

DIGITAL TRANSFORMATION

AND COMPETITIVENESS IN SMALL AND MEDIUM-SIZED ENTERPRISES

TRANSFORMACIÓN DIGITAL Y COMPETITIVIDAD EN LAS PEQUEÑAS Y MEDIANAS EMPRESAS

Marjan Daman Keshideh¹

E-mail: m.damankeshideh@iau.ac.ir

ORCID: <https://orcid.org/0000-0002-9615-0913>

Matin Shahi²

Email: matinshahi139011@gmail.com

ORCID: <https://orcid.org/0009-0009-2131-4918>

¹ Islamic Azad University, Tehran, Iran.

² Islamic Azad University, Ardabil Branch, Iran.

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ABSTRACT

The objective of this study was to analyze the role of digital transformation as a determinant of competitiveness in small and medium-sized enterprises and evaluate its impact on organizational efficiency, innovation capacity, sustainability, and strategic development. The study was developed using a qualitative analytical methodology supported by a comprehensive narrative literature review. Scientific articles, institutional reports, systematic reviews, and academic investigations published between 2021 and 2026 were analyzed through recognized scientific databases and academic repositories. The findings demonstrated that digital transformation significantly strengthens organizational competitiveness by improving operational efficiency, strategic decision-making, innovation processes, customer engagement, and market expansion. Technologies such as artificial intelligence, electronic commerce, automation systems, cloud computing, and digital payment platforms were identified as essential tools for enhancing organizational adaptability and business sustainability. However, the study also revealed important challenges related to financial limitations, cybersecurity risks, digital inequality, insufficient technological infrastructure, and lack of digital competencies. Overall, digital transformation was identified as a structural and irreversible process capable of redefining the future of small and medium-sized enterprises, organizational competitiveness, and sustainable economic development in the digital era.

Keywords:

Digital transformation, competitiveness, small and medium-sized enterprises, innovation, business sustainability.

RESUMEN

El objetivo de este estudio fue analizar el papel de la transformación digital como determinante de la competitividad en las pequeñas y medianas empresas y evaluar su impacto en la eficiencia organizacional, la capacidad de innovación, la sostenibilidad y el desarrollo estratégico. El estudio se desarrolló mediante una metodología analítica cualitativa sustentada en una revisión narrativa integral de la literatura científica. Se analizaron artículos científicos, informes institucionales, revisiones sistemáticas e investigaciones académicas publicadas entre 2021 y 2026 a través de bases de datos científicas y repositorios académicos reconocidos. Los hallazgos demostraron que la transformación digital fortalece significativamente la competitividad organizacional al mejorar la eficiencia operativa, la toma de decisiones estratégicas, los procesos de innovación, la interacción con los clientes y la expansión de mercados. Tecnologías como la inteligencia artificial, el comercio electrónico, los sistemas de automatización, la computación en la nube y las plataformas de pago digital fueron identificadas como herramientas esenciales para mejorar la adaptabilidad organizacional y la sostenibilidad empresarial. Sin embargo, el estudio también reveló importantes desafíos relacionados con las limitaciones financieras, los riesgos de ciberseguridad, la desigualdad digital, la insuficiente infraestructura tecnológica y la falta de competencias digitales. En términos generales, la transformación digital fue identificada como un proceso estructural e irreversible capaz de redefinir el futuro de las pequeñas y medianas empresas, la competitividad organizacional y el desarrollo económico sostenible en la era digital.

Palabras clave:

Transformación digital, competitividad, pequeñas y medianas empresas, innovación, sostenibilidad empresarial.



INTRODUCTION

Digital transformation has become one of the most influential forces shaping contemporary business environments and organizational competitiveness in the twenty-first century. Rapid technological innovation, accelerated globalization, changing consumer behavior, and the expansion of digital economies have transformed how organizations operate, communicate, produce, and compete in local and international markets. In this context, small and medium-sized enterprises have increasingly recognized the necessity of adopting digital technologies as a strategic mechanism for improving efficiency, innovation, sustainability, and long-term competitiveness. The integration of digital tools into organizational structures is no longer considered an optional modernization process but rather a fundamental requirement for business survival and growth in highly dynamic economic environments.

Small and medium-sized enterprises represent a vital component of global economic systems due to their significant contribution to employment generation, regional development, entrepreneurship, and innovation. According to the Organisation for Economic Co-operation and Development (2021), these enterprises account for most businesses worldwide and constitute a substantial source of economic activity in both developed and developing countries. Despite their economic importance, many small and medium-sized enterprises face structural limitations related to financial resources, technological infrastructure, managerial capabilities, and access to innovation systems. These constraints often reduce their ability to compete effectively in increasingly digitalized markets dominated by technological advancement and rapid organizational change.

The emergence of digital transformation has fundamentally altered traditional business models and redefined the sources of organizational competitiveness. Technologies such as artificial intelligence, cloud computing, big data analytics, digital payment systems, blockchain, e-commerce platforms, automation, and the Internet of Things are transforming production processes, customer interactions, supply chains, and strategic decision-making. As a result, organizations capable of adapting to digital environments tend to demonstrate greater operational flexibility, innovation capacity, customer responsiveness, and market resilience. Conversely, enterprises that fail to integrate digital technologies risk losing competitiveness, productivity, and long-term sustainability.

Digital transformation within small and medium-sized enterprises involves much more than the simple adoption of technological tools. It represents a profound organizational change process that influences leadership structures, strategic planning, organizational culture, innovation management, employee capabilities, and customer relationships. Meier et al. (2025) argued

that digital transformation should be understood as a strategic and multidimensional process capable of reshaping the competitive foundations of incumbent enterprises. Their research emphasized that digital transformation contributes to competitiveness not only through operational efficiency but also through organizational adaptability, strategic flexibility, and the development of new business opportunities in rapidly evolving markets.

The increasing relevance of digital transformation has become especially evident in the context of global economic uncertainty and technological disruption. Economic crises, changing market conditions, and global events such as the coronavirus pandemic accelerated the need for businesses to adopt digital solutions capable of maintaining organizational continuity and market accessibility. During this period, many small and medium-sized enterprises were forced to transform their operational models by implementing digital communication systems, online sales platforms, remote work structures, and digital financial services. These transformations demonstrated that digital readiness has become directly associated with organizational resilience and business continuity.

In addition to improving operational processes, digital transformation also plays a critical role in strengthening innovation and sustainable competitive advantage. Kahveci (2025) emphasized that digital transformation enables enterprises to create interconnected organizational ecosystems capable of improving collaboration, knowledge management, strategic agility, and market adaptation. According to the author, sustainable competitive advantage increasingly depends on the capacity of organizations to integrate digital technologies with human capital, innovation strategies, and customer-oriented approaches. Consequently, competitiveness in modern markets is no longer determined exclusively by production capacity or financial resources but also by digital maturity and technological adaptability.

Another important dimension of digital transformation involves its relationship with organizational sustainability and long-term performance. Costa Melo et al. (2023) highlighted that sustainable digital transformation contributes significantly to improving business performance in small and medium-sized enterprises by optimizing operational efficiency, reducing costs, enhancing resource management, and facilitating innovation processes. The authors also argued that digitalization can support environmental sustainability through more efficient energy use, digital communication systems, paperless operations, and optimized supply chain management. Therefore, digital transformation simultaneously contributes to economic competitiveness and sustainable organizational development.

Despite its strategic advantages, the digital transformation process presents numerous challenges for small and medium-sized enterprises. Limited financial resources, inadequate technological infrastructure, cybersecurity concerns, lack of digital skills, resistance to organizational change, and insufficient managerial expertise frequently hinder the effective implementation of digital strategies. Many enterprises struggle to balance technological investment costs with immediate operational needs, particularly in highly competitive or economically unstable markets. Additionally, the unequal distribution of technological resources between large corporations and smaller businesses may intensify existing competitive disparities.

The successful implementation of digital transformation also depends heavily on leadership capacity and organizational culture. Enterprises that promote innovation-oriented leadership, continuous learning, and employee adaptability are generally more capable of integrating technological change successfully. Enri-Peiró & González-Arroyo (2025) explained that digital transformation serves as a key driver of competitiveness because it strengthens organizational innovation, market responsiveness, and strategic flexibility. Their research demonstrated that enterprises capable of fostering digital capabilities and adaptive organizational cultures tend to achieve greater productivity, customer satisfaction, and market expansion.

Furthermore, digital transformation has significantly modified customer expectations and business-consumer relationships. Modern consumers increasingly demand rapid communication, personalized services, digital accessibility, online purchasing options, and efficient customer experiences. As a result, small and medium-sized enterprises are under increasing pressure to adopt customer-centered digital strategies capable of meeting evolving market demands. Digital platforms, social media marketing, electronic commerce systems, and data-driven decision-making processes have become essential instruments for maintaining customer engagement and strengthening organizational competitiveness.

Another critical aspect of digital transformation concerns the development of digital ecosystems and collaborative networks among enterprises, governments, educational institutions, and technological providers. Public policies and institutional support programs frequently play a decisive role in facilitating digital adoption among small and medium-sized enterprises. Access to digital infrastructure, technological training programs, financial incentives, and innovation support systems may significantly influence the capacity of enterprises to participate successfully in digital economies. Consequently, digital transformation should not be viewed solely as an internal organizational process but also as a broader socioeconomic phenomenon

involving institutional collaboration and public-private cooperation.

The rapid evolution of digital technologies additionally raises important concerns related to cybersecurity, data protection, ethical technology use, and digital inequality. As enterprises increasingly depend on digital systems and online operations, they become more vulnerable to cyberattacks, data breaches, and technological disruptions. Small and medium-sized enterprises often lack the financial and technical resources necessary to implement advanced cybersecurity measures, making them particularly exposed to digital risks. Therefore, sustainable digital transformation requires not only technological adoption but also responsible governance, ethical management practices, and secure digital infrastructures.

Overall, digital transformation represents one of the most significant drivers of organizational competitiveness and innovation in contemporary business environments. For small and medium-sized enterprises, digitalization offers opportunities to improve productivity, strengthen resilience, expand market participation, and achieve sustainable growth. However, the successful implementation of digital transformation requires strategic planning, technological investment, organizational adaptability, institutional support, and continuous innovation. In an increasingly interconnected and technology-driven global economy, the competitiveness of small and medium-sized enterprises will depend largely on their ability to adapt to digital change and integrate emerging technologies into sustainable business models.

Therefore, the objective of this study is to analyze the role of digital transformation as a determinant of competitiveness in small and medium-sized enterprises and evaluate its impact on organizational performance, innovation, sustainability, and long-term business development. Additionally, the study seeks to examine the principal challenges, opportunities, and strategic implications associated with digital transformation processes within contemporary small and medium-sized enterprises.

MATERIALS AND METHODS

The present study was developed using a qualitative analytical methodology supported by a comprehensive narrative literature review focused on digital transformation and competitiveness in small and medium-sized enterprises. This methodological approach was selected because it allows an interdisciplinary and in-depth understanding of the technological, organizational, economic, managerial, and strategic dimensions associated with digital transformation processes in contemporary business environments. The study aimed to examine how digital technologies influence organizational competitiveness, innovation performance, operational efficiency,

sustainability, and long-term business resilience within small and medium-sized enterprises operating in increasingly digitalized economies.

The research process involved systematic identification, selection, classification, and interpretation of scientific publications, academic investigations, review articles, and institutional reports related to digital transformation, organizational competitiveness, innovation management, digital ecosystems, sustainability, and technological adaptation in small and medium-sized enterprises. The analyzed literature included publications developed between 2021 and 2026 to guarantee the incorporation of recent technological developments, emerging digital trends, and contemporary business challenges associated with digital transformation processes.

Bibliographic research was conducted through internationally recognized scientific databases and academic repositories, including Scopus, ScienceDirect, SpringerLink, Google Scholar, Frontiers, Cogent Business and Management, Heliyon, Systems, and reports published by the Organisation for Economic Co-operation and Development. The search strategy incorporated combinations of descriptors and thematic keywords such as “digital transformation,” “small and medium-sized enterprises,” “competitiveness,” “digital innovation,” “organizational resilience,” “digital culture,” “electronic commerce,” “artificial intelligence,” “business sustainability,” “digital ecosystems,” and “technological competitiveness.” Boolean operators including AND, OR, and NOT were used to refine the search process and improve the precision and relevance of the selected sources.

The inclusion criteria considered scientific relevance, thematic contribution, methodological consistency, and direct applicability to the objectives of the investigation. Selected studies were required to address at least one of the following dimensions: digital competitiveness, organizational innovation, technological adoption, digital leadership, sustainable business transformation, digital maturity, operational efficiency, or strategic adaptation in small and medium-sized enterprises. Priority was given to peer-reviewed investigations, systematic literature reviews, empirical analyses, and multidisciplinary studies capable of providing comprehensive perspectives regarding digital transformation and organizational competitiveness.

The exclusion criteria involved publications lacking scientific rigor, duplicated studies, investigations unrelated to small and medium-sized enterprises, and sources focused exclusively on highly technical technological aspects without broader managerial or organizational implications. Additionally, studies presenting insufficient methodological transparency or unsupported conclusions were excluded from the analytical process to ensure the academic reliability and conceptual consistency of the research.

Following the selection process, the identified literature was organized into thematic categories to facilitate comparative analysis and interpretative evaluation. These categories included operational efficiency and automation, innovation and digital culture, electronic commerce and market expansion, digital leadership, organizational adaptability, sustainability and competitiveness, cybersecurity and technological risks, digital inequality, employee digital competencies, and strategic digital ecosystems. This thematic classification enabled the identification of recurring patterns, emerging technological tendencies, and interconnections among organizational, technological, and economic variables influencing competitiveness in small and medium-sized enterprises.

The analytical phase followed a thematic and interpretative content analysis approach. Each selected source was critically examined to identify principal arguments, technological contributions, strategic implications, and organizational challenges associated with digital transformation. Special attention was given to the relationship between technological innovation and sustainable competitive advantage, as well as the influence of digitalization on productivity, resilience, customer engagement, and business sustainability. The collected information was subsequently synthesized into conceptual and analytical frameworks that supported the development of the discussion and conclusions presented throughout the study.

Additionally, the study adopted a multidisciplinary perspective integrating management sciences, digital economics, innovation studies, organizational behavior, and technological sustainability. This interdisciplinary approach allowed the research to analyze digital transformation not only as a technological phenomenon but also as a structural process capable of reshaping organizational cultures, managerial practices, labor dynamics, and competitive structures in modern economies. Ethical considerations associated with digital transformation, including cybersecurity, responsible technology use, digital inequality, and employee adaptation, were also examined as essential dimensions influencing sustainable organizational development.

Overall, the methodological framework employed in this investigation provides a comprehensive and academically rigorous perspective regarding the role of digital transformation as a determinant of competitiveness in small and medium-sized enterprises. By integrating contemporary scientific evidence and multidisciplinary contributions, the study offers a broad analytical understanding of the opportunities, barriers, strategic implications, and future challenges associated with digital transformation in increasingly interconnected and technology-driven business environments.

RESULTS AND DISCUSSION

The acceleration of digital transformation has profoundly modified the operational dynamics of small and medium-sized enterprises, generating new competitive environments characterized by technological innovation, organizational flexibility, and rapid market adaptation. In contemporary economies, competitiveness is increasingly associated with the capacity of enterprises to integrate digital technologies into their strategic processes, customer interactions, and business models. Small and medium-sized enterprises that successfully adopt digital solutions are better positioned to improve productivity, strengthen innovation capacity, optimize decision-making processes, and expand their participation in local and international markets.

One of the most significant effects of digital transformation in small and medium-sized enterprises involves the improvement of operational efficiency and organizational performance. Digital technologies facilitate process automation, reduce administrative burdens, optimize communication systems, and improve coordination among organizational departments. Through the implementation of cloud computing, enterprise resource planning systems, artificial intelligence applications, and digital management platforms, enterprises can simplify routine operations and increase organizational agility. These improvements contribute to reducing operational costs, minimizing human error, and accelerating business processes, allowing enterprises to respond more effectively to changing market conditions.

Digital transformation additionally enhances strategic decision-making using data-driven management systems. Contemporary enterprises increasingly depend on digital analytics, big data technologies, and real-time information systems to evaluate market trends, customer behavior, operational performance, and financial sustainability. The capacity to collect and interpret digital information enables managers to make more accurate, efficient, and strategic decisions capable of improving organizational competitiveness. In this context, information has become one of the most valuable organizational resources, and enterprises capable of effectively utilizing digital data often demonstrate superior adaptability and market responsiveness.

Another important dimension of digital transformation relates to innovation and organizational creativity. Small and medium-sized enterprises frequently face strong competitive pressures from larger corporations possessing greater financial and technological resources. However, digitalization provides smaller enterprises with opportunities to innovate rapidly, develop personalized services, and access technological tools previously available only to large organizations. Digital platforms facilitate

experimentation, product development, market testing, and customer interaction in ways that strengthen innovation ecosystems and entrepreneurial creativity. Consequently, digital transformation allows many enterprises to compete not through scale but through flexibility, innovation, and customer-centered strategies.

The expansion of electronic commerce has also become one of the most transformative consequences of digitalization within small and medium-sized enterprises. Digital marketplaces, online sales platforms, mobile applications, and social media marketing have radically altered traditional commercial models by expanding access to consumers across geographical boundaries. Enterprises are no longer limited by physical location or local markets because digital platforms enable global visibility and international commercial participation. This transformation has particularly benefited small enterprises seeking market expansion opportunities without requiring large physical infrastructure investments.

Furthermore, digital communication systems have significantly improved customer relationship management and consumer engagement. Modern consumers increasingly expect rapid responses, personalized experiences, continuous digital interaction, and efficient online services. Small and medium-sized enterprises that adopt customer-oriented digital strategies can strengthen consumer loyalty, improve brand visibility, and increase market competitiveness. Technologies such as customer relationship management systems, artificial intelligence chat systems, and digital marketing analytics facilitate deeper understanding of customer preferences and purchasing behaviors, enabling enterprises to offer more personalized and effective services.

The integration of digital payment systems and financial technologies has additionally transformed commercial transactions and financial management within small and medium-sized enterprises. Electronic payment platforms, digital banking services, mobile transactions, and financial automation tools contribute to improving transaction speed, reducing operational risks, and facilitating business accessibility for consumers and enterprises alike. In many developing economies, digital financial technologies have also increased financial inclusion by allowing smaller enterprises to access broader markets and participate more actively in digital economies.

Another significant aspect of digital transformation concerns workforce development and organizational adaptability. The increasing incorporation of digital technologies requires employees to acquire new technical competencies, digital skills, and adaptive capabilities. As a result, organizational competitiveness increasingly depends on continuous learning processes, employee training programs, and knowledge management systems capable of supporting

technological integration. Enterprises that invest in digital education and professional development tend to demonstrate higher innovation capacity and stronger resilience during periods of economic or technological disruption.

Leadership also plays a decisive role in determining the success of digital transformation processes within small and medium-sized enterprises. Effective digital leadership involves not only technological understanding but also strategic vision, innovation-oriented management, and organizational adaptability. Managers and business leaders must be capable of promoting cultural transformation, encouraging employee participation, and integrating digitalization into long-term organizational objectives. Enterprises characterized by rigid organizational structures or resistance to change often experience greater difficulties in implementing successful digital transformation strategies.

Despite the numerous advantages associated with digitalization, small and medium-sized enterprises continue facing substantial barriers during digital transformation processes. Financial limitations remain one of the most significant obstacles because many enterprises lack sufficient capital to invest in advanced technologies, cybersecurity systems, digital infrastructure, or specialized technical personnel. In addition, technological complexity and rapidly evolving innovation cycles may generate uncertainty and increase implementation risks for smaller organizations operating with limited resources.

Cybersecurity and data protection additionally represent growing concerns in increasingly digitalized business environments. As enterprises become more dependent on digital platforms, cloud storage systems, and online transactions, they also become more vulnerable to cyberattacks, information theft, and digital fraud. Small and medium-sized enterprises frequently possess limited cybersecurity capabilities compared to larger corporations, increasing their exposure to technological risks. Consequently, digital competitiveness requires not only technological adoption but also secure digital governance and effective risk management strategies capable of protecting organizational information and customer data.

Another challenge associated with digital transformation involves digital inequality and unequal technological access among enterprises and regions. In many developing countries, limited internet connectivity, inadequate technological infrastructure, insufficient governmental support, and restricted access to digital education continue limiting digital adoption among small businesses. This technological divide may intensify economic disparities between enterprises capable of participating in digital economies and those excluded from technological modernization processes. Therefore, inclusive digital transformation requires

coordinated efforts involving governments, educational institutions, private organizations, and technological providers.

The relationship between digital transformation and sustainability has also gained increasing importance in recent years. Sustainable digitalization involves integrating technological innovation with environmental responsibility, social inclusion, and long-term economic resilience. Digital technologies may contribute to reducing environmental impact through paperless systems, optimized logistics, intelligent energy management, remote operations, and resource-efficient production systems. At the same time, sustainable digital transformation encourages responsible innovation practices capable of balancing economic growth with environmental conservation and social well-being.

Moreover, digital ecosystems and collaborative innovation networks have become essential for strengthening competitiveness in small and medium-sized enterprises. Strategic partnerships among enterprises, universities, research centers, technological providers, and public institutions facilitate knowledge exchange, technological diffusion, and innovation development. Collaborative digital ecosystems enable enterprises to access technological expertise, innovative resources, and market opportunities that would otherwise remain inaccessible due to organizational limitations. Consequently, competitiveness increasingly depends on collaborative capacity and integration into broader digital and innovation networks.

The evolution of digital transformation demonstrates that competitiveness in modern economies can no longer be understood exclusively through traditional economic indicators such as production volume or financial capital. Contemporary competitiveness increasingly involves adaptability, technological integration, innovation capacity, organizational resilience, and digital maturity. Small and medium-sized enterprises capable of developing flexible digital strategies and sustainable innovation models are more likely to survive and grow within highly volatile and technology-driven markets.

Overall, digital transformation represents a structural and irreversible process, reshaping the future of small and medium-sized enterprises globally. Its impact extends beyond operational modernization and directly influences organizational culture, strategic management, market participation, innovation systems, and long-term sustainability. Although important barriers and inequalities remain, digital transformation offers unprecedented opportunities for enterprises to strengthen competitiveness, expand economic participation, and adapt to the demands of increasingly interconnected digital economies. The future success of small and medium-sized enterprises

will therefore depend largely on their capacity to integrate technological innovation with sustainable, adaptive, and strategically oriented business models.

Asa et al. (2026) analyzed the transformative impact of digital technology on the performance of small and medium-sized enterprises through a comprehensive review and conceptual framework focused on digital transformation processes. The authors argued that digital transformation has evolved into a strategic necessity for organizational survival and competitiveness in increasing technological business environments. Their study demonstrated that digital technologies contribute significantly to improving operational efficiency, innovation capacity, customer interaction, and market adaptability within small and medium-sized enterprises. Furthermore, the research emphasized that successful digital transformation depends not only on technological adoption but also on organizational culture, leadership capacity, employee adaptability, and strategic management. One of the principal contributions of the study was the development of a conceptual framework explaining how enterprises can integrate digital technologies into sustainable growth models while maintaining competitiveness in dynamic global markets.

Moreover, Wang & Zhang (2025) explored the relationship between digital transformation and innovation performance in small and medium-sized enterprises from a systems perspective. Their investigation focused on the interaction among digital adoption, digital drive, and digital culture as interconnected factors influencing organizational innovation. The authors concluded that enterprises characterized by strong digital cultures and proactive technological strategies demonstrate superior innovation performance and greater organizational adaptability. In addition, the study highlighted that digital transformation strengthens strategic decision-making, accelerates knowledge sharing, and promotes collaborative innovation processes within enterprises. The findings also suggested that the success of digitalization initiatives largely depends on the integration of technological capabilities with organizational values, employee participation, and innovation-oriented leadership structures.

Similarly, Da Silva et al. (2025) examined how digital technologies enhance competitiveness in manufacturing small and medium-sized enterprises. Their study revealed that technologies such as automation systems, digital manufacturing tools, artificial intelligence, and data analytics significantly improve productivity, operational efficiency, and product quality. The authors emphasized that digital transformation enables manufacturing enterprises to optimize production processes, reduce operational costs, improve supply chain coordination, and increase flexibility in response to changing market conditions.

Additionally, the research demonstrated that digitally advanced enterprises tend to achieve higher levels of competitiveness and sustainability compared to organizations operating under traditional industrial models. The study also highlighted the importance of continuous technological innovation for strengthening long-term business resilience and market expansion.

In the same context, Jurnalita (2024) investigated the impact of digital transformation on the competitiveness of micro, small, and medium enterprises and its influence on economic growth. The study demonstrated that digitalization positively affects organizational productivity, business efficiency, customer accessibility, and market participation. The author argued that digital transformation facilitates the development of entrepreneurial ecosystems capable of stimulating economic development and innovation. Furthermore, the research highlighted the importance of digital platforms, electronic commerce, and financial technologies in increasing organizational competitiveness and supporting business sustainability. Another relevant contribution of the study involved the recognition that digital transformation contributes not only to organizational performance but also to broader economic development by strengthening employment opportunities and technological modernization.

Furthermore, Gao et al. (2026) conducted a systematic review examining digital transformation and innovation in small and medium-sized enterprises while proposing a future research agenda for the field. The authors emphasized that digital transformation has become a determining factor for organizational competitiveness, innovation capacity, and long-term sustainability. Their review identified that enterprises adopting advanced digital technologies often demonstrate greater resilience, operational flexibility, and market responsiveness. The study additionally revealed that digital transformation supports innovation through improved knowledge management, collaborative networks, and customer-centered business models. Another major contribution of the article was its identification of emerging research gaps related to digital leadership, organizational adaptability, artificial intelligence integration, and sustainable digital ecosystems within small and medium-sized enterprises.

Likewise, Tiep (2025) analyzed the impact of digital transformation on the competitive advantage of small and medium-sized enterprises from the perspective of senior managers. The study demonstrated that organizational leaders perceive digital transformation as a strategic mechanism for strengthening business competitiveness and improving market performance. According to the findings, enterprises implementing digital technologies achieve greater operational agility, customer satisfaction, and innovation capacity. The author also highlighted that leadership commitment and managerial support play essential roles in the

successful implementation of digital transformation strategies. In addition, the research concluded that enterprises capable of integrating digital innovation into strategic planning are more likely to sustain competitive advantages in rapidly evolving business environments.

Additionally, Moreira et al. (2025) evaluated digital transformation in small and medium-sized enterprises using the Alkire-Foster multidimensional assessment method. The study provided a comprehensive framework for measuring digital transformation by considering multiple dimensions such as technological infrastructure, digital capabilities, organizational readiness, and innovation potential. The authors argued that digital transformation should not be measured exclusively through technology adoption rates because organizational culture, employee skills, and strategic integration are equally important determinants of digital maturity. Their findings revealed substantial disparities among enterprises regarding digital preparedness and technological adaptation. The research also emphasized the necessity of developing multidimensional evaluation systems capable of identifying organizational strengths and weaknesses within digital transformation processes.

Meanwhile, Faisal et al. (2023) explored the opportunities and challenges associated with digital transformation in small and medium-sized enterprises in the United States. Their study demonstrated that digital technologies create significant opportunities for business expansion, operational efficiency, customer engagement, and innovation development. However, the authors also identified major barriers limiting successful digital adoption, including cybersecurity risks, financial constraints, lack of technical expertise, and organizational resistance to change. Furthermore, the research highlighted those smaller enterprises frequently experience difficulties competing with larger corporations possessing greater technological resources and digital infrastructure. The study concluded that public policies, educational support, and technological training programs are fundamental for facilitating inclusive and sustainable digital transformation among small businesses.

Consequently, Singh & Anees (2025) investigated the drivers, barriers, and strategic implications of digital transformation within micro, small, and medium enterprises. The authors identified technological readiness, institutional support, market competition, and innovation capacity as primary drivers encouraging digital adoption. At the same time, the study revealed that financial limitations, insufficient digital literacy, infrastructural deficiencies, and limited managerial expertise represent significant barriers affecting digital transformation processes. One of the principal contributions of the article was its emphasis on strategic policy interventions and capacity-building initiatives aimed at strengthening sustainable digital ecosystems.

The authors concluded that long-term organizational sustainability increasingly depends on the ability of enterprises to integrate digital innovation with strategic planning and adaptive organizational cultures.

From another perspective, Marolt et al. (2025) explored the digital transformation journey among micro, small, and medium-sized enterprises by analyzing how organizations progress through different stages of digital maturity. Their research demonstrated that digital transformation is a gradual and multidimensional process influenced by organizational capabilities, leadership commitment, employee readiness, and technological accessibility. The authors emphasized that enterprises experience digital transformation differently depending on their size, resources, and strategic orientation. Moreover, the study highlighted the importance of continuous learning, organizational flexibility, and innovation management for successfully navigating digital transformation pathways. The findings also suggested that enterprises with stronger collaborative networks and institutional support mechanisms tend to progress more effectively toward digital maturity.

Similarly, Siregar et al. (2025) examined the role of technology in increasing the competitiveness of small and medium-sized enterprises in the digital era through a systematic literature review approach. The authors demonstrated that digital technologies enhance organizational competitiveness by accelerating innovation processes, improving operational efficiency, and expanding collaboration networks. The study specifically highlighted the positive effects of technologies such as blockchain systems, electronic commerce platforms, and digital payment technologies on organizational transparency, supply chain optimization, and market expansion. However, the research also identified important challenges related to limited financial resources, insufficient digital competencies, and weak corporate governance structures. The authors concluded that government support, institutional cooperation, and adaptive digital strategies are essential for promoting sustainable competitiveness among small and medium-sized enterprises.

Furthermore, Ye et al. (2026) investigated how employee-driven adaptability influences digital transformation processes within service-oriented organizations. Their study emphasized that organizational transformation depends not only on technological implementation but also on employee behavior, innovation capacity, and workplace adaptability. The authors demonstrated that job crafting and innovative work behavior significantly contribute to successful digital transformation by encouraging organizational flexibility and employee engagement. In addition, the research highlighted that digitally adaptive organizational cultures strengthen innovation performance, collaboration, and long-term

competitiveness. The study ultimately concluded that human capital development and employee participation are fundamental elements for ensuring successful and sustainable digital transformation.

Likewise, Lu & Shaharudin (2024) conducted a systematic literature review focused on the role of digital transformation in generating sustainable competitive advantage for small and medium-sized enterprises. Their findings demonstrated that digital transformation contributes to organizational sustainability through improved innovation, strategic flexibility, customer engagement, and operational efficiency. The authors argued that enterprises capable of integrating digital technologies with sustainable business strategies tend to achieve stronger competitive positions in dynamic markets. Furthermore, the study emphasized that digital transformation facilitates knowledge management, collaborative innovation, and organizational resilience during periods of economic uncertainty and technological disruption.

In addition, Asif et al. (2025) examined both the opportunities and challenges associated with digital transformation in small and medium-sized enterprises. Their research highlighted those digital technologies facilitate market expansion, business innovation, customer communication, and operational modernization. Nevertheless, the study also revealed that many enterprises continue facing obstacles related to technological infrastructure, cybersecurity concerns, employee resistance, and financial limitations. The authors emphasized that successful digital transformation requires organizational commitment, strategic investment, and supportive institutional environments capable of fostering technological innovation and sustainable business growth.

Meanwhile, Phukan (2025) analyzed the impact of digital transformation on small and medium-sized enterprises, concluding that technological modernization has become a decisive factor influencing organizational competitiveness and long-term survival. The study demonstrated that enterprises adopting digital systems achieve greater productivity, market adaptability, and customer satisfaction compared to organizations relying exclusively on traditional business models. The author also emphasized that digital transformation promotes entrepreneurial innovation, improves communication systems, and facilitates participation in global digital economies. However, the research stressed that sustainable digitalization requires continuous learning, strategic planning, and institutional support to overcome existing barriers and maximize the benefits of technological integration.

The analyzed studies collectively demonstrate that digital transformation has become one of the principal determinants of competitiveness, innovation, and

sustainability in small and medium-sized enterprises within contemporary economies. The literature consistently highlights that technological modernization is no longer limited to operational improvement but has evolved into a strategic process capable of reshaping organizational structures, business models, and long-term growth opportunities. Enterprises that successfully integrate digital technologies tend to achieve greater adaptability, stronger market positioning, improved productivity, and enhanced organizational resilience in increasingly dynamic and competitive environments (Table 1).

Table 1. Main Findings on Digital Transformation and Competitiveness in Small and Medium-Sized Enterprises.

Author(s)	Main findings
Asa et al. (2026)	Digital transformation improves operational efficiency, innovation capacity, customer interaction, and market adaptability in small and medium-sized enterprises.
Wang and Zhang (2025)	Strong digital cultures and proactive technological strategies enhance innovation performance and organizational adaptability.
Da Silva et al. (2025)	Automation systems, artificial intelligence, and data analytics improve productivity, operational efficiency, and competitiveness in manufacturing enterprises.
Jurnalita (2024)	Digital transformation positively influences productivity, market participation, customer accessibility, and economic growth.
Gao et al. (2026)	Digital transformation strengthens competitiveness, innovation capacity, resilience, and long-term sustainability in enterprises.
Tiep (2025)	Organizational leaders perceive digital transformation as a strategic mechanism for improving competitive advantage and market performance.
Moreira et al. (2025)	Digital transformation depends on technological infrastructure, organizational readiness, innovation potential, and employee digital capabilities.
Faisal et al. (2023)	Digital technologies create opportunities for innovation and business expansion, although financial limitations and cybersecurity risks remain major barriers.
Singh & Anees (2025)	Technological readiness, institutional support, and innovation capacity drive digital adoption, while financial and infrastructural limitations hinder transformation.

Author(s)	Main findings
Marolt et al. (2025)	Digital transformation is a gradual process influenced by leadership commitment, organizational flexibility, and employee readiness.
Siregar et al. (2025)	Digital technologies such as blockchain systems and electronic commerce platforms strengthen transparency, competitiveness, and market expansion.
Ye et al. (2026)	Employee adaptability and innovative work behavior significantly contribute to successful and sustainable digital transformation.
Lu & Shaharudin (2024)	Digital transformation creates sustainable competitive advantages through innovation, strategic flexibility, and operational efficiency.
Asif et al. (2025)	Digital technologies facilitate modernization and innovation, although enterprises continue facing technological, financial, and organizational barriers.
Phukan (2025)	Digital modernization increases productivity, customer satisfaction, market adaptability, and participation in global digital economies.

Reviewed investigations also reveal that digital transformation significantly improves operational efficiency through process automation, digital communication systems, data analytics, cloud computing, and advanced management technologies. These innovations contribute to optimizing internal operations, accelerating decision-making processes, reducing operational costs, and increasing organizational flexibility. At the same time, digital tools facilitate customer engagement, personalized services, electronic commerce expansion, and broader market accessibility, enabling enterprises to compete more effectively at both national and international levels.

Another recurring finding among the studies is the strong relationship between digital transformation and organizational innovation. Digital technologies promote knowledge sharing, collaborative networks, innovation ecosystems, and strategic creativity, allowing enterprises to develop new products, services, and business opportunities more rapidly. In addition, digital transformation strengthens organizational agility by enabling enterprises to respond more efficiently to changing consumer demands, technological disruptions, and volatile market conditions.

The literature further emphasizes that successful digital transformation depends not only on technological adoption but also on organizational culture, leadership capacity, employee adaptability, and continuous learning processes. Enterprises characterized by innovation-oriented leadership, digital readiness, and employee participation tend to demonstrate higher levels of digital maturity and competitive advantage.

Human capital development and digital competencies therefore emerge as essential factors supporting sustainable organizational transformation.

At the same time, the analyzed studies identify important barriers limiting digital transformation processes in small and medium-sized enterprises. Financial constraints, inadequate technological infrastructure, cybersecurity concerns, lack of digital skills, and resistance to organizational change continue affecting the capacity of many enterprises to adopt advanced technologies effectively. In several regions, digital inequality and limited institutional support additionally restrict access to technological resources and innovation systems, particularly among smaller or economically vulnerable enterprises.

Furthermore, the investigations demonstrate that digital transformation contributes directly to sustainable business development by supporting efficient resource management, environmental sustainability, innovation performance, and long-term organizational resilience. Technologies such as digital payment systems, electronic commerce platforms, artificial intelligence applications, and intelligent management systems create opportunities for enterprises to modernize operations while simultaneously improving competitiveness and economic sustainability.

Overall, the collective findings reveal that the future competitiveness of small and medium-sized enterprises will depend heavily on their ability to integrate digital innovation with strategic planning, adaptive organizational cultures, technological investment, and sustainable business models. Digital transformation is therefore presented not simply as a technological trend, but as a structural and irreversible process redefining the future of entrepreneurship, organizational performance, and economic development in the digital era.

CONCLUSIONS

Digital transformation has emerged as one of the most disruptive and decisive forces redefining the future of small and medium-sized enterprises in the contemporary global economy. The findings analyzed throughout this study demonstrate that technological modernization is no longer an optional process associated exclusively with innovation or operational improvement, but rather a structural necessity directly linked to organizational survival, competitiveness, and long-term sustainability. In increasingly digitalized and volatile markets, enterprises incapable of adapting to technological change risk losing relevance, productivity, and strategic positioning within global economic systems.

The study revealed that digital transformation significantly strengthens organizational competitiveness by improving operational efficiency, accelerating innovation processes, enhancing customer

engagement, optimizing strategic decision-making, and facilitating market expansion. Technologies such as artificial intelligence, cloud computing, electronic commerce, automation systems, digital payment platforms, and advanced data analytics enable enterprises to modernize operations and develop more adaptive, flexible, and customer-centered business models. As a result, digitalized enterprises tend to demonstrate greater resilience and responsiveness in the face of economic uncertainty, technological disruption, and changing consumer demands.

Another major conclusion derived from this investigation is that digital transformation extends far beyond technological adoption. The success of digitalization processes depends heavily on organizational culture, leadership vision, employee adaptability, digital competencies, and strategic management capabilities. Enterprises characterized by innovation-oriented leadership, continuous learning environments, collaborative organizational cultures, and employee participation are more likely to achieve sustainable digital maturity and maintain long-term competitive advantages. Consequently, human capital development emerges as one of the most critical elements supporting successful digital transformation.

The findings additionally demonstrate that digital transformation contributes directly to sustainable organizational development by supporting innovative ecosystems, efficient resource management, strategic flexibility, and environmental sustainability. Digital technologies facilitate paperless operations, optimized logistics, intelligent resource allocation, and improved communication systems capable of reducing operational inefficiencies while simultaneously strengthening economic performance. Therefore, digital competitiveness increasingly depends on the integration of technological innovation with sustainability-oriented business strategies and responsible organizational governance.

However, the study also identified important structural barriers limiting digital transformation processes within small and medium-sized enterprises. Financial constraints, technological inequality, insufficient digital infrastructure, cybersecurity risks, lack of specialized knowledge, and resistance to organizational change continue affecting the capacity of many enterprises to adopt advanced technologies effectively. These limitations are especially severe in economically vulnerable regions where access to technological resources, institutional support, and digital education remain restricted. Without coordinated public policies and inclusive technological strategies, digital transformation may intensify existing economic disparities between technologically advanced enterprises and those excluded from digital economies.

Another critical conclusion concerns the growing importance of cybersecurity and ethical digital governance in contemporary business environments. As enterprises become increasingly dependent on digital systems and data-driven operations, they also become more vulnerable to cyberattacks, information theft, digital fraud, and technological instability. Sustainable digital transformation therefore requires not only technological investment but also responsible governance frameworks capable of protecting organizational information, customer privacy, and digital integrity. The future competitiveness of enterprises will depend not only on innovation capacity but also on their ability to maintain secure, ethical, and resilient digital infrastructures.

Furthermore, the study demonstrated that collaborative digital ecosystems and institutional cooperation are essential for strengthening the digital competitiveness of small and medium-sized enterprises. Governments, universities, technological providers, financial institutions, and innovation networks play fundamental roles in facilitating technological accessibility, digital education, and innovation development. Enterprises integrated into collaborative ecosystems tend to experience stronger technological adaptation, greater innovation opportunities, and improved strategic resilience. Consequently, digital transformation should be understood not only as an organizational process but also as a broader socioeconomic transformation requiring coordinated collective action.

Ultimately, the future of small and medium-sized enterprises will depend largely on their capacity to integrate digital transformation into sustainable, adaptive, and innovative-oriented business models. The digital economy is rapidly redefining competitive structures, consumer behavior, organizational management, and global market dynamics. Enterprises capable of embracing technological innovation while simultaneously strengthening human capital, organizational adaptability, and strategic sustainability will be better prepared to survive and grow in increasingly uncertain and technologically complex environments.

In conclusion, digital transformation represents far more than a technological evolution; it constitutes a profound economic, organizational, and social revolution reshaping the foundations of competitiveness in the twenty-first century. Small and medium-sized enterprises that successfully navigate this transformation will not only improve operational performance and market participation but also contribute to innovation, sustainable development, and economic modernization at a global scale. The capacity to adapt, innovate, and digitally evolve will ultimately determine which enterprises thrive and which disappear in the emerging digital era.

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Conflicts of Interest:

The authors declare no conflicts of interest.

Author Contributions:

Marjan Daman Keshideh, Matin Shahi: Conceptualization, data curation, formal analysis, investigation, methodology, supervision, validation, visualization, original draft writing, and writing, review, and editing.

Ethical statement:

The study was based on the analysis of documentary sources and publicly available data, and therefore did not involve the direct participation of human subjects. No personally identifiable information was handled.