, which are key features of Quality 4.0. *The purpose of the paper* is to demonstrate a comprehensive definition of the digital transformation of quality management systems (QMS) by critically analyzing recent scientific literature. *Methodology* of the study is based on a critical review and synthesis of key scientific publications from the last five years. It draws on findings from systematic literature reviews and exploratory qualitative studies to create a holistic and multi-level framework for the transformation process. Results of the survey showed that the digital transformation of quality management, known as "Quality 4.0," is an evolutionary process that enhances traditional TQM principles with digital technologies. Key technological drivers, such as IoT, Big Data, AI, and Cloud Computing, facilitate a shift from reactive to proactive and data-driven quality management. The implementation, however, faces significant barriers, primarily organizational and human, such as employee resistance, a lack of necessary skills, and high investment costs with a potential for delayed returns. *Practical implications.* The findings

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provide practical guidance for managers seeking to implement Quality 4.0. They highlight the necessity of a multi-level approach that, in addition to technology adoption, focuses on fostering an adaptive organizational culture, providing adequate training to bridge the "skill gap," and securing strong leadership support to overcome resistance. *Value/originality.* This paper contributes a structured and comprehensive definition of the digital transformation of quality management. Its value lies in synthesizing scattered literature into a coherent framework, critically analyzing the interdependencies between technological, organizational, and human factors, and identifying key challenges and future research directions in this still-nascent field.

1. Introduction

In the context of the Fourth Industrial Revolution (Industry 4.0), which is characterized by the convergence of cyber and physical technologies, as well as massive digitalization and the implementation of artificial intelligence (AI) and Big Data, traditional approaches to Quality Management (QM) are undergoing fundamental changes [1; 2; 3]. This technological shift does not simply provide new tools; it revolutionizes the way companies operate and interact with their ecosystems [4]. Traditional Total Quality Management (TQM) aims to minimize defects, reduce waste, and increase customer satisfaction, which ultimately leads to lower costs and higher productivity [5]. However, as Souza et al. [5] note, the integration of TQM with Industry 4.0 technologies unlocks new opportunities for improving the quality of products and services.

This study aims to formulate a comprehensive definition of the digital transformation of quality management systems. This definition will be based on a critical analysis of current scientific literature, with a particular focus on publications that have laid the foundation for the "Quality 4.0" or "TQM 4.0" concept, such as the works of Souza et al. [5], Baran et al. [6] and Antony et al. [7; 8]. The study's structure sequentially covers the evolution of concepts, key technological drivers, a multi-level transformation model, practical benefits, as well as barriers and success factors, providing a holistic view of this complex process.

2. Evolution of Concepts: From TQM to Quality 4.0

Digital transformation in quality management is not a uniform process but rather a complex evolution that combines established TQM principles with modern technologies. Baran et al. [6] remind us that the philosophy of TQM is based on ensuring quality in all processes through the contribution of every employee. This concept assumes that all processes, technology, and workforce in an enterprise represent the "total quality" of the organization, and continuous adjustments and control are necessary for its sustainability.

Within the framework of Industry 4.0, the concept of TQM evolves into what is called "Quality 4.0" or "TQM 4.0". Antony et al. [7] define Quality 4.0 as "the alignment of quality management practices with the new capabilities of Industry 4.0" to improve product quality, efficiency, and reduce costs and time. Similarly, Sader et al., cited in [5], describe Quality 4.0 as "an evolution of quality management" that occurs under the influence of Industry 4.0 advancements, with an emphasis on automation, enhanced data analysis, and integration. Souza et al. [5], propose the concept of a "TQM 4.0 ecosystem" that integrates three key elements: technology, quality, and the human factor. This model emphasizes that successful transformation depends not only on the implementation of technology but also on the creation of a corresponding quality culture.

The analysis shows that the digital transformation of quality management is more of an evolutionary than a revolutionary process. The sources describe Quality 4.0 as an "emerging concept" [7] and as "adapting quality management to Industry 4.0" [5], which indicates that it is not a replacement for traditional practices but an extension and enhancement of them. The fundamental principles of TQM, such as customer focus, continuous improvement, and the involvement of all employees, remain relevant. Digitalization provides new, more effective tools for their implementation, for example, by allowing decisions to be made based on real-time data rather than intuition [2]. For companies, this means that successful transformation requires not abandoning existing systems but strategically integrating them with new technologies, which is a more complex task than simply implementing new software.

Furthermore, digital transformation is not a one-time event but a continuous, multidimensional process. Vial [1] argues that technology should not be seen as the sole and most important factor of transformation. Rihawi

[4] adds that digital transformation is "revolutionizing how companies operate and interact with their ecosystems" and affects leadership, culture, processes, and customer satisfaction. This indicates that the transformation of quality management systems goes far beyond technical improvements and affects all levels of the organization, from strategic planning to operational workflows.

To systematize the understanding of the Quality 4.0 concept, Table 1 provides a comparative analysis of key definitions from the literature reviewed.

Table 1

Comparative Analysis of Quality 4.0 / TQM 4.0 Definitions

Author(s)	Key Publication	Definition / Key Characteristics
Antony et al. [7]	<i>Quality 4.0 conceptualisation and theoretical understanding</i>	Alignment of quality management practices with Industry 4.0 capabilities to enhance efficiency, reduce costs and time, and improve product quality. Emphasis on technologies such as predictive analytics, sensors, and electronic feedback loops.
Souza et al. [5]	<i>Total quality management 4.0: adapting quality management to Industry 4.0</i>	Integration of traditional TQM with Industry 4.0 technologies. The concept of a "TQM 4.0 ecosystem" is introduced, which combines technology, quality, and the human factor.
Sader et al., cited in [5]	<i>review study</i>	The evolution of quality management under the influence of Industry 4.0 advancements. Key features: automation, enhanced data analysis, and integration.

The table clearly demonstrates that despite differences in phrasing, all definitions converge on key points: Quality 4.0 is an integrative approach that uses Industry 4.0 technologies to strengthen and modernize traditional quality management principles.

The definitions reviewed, while similar in nature, have important differences in emphasis. The work of Antony et al. [7] is based on a qualitative study with 12 managers, engineers, and continuous improvement specialists from leading companies in Europe, Asia, and America. In their view, Quality 4.0 is not only about aligning practices with technologies but

also about a conceptual framework that enables organizations to overcome implementation difficulties. The respondents of this study named predictive analytics, sensors and tracking, and electronic feedback loops as the most critical technologies for the development of Quality 4.0.

In turn, Souza et al. [5], present Quality 4.0 as an evolution of traditional TQM, integrating Industry 4.0 technologies. They proposed the concept of a "TQM 4.0 ecosystem," which emphasizes that successful transformation depends on the balance between technology, quality, and the human factor. This model is important because it goes beyond the simple implementation of technology, highlighting the need to create a corresponding organizational culture and engage employees.

Finally, Sader et al., cited in [5] define Quality 4.0 as "the evolution of quality management," which is consistent with the ideas of Souza et al. [5]. Their definition places a special emphasis on automation, advanced data analysis, and integration, which corresponds to the main technological features of Industry 4.0. They also emphasize that Quality 4.0 is still an "emerging concept", which requires further study and dissemination.

Thus, all these definitions complement each other, creating a holistic view of Quality 4.0 as a strategic, technology-oriented, but at the same time deeply dependent on the human factor and organizational culture process.

3. Multi-level Model of Digital Transformation of QMS

3.1 Technological Drivers of Transformation

The digital transformation of quality management systems relies on a number of key technologies that act as driving forces for this process. These technologies do not simply automate existing tasks but create fundamentally new opportunities for quality control, analysis, and improvement.

Internet of Things (IoT) and Sensors: The implementation of IoT devices and sensors allows for the collection of data from production equipment and processes in real-time [3; 9; 10]. This provides continuous monitoring of equipment status and production metrics, which is critically important for the timely detection of anomalies. Rihawi [4] notes that sensors and applications allow for real-time recording of performance indicators, which facilitates process management and quality control.

Big Data and Analytics: With the availability of Big Data, quality management is transformed into a data-driven method, allowing for decisions

to be based on facts rather than intuition [2]. Mhlongo & Nyembwe [3] state that Big Data analytics helps in process management and evidence-based decision-making. Analytical algorithms can provide accurate metrics for design quality, conformance, and performance, which supports data-driven decision-making.

Artificial Intelligence (AI) and Machine Learning (ML): These technologies go beyond simple analytics by enabling predictive maintenance [3; 11]. They are capable of analyzing vast amounts of data from sensors and predicting potential equipment failures or malfunctions before they occur. Rihawi [4] emphasizes that digitalization can minimize the influence of the "human factor" in identifying and preventing non-conformities and errors, as AI takes over routine monitoring and control tasks.

Cloud Computing: Cloud platforms provide the necessary infrastructure for storing, processing, and analyzing the vast amounts of data collected by IoT devices. They enhance data accessibility and system scalability, which is critically important for the effective functioning of analytics and AI [3; 12].

Blockchain: This technology provides enhanced traceability and transparency in supply chains [3; 13; 14]. Rihawi [4] points out that improved product traceability, which is achieved through RFID and other digital solutions, is crucial for industries such as food and pharmaceuticals, where controlling the origin and movement of products is critical for ensuring safety and quality.

The use of these technologies facilitates a fundamental shift from reactive to proactive quality management. Traditional methods often focused on identifying and correcting defects after they had occurred. The implementation of Quality 4.0 allows organizations to move to a preventive model, where problems are predicted and prevented in advance. IoT and Big Data provide the data, while AI and analytics transform it into predictive insights, enabling organizations to prevent failures before they impact quality, reduce productivity, or lead to financial losses. This paradigm shift is one of the most significant transformative forces in modern quality management practice.

Table 2 systematizes the impact that each of the mentioned technologies has on core quality management practices.

Table 2

Industry 4.0 Technologies and Their Impact on Key QM Practices

Industry 4.0 Technology	Impact on Quality Management
Internet of Things (IoT) and Sensors	Provide real-time data collection, enabling continuous monitoring [11]. Minimize the influence of the "human factor" in quality control processes [4].
Big Data and Analytics	Shift QM to a data-driven model [2]. Improve decision-making, making it more informed and proactive [3]. Assist in process management and problem identification [3].
Artificial Intelligence (AI) and Machine Learning (ML)	Enable predictive maintenance by forecasting equipment failures [11]. Automate routine quality control tasks [4].
Cloud Computing	Increase data accessibility and the scalability of analytical systems, which is critically important for effective QM [3].
Blockchain	Provides improved traceability and transparency in the supply chain [3]. Enhances data security and trust [13; 14].

A critical analysis of the data presented in Table 2 shows that, despite the obvious advantages, the technological drivers of the digital transformation of quality management systems are accompanied by a number of important challenges and limitations.

Firstly, the implementation of these technologies often comes down to the question of "what," not "how." The existing literature describes in detail the potential benefits of using Big Data or AI, but not enough attention is paid to the practical aspects of their implementation [14; 15]. This creates a significant gap between theory and practice, leaving managers without clear guidance on how to integrate these tools into day-to-day workflows.

Secondly, while technologies like AI can minimize the influence of the "human factor," they also create new risks that require new forms of control. For example, auditors may be reluctant to fully trust the results obtained from AI due to the "black box" effect, where the algorithm's decision-making process is unclear [13]. This emphasizes that a purely technological approach, without the parallel development of new control and trust mechanisms, may be limited.

Thirdly, the cultural gap between technological and management departments often becomes a serious obstacle. A study by Elg et al. shows that IT specialists may not understand why quality specialists continue to

use physical tools (e.g., whiteboards and sticky notes) for certain tasks, even though their work "could be hidden in a computer" [9]. This demonstrates that digital transformation is not just about moving processes online, but a deep integration that requires understanding and overcoming cultural and operational differences.

Thus, for a successful transformation, it is not enough to simply implement advanced technologies. It is necessary to develop practical recommendations, overcome cultural and organizational barriers, and build systems that can manage new risks and maintain trust in digital tools.

3.2. Development of a Multi-Level Model for Digital Transformation of QMS

The digital transformation of a quality management system is a complex phenomenon that affects not only the technological infrastructure but also organizational structures, processes, and corporate culture. For a comprehensive understanding of this process, it is necessary to consider it at three interconnected levels: technological, organizational-process, and cultural-human.

The technological component is the foundation of the transformation. It includes the implementation of digital solutions and platforms, such as IoT, Big Data, AI, and cloud computing. These technologies provide automation, real-time data collection, and advanced analysis, which allows for more informed and faster decisions [4; 10].

The organizational-process component describes how technologies change business models, operational processes, and strategic planning. Rihawi [4] indicates that digital transformation "reshapes quality management practices," optimizes processes, and fosters continuous improvement. Studies by Antony et al. [7] and [5] emphasize that Quality 4.0 is not just a set of technologies, but the integration of these technologies with traditional QM practices, such as process management and continuous improvement.

The cultural-human component is, perhaps, the most complex and critically important aspect of the transformation. Vial [1] points out that technology is only one part of the "complex puzzle" that organizations must solve to remain competitive. Antony et al. [8] divide the transformation process into "science" (understanding data) and "art" (cultural changes,

vision creation, and strategy formulation). Rihawi [4] notes that transformation affects leadership strategies, employee engagement, and decision-making. Balouei Jamkhaneh et al. [12] also emphasize that the human factor remains key, and "technical abilities and capability to solve problems" were identified as the most significant driver.

Focusing on this multi-level approach allows for the understanding that the success of digital transformation depends not only on investments in technology but also on the organization's readiness for change. Studies show that the human factor is both the main catalyst and a key barrier. Rihawi [4] and Calvo-Mora et al. [13] note that employee resistance and the lack of necessary competencies are among the main challenges. This indicates that technology is merely a tool, and without adapting the organizational culture, preparing the personnel, and a corresponding leadership style that fosters learning and innovation, the transformation cannot be successful.

While the multi-level model is a useful tool for conceptualizing the transformation process, a critical analysis of the literature reveals several important nuances and problems that companies face in its implementation.

First, the technological component is often mistakenly seen as the sole or primary driver of transformation. Vial [1] notes that technology is only one element in a "complex puzzle" and that digital transformation is only partially described by traditional models of organizational change [16; 17]. Some companies make the mistake of focusing exclusively on implementing "flashy digital technologies" and ignoring deeper issues related to management, organizational structure, and corporate culture. This one-sided approach makes transformation efforts ineffective [15].

Second, the cultural-human component, despite its recognized importance, is the most difficult. Studies show that IT departments may not understand the specifics of quality specialists' work, which leads to conflicts and resistance [11; 12]. This creates a "skill gap" when experienced employees with extensive knowledge in their field are unfamiliar with new digital tools and processes [12]. Successful transformation, therefore, requires not only investment in technology but also in training and the creation of a culture that fosters innovation.

Third, the universality of the model is limited. The barriers and problems associated with transformation vary significantly depending on the characteristics of the organization. For example, small and medium-sized

enterprises (SMEs) face more serious technological and financial barriers, while service sector organizations more often face problems related to culture and knowledge than manufacturing enterprises [17; 18]. This means that there is no single "road map" for transformation, and each organization must develop an individualized strategy that considers its specifics.

Finally, the academic and practical approach to digital transformation is still in its early stages. As Ivančić et al. [19] note, academic concepts are lagging behind practical interest, and existing frameworks are constantly evolving. This suggests that the multi-level model, while a valuable starting point, does not provide a definitive and universal solution for all companies.

4. Digital transformation of QMS: benefits and practical outcomes

The digital transformation of quality management systems brings tangible benefits at various levels, from operational efficiency to strategic competitiveness.

Financial and Operational Benefits:

- **Cost reduction:** The integration of Industry 4.0 technologies helps reduce defects, errors, and waste, which leads to lower overall costs [5; 9].

- **Increased productivity and efficiency:** Digital solutions, such as automation and process optimization, increase overall productivity [4; 10]. Tu et al. [14] provide empirical evidence that digital technologies significantly increase Total Factor Productivity (TFP) in manufacturing enterprises by enhancing innovation potential and reducing operational and management costs.

Strategic Benefits:

- **Quality improvement:** Quality 4.0 allows for the improvement of product and service quality and the creation of new, customer-oriented business models [2; 7].

- **Strengthening competitive advantages:** Companies that successfully implement Quality 4.0 can gain a competitive advantage in the market by offering higher-quality and more customized products and services and by increasing customer satisfaction [5; 19].

It is important to note that the impact of digital transformation on productivity may have a delayed effect. Tu et al. [14] indicate that the implementation of digital technologies may not lead to an immediate increase in Total Factor Productivity in the short term, which, however, does

not negate the long-term positive impact. Such observations are crucial for management, as they emphasize the need for long-term strategic planning and patience in the transformation process. This also helps to explain why some companies may not see an immediate return on their investments and why it is so important to overcome the so-called "productivity paradox" [14].

While the benefits of digital transformation in quality management are significant and well-documented, it is important to understand that their achievement is not automatic and is associated with a number of critical challenges.

First, as mentioned in the section, there is a so-called "productivity paradox," according to which investments in technology may not lead to an immediate increase in Total Factor Productivity in the short term [14]. This paradox is explained by the fact that to get the full return on digital solutions, it takes not only time but also a deep reorganization of internal processes, retraining of personnel, and adaptation of the entire corporate culture [1]. The lack of a clear strategy and patience can lead to companies not seeing the expected return and considering their investments ineffective.

Second, the benefits of digitalization may not be the same for different types of organizations. Studies show that small and medium-sized enterprises (SMEs), despite their need for digitalization to remain competitive, face serious financial and operational constraints that can prevent them from realizing the expected performance improvements [18]. This suggests that to achieve practical results, not only internal efforts but also external support are needed, for example, in the form of government programs or access to venture capital [11].

Third, the implementation of digital technologies to increase efficiency and reduce the human factor can create new risks. For example, by relying solely on artificial intelligence for quality control, companies risk facing "systemic errors" due to flaws in the AI's logic, which may go unnoticed ([13]). Additionally, auditors and other specialists may be reluctant to fully trust the results obtained from AI due to the "black box" effect, where the algorithm's decision-making process is unclear. Thus, digitalization requires not only minimizing human intervention but also implementing new control and trust mechanisms.

Therefore, although digital transformation provides enormous opportunities for improving quality, these benefits are not an automatic result of technological implementation. They depend on the organization's readiness for long-term change, its ability to overcome internal barriers, and the careful management of new risks introduced by digital tools.

5. Barriers, Challenges, and Success Factors of digital transformation in QMS

The successful implementation of digital transformation in quality management systems is associated with overcoming significant barriers, which, as studies show, are often not technological but organizational and human in nature. Calvo-Mora et al. [13] classify these barriers into three main groups.

Organizational barriers include employee resistance and the unreadiness of the organizational culture for change [2; 4]. Rihawi [4] notes that employee resistance, caused by fear of job loss and unfamiliarity with new systems, is a serious challenge.

Knowledge-related barriers include the lack of competencies and skills among personnel, as well as the lack of knowledge about how to correctly implement new technologies [8; 9; 10]. Balouei Jamkhaneh et al. [12] and Antony et al. [7] emphasize that quality specialists need to develop new competencies, such as working with Big Data, analytical thinking, and change management.

Technological barriers include high investment costs for implementing new systems, as well as problems with integrating old, "legacy" systems with new digital platforms [2; 8; 9].

However, studies also indicate that these barriers vary depending on the characteristics of the organization. Calvo-Mora et al. [13] found that organizations in the service sector face more organizational and knowledge barriers to implementing Quality 4.0 than industrial organizations; no differences were identified for technological barriers. At the same time, small and medium-sized enterprises (SMEs) face more serious technological barriers compared to large companies [17; 18]. This emphasizes that there is no universal set of problems, and the transformation strategy must be individualized to account for the specifics of the industry and company size.

Table 3 presents the key barriers and readiness factors identified through the analysis. A critical analysis of the data presented in Table 3 shows that barriers to the digital transformation of quality management do not exist in isolation but are closely interconnected.

Table 3

Main Barriers and Readiness Factors for Quality 4.0 Implementation

Category	Main Barriers	Readiness/Success Factors
Organizational	High investments and unclear ROI. Unfavorable organizational culture. Employee resistance.	Top management support. Organizational readiness. Clear vision and strategy.
Knowledge-related	Lack of knowledge and competencies among personnel. Insufficient training.	Development of new skills. Teamwork and communication.
Technological	High technology costs [10]. Problems with integrating legacy systems [10].	The role of leadership in providing resources and trust.

The main problems that organizations face are high financial investments and an unclear return on them, which relates to both technological and organizational barriers [8; 9]. These financial difficulties are compounded by a lack of knowledge and competencies among personnel who are not ready to work with new systems [8; 9]. Thus, the success of transformation depends on a comprehensive approach that considers both technological and, more importantly, organizational and human aspects.

While the barriers associated with digital transformation are well-studied, overcoming them in practice is often a difficult task. The analysis shows that these challenges are deeply interconnected and depend on the specifics of a particular organization.

Interconnectedness of Barriers: The main barriers, according to research, are high investment costs and a lack of employee competencies [13; 18]. At the same time, financial constraints and technological difficulties are often exacerbated by organizational and cultural problems. For example, employee resistance caused by the fear of job loss or unfamiliarity with new systems can nullify the most extensive technological investments [4].

In this context, leadership plays a key role, as it must not only provide financial resources but also create an atmosphere of trust and organize appropriate training for personnel [4].

The Specificity of the Human Factor: The complexity of the human factor lies not only in resistance but also in the "skill gap" when experienced quality specialists with deep knowledge in their field are unfamiliar with new digital tools ([10]). Moreover, a study by Elg et al. [9] shows that a cultural gap can exist between IT and quality specialists: IT specialists may not understand why quality specialists continue to use physical tools like whiteboards and sticky notes, even though their work "could be hidden in a computer" [9]. This emphasizes that digital transformation is not just about moving processes online, but a deep integration that requires understanding and overcoming cultural and operational differences between departments.

Lack of a Universal Solution: The results of the research show that there is no single "road map" for overcoming barriers. For example, Calvo-Mora et al. [13] indicate that companies in the service sector face more organizational and knowledge barriers than industrial enterprises. At the same time, small and medium-sized enterprises (SMEs) face more serious technological barriers compared to large companies [17; 18]. This confirms that the implementation strategy must be adapted to the specific nature of the company, its size, industry, and level of maturity.

Finally, it should be noted that research in the field of Quality 4.0 is still in its early stages. For example, the work of Sony et al. [8] was the first empirical study to analyze the readiness factors and barriers to implementing Quality 4.0. This suggests that the scientific understanding of this process continues to evolve, and many "how-level" questions (how to do it in practice) are still awaiting answers [14].

6. Conclusions

Based on a critical analysis of the scientific literature, a comprehensive definition of the digital transformation of quality management systems can be formulated.

Digital transformation of a quality management system is a strategic, multi-level, and continuous process that involves the integration of advanced digital technologies of Industry 4.0, such as the Internet of

Things, Big Data, artificial intelligence, and cloud computing, with the fundamental principles of quality management. The goal of this process is to create new value and achieve sustainable competitive advantages by increasing operational efficiency, improving product and service quality, and enhancing customer focus. This is not simply the implementation of technology but a profound restructuring of the organizational structure, business models, operational processes, and the development of employee culture and competencies, which allows for a shift from reactive defect correction to proactive problem prevention.

The key conclusions drawn from the analysis emphasize that the digital transformation of quality management is an evolution, not a revolution. It does not cancel traditional approaches but modernizes them, making management more data-driven, predictive, and effective. The most significant finding is that the human factor and organizational culture act as the main catalysts and barriers. The success of the transformation depends on top management support, the organization's readiness for change, and investments in developing personnel skills. At the same time, the benefits of digitalization may be delayed, which requires long-term strategic planning and readiness to overcome the "productivity paradox."

Despite the growing interest in this topic, research in the field of Quality 4.0 is still in its early stages ([9]). Significant gaps have been identified that can form the basis for future research:

- **Practical implementation ("how-level"):** The literature pays a lot of attention to *what* Quality 4.0 is, but not enough to *how* to implement it in practice, especially considering the specifics of different industries.

- **Sector-specific nature:** More in-depth research is needed on the impact of the digital transformation of QM on sectors other than manufacturing and logistics.

- **Human aspects:** Further analysis is required on the impact of digitalization on the development of competencies, motivation, and employee resistance in the context of QM.

Research in these areas will deepen the understanding of the digital transformation process and allow for the development of more precise and individualized strategies for organizations striving for excellence in the digital age.

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