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Building Competitiveness in the Digital Era: The Role of Sustainable Project Strategy and Customer-Centric Innovation

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Abstract: In today's rapidly evolving digital landscape, achieving digital product success is vital for maintaining business competitiveness. This study delves into the complexities of digital product success by focusing on the integration of customer-centric innovation and sustainable project strategies alongside external knowledge, AI technologies, and digital resilience. Despite robust theoretical underpinnings, challenges such as inadequate requirements, insufficient user knowledge, and ineffective project management continue to hinder product success. Through a survey of 239 professionals in product-related roles and Structural Equation Modeling (SEM), the research examines how key factors—including the Collaborative Knowledge Ecosystem, AI-Enhanced Management, Digital Resilience, Customer-Centric Innovation Strategy, and Sustainable Project Strategy—impact Product Success. The results reveal that these factors significantly contribute to success, with the Customer-Centric Innovation Strategy and Sustainable Project Strategy playing important roles in shaping outcomes. The study underscores the importance of aligning product development with customer needs while ensuring sustainability as a core component of strategic success. Environments that foster continuous knowledge sharing, advanced technology use, resilient infrastructures, and sustainable practices are pivotal to achieving long-term competitiveness in the digital marketplace. This paper offers actionable insights for organizations seeking to enhance their digital product strategies through customer-centric approaches and sustainable development practices.

Keywords: *Digital Product Success, Collaborative Knowledge Ecosystem, AI-Enhanced Management, Digital Resilience, Customer-Centric Innovation, Sustainable Project Strategy, Structural Equation Modeling (SEM)*

JEL Classification: O32, M15, L86, Q01

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1. Introduction

In a time of swift technological progress and digital revolution, businesses must have successful digital products to stay ahead of the competition. Because the digital landscape constantly changes, developing and implementing successful digital products requires constant innovation, flexibility, and strategic foresight. The goal of this study is to investigate the various facets of digital product success to highlight the necessity of an all-encompassing strategy that integrates collaboration, AI opportunities, sustainability, adaptability, and customer-focused tactics.

The Standish Group's Chaos Reports have historically provided critical insights into the success rates of digital projects and their products, often highlighting the complex obstacles these

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projects face. For instance, previous reports have indicated that only about 31% of digital projects are considered successful, and among these successful projects and final products, only 46% return high value (Ismail, 2018; Standish Group, 2020). More recently, Gartner 2025 CIO and Technology Executive Survey showed that, on average, only 48% of digital initiatives meet or exceed their business outcome targets, based on responses from over 3,100 CIOs and technology executives (Gartner, 2024). These findings reflect persistent challenges in digital transformation. While 61% of top executives identify digital transformation as a key priority, many struggle to translate that priority into successful execution (West Monroe, 2023). Supporting this, the TEKsystems State of Digital Transformation 2024 reported that 32% of business leaders cite complex work environments as a significant barrier to transformation success (TEKsystems, 2024). Additionally, KPMG's 2023 Global Tech Report revealed that 54% of employees feel unprepared to adapt to new technologies, leading to increased resistance, implementation errors, and slower adoption (KPMG, 2023). Furthermore, MuleSoft's 2024 Connectivity Benchmark Report finds that 85% of organizations struggle with system integration, hindering their digital transformation efforts, and 57% cite legacy systems as a significant barrier to digital innovation. These integration challenges directly affect product success by creating siloed data and processes, which result in inefficiencies and a sluggish innovation cycle (MuleSoft, 2024). Taken together, these findings highlight the important need for a more comprehensive understanding of the strategic and operational elements that drive digital product success.

On the other hand, the theoretical foundation for understanding digital product success is built on several key concepts and frameworks. The first of these is Vargo and Lusch's (2004) service-dominant logic, which emphasizes the co-creation of value between companies and customers and is central to customer-centric innovation of products. Ramaswamy and Ozcan (2018) further advocated for co-creation experiences, highlighting the importance of integrating customer feedback and insights throughout the innovation process. Building on these foundations, recent studies have explored how AI and digital ecosystems are reshaping co-creation and product innovation. Babatunde et al. (2024) emphasized that AI-powered platforms enhance customer engagement by enabling real-time feedback, adaptive personalization, and interactive brand experiences, such as through AI-powered chatbots and virtual assistants that deliver personalized support and product recommendations. Similarly, Shirazi et al. (2025) advocated that integrating data analytics with customer co-creation strategies allows firms to develop more agile and responsive digital product strategies. These developments reflect a shift toward more technologically embedded forms of value co-creation in the digital era. Moreover, Sánchez (2015) proposed a comprehensive model for integrating sustainability into project management, prioritizing corporate policies, resource management, and stakeholder engagement, leading to product success. More recent studies have expanded this view by emphasizing the strategic integration of digital capabilities with sustainability principles. Wang et al. (2023) argued that digital technologies allow firms to embed sustainability into innovation and project governance, while Silva et al. (2024) highlighted their role in enhancing transparency, adaptive execution, and sustainability tracking. Additionally, Chesbrough and Crowther (2006) highlighted the necessity of open innovation and leveraging external knowledge sources for sustained advancements. Recent work by Liao et al. (2024) reinforced the enduring importance of ecosystem-based collaboration as a key mechanism for addressing the challenges of digital transformation and advancing sustainability goals. Furthermore, studies by Vial (2019) examined digital transformation, emphasizing the role of

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digital technologies in disrupting traditional business models and creating new opportunities for innovation to facilitate product success.

Despite these robust theoretical foundations, achieving digital product success remains a challenge. While existing literature offers valuable insights into individual aspects of digital transformation, such as artificial intelligence (AI) for decision-making and digital resilience for continuity, it often treats these constructs in isolation. Similarly, while customer-centric innovation and sustainability are recognized as essential strategic priorities, their connection with foundational digital capabilities is still underexplored. Even though some studies have begun to examine integrated perspectives (e.g., AI with innovation, or sustainability with project strategy), these are typically limited in scope and focus on only one or two constructs at a time. To the best of our knowledge, literature lacks comprehensive models that combine both technological enablers (such as AI-Enhanced Management and Digital Resilience) and strategic orientations (such as Customer-Centric Innovation Strategy and Sustainable Project Strategy). Furthermore, most research lacks quantitative evaluations of how different factors impact product outcomes, leaving open important questions, such as whether customer-centricity exerts a more substantial influence on product outcomes than sustainability, and whether digital capabilities act as core strategic drivers or simply offer operational support. These questions are often treated as resolved in managerial discourse, yet remain empirically ambiguous (Teece, 2018). Exploring these assumptions through a quantitative lens offers a chance to surface strategic tensions that are frequently overlooked in theory and practice. In addition, many contributions remain conceptual or descriptive, lacking empirical testing of the interdependencies between these variables - an issue previously pointed out by Crossan and Apaydin (2010), and one that, based on our literature review, still persists with minimal empirical advancement. As a result, the current knowledge about the elements that drive digital product success is fragmented and incomplete, specifically where success relies on the coordinated alignment of internal capabilities with strategic priorities.

To address these problems and advance our understanding of digital product success, this research attempts to make three contributions to the existing body of knowledge. First, it aims to provide a detailed theoretical and practical framework for digital product success, integrating insights from various fields, including knowledge management, AI, sustainability, digital resilience, and customer-centric innovation. By examining the interconnections among these components, the study offers a holistic view of the mechanisms that collectively shape digital product success. Second, it seeks to identify and analyze the key factors that influence digital product success, offering actionable recommendations for practitioners to enhance their project outcomes. Finally, it addresses the existing gaps in the literature by providing a comprehensive and holistic approach to digital product success, ensuring that theoretical concepts are closely aligned with practical applications in dynamic business environments. In doing so, the proposed framework offers direct solutions to the critical challenges that often lead to the failure of digital product initiatives. By integrating both strategic and technological dimensions, it offers insights to help businesses navigate stakeholder engagement challenges and align innovation strategies with execution while addressing integration issues caused by legacy systems and disconnected technology. Moreover, the proposed approach builds the foundation for enhanced cross-functional coordination, which enables businesses to respond rapidly and adjust smoothly to evolving market conditions and customer requirements.

Following this introduction, Section 2 provides a literature review, exploring key concepts - Collaborative Knowledge Ecosystem (CKE), AI-Enhanced Management (AIEM), Digital

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Resilience (DR), Customer-Centric Innovation Strategy (CCIS), Sustainable Project Strategy (SPS), Product Success (PS), and an integrated view of these concepts. Section 3 outlines the research hypotheses and conceptual model, illustrating the hypothesized relationships between the constructs. Section 4 details the research methodology, describing the survey design, data collection, and analytical techniques employed. Additionally, within this section, we provide sample characteristics as well as the assessment of the measurement method. Section 5 presents the results of the Structural Equation Modeling (SEM) analysis, highlighting the significant relationships among the variables. Section 6 discusses the implications of the findings, offering insights for practitioners and policymakers. Finally, Section 7 concludes the paper by summarizing its key contributions, discussing its limitations and directions for future research, and emphasizing the importance of an integrated approach to achieve digital product success.

2. Literature Review

An in-depth comprehension of the theoretical foundations is necessary for achieving product success in the quickly changing field of digital product management. Key frameworks and concepts, such as CKE, AIEM, DR, CCIS, and SPS, are examined in this literature review to provide a basis for understanding the viability of digital products. This study attempts to give a thorough overview of the factors that affect the success of digital products by combining insights from various fields and emphasizing the interdependence and complexity of these components. This foundational knowledge sets the stage for the subsequent empirical analysis and hypothesis testing, underscoring the importance of an integrated approach to digital product innovation and management.

2.1 Collaborative Knowledge Ecosystem

The idea of a CKE has become increasingly significant, with researchers emphasizing its transformative impact on fostering innovation and organizational learning. Nonaka and Takeuchi (1995) laid the foundation of CKEs by introducing the SECI model, in which they promoted the conversion of tacit knowledge to explicit knowledge through socialization, externalization, combination, and internalization processes within organizations. Chesbrough (2003) expanded on this model by advocating for open innovation, stressing the importance of leveraging external knowledge sources to enhance internal innovation capabilities. This highlights the role of *Knowledge Co-Creation*, where various stakeholders collaborate to generate new insights and solutions. Furthermore, Corvello et al. (2023) explored the role of digital platforms in facilitating knowledge sharing and collaboration across organizational boundaries; their effective *Knowledge Sharing and Distribution* enhanced the dynamism of CKEs. More recently, Chierici et al. (2019) underscored the integration of technological advancements, such as AI and big data, in optimizing knowledge flows and fostering collaborative innovation networks, which is critical for *Collaborative Technologies Integration*. Collectively, these contributions underscore the evolution of CKEs from traditional knowledge management systems to the dynamic, technology-enhanced ecosystems that they are today, which are crucial for sustained innovation and competitive advantage in today's rapidly changing business environment.

However, the effectiveness of CKEs as innovation enablers is not universal and may vary considerably depending on context. When knowledge flows lack structure or strategic alignment, excessive collaboration can lead to information overload, decision-making delays, and coordination inefficiencies (Cross & Gray, 2013). Moreover, the open innovation approach

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in CKEs introduces potential risks to intellectual property rights along with challenges in governance and partner goal alignment (Bican et al., 2017). These concerns emphasize the importance of balancing openness with control while deliberately structuring knowledge-sharing processes to prevent diminishing returns and unintended consequences.

2.2 AI-Enhanced Management

AIEM has quickly become a focal point of research, with scholars underscoring its potential to revolutionize decision-making, operational efficiency, and strategic planning within organizations. Brynjolfsson and McAfee (2014) discussed the profound impact of AI and machine learning on productivity and economic growth, stressing the need for organizations to adapt to the rapidly changing technological landscape. Davenport and Ronanki (2018) were among the pioneers who highlighted the strategic importance of AI, demonstrating how AI technologies can augment human decision-making and enhance business processes across various industries. This includes key components such as *AI Utilization*, which focuses on the effective use of AI tools to optimize operations, and *AI Integration*, which involves the seamless incorporation of AI systems into existing workflows. Dwivedi et al. (2021) explored how AI can be leveraged to improve managerial decision-making through advanced data analytics, thus enabling more precise and timely decisions, a critical aspect of AI Utilization. Additionally, studies by Haenlein and Kaplan (2019) have underscored the ethical and governance challenges posed by AI, advocating for robust frameworks to manage AI deployment responsibly to ensure *AI Effectiveness* and AI Integration are achieved without compromising ethical standards. Collectively, these contributions illustrate the transformative potential of AIEM, highlighting its role in driving innovation, efficiency, and strategic advantage in the contemporary business environment.

Despite the growing emphasis on AI's transformative potential, its impact on management practices is shaped by significant limitations. The presence of biased training data combined with non-transparent algorithms and insufficient contextual understanding leads to flawed or unethical decisions (Daneshjou et al., 2021). Furthermore, organizations that have not yet developed strong digital capabilities face employee pushback against AI deployment, integration difficulties, and cultural incompatibility issues (Presbitero & Teng-Calleja, 2022). These constraints suggest that the value of AIEM depends on organizational readiness and ethical design, while requiring human oversight to be beneficial.

2.3 Digital Resilience

The concept of DR has become increasingly critical for organizations seeking to thrive in a highly digital and interconnected world. Researchers have underscored its importance in ensuring the continuity and security of digital operations amid various disruptions. Wallace and Webber (2018) highlighted the necessity of robust disaster recovery plans and continuity strategies to ensure quick recovery from disruptions. Their work underscored the importance of implementing data backup solutions, redundancy systems, and clear protocols for restoring operations, which are essential elements of *Digital Recovery and Continuity*. Bharadwaj et al. (2013) expanded on this by discussing the role of continuous digital adaptation in organizational resilience. By focusing on the concept of *Digital Adaptation*, they argued that companies must integrate new technologies and foster a culture of continuous learning and flexibility to stay resilient. This involves not only updating technological tools but also ensuring that staff are well-trained and adaptable to new digital environments. Building on this, Mele et al. (2023) show that digital adaptation is increasingly tied to dynamic capabilities and innovation

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responsiveness. Firms that prioritize agile learning environments and cross-functional digital skills are better positioned to adjust project strategies in real time, making adaptation a key enabler of both resilience and sustainability. Alshaikh et al. (2018) highlighted the significance of building robust cybersecurity frameworks to protect against digital threats and ensure business continuity, emphasizing proactive risk management. This aligns with the need for comprehensive *Cybersecurity and Risk Management* strategies that can preemptively address potential vulnerabilities and mitigate threats. Additionally, Linkov and Palma-Oliveira (2017) discussed the interconnected nature of these elements, advocating for a holistic approach that integrates digital adaptation, robust cybersecurity measures, and effective recovery strategies to build a resilient digital infrastructure.

While digital resilience is widely framed as a long-term strategic asset, it can also create friction with short-term performance goals. Building resilient digital infrastructures, including redundancy measures, monitoring systems, and compliance controls, redirects financial and human resources from product innovation and time-sensitive market ventures (Yang et al., 2024). The effort to build resilience in quick-moving digital environments results in bureaucratic slowdowns and delayed product launches because risk management takes precedence over rapid response capabilities (Gligor et al., 2019). This uncovers a strategic conflict between sustaining operational continuity and achieving organizational agility. Therefore, organizations must balance their resilience strategies to preserve short-term competitiveness because customer requirements and innovation patterns demand quick delivery and experimentation. Recognizing and managing this trade-off is essential to fully leveraging digital resilience as a competitive capability rather than a limiting factor.

2.4 Customer-Centric Innovation Strategy

CCIS has gained prominence in strategic innovation research, as it is recognized for driving customer value, market alignment, and long-term business performance. Vargo and Lusch (2004) laid the foundation for this strategy by introducing service-dominant logic, a concept central to customer-centric innovation that emphasizes the co-creation of value between companies and customers. Their work underscored the importance of viewing customers as active participants rather than passive recipients of products and services. Bjelica et al. (2023) further emphasized that prioritizing customer collaboration over contract negotiation and incorporating early feedback are key factors in achieving project success. This aligns with the importance of integrating customer feedback and insights throughout the innovation process for the purpose of *Customer Involvement in Innovation*. Further contributions by Ramaswamy and Ozcan (2018) highlighted the role of open innovation in customer-centric strategies. They emphasized the need for companies to leverage external sources of knowledge, including customer input, to complement internal research and development (R&D) efforts. This perspective underscores the importance of *Market Research and Analysis* in identifying customer needs and preferences, thereby guiding the innovation process more effectively. Additionally, von Hippel (2006) explored the concept of lead users, who are customers that have needs ahead of the market and can therefore contribute significantly to innovation. His research demonstrated that involving these advanced users can lead to breakthrough innovations and a deeper understanding of emerging market trends, which is crucial for *Product Customization and Personalization*. More recently, Navarro et al. (2022) reviewed the impact of CRM on entrepreneurial marketing, demonstrating how CRM tools facilitate the collection and use of customer data to drive innovation and business performance. Collectively, these contributions highlight the critical role of CCIS in driving sustainable business growth. By

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actively involving customers in the innovation process, companies can create more relevant, high-quality products and promote deeper customer loyalty and satisfaction.

Nonetheless, while customer-centricity enhances innovation relevance and adoption, excessive reliance on user input may constrain breakthrough innovation and long-term differentiation. Listening too closely to current users can lead to incrementalism and feature overload, making products more complex and costly (Schweitzer et al., 2020). Moreover, when firms focus too narrowly on current customer needs, they risk missing emerging trends and hidden market demands (Han et al., 2017). Therefore, businesses must balance customer co-creation with strategic foresight and innovation leadership.

2.5 Sustainable Project Strategy

The emphasis on SPS has grown significantly, focusing on integrating sustainability into project management to deliver long-term environmental, social, and economic value. Researchers underscore the importance of embedding sustainability in project governance and execution to support sustainable development goals. Silvius and Schipper (2014) discussed the paradigm shift required for sustainable project management, advocating for a green project management approach that integrates sustainability principles into traditional project management practices. This approach includes *Project Alignment with Sustainability Goals*, ensuring that all project objectives support broader sustainability targets. Building on this, Stanitsas et al. (2021) stress the importance of integrating sustainability indicators and lifecycle thinking into early project planning stages. Tools such as sustainable work breakdown structures (WBS) are increasingly used to integrate sustainability into projects from the very beginning. Martens and Carvalho (2017) explored the integration of sustainability into project management, identifying key elements such as stakeholder engagement, environmental impact assessment, and *Sustainable Project Planning and Execution*, which ensure that sustainability considerations are incorporated throughout the project lifecycle. Silvius et al. (2024) emphasize the need for sustainability-oriented competencies, including long-term value orientation, ethical decision-making, and systems thinking. These competencies are crucial for enabling sustainability strategies in volatile environments. Additionally, Ed-Dafali et al. (2024) conducted a scientometric analysis of sustainable project governance, highlighting emerging trends and research gaps and emphasizing *Governance and Sustainability Oversight*. Current studies, such as Peng and Chen (2024), call for greater board-level oversight and cross-functional governance structures that ensure project portfolios align with ESG (environmental, social, and governance) metrics. Sustainability steering committees and integrated reporting systems are now widely recommended for tracking sustainability-related outcomes across projects. This evolution strengthens accountability mechanisms and embeds sustainability into the strategic core of project-based organizations. Collectively, these contributions highlight the role of SPS in driving project success and ensuring alignment with global sustainability standards.

It is important, however, to critically assess the belief that embedding sustainability in project strategies consistently leads to improved product outcomes. Sustainability initiatives provide benefits through brand value enhancement and long-term competitiveness, but bring challenges such as increased project complexity and higher initial investment, which can affect short-term product success (Sánchez, 2015). This suggests that the connection between sustainability practices and product outcomes shows non-linear or contingent patterns that depend on industry type, market development stages, and organizational capabilities. For instance, sustainability practices may compete with speed, cost-efficiency, or customization demands in fast-paced

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digital markets. Thus, viewing sustainability as a direct path to success could trivialize the complex strategic trade-offs necessary for actual achievement. Therefore, successful sustainability implementation requires a flexible strategy that acknowledges its eventual benefits while considering its dependence on project goals and market circumstances (Sánchez, 2015).

2.6 Product Success

In recent years, researchers have focused a great deal of attention on the factors that lead to the successful development and implementation of digital innovations, with a particular emphasis on the success of digital products. Understanding market needs, leveraging technological advancements, and implementing effective management strategies are crucial components of this success. Bharadwaj et al. (2013) provided a comprehensive framework for understanding digital business strategies, which included the integration of IT capabilities with business processes to enhance *Product Performance*. Their work highlights the importance of aligning digital products with overall business strategies to achieve a competitive advantage. Huang and Tsai (2013) explored the drivers of new product success in the context of digital products, identifying key factors such as the level of product innovation, market orientation, and technological capability. Their meta-analysis provides insights into how these factors interact to influence the success of digital product launches and reveals the need for a balanced approach that considers both market needs and technological potential to ensure successful *Market Performance*. Vial (2019) examined the role of digital transformation in product innovation, highlighting how digital technologies can disrupt traditional business models and create new opportunities for product development. Vial (2019) further analyzed digital transformation and its impact on firm performance, synthesizing existing literature on digital transformation. He emphasized that successful digital products often result from a comprehensive digital transformation strategy that includes technological adoption, process optimization, and organizational change, leading to enhanced *Innovation and Quality*. More recently, Rahman (2022) investigated the management of new product launches and development in dynamic emerging markets, focusing on digital products. This study showcases the importance of agility and responsiveness in product development processes, particularly in rapidly changing digital environments. Rahman's findings suggest that successful digital products can quickly adapt to market changes and effectively leverage emerging technologies. Collectively, these contributions underscore the multifaceted nature of PS in digital products. By integrating market research, technological innovation, and strategic management, organizations can enhance the success of their digital products, ensuring they meet market demands and achieve long-term sustainability.

2.7 Integrated View of Theoretical Foundations

The effectiveness of digital product strategies depends not only on the strength of individual organizational capabilities but also on the way these capabilities interact and reinforce one another. CKEs establish customer-centric foundations by offering organizations structured knowledge flows and valuable external insights for market-aligned innovation. Through systematic knowledge sharing and co-creation firms gain enhanced capabilities to predict customer needs and provide personalized solutions which drive relevant innovative results (Wang & Hu, 2017). AIEM operates as a digital facilitator across multiple strategic levels. The ability to quickly and accurately meet customer demands improves because of its integration into innovation efforts, while its support for sustainability initiatives strengthens planning and decision-making for long-term project goals (Silvius et al., 2024). This dual contribution

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reinforces AI's importance as an operational and strategic asset. DR enables continuous strategic implementation by protecting sustainability initiatives from environmental disruptions, system failures, and cyber risks (Nishant et al., 2020). The organizational infrastructure benefits from stability, which ensures that sustainability projects stay steady and dependable throughout time.

Together, these foundational capabilities work in tandem with strategic orientations such as customer-centric innovation and sustainability to shape digital product outcomes. Through CCIS, organizations create products that meet users' expectations and adapt to market changes, while SPS guides innovation processes to deliver long-term value and responsible results. When robust enabling capabilities support these orientations, they collectively enhance product quality, market relevance, and overall product success in digital environments.

3. Research hypotheses and conceptual model

The research model for this study aims to explore the relationships between various factors impacting the success of digital products. The hypotheses are developed based on existing literature and theoretical frameworks, highlighting the significance of CKEs, AIEM, DR, CCIS, and SPS in driving PS. The conceptual model is illustrated in Figure 1 and displays hypothesized relationships among the constructs.

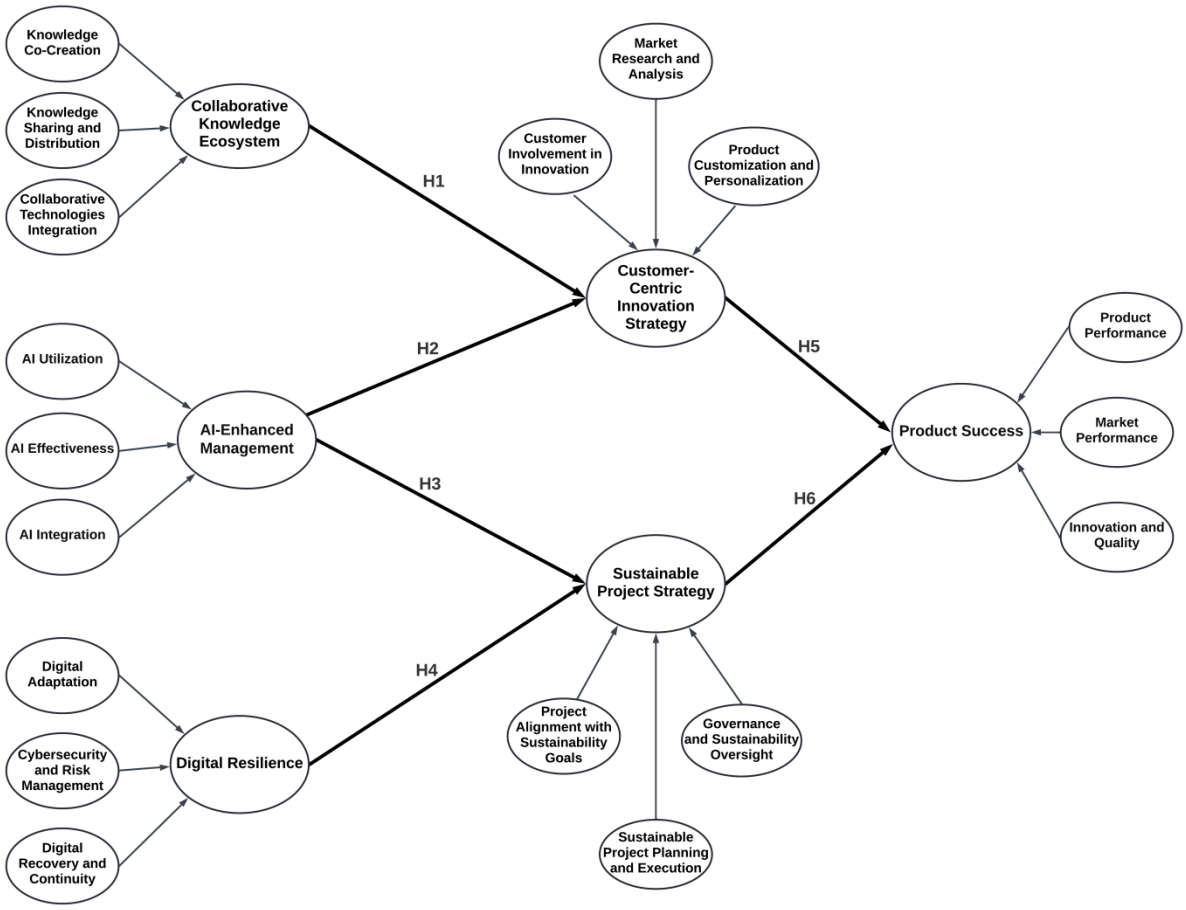

Fig. 1 - Conceptual model of Digital Product Success. Source: own research.

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3.1 Collaborative Knowledge Ecosystem and Customer-Centric Innovation Strategy

A CKE facilitates the integration and utilization of diverse knowledge resources from both internal and external sources, significantly enhancing a firm's ability to engage in a CCIS. By promoting knowledge co-creation and dissemination through advanced collaborative technologies, the CKE allows organizations to harness the collective intelligence of customers, partners, and employees, fostering a deeper understanding of market needs and customer preferences. This alignment with the principles of open innovation and customer involvement is critical for developing products that meet customer expectations and drive market success (Chesbrough, 2019). CKE enables the seamless flow of information and ideas across organizational boundaries, leveraging collaborative platforms and tools to facilitate real-time knowledge exchange. This real-time collaboration is essential for responding swiftly to changing market demands and customer preferences and ensuring the innovation process remains agile and customer-focused. By integrating customer feedback and market insights into the innovation process, organizations can develop highly tailored and innovative digital products that closely align with customer needs, thereby enhancing product performance and market success (Chesbrough, 2019). Empirical studies emphasize that firms with robust knowledge management practices and collaborative networks achieve faster innovation cycles and higher levels of product customization, leading to increased customer satisfaction and loyalty (Gloor, 2017). Moreover, using CKE supports continuous learning and adaptation by enabling firms to tap into external knowledge sources and co-create value with customers, partners, and other stakeholders. This collaborative approach not only enhances the relevance and appeal of new products but also strengthens customer relationships and loyalty and fosters a culture of continuous improvement and innovation, enabling firms to remain competitive in dynamic markets.

Therefore, we hypothesize that a CKE positively impacts the CCIS, enabling firms to achieve superior digital product innovation and market performance outcomes. It should be noted that this relationship may be subject to boundary conditions such as inter-organizational trust, alignment of knowledge-sharing goals, and the organization's digital infrastructure, which influence how effectively collaboration translates into actionable innovation strategies.

H1: The Collaborative Knowledge Ecosystem has a positive impact on Customer-Centric Innovation Strategy.

3.2 AI-Enhanced Management and Customer-Centric Innovation Strategy

AIEM leverages advanced artificial intelligence technologies to optimize managerial decision-making processes, significantly enhancing a firm's ability to engage in a CCIS. AIEM facilitates the rapid processing and interpretation of vast amounts of customer data through machine learning and natural language processing, which enables organizations to gain deeper insights into customer needs and preferences. Such a data-driven approach fosters the development of highly tailored and innovative digital products that meet and exceed customer expectations, which aligns closely with the principles of customer-centricity and proactive innovation (Davenport & Ronanki, 2018). AI tools allow organizations to analyze customer feedback and behavior patterns efficiently, supporting rapid and data-driven decision-making for

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personalized offerings. Technologies such as predictive analytics enable firms to anticipate customer trends, adjust their innovation strategies accordingly, and more effectively align with evolving market demands (Chui et al., 2018). Empirical studies demonstrate that firms utilizing AI in management achieve faster innovation cycles and higher precision in addressing market needs, resulting in increased customer satisfaction and loyalty (Verhoef et al., 2021). Additionally, AI integrated in management supports customer co-creation by enabling more interactive and personalized interactions through AI-powered platforms. This fosters a collaborative environment where customer feedback directly influences product development, improving product relevance and strengthening customer relationships. The mechanism through which AI influences CCIS primarily involves customer-level responsiveness and personalization. AI facilitates real-time changes in offerings through dynamic feedback loops and tailored engagement by employing tools such as CRM systems and recommendation engines (Okeke et al., 2024). It also supports micro-segmentation, allowing innovation strategies to be shaped by nuanced customer insights. These capabilities enhance both the relevance and speed of product development, which contrasts with AI's role in sustainability, focusing more on internal efficiency and long-term planning.

Therefore, we hypothesize that AIEM positively impacts CCIS by providing advanced analytical capabilities, enhancing real-time responsiveness, and facilitating value co-creation with customers. This strategic integration of AI into management practices enables organizations to develop innovative products that closely align with customer needs, thus driving a sustained competitive advantage in the digital marketplace. However, the strength of this relationship can be affected by various factors, including data accuracy, ethical issues in customer profiling, and how users accept AI interactions, which together can change AI's capability to enable personalized innovation.

H2: AI-Enhanced Management has a positive impact on Customer-Centric Innovation Strategy.

3.3 AI-Enhanced Management and Sustainable Project Strategy

AIEM employs sophisticated artificial intelligence technologies to streamline managerial processes, substantially boosting a firm's capacity to execute an SPS. AIEM enhances the ability to analyze and integrate extensive environmental, social, and governance (ESG) data, facilitating more effective and sustainable decision-making (Davenport & Ronanki, 2018). By leveraging AI capabilities such as advanced analytics and automated reporting, organizations can improve their sustainability performance by accurately tracking and optimizing resource use and minimizing waste (Chui et al., 2018). The application of AI in management enables the real-time monitoring of sustainability indicators, providing managers with timely insights to ensure projects adhere to sustainability goals. AI systems can predict and identify potential environmental risks, allowing organizations to address issues before they escalate proactively. This predictive power is essential for maintaining the integrity of SPS and achieving long-term environmental benefits (Batarseh & Yang, 2020). Research has shown that firms integrating AI management practices are better equipped to meet sustainability targets due to the precision and efficiency of AI tools (Silvius et al., 2024). AI facilitates comprehensive sustainability assessments, helping firms comply with regulatory requirements and exceed them, thereby enhancing their reputation and stakeholder trust. Furthermore, AI's capacity to automate and streamline complex data processes reduces the burden on human resources, allowing teams to focus on strategic sustainability initiatives (Nishant et al., 2020).

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In contrast to its role in customer innovation, AI's contribution to sustainability lies in system-level optimization, risk prediction, and compliance support (Nishant et al., 2020). It integrates data from sources such as IoT sensors, ERP systems, and sustainability dashboards to monitor key indicators and forecast environmental impacts. Through data-driven decision-making capabilities, these systems enable organizations to enhance their sustainability performance and resource efficiency across extended periods.

Therefore, we hypothesize that AIEM positively impacts SPS by providing sophisticated data analysis, real-time risk management, and enhanced decision-making capabilities. Through strategic AI implementation, organizations can attain exceptional sustainability results by creating economically viable projects while remaining environmentally cautious and socially advantageous. Still, this relationship can be additionally shaped by contextual boundary factors like digital maturity levels, availability of sustainability-related data, and the degree of commitment from top management toward sustainability objectives.

H3: AI-Enhanced Management has a positive impact on Sustainable Project Strategy.

3.4 Digital Resilience and Sustainable Project Strategy

DR refers to an organization's capacity to adapt to, recover from, and capitalize on digital disruptions. This resilience is important for maintaining operational continuity and achieving long-term sustainability goals. In the context of SPS, digital resilience ensures that projects can withstand and adapt to unexpected digital challenges, thereby supporting sustainable outcomes. Digital resilience integrates robust cybersecurity measures, data recovery plans, and adaptable digital infrastructures, essential for maintaining project operations without interruption. By leveraging technologies such as AI, IoT, and blockchain, organizations can enhance real-time monitoring, resource allocation, and decision-making processes, which are critical for sustainable project management (Chauhan & Sahoo, 2024). These technologies facilitate transparency and accountability, helping organizations meet their sustainability targets despite disruptions (Kulkov et al., 2023). For instance, AI can predict potential disruptions and suggest mitigation strategies, while IoT enables the continuous monitoring of environmental conditions and resource utilization. Blockchain technology ensures secure and transparent transactions, fostering stakeholder trust (Paul-Emeka et al., 2024). Studies have shown that resilient digital systems significantly contribute to sustainability by ensuring efficient resource use, minimizing environmental impact, and enhancing social outcomes (Aksoy, 2023). Additionally, digital resilience fosters continuous improvement and innovation by providing a stable foundation on which new sustainable practices and technologies can be developed and implemented (Aksoy, 2023). Empirical evidence underscores the importance of digital resilience in achieving sustainable project outcomes. Organizations that invest in building robust digital infrastructures are better equipped to handle disruptions, maintain operational continuity, and achieve their sustainability goals (Teece, 2018). This capability is especially critical in today's rapidly changing digital landscape, where unforeseen challenges can arise at any moment.

Therefore, we hypothesize that DR positively impacts SPS by providing the necessary infrastructure and capabilities to ensure project continuity, resource efficiency, and alignment with sustainability goals, even during disruptions. Nonetheless, boundary conditions such as the organization's level of digital maturity, the complexity of project environments, and the industry's exposure to technological volatility may influence how effectively DR supports SPS efforts (Guo et al., 2023).

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H4: Digital Resilience has a positive impact on Sustainable Project Strategy.

3.5 Customer-Centric Innovation Strategy and Product Success

CCIS emphasizes how integrating customer feedback and preferences into the product development process significantly impacts the success of digital products. This approach is rooted in the principles of market orientation, which suggest that understanding and responding to customer needs is pivotal for driving innovation and achieving competitive advantages (Homburg et al., 2017). By focusing on customer-centric innovation, organizations can align their product features with market demands, thereby enhancing product relevance and customer satisfaction (Kohli & Melville, 2019). Incorporating customer insights throughout the product lifecycle, from ideation to post-launch, ensures that the end products are well-suited to meet user needs and preferences. This continuous engagement with customers helps with the refinement of product functionalities and improving the overall user experience, which is crucial for the success of digital products in a rapidly evolving market (Nenonen et al., 2019). Furthermore, customer-centric innovation facilitates co-creation, where customers actively participate in the development process. Co-creation enhances the relevance and appeal of products by incorporating direct customer input, leading to higher satisfaction and engagement. This collaborative approach reduces the uncertainty associated with new product development and drives higher adoption rates and stronger market performance (Ramaswamy & Ozcan, 2018).

Therefore, we hypothesize that a CCIS positively impacts PS in the context of digital products by ensuring alignment with customer needs, fostering strong customer relationships, and leveraging co-creation to enhance product development. This strategy establishes a solid structure to create products that fulfill market demands and deliver lasting success in today's competitive digital landscape. While CCIS generally improves product outcomes, its impact may be shaped by external market dynamics, such as customer heterogeneity or rapid shifts in demand, which can reduce alignment between customer input and final PS (Helm & Conrad, 2014).

H5: Customer-Centric Innovation Strategy has a positive impact on Product Success.

3.6 Sustainable Project Strategy and Product Success

SPS focuses on integrating environmental, social, and economic sustainability principles into the project management process. This approach ensures that sustainability is embedded in every stage of project development, from planning and execution to monitoring and evaluation, thereby promoting long-term success and market competitiveness (Silvius & Schipper, 2014). By adopting sustainable strategies, organizations can achieve resource efficiency, reduce environmental impact, and enhance social value, all of which are valuable for the sustainable success of digital products (Marcelino-Sádaba et al., 2015). The incorporation of sustainable practices into project management aligns with the growing market demand for environmentally responsible and socially inclusive products. This alignment meets regulatory and stakeholder expectations and enhances brand reputation and customer loyalty (Moehler et al., 2018). Sustainable project strategies incorporate the use of renewable resources, waste reduction, energy efficiency, and ethical labor practices, which collectively contribute to the creation of high-quality, sustainable digital products (Silvius & Schipper, 2014). Empirical studies have shown that projects that integrate sustainability principles are more likely to succeed due to

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improved risk management, innovation, and stakeholder engagement (Silvius et al., 2024). Adopting sustainable project strategies fosters a holistic view of project management that balances short-term objectives with long-term sustainability goals, ensuring that digital products are economically viable and socially and environmentally beneficial (Moehler et al., 2018).

Therefore, we hypothesize that SPS positively affects PS in the context of digital products by ensuring resource efficiency, reducing environmental impact, and enhancing social value. This outlines a complete framework for digital product development that addresses market needs and sustainability targets to generate enduring successes and secure competitive advantages in the digital world. On the other hand, the influence of SPS on PS may be moderated by competing project priorities, regulatory pressures, or short-term delivery expectations that deprioritize long-term value creation (Sabini & Alderman, 2021).

H6: Sustainable Project Strategy has a positive impact on Product Success.

4. Research methodology

To gather data from the respondents, a survey approach was employed in this study. The survey comprised socio-demographic questions to capture essential background information about the participants, alongside questions related to the six key constructs in the research model. The survey was administered using Google Forms, which facilitated efficient data collection and ensured ease of access for respondents. The collected data were subsequently analyzed using SPSS 23 for descriptive statistics and preliminary analysis, while AMOS 26 was employed for structural equation modeling (SEM) to test the proposed hypotheses and examine the relationships between the constructs.

4.1 Procedure

The research methodology of this study was designed to investigate the factors contributing to digital product success systematically. The procedure followed several structured steps to ensure the reliability and validity of the data aligned with the research procedure illustrated in Figure 2.

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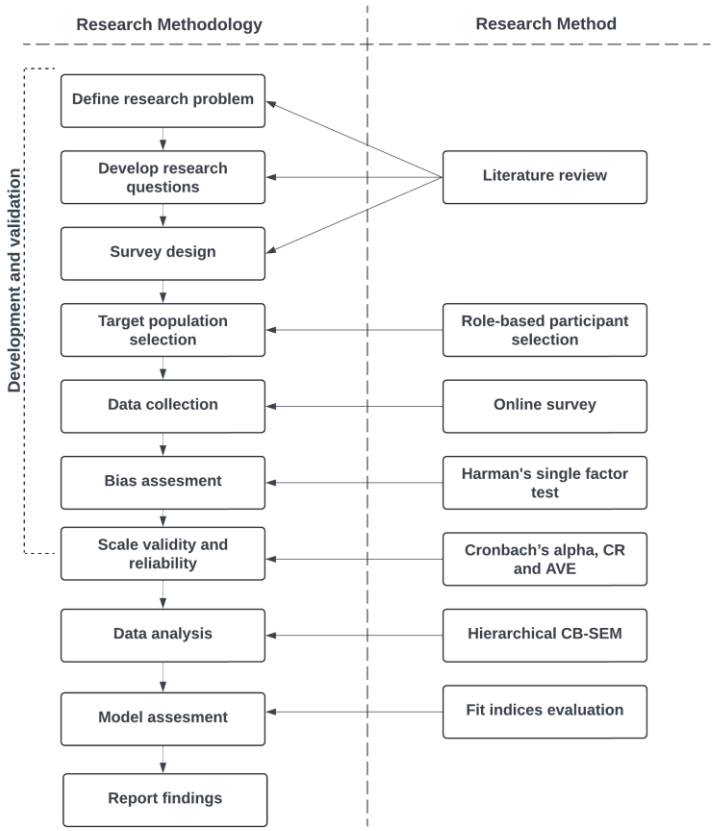

Fig. 1 - Research procedure. Source: own research.

The initial step defined the research problem through a comprehensive literature review. This involved understanding the factors contributing to digital product success. This foundational step set the stage for developing specific research questions to guide the study. These questions aimed to explore various constructs such as CKE, AIEM, DR, SPS, CCIS, and PS. Further, a comprehensive review of the body of literature was carried out to ensure the survey was developed with solid theoretical underpinnings. The literature review ensured that the survey captured relevant constructs and that items were robustly grounded in existing literature to ensure content validity and reliability. The survey was structured to fully include all necessary constructs with clarity. Target population selection involved choosing professionals working in product-related roles such as product managers, product owners, and product officers. The survey was distributed through various professional groups and communities. Data collection was facilitated by administering the survey online using Google Forms, which ensured efficient data collection and ease of access for respondents. To maximize response rates and ensure completeness of data, all survey questions were marked as mandatory. Bias assessment was conducted to ensure the data's reliability. A Harman's Single-Factor Test was conducted to assess common method bias, ensuring that the measurement method did not unduly influence the data. Internal consistency of the scales was evaluated using Cronbach's alpha and Composite Reliability (CR) to ensure strong reliability. Additionally, convergent validity was evaluated using Average Variance Extracted (AVE). Model assessment involved evaluating the fitness of the data to the model using the Structural Equation Modeling (SEM) framework

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through various fit measures, including Chi-Square per Degrees of Freedom ratio (CMIN/DF), p-value, Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI). Modifications to the model were made based on the recommendations of the modification indices to improve fit. Finally, data analysis was performed using SEM with AMOS 26 to test the proposed hypotheses and examine the relationships between the constructs. The relationships between the constructs were analyzed, providing valuable insights into the factors influencing digital product success. The results were then reported to facilitate a comprehensive understanding for researchers, practitioners, and stakeholders, and to share the research conclusions.

By following this systematic procedure, the study ensured the findings were robust and valid, effectively contributing to the current research on digital product success.

4.2 Measurement items

Each independent construct in the model is operationalized as a latent construct measured through four survey items on a 5-point Likert scale (1 – strongly disagree, 5 – strongly agree). The development of the survey questions is firmly grounded in existing literature, ensuring both the robustness and validity of the scales, as emphasized by Devellis (2017), who highlights the importance of grounding items in existing literature to ensure content validity. Items were adapted from previously validated sources to reflect the context of digital product development and management, with wording tailored to match the roles, responsibilities, and terminology familiar to professionals in this field. Although a formal pilot study was not conducted, the survey items were iteratively reviewed by internal experts in product development to ensure clarity, conceptual alignment, and contextual relevance. This expert validation process served as a quality checkpoint to refine item wording and improve the practical fit of the instrument within the targeted industry context. The entire set of survey questions is available in the supplementary material.

CKE comprises Knowledge Co-Creation, Knowledge Sharing and Distribution, and Collaborative Technologies Integration. Items for Knowledge Co-Creation draw on Chesbrough's (2003) Open Innovation and Cassiman et al.'s (2010) studies on scientific collaboration, highlighting the pivotal role of external partnerships in driving innovation. Measures for Knowledge Sharing and Distribution are inspired by Chow and Chan's (2008) work on social networks and Castaner and Oliveira's (2020) review on organizational collaboration, emphasizing the importance of knowledge dissemination and collective intelligence. The integration of Collaborative Technologies is supported by Corvello et al.'s (2023) research on innovation ecosystems and Davis's (2016) study on interorganizational relationships, demonstrating the significant impact of technology on productivity and collaboration.

AIEM includes AI Utilization, AI Effectiveness, and AI Integration. Items for AI Utilization are informed by Aboelmaged's (2014) research on IT success in SMEs and Dwivedi et al.'s (2021) perspectives on AI challenges and opportunities, focusing on the frequency and integration of AI tools in daily operations. Measures of AI Effectiveness leverage findings from Ransbotham et al.'s (2015) analysis of analytics gaps and Delen and Demirkan's (2013) exploration of data services, illustrating AI's role in enhancing planning, risk management, and project outcomes. AI Integration items are grounded in Davenport and Ronanki's (2018) insights on real-world AI applications and Müller et al.'s (2018) study on business model innovations, highlighting AI's contribution to process efficiency and user experience.

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DR comprises Digital Adaptation, Cybersecurity and Risk Management, and Digital Recovery and Continuity. Items for Digital Adaptation are drawn from Vial's (2019) review of digital transformation and Kane et al.'s (2015) study on digital strategy, focusing on organizational adaptability and managing digital disruptions. Cybersecurity and Risk Management measures are based on von Solms and van Niekerk's (2013) work on cybersecurity and Alshaikh et al.'s (2018) study on cybersecurity governance, which underlines the robustness of cybersecurity measures and training protocols. Digital Recovery and Continuity items are validated by Cerullo and Cerullo's (2004) comprehensive approach to business continuity and Wallace and Webber's (2018) handbook on disaster recovery, underscoring the importance of recovery plans and minimizing operational disruptions.

SPS involves Project Alignment with Sustainability Goals, Sustainable Project Planning and Execution, and Governance and Sustainability Oversight. Items for Project Alignment with Sustainability Goals are derived from Silvius and Schipper's (2014) study on sustainability in project management and Martens and Carvalho's (2017) analysis of key sustainability factors, focusing on aligning and communicating sustainability objectives. Sustainable Project Planning and Execution measures are based on Martens and Carvalho's (2016) research on sustainability challenges and Silvius and Schipper's (2014) conceptual model, highlighting the integration and execution of sustainability guidelines. Governance and Sustainability Oversight items are supported by Mok et al.'s (2015) review of stakeholder management and Banihashemi et al.'s (2017) study on integrating sustainability into project management, emphasizing the significance of governance structures and risk management.

CCIS includes Customer Involvement in Innovation, Market Research and Analysis, and Product Customization and Personalization. Items for Customer Involvement in Innovation are informed by Chang and Taylor's (2016) meta-analysis on customer participation and Ramaswamy and Ozcan's (2018) co-creation framework, emphasizing the active role of customers in product development and feedback incorporation. Measures of Market Research and Analysis are based on Morgan et al.'s (2019) research on marketing strategy and Kumar and Reinartz's (2016) focus on customer value creation, highlighting the importance of regular market research and feedback analysis. Product Customization and Personalization items are validated by Smith and Colgate's (2007) study on customer value creation and Parasuraman and Colby's (2015) updated Technology Readiness Index, demonstrating the significance of meeting customer needs and preferences.

PS encompasses Product Performance, Market Performance, and Innovation and Quality. Items for Product Performance are derived from Cooper's (2019) research on new product development drivers and Homburg et al.'s (2017) study on customer experience management, underlining product success and customer satisfaction. Measures of Market Performance are supported by Katsikeas et al.'s (2016) findings on eco-friendly product development and Morgan and Rego's (2006) work on customer satisfaction metrics, focusing on market success and profitability. Innovation and Quality items are validated by Rubera and Kirca's (2012) meta-analytic review on firm innovativeness and Flynn et al.'s (2010) research on supply chain integration, indicating the importance of product innovation and quality standards. These references collectively ensure that our scale captures the essential dimensions of product performance, market success, and innovation within our product strategy framework.

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4.3 Data collection and sample description

To examine the impact of the defined factors on the success of digital products, the data collection process was designed to ensure an adequate and relevant sample. The survey was exclusively distributed to individuals in product-related positions, such as product owners, product managers, and similar roles, ensuring that respondents possessed the necessary expertise and experience to provide meaningful insights. This targeted approach was facilitated through the approval and support of several prominent professional groups. Specifically, the survey was disseminated among members of the Serbian Product Community group, Product Managers Community, Digital Product Managers, Product Owner's Help Desk, and the Product Development and Management Association (PDMA). By leveraging these specialized communities, we ensured that the survey reached a well-defined and knowledgeable audience, enhancing the reliability and validity of the data collected for this study on digital product success. While the survey was distributed through professional communities, efforts were made to mitigate selection bias by targeting diverse industries, company sizes, and regions. This purposive yet varied sampling approach aimed to capture a broad range of perspectives relevant to digital product development and innovation contexts. While the survey was also distributed through several professional communities with large memberships, the exact number of individuals reached in these communities is unknown, making it impossible to calculate a precise response rate for this distribution method.

A total of 239 responses were collected, each complete and free of missing values. The gender distribution showed a slight predominance of females at 55.2%, with males constituting 43.9%, and 0.8% preferring not to disclose their gender. A high educational attainment was evident, with 47.3% of respondents holding a bachelor's degree and 41.4% a master's degree. Notably, 40.6% of respondents had more than 10 years of work experience. Of the respondents, 38.5% worked in companies with 51-200 employees, and 21.8% in companies with 201-500 employees. Geographically, the respondents' companies were primarily located in North America (17.6%), South America (20.5%), Europe (54.4%), and Asia (7.5%). Detailed descriptive statistics of the sample are provided in Table 1.

Although the survey population contains professionals from different regions and sectors with various organizational experiences, the fact remains that over half of the participants (54.4%) work within European borders. The regional concentration of survey participants suggests European-specific trends in sustainability practices and digital and innovation maturity that European policies may influence, thus restricting findings to broader global application. In terms of organizational size, the sample is predominantly composed of professionals from mid-sized companies (51–500 employees), though a significant portion (31%) represents large organizations with over 500 employees. This distribution shows strong relevance for structured firms focused on innovation, but finds its applicability less convincing for early-stage startups that operate with smaller teams and limited infrastructure alongside shifting priorities. Nonetheless, the sample’s high level of professional experience—65% of participants having more than 7 years in product-related roles—and its strong educational profile support the credibility and relevance of the data. The extensive experience of respondents is particularly valuable for studying digital product success, as it reflects insights from individuals actively involved in strategic decision-making and product innovation processes. These characteristics suggest that the responses are grounded in substantial practical knowledge. Future research could benefit from comparative studies across regions or cultural environments to validate and expand the findings of this study.

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Tab. 1 – Sample demographics (N=239). Source: own research.

Characteristic variables	Value	Frequency	Percentage(%)
Gender	Male	105	43.9
	Female	132	55.2
	Prefer not to say	2	0.8
Education	High school or equivalent	20	8.4
	Bachelor's degree	113	47.3
	Master's degree	99	41.4
	Doctorate (PhD)	6	2.5
	Other	1	0.4
Experience	Less than 1 year	20	8.4
	1-3 years	22	9.2
	4-6 years	41	17.2
	7-10 years	59	24.7
	More than 10 years	97	40.6
Company Size	11-50 employees	21	8.8
	51-200 employees	92	38.5
	201-500 employees	52	21.8
	501-1000 employees	31	13.0
	More than 1000 employees	43	18.0
Main Company Location	North America	42	17.6
	South America	49	20.5
	Europe	130	54.4
	Asia	18	7.5

4.4 Assessment of Common Method Bias

A Harman's Single-Factor Test was performed to evaluate whether common method bias was present in the data. This test involves carrying out an exploratory factor analysis (EFA) using principal axis factoring to identify the proportion of variance attributed to a single factor. The results indicate that the first factor accounts for 43.614% of the total variance, which is below the threshold of 50% typically used to indicate significant common method bias (Podsakoff et al., 2003). As a result, these findings indicate that common method bias is not a significant issue in this dataset, since no single factor accounts for the majority of the variance. This supports the validity of the devised measurement method.

In addition, the study addressed self-report bias by ensuring respondent anonymity and confidentiality while designing the questionnaire to minimize evaluation apprehension. Instructions emphasized that there were no right or wrong answers, encouraging participants to respond honestly based on their professional experience.

5. Structural equation modelling (SEM) results

Structural Equation Modeling (SEM) was employed to assess the proposed conceptual model and test the devised hypothesis. SEM is a robust multivariate statistical analysis technique particularly suited for testing hypotheses about the relationships among multiple variables, both observed and latent (Kline, 2023). This study follows established practices in related research contexts, as used by Ivancevic et al. (2023), who employed a second-order hierarchical latent variable modeling strategy, in which first-order constructs were validated through confirmatory factor analysis before being used to estimate second-order latent variables and assess structural relationships.

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SEM enables researchers to simultaneously test a series of dependence relationships, making it a preferred method for this study. The use of AMOS software provides several advantages, including the ability to handle complex models and produce detailed graphics for better visualization of the model structure. This approach ensures that the interdependencies within the conceptual model are comprehensively assessed, leading to robust and reliable results.

5.1 Internal consistency analysis

The initial step in the SEM analysis involves assessing the internal consistency of the scales that comprise the proposed conceptual model. To evaluate internal consistency, we utilized Cronbach's alpha (Cronbach, 1951), a widely recognized and frequently cited metric. Cronbach's alpha values range from 0 (indicating no consistency) to 1 (indicating perfect consistency). Consequently, a value closer to 1 signifies a higher degree of consistency within the scale. Cronbach's alpha is instrumental in determining the reliability of measurement scales, ensuring that the items within each scale consistently measure the same underlying construct. The generally accepted threshold for Cronbach's alpha is 0.7 (Taber, 2018). Values exceeding this threshold denote satisfactory internal consistency.

In addition to Cronbach's alpha, internal consistency was further examined using Composite Reliability (CR), which offers a more robust estimate as it does not assume equal factor loadings across items and better reflects the congeneric nature of constructs (Cheung et al., 2024). A CR value above 0.7 is indicative of strong reliability. We also evaluated convergent validity using Average Variance Extracted (AVE), which reflects the average proportion of variance explained by the construct's indicators. AVE values above 0.5 are considered acceptable and support convergent validity (Cheung et al., 2024).
In our research, the Cronbach's alpha, CR, and AVE values for each scale are detailed in Table 2, alongside the number of items per scale, mean score, and standard deviation.

Tab. 2 - Reliability analysis and descriptive statistics of constructs and indicators. Source: own research

Constructs	Indicators	Cronbach's Alpha	AVE	CR	Number of Items	Mean Score	Standard Deviation
Collaborative Knowledge Ecosystem	Knowledge Co-Creation	0.900	0.773	0.931	4	3.294	0.919
	Knowledge Sharing and Distribution	0.923	0.811	0.945	4	3.457	1.067
	Collaborative Technologies Integration	0.945	0.860	0.961	4	2.979	1.137
AI-Enhanced Management	AI Utilization	0.862	0.733	0.916	4	2.781	0.971
	AI Effectiveness	0.902	0.764	0.928	4	2.426	0.871
	AI Integration	0.917	0.798	0.941	4	2.438	0.941
Digital Resilience	Digital Adaptation	0.916	0.801	0.941	4	3.105	1.016
	Cybersecurity and Risk Management	0.922	0.820	0.948	4	3.620	1.003
	Digital Recovery and Continuity	0.930	0.826	0.950	4	3.157	1.026
Customer-Centric Innovation Strategy	Customer Involvement in Innovation	0.935	0.841	0.955	4	3.377	1.065

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	Market Research and Analysis	0.903	0.770	0.930	4	3.481	1.016
	Product Customization and Personalization	0.907	0.781	0.934	4	2.968	1.073
Sustainable Project Strategy	Project Alignment with Sustainability Goals	0.908	0.789	0.937	4	3.325	0.966
	Sustainable Project Planning and Execution	0.921	0.804	0.943	4	3.220	1.020
	Governance and Sustainability Oversight	0.916	0.794	0.939	4	3.141	1.059
Product Success	Product Performance	0.867	0.719	0.910	4	3.500	0.935
	Market Performance	0.914	0.799	0.941	4	3.196	0.959
	Innovation and Quality	0.866	0.710	0.907	4	3.174	0.959

Notably, all scales exhibited alpha values greater than 0.85, reflecting strong internal consistency. The CR values surpassed the 0.90 mark while AVE values reached well beyond 0.50, demonstrating each construct's strong internal consistency and convergent validity. The findings demonstrate that the items both reliably assess their respective latent constructs and effectively capture the essential variance in each scale.

Furthermore, the mean scores and standard deviations reveal both the central tendency and the variability of responses, demonstrating how participants rated each construct and the distribution of their evaluations. Among all constructs, Cybersecurity and Risk Management received the top mean score at 3.620, reflecting that respondents feel their organizations handle digital risks effectively. AI Effectiveness registered the smallest mean score, 2.426, demonstrating a low level of trust in AI's ability to produce effective outcomes. The Collaborative Technologies Integration showed the most significant evaluation variability with a standard deviation of 1.137, demonstrating diverse organizational experiences, while the ratings for AI Effectiveness presented the least variability with a standard deviation of 0.871, which indicates consistently low yet homogeneous perceptions. These patterns provide a deeper understanding of how different capabilities and strategies are perceived in practice.

Given that all scales demonstrate strong reliability and convergent validity, we can confidently proceed with the SEM analysis. The robustness of our measurement model supports the continued use of the original constructs without requiring substantial revision. By ensuring strong internal consistency and construct validity, we reinforce the analysis's methodological rigor and the conceptual framework's overall integrity.

5.2 SEM modelling

This study applies a second-order hierarchical latent variable model, where each first-order construct (such as AI Utilization, Digital Adaptation) is modeled as a latent variable measured through its associated items. Instead of using averaged or summed scores, a congeneric approach is employed, allowing each indicator to load uniquely onto its construct while accounting for individual measurement error. These first-order latent constructs are then used to estimate second-order latent variables, such as AIEM and DR. This approach yields more precise construct estimation and aligns with psychometric best practices for structural equation modeling (Pattnaik, 2019), contributing to a more rigorous and valid representation of theoretical relationships.

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Before testing the hypotheses, it is essential to evaluate the fitness of the data to the proposed model. Ensuring that the data adequately fits the SEM model is crucial for validating the results and confirming their reliability and accuracy. Initially, the model exhibited the following fit indices: The CMIN/DF was 1.725, which is below the recommended threshold of less than 5. The p-value was less than 0.001, demonstrating statistical significance. The TLI was 0.893, and the CFI was 0.897. Both CFI and TLI were slightly below the recommended threshold of 0.9, indicating room for improvement.
To enhance the model fit, we followed the recommendations provided by the modification indices. These indices suggested correlating specific error terms to better align the model with the observed data. Consequently, the errors were connected, and the model was re-evaluated.
Post-modification, the model exhibited improved fit indices: The CMIN/DF decreased to 1.687, indicating a better fit and falling within the acceptable range lower than 5 (Hooper et al., 2008). The p-value remained below 0.001, continuing to demonstrate statistical significance. The Tucker-Lewis Index (TLI) reached a value of 0.899, which is generally considered indicative of an acceptable model fit, particularly when interpreted alongside other fit indices that meet conventional benchmarks. The CFI increased to 0.903, further validating the model's fit (Hooper et al., 2008).

These adjustments led to noticeable improvements in all evaluated fit indices, as visible in Table 3, enhancing the model's alignment with the data and increasing the validity and reliability of the SEM analysis. The modifications made to the model were appropriate, resulting in a better fit between the model and the data. This improved fit enhanced the plausibility of the model, ensuring that it can be reliably interpreted and used for further analysis. The refined model now provides a better representation of the underlying relationships among the variables, supporting the robustness of the conceptual framework.

Tab. 3 - Model fit indices before and after modification.

Source: own research.

Fit Index	Level of Acceptance	Reference	Pre-Modification Fit Indices	Post-Modification Fit Indices
CMIN / DF	<5	Hooper et al., 2008	1.725	1.687
p	<0.05		<0.001	<0.001
TLI	>=0.9		0.893	0.899
CFI	>=0.9		0.897	0.903

5.3 SEM results

The findings of the conducted SEM analysis, illustrated in Figure 3, are detailed in Table 4, which provides evidence supporting all proposed hypotheses.

Hypothesis 1 posits that the CKE positively influences the CCIS. This is supported by a standardized coefficient of 0.881 ($p < 0.001$). Hypothesis 2 suggests that AIEM positively impacts the CCIS, supported by a standardized coefficient of 0.085 ($p = 0.045$). The two predictors create a model whose R^2 is 0.783, indicating that 78.3% of the variance in CCIS is explained. Hypothesis 3, which proposes that AIEM positively influences the SPS, is also supported with a standardized coefficient of 0.255 ($p < 0.001$). Hypothesis 4, which asserts that DR positively influences the SPS, is validated by a standardized coefficient of 0.687 ($p < 0.001$). The R^2 for SPS is 0.743, meaning that 74.3% of its variance is explained by AIEM and

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DR. Hypothesis 5 claims that the CCIS positively affects PS and is strongly supported, with a standardized coefficient of 0.915 ($p < 0.001$). Finally, Hypothesis 6 posits that SPS positively impacts PS. This is supported by a standardized coefficient of 0.176 ($p < 0.001$). The R^2 value for PS is 0.887, indicating that the CCIS and SPS explain 88.7% of its variance.

The presented findings underscore the significant relationships between the constructs within the conceptual model. The obtained R^2 values highlight the model's strong explanatory power, demonstrating that the CCIS and SPS are critical determinants of PS. This study indicates that fostering a CKE, leveraging AIEM, and enhancing DR are valuable strategies for achieving PS. These insights can provide useful guidance for organizations seeking to enhance their innovation strategies and project outcomes.

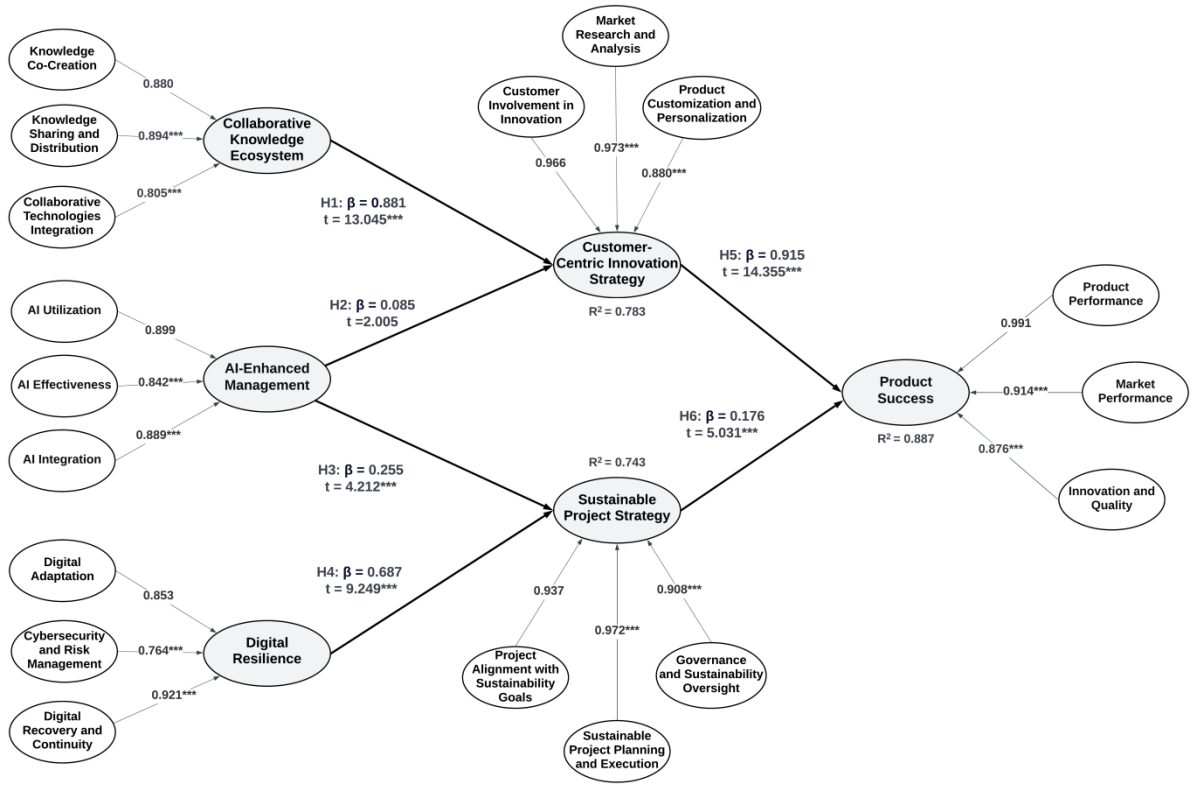

Fig. 2 - Structural equation model (SEM) of factors influencing product success. Source: own research.

Tab. 4 - Summary of hypothesis testing and structural paths in the structural equation model (SEM).

Source: own research

	Structural paths in the model	Result	β*	B**	t-statistic	p-value	R^2
H1:	Collaborative Knowledge Ecosystem -> Customer Centric Innovation Strategy	Supported	0.881	0.962	13.045	< 0.001	0.783
H2:	AI-Enhanced Management -> Customer Centric Innovation Strategy	Supported	0.085	0.085	2.005	< 0.05	
H3:	AI-Enhanced Management -> Sustainable Project Strategy	Supported	0.255	0.244	4.212	< 0.001	0.743
H4:	Digital Resilience -> Sustainable Project Strategy	Supported	0.687	0.698	9.249	< 0.001	

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H5:	Customer Centric Innovation Strategy -> Product Success	Supported	0.915	0.722	14.355	< 0.001	0.887
H6:	Sustainable Project Strategy -> Product Success	Supported	0.176	0.146	5.031	< 0.001	

* Standardized Path Coefficients, ** Unstandardized Path Coefficients

6. Discussion

The findings of this study provide a better understanding of the critical factors contributing to digital PS, highlighting the value of an integrated approach that combines CKEs, AIEM, DR, CCIS, and SPS. By demonstrating how these elements collectively impact PS, this section points to the advantages of fostering environments that support continually sharing knowledge, leveraging advanced technologies for decision-making, building resilient digital infrastructures, and prioritizing customer needs and sustainability in innovation processes. These insights offer guidance for practitioners and policymakers aiming to enhance the effectiveness and competitiveness of digital products in a challenging market.

6.1 Effects of Collaborative Knowledge Ecosystem on the Customer-Centric Innovation Strategy

A substantial positive impact of CKE on CCIS has been found, with a standardized coefficient of 0.881. This strong path highlights the important role that cooperative knowledge ecosystems play in fostering innovation with a customer-centric approach. This relationship is strong, suggesting that companies that successfully cultivate collaborative knowledge environments are better at using these environments to improve their innovation strategies in ways that put the needs of their customers first.

This finding aligns with the work of Chesbrough (2003) and von Hippel (2006), who highlighted the importance of open innovation and customer involvement in the innovation process. The high value of the path coefficient determined in this study is consistent with their arguments, as it demonstrates the strong role that CKEs play in driving customer-centric innovation. Organizations can better understand and respond to customer preferences by creating and maintaining robust knowledge-sharing cultures, leading to more relevant and successful product innovations. Studies by Bogers et al. (2018) further support the idea that leveraging both internal and external knowledge resources significantly enhances an organization's capacity to innovate in a customer-centric manner. The strength of this effect reinforces the notion that collaborative knowledge practices are not only complementary but central to shaping innovation strategies that are responsive to customer needs. Within a broader context, these findings emphasize the importance of cultivating cooperative knowledge ecosystems to improve an organization's capacity for innovation in response to market demands and provide a competitive advantage. For society, this means creating more inventive goods and services that more effectively cater to consumers' needs, which could increase market efficiency and customer satisfaction. Promoting frameworks that facilitate open innovation and foster cooperation between organizations is something that policymakers ought to think about doing. These regulations might provide financial incentives for cooperative R&D projects and create cooperative platforms that promote information exchange. It is important that practitioners invest in developing and maintaining knowledge management systems that facilitate the unrestricted exchange of ideas and information. One way to achieve this is to utilize collaborative technologies like social media platforms and shared digital workspaces. Organizations should incorporate collaborative knowledge practices to guarantee that their product development processes align with customer needs. To do this, settings that encourage

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candid dialogue and information exchange between staff members, business associates, and clients must be established. By doing so, companies can develop innovative products that are highly relevant to their target markets and achieve higher customer satisfaction and loyalty.

The CKE and CCIS have a strong positive relationship overall, which suggests the benefits of creating collaborative environments in which knowledge is shared and co-created. This strategy promotes customer-focused innovation and strengthens an organization's capacity to compete in ever-changing markets. These findings highlight the need for ongoing investment in collaborative knowledge practices and additional investigation into their impact on innovation.

6.2 Effects of AI-Enhanced Management on the Customer-Centric Innovation Strategy

The results from the SEM analysis indicate a statistically significant but modest positive relationship between AIEM and CCIS, with a standardized coefficient of 0.085. This finding highlights that while AIEM practices contribute to customer-centric innovation, their influence may be more limited compared to other organizational capabilities. Organizations integrating AI into their management processes are still better positioned to meet customer needs by leveraging data and insights to refine innovation strategies.

This finding is consistent with research by Davenport and Ronanki (2018), who emphasized the potential of AI in enhancing decision-making and business processes. The result obtained in this study aligns with the notion that AI contributes more indirectly to innovation through improved information processing and responsiveness. This comparatively small effect size supports the findings of Gama and Magistretti (2023), who suggest that AI serves primarily as a complementary enabler of customer-centric innovation, rather than its core driver. The result underscores the need for AI tools to be embedded within broader knowledge-sharing and user-engagement systems to have a more transformative impact on innovation strategy. AI technologies enable organizations to gain deeper insights into customer needs and preferences by efficiently processing large volumes of data and generating actionable insights. These results echo prior findings that AI enhances responsiveness and personalization, but also suggest that customer-centric innovation continues to depend more heavily on collaborative knowledge practices and direct customer engagement. Thus, AI's role should be considered part of a broader innovation ecosystem rather than a standalone determinant. Taking a broader view, these findings suggest the need to incorporate AI technologies into management procedures to improve organizations' capacity for innovation in response to market demands and give them a competitive edge. For society, this implies the development of more innovative and personalized products and services that better meet consumer needs, leading to improved customer satisfaction and market efficiency. Policymakers should consider promoting frameworks that support the adoption of AI technologies in management practices. This could include incentives for AI-driven innovation initiatives and the development of regulatory standards that encourage the ethical use of AI in business operations. For practitioners, investing in AI technologies that improve management practices and enhance decision-making processes is valuable. By leveraging AI tools, organizations can enable more interactive and personalized customer interactions, fostering co-creation and increasing product relevance. Companies should integrate AI capabilities into their innovation processes to ensure they align with customer needs. This involves developing environments that support AI-driven data analysis and decision-making, which can help create innovative products that resonate with target markets and ultimately achieve higher levels of customer satisfaction and loyalty.

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Generally, the relationship between CCIS and AIEM is positive, highlighting the importance of integrating AI technologies into management procedures to promote customer-centric innovation. This methodology yields more inventive and customized goods and services while improving an organization's capacity to stay competitive in ever-changing markets. These results underscore the need for ongoing investment in AI technologies and more research into their impact on innovation. Although the impact of AIEM on CCIS is significant, it is notable that the impact of the CKE on CCIS is more substantial. This comparison indicates that while AIEM contributes to customer-centric innovation, fostering a CKE has a more substantial influence. This underscores the importance of combining both AI capabilities and a strong knowledge-sharing culture to maximize innovation outcomes.

6.3 Effects of AI-Enhanced Management on Sustainable Project Strategy

The relationship between AIEM and SPS is significantly positive, as demonstrated by the standardized coefficient 0.255. This finding reveals the impact of AIEM practices in promoting sustainability within project strategies. Organizations that integrate AI into their management processes can more effectively optimize resources, reduce waste, and enhance overall project sustainability.

This result aligns with research by Chui et al. (2018) and Silvius et al. (2024), which highlight AI's potential to improve efficiency and sustainability in business operations. The observed effect of AIEM on SPS corresponds with prior studies suggesting that AI contributes indirectly by enabling more informed, streamlined, and adaptive decision-making. AI technologies support these efforts through advanced analytics, predictive insights, and automated processes that help optimize resource allocation and reduce environmental impact. Although the effect is not among the strongest in the model, its magnitude reinforces the perspective found in recent literature, such as in the work of Kulkov et al. (2023), that AI serves as an operational enabler for sustainability initiatives when integrated into broader governance and strategic structures. This finding strengthens the case for AI's role as a practical tool in promoting sustainable innovation and responsible project execution. These findings bring attention to the value of integrating AI technologies into management practices to enhance an organization's capacity to develop and implement SPS. This has the potential to benefit society by encouraging more environmentally friendly corporate practices, which will also fuel long-term economic expansion. Policymakers should encourage frameworks that support the use of AI technologies in sustainable project management. This could involve offering incentives for AI-driven sustainability initiatives and developing regulatory standards that promote the ethical use of AI in advancing environmental sustainability. In terms of practical application, companies should focus on investing in AI technologies to improve sustainability in project management. Utilizing AI tools can optimize resource allocation, enhance efficiency, and reduce environmental impact. Organizations should incorporate AI capabilities into their project management processes to meet sustainability goals. This includes creating environments that support AI-driven analytics and decision-making to help develop SPS aligned with organizational objectives and societal expectations, which can contribute to achieving higher levels of efficiency and sustainability.

The positive relationship between AIEM and SPS indicates the benefit of integrating AI technologies into management practices to drive sustainability. This approach enhances an organization's ability to remain competitive and efficient while contributing to broader

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environmental and societal benefits. These findings offer valuable insights, emphasizing the need for ongoing investment in AI technologies and further exploring their impact on sustainability in project management. While the impact of AIEM on SPS is noteworthy, the influence of DR on SPS is even more pronounced, with a standardized coefficient of 0.687. This comparison illustrates the importance of both adopting AI capabilities and fostering digital resilience to achieve sustainable project goals. AI offers tools for optimizing processes and decision-making, whereas digital resilience ensures these processes can withstand and adapt to disruptions, thereby maintaining sustainability in the long term.

6.4 Effects of Digital Resilience on Sustainable Project Strategy

With a standardized coefficient of 0.687, the results show a substantial positive impact of DR on SPS. This result emphasizes how valuable digital resilience can be to maintaining the long-term viability of project strategies. Businesses that build strong digital resilience are better able to handle disruptions, keep things running smoothly, and promote long-term sustainability objectives.

This finding aligns with research by Bharadwaj et al. (2013) and Linkov and Palma-Oliveira (2017), who emphasized the importance of resilience in digital business strategies and risk management. The observed effect of DR on SPS provides empirical backing for these theoretical assertions, indicating that resilience capabilities play a central role in supporting long-term sustainability outcomes. Recent work by Wang and Zhang (2024) further supports this interpretation, demonstrating that aligning digital transformation initiatives with sustainable development goals significantly enhances organizational performance over time. Digital resilience enables organizations to adapt to and recover from digital disruptions, ensuring that sustainability initiatives remain on track despite unforeseen challenges and external volatility. The substantial impact of digital resilience on sustainable project strategy highlights the need to invest in resilient digital infrastructures. This benefits society by enabling businesses to withstand and adjust to digital threats and disruptions more effectively, resulting in steadier and long-term economic growth. Moreover, resilient organizations contribute to the broader goal of environmental sustainability by ensuring that digital crises do not derail their sustainability efforts. Policymakers should consider developing policies that promote the enhancement of digital resilience within organizations. This could include support for cybersecurity initiatives, incentives for resilience training programs, and frameworks that encourage the adoption of resilient digital practices. From a practical standpoint, organizations should prioritize digital resilience as a core component of their project management strategies. This involves implementing robust cybersecurity measures, developing comprehensive digital risk management plans, and fostering a culture of continuous improvement and adaptability. By doing so, companies can ensure that their sustainability projects are not only effective but also resilient to disruptions, thereby enhancing their long-term viability and success.

Overall, the positive relationship between DR and SPS underscores the importance of incorporating resilience into project management practices to drive sustainability. This approach has the potential to strengthen an organization's ability to remain competitive and efficient and help sustainability initiatives withstand and adapt to digital disruptions. These findings highlight the need for continued investment in digital resilience to support sustainable project strategies.

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6.5 Effects of Centric Innovation Strategy on Product Success

The obtained results show a strong positive relationship between CCIS and PS, with a standardized coefficient of 0.915. This finding suggests that a customer-centric approach to innovation plays an important role in determining a product's success. Organizations that prioritize customer needs and preferences in their innovation processes are more likely to achieve successful product outcomes.

This result is consistent with the market orientation and co-creation principles highlighted by Vargo and Lusch (2004). The observed path coefficient between CCIS and PS reflects a strong and direct relationship, affirming that aligning product development with customer insights yields substantial performance benefits. By actively involving customers in the innovation process, organizations are better positioned to create offerings that meet market demands, resulting in higher satisfaction and loyalty. More recent research, such as the study by Ramaswamy and Ozcan (2018), supports this view, showing that customer engagement and co-creation are among the most influential drivers of product success in today's dynamic digital markets. The strong impact of customer-centric innovation on product success highlights the importance of adopting a customer-focused perspective in innovation activities. For society, this means that products are more likely to effectively meet consumer needs, which enhances overall consumer welfare and drives market efficiency. Policymakers should consider encouraging practices that support customer-centric innovation within organizations. This could include creating incentives for companies to engage customers in the innovation process and establishing standards for customer feedback integration. Practically, companies should focus on embedding customer-centric practices into their innovation strategies. This involves systematically gathering and analyzing customer feedback, involving customers in co-creation activities, and ensuring product development aligns with customer needs and preferences. By doing so, organizations can enhance their ability to develop successful products that resonate with the market, achieving higher levels of customer satisfaction and business success.

Prioritizing customer needs in the innovation process may be crucial, as evidenced by the overall positive relationship between CCIS and PS. This strategy builds more enduring relationships and customer loyalty in addition to increasing the likelihood that the product will succeed. In order to drive PS, these findings imply the importance of maintaining a focus on customer-centric innovation practices.

6.6 Effects of Sustainable Project Strategy on Product Success

The relationship between SPS and PS is significant and positive, with a calculated standardized coefficient of 0.176. This finding highlights the role that SPS plays in achieving successful product outcomes. Organizations that embed sustainability principles into their project management processes are more likely to develop products that meet both market demands and environmental standards.

This result aligns with research by Silvius et al. (2024) and Marcelino-Sádaba et al. (2015), emphasizing the importance of integrating sustainability into project management to improve project outcomes and organizational performance. In this study, the relationship between SPS and PS shows a moderate effect, indicating that while sustainability contributes meaningfully to product success, its impact may be more long-term and indirect compared to more immediate, market-driven factors. SPS—such as minimizing environmental impact, optimizing resource use, and promoting long-term ecological balance—enhances product value through responsible

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execution and stakeholder alignment. This supports existing literature suggesting that sustainability adds strategic value, especially when embedded consistently within project governance and operational planning. Compared to the impact of CCIS on PS, which has a much stronger standardized coefficient of 0.915, it becomes evident that while SPS are important for achieving product success, focusing on customer-centric innovation has a more substantial impact. Organizations that prioritize understanding and meeting customer needs and preferences in their innovation processes tend to achieve higher levels of product success. These findings suggest that for maximum product success, organizations should adopt a dual approach that integrates both customer-centric innovation and sustainability principles into their project management practices. This combined strategy can ensure that products meet customer expectations and adhere to sustainability standards, thus ensuring their market acceptance and long-term viability. Policymakers should consider promoting regulations and incentives that encourage companies to integrate sustainable, customer-centric practices into their project management and innovation processes. This could include grant provision for sustainable innovation projects and establishing environmentally friendly product development standards. For companies, it is important to implement sustainable project strategies, such as project management frameworks, that prioritize sustainability through, for instance, renewable resources, waste reduction, and energy efficiency. By focusing on sustainability, organizations can meet regulatory requirements and gain a competitive advantage by appealing to environmentally conscious consumers and stakeholders. Moreover, sustainable practices can lead to cost savings through improved resource efficiency and waste reduction, further enhancing the financial performance of products.

All things considered, the relationship between PS and SPS is positive, which underscores the potential significance of incorporating sustainability into project management procedures. A balanced approach that incorporates sustainability and customer focus might be essential to achieve the best possible product outcomes, as demonstrated by the comparison with the stronger impact of the CCIS.

6.7 Towards a Unified View of Digital Product Success

This study offers a holistic framework for understanding the drivers of digital PS by integrating digital capabilities, strategic orientations, and foundational enablers. The framework illustrates how CKEs, DR, AIEM, CCIS, and SPS combine to influence product results, providing valuable theoretical and practical knowledge for ongoing research.

From a theoretical perspective, the findings emphasize the pivotal role of CKEs in shaping customer-centric innovation. Organizations that allocate resources to maintain open knowledge exchanges, both internally and externally, can develop customer-focused strategies more effectively (Wang & Xu, 2018). This supports open innovation and service-dominant logic theories by confirming that knowledge infrastructure plays a central role in enabling strategic innovation. Digital capabilities show distinct patterns of influence. DR is a crucial element of sustainability strategy because it represents an anticipatory capability supporting sustainable governance beyond just reactive measures (Gomez-Trujillo & Gonzalez-Perez, 2021). The results confirm new theoretical approaches that place resilience as a dynamic organizational capability that requires active management instead of passive risk-management measures. AIEM, however, plays a more modest role. Its stronger influence on sustainability strategy and weaker link to customer-centric innovation underscores that AI may operate more effectively in decision-support roles and structured processes, rather than in dynamic, empathy-driven

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innovation contexts (Kakatkar et al., 2019). Theoretical frameworks that position AI as a universal enabler may need to be revisited to account for its domain-specific impact. Strategic orientations also differ in their impact on PS. CCIS exerts a more immediate and pronounced influence, supporting existing theories that emphasize the centrality of market orientation, co-creation, and personalization in driving product performance (Verhees & Meulenberg, 2004). In contrast, SPS tend to influence outcomes more gradually, aligning with long-standing views that their value materializes systemically and over time (Aarseth et al., 2017). This difference can be attributed to the visibility and immediacy of customer-oriented results, such as improved satisfaction and market fit, which quickly resonate with users and stakeholders. Meanwhile, the benefits of sustainability, though equally important, often remain indirect and long-term, making them less likely to affect short-term success indicators. These findings enrich theory by clarifying the temporal dynamics of strategic value creation and highlighting that responsiveness and responsibility, while often treated as complementary, can introduce competing demands. Organizations must therefore intentionally align these priorities to avoid trade-offs and ensure cohesive execution that supports both near-term impact and long-term resilience.

From a practical standpoint, the study highlights several actionable insights for organizations navigating digital product development. First, because collaborative knowledge ecosystems significantly impact customer-focused innovation, businesses need to invest in frameworks that enable transparency and shared creation processes while maintaining up-to-date information flows. This includes implementing digital collaboration tools, encouraging cross-functional teamwork, and building external partnerships that amplify innovation through shared knowledge. Successful product co-development through external community engagement demonstrates collaborative knowledge ecosystems as seen in examples such as LEGO and GitHub (Jain & Sangal, 2025). Sustainable business methodologies require digital resilience as their fundamental support system. Organizations must incorporate resilience into their strategic plans instead of viewing it as a reactive function and manage it through continuity measures, cybersecurity, and adaptive governance. Resource allocation also requires careful consideration. Since customer-centric innovation is more directly associated with product success, it may warrant prioritization in highly competitive or fast-changing environments. At the same time, sustainability initiatives remain essential for long-term positioning and resilience. Managers should integrate efforts toward responsiveness and responsibility to support and enhance each other to prevent strategic misalignment and trade-offs. These insights challenge the common assumption that sustainability and customer-centricity naturally reinforce each other, as in practice, they may introduce competing priorities, such as the pressure for rapid delivery versus the need for long-term environmental or ethical considerations, which organizations must actively reconcile. AI-enhanced management plays a more supportive than a leading role. While AI can improve decision quality and reduce uncertainty, its value is realized only when integrated within broader strategic and human-centered processes. Strategic judgment must remain human-centered because AI should act as an augmentative rather than a replacement tool in areas that demand empathy, creativity, or ethical evaluation. As implemented by firms such as Siemens, AI applications in sustainability reporting and predictive maintenance illustrate the value of domain-specific integration. Frameworks like ISO 14001 and the Circular Design Guide offer practical structures for embedding sustainability into digital project governance.

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The study also opens multiple directions for future research. While the study includes respondents from various sectors and regions, certain contextual limitations remain. The sample is primarily concentrated within Europe and composed mainly of mid-sized and large organizations, which may reflect region-specific trends in digital maturity and sustainability practices influenced by European policies. Additionally, the results demonstrate limited applicability when considering early-stage startups or industries that operate on different innovation principles. These nuances highlight the value of future research exploring how cultural, industry-specific, or organizational differences may shape digital product success strategies. Comparative studies across industries, firm sizes, or regions may reveal variations in the strength or direction of effects. One approach to comparing the path strengths among model elements between different respondent groups would be applying the Multigroup SEM (MG-SEM) analysis. MG-SEM is an extension of SEM that allows for comparing SEM models evaluated on different respondent groups (Fischer & Karl, 2019). Specifically, the same SEM model is created on several groups, and the path coefficients are compared to explore whether statistically significant differences exist between the evaluated models. MG-SEM analysis has gained the attention of business scholars as it can uncover differences in the subgroups within the entire population that may remain unidentified when examining the entire sample (Cheah et al., 2023). Therefore, MG-SEM analysis can provide details and more insights, allowing decision-makers and managers to propose tailor-made strategies and policies for specific population sub-groups. Longitudinal research could reveal how these relationships evolve over time, especially in response to digital disruption or crisis. Future work could also explore mediators such as digital maturity, organizational agility, or leadership orientation (Yamin & Etty, 2023), as well as moderators that clarify when and where specific strategies are most effective.

7. Conclusion

The current study aimed to determine the various facets contributing to digital product success. The aims of this research were threefold. First, it aimed to provide a detailed theoretical and practical framework for digital product success by integrating insights from various fields, including knowledge management, AI, sustainability, digital resilience, and customer-centric innovation. Second, it sought to identify and analyze the key factors influencing digital product success, offering actionable recommendations for practitioners to enhance project outcomes. Lastly, it aimed to address existing gaps in the literature by providing a comprehensive and holistic approach to digital product success, ensuring that theoretical concepts are closely aligned with practical applications in dynamic business environments. These aims were met, offering contributions to both academic research and practical applications in the field of digital product management.

The study's findings emphasize the interconnectedness and holistic approach needed for digital product success. The relationships between CKE, AIEM, DR, CCIS, and SPS collectively contribute to PS. Firstly, the influence of CKE and AIEM on CCIS may be pivotal, with CKE playing a powerful role. The CKE fosters an environment where knowledge is co-created and shared among employees, partners, and customers. This collaborative approach significantly enhances an organization's ability to innovate based on real-time customer feedback and market insights, making it a critical driver of CCIS. AIEM further amplifies this on a lesser scale by providing advanced analytical tools that help reveal customer preferences and predict market trends. Together, CKE and AIEM significantly boost the effectiveness of customer-centric

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innovation strategies, ensuring that product development is closely aligned with customer needs. Secondly, along with DR, AIEM significantly impacts SPS. Here, DR has a stronger influence on SPS compared to AIEM, which highlights the need for organizations to build robust digital infrastructures that can withstand and quickly recover from disruptions, ensuring continuity and minimizing downtime. AI technologies, while also beneficial, primarily optimize project management by improving resource allocation and risk management. Combining these elements is likely essential for effectively embedding sustainability into project management. Finally, the influence of CCIS and SPS on PS can be profound, with CCIS having a particularly strong impact. This indicates that prioritizing customer needs and integrating their feedback into the innovation process could be essential for developing successful digital products. SPS also positively affects Product Success, but to a lesser extent, highlighting the importance of responsible and sustainable development practices in achieving long-term product viability.

The results demonstrate the importance of an integrated approach, as all the components of the model are interconnected. Each element—collaboration, AI, resilience, customer focus, and sustainability—plays a valuable role in driving digital product success. Focusing on these interconnected strategies can significantly benefit organizations in their efforts to innovate continuously, adapt to changes, and maintain sustainable practices.

The implications of these findings are noteworthy for both theory and practice. For practitioners, adopting a holistic approach that integrates collaborative knowledge practices, AI technologies, digital resilience, customer-centric innovation, and sustainability principles can significantly enhance product success. Policymakers should support frameworks that promote collaboration, innovation, and sustainability within organizations. This can include incentives for sustainable practices and regulations encouraging ethical AI use and robust digital infrastructure development. For the theory, these findings contribute to a more comprehensive understanding of the current knowledge of the factors that drive digital product success. By demonstrating the importance of integrating multiple strategic elements, this research supports the development of more holistic theoretical models. It reveals that theories on digital product success must account for the interplay between knowledge sharing, AI, resilience, customer focus, and sustainability. This integrative perspective can guide future theoretical advancements and inform the design of empirical studies that further explore these complex relationships.

However, this study has several limitations. Firstly, the sample focuses on professionals in product-related roles, potentially overlooking insights from other relevant fields. Secondly, the use of a survey methodology may limit the depth of responses and the ability to capture nuanced insights. Additionally, the study's cross-sectional design does not allow for the observation of changes over time, and longitudinal studies would be beneficial to examine the long-term effects and causal relationships. Future research could address these limitations by employing more diverse methodologies, expanding the sample to include other relevant professions, and incorporating objective performance metrics. Additionally, expanding the research to include additional factors such as organizational culture, leadership, and external environmental conditions could offer a more comprehensive understanding of digital product success.

The key takeaways from this study emphasize the value of an integrated approach that combines collaboration, AI, resilience, customer focus, and sustainability to achieve digital product

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success. The most significant relationship identified is the impact of CCIS on PS, which highlights the critical importance of prioritizing customer needs and integrating their feedback into the innovation process for developing successful products. Equally important is the influence of the CKE on CCIS, underscoring how fostering collaborative environments enhances innovation capabilities. DR also plays a vital role in supporting SPS, ensuring that sustainability practices can withstand disruptions and maintain continuity. While AI technologies optimize processes, their effectiveness is maximized when integrated with collaborative and resilient practices.

In conclusion, an integrated approach that combines knowledge-based collaboration, AI, digital resilience, customer focus, and project sustainability appears to be essential for the success of digital products. By focusing on these interconnected components, organizations can achieve higher levels of innovation, market relevance, and operational efficiency, ultimately leading to successful digital products.

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