

Accelerating Time to Market through Agile in AI Innovation

Susy Alestriani Sibagariang¹ , Farisha Andi Baso² , Nugroho Prihantoni³ , Noah Rangi^{4*} 

¹Department of Economic Education, Universitas HKBP Nommensen Pematangsiantar, Indonesia

²Department of English Education, Muhammadiyah University of Makassar, Indonesia

³Faculty of Economics and Business, University of Raharja, Indonesia

⁴Department of Science and Technology, Pandawan Incorporation, New Zealand

¹susysibagariang@gmail.com, ²farisha@unismuh.ac.id, ³nugroho.prihantoni@raharja.info, ⁴no.rangi3@pandawan.ac.nz

*Corresponding Author

Article Info

Article history:

Submission December 22, 2025

Revised January 7, 2026

Accepted January 29, 2026

Keywords:

Artificial Intelligence

Digital Innovation

Time-to-Market

Organizational Agility

Agile Adoption



ABSTRACT

Rapid digital transformation, driven by the increasing integration of Artificial Intelligence (AI) into digital products and services, has intensified competition across industries and positioned Time-to-Market (TTM) as a critical success factor for digital innovation projects. AI-oriented development requires rapid iteration, continuous data processing, and frequent model refinement, which are often difficult to support using traditional project management approaches, leading to delayed deployment and reduced adaptability. In this context, **agile methodologies** have emerged as a flexible and adaptive framework that aligns well with the iterative and data-driven nature of AI development. **This study** examines the impact of agile adoption on TTM performance in digital innovation projects, particularly those involving AI-enabled components, using a qualitative multiple-case study design based on semi-structured interviews with product managers, developers, and agile practitioners, complemented by analysis of project documentation, AI workflows, and delivery metrics. **The findings** show that organizations adopting agile methodologies achieve a development cycle time reduction of approximately 25% to 40% within the first two years of implementation, supported by key practices such as iterative sprint development, cross-functional collaboration between engineering and data teams, continuous feedback loops, and early testing of AI components. Overall, **the study confirms** that agile methodologies serve as an effective strategic mechanism for accelerating TTM in AI-driven digital innovation projects.

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DOI: <https://doi.org/10.33050/corisinta.v3n1.158>

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1. INTRODUCTION

Agile development has emerged as a transformative approach to managing complex, technology-intensive projects within digital product development, particularly in software engineering, systems design, and Artificial Intelligence (AI) enabled innovation. Originating from the Agile Manifesto introduced in 2001, this methodology emphasizes collaboration, adaptability, and continuous delivery, which align closely with the iterative and data-driven nature of AI system development [1]. Over the past two decades, organizations across industries ranging from software and finance to healthcare and retail have increasingly adopted Agile practices to support rapid experimentation, model refinement, and system integration required in AI-driven environments. In today's competitive digital economy, where AI-powered products rely on timely deployment and

continuous learning, Time-to-Market (TTM) has become a critical determinant of success [2]. Organizations capable of delivering high-quality, AI enabled digital products swiftly gain substantial advantages in customer engagement, data utilization, and competitive positioning. Despite widespread Agile adoption, many organizations still face challenges in shortening development cycles and accelerating AI product launches due to rigid planning structures, limited flexibility, and slow decision-making processes. These constraints hinder the ability to respond effectively to fast-evolving AI technologies and dynamic user demands. This paper investigates how adopting Agile methodologies can address these challenges by enabling iterative workflows, cross-functional collaboration between engineering and data teams, and adaptive planning processes that collectively enhance development speed and delivery efficiency in AI-oriented digital innovation projects [3–5].

This study is guided by two primary research questions: how Agile adoption influences the speed of digital product development, particularly in AI-enabled environments, and which specific elements of Agile methodology contribute most effectively to reducing TTM. The main objective of this paper is to analyze the impact of Agile adoption on TTM performance in digital innovation projects by integrating qualitative and quantitative perspectives, with a focus on projects that involve data-driven and AI-based components. The study seeks to identify Agile practices that most effectively enhance development speed and to provide evidence-based insights into how organizations can strategically implement Agile principles to support rapid experimentation, continuous learning, and scalable AI deployment while maintaining competitive advantage in the digital era [6, 7]. The accelerating pace of digital transformation, driven in part by the widespread adoption of AI, has reshaped industries and intensified the need for flexible and adaptive development strategies. Traditional project management methodologies, such as Waterfall, often struggle to accommodate the iterative nature of AI development, where frequent model updates, data refinement, and system integration are required [8]. These rigid, sequential approaches tend to introduce bottlenecks that delay development cycles and hinder timely market entry. In contrast, Agile methodologies emphasize iterative cycles, adaptability, and cross-functional collaboration between engineering, data, and business teams, enabling organizations to respond more effectively to evolving AI technologies and rapidly changing user requirements, thereby accelerating product delivery and improving TTM outcomes [9–11].

Agile methodologies, initially developed for software development, have been widely adopted across various industries, including finance, healthcare, retail, and manufacturing, particularly in contexts where AI and data-driven technologies are increasingly embedded in digital products and services. This cross-sector adoption demonstrates the flexibility of Agile practices in addressing the complexity and uncertainty inherent in AI-enabled innovation. Agile's emphasis on continuous improvement, iterative testing, and rapid feedback loops aligns closely with AI development processes that require frequent model validation, data refinement, and performance optimization. Furthermore, adaptive planning and decentralized decision-making foster closer collaboration between engineering, data science, and business teams, supporting more integrated AI system development and problem-solving [12]. As organizations face growing pressure to deliver AI-enabled products at higher speeds, the importance of TTM has become increasingly pronounced. In technology-intensive industries where AI capabilities evolve rapidly, the ability to deploy intelligent systems swiftly can determine organizational success or failure [13]. TTM in AI-driven contexts extends beyond development speed to include the timely exploitation of data insights and emerging algorithmic opportunities. Organizations that effectively reduce TTM can accelerate revenue realization, rapidly incorporate user feedback into AI models, and strengthen competitive advantage [14]. Within digital product ecosystems characterized by fast-changing user behavior and technological advancement, Agile-supported reductions in development cycles position organizations to deploy AI-enabled solutions more effectively and sustain innovation performance [15].

Despite the widespread recognition of Agile's benefits, many organizations continue to face difficulties in fully implementing Agile practices, particularly when transitioning from traditional development models or scaling Agile across large, AI-intensive teams. These challenges are further amplified in AI-driven digital innovation projects, where development complexity, data dependency, and model uncertainty introduce additional coordination and governance issues. Common barriers to Agile adoption include resistance to change, shortages of skilled personnel capable of working with both Agile and AI technologies, and difficulties in aligning Agile practices with existing organizational and data infrastructures [16–18]. Moreover, effective Agile adoption in AI contexts requires substantial cultural transformation, including a strong emphasis on continuous learning, experimentation, collaboration between data and engineering teams, and openness to iterative improvement. Without adequate leadership commitment, training, and resource allocation, these organizational and cultural constraints can significantly slow or undermine Agile implementation. This study therefore

investigates the impact of Agile adoption on TTM in digital innovation projects, with particular attention to AI-enabled development environments, and examines how Agile practices contribute to faster delivery cycles and improved product quality [19]. Through the analysis of multiple case studies across diverse sectors, the study aims to identify Agile practices that most effectively reduce TTM in AI-oriented projects and to provide evidence-based recommendations for organizations seeking to scale Agile adoption and accelerate innovation performance in dynamic, data-driven market environments [20, 21].

The adoption of Agile is increasingly becoming a strategic imperative for organizations operating in the digital economy. In an era where speed and flexibility are paramount, Agile offers a pathway to improving not only development cycles but also organizational agility. The rise of digital-first businesses and the increasing reliance on software solutions across industries have made Agile methodologies an essential component of modern project management [22]. As digital innovation continues to shape industries such as finance, healthcare, and e-commerce, the ability to deliver new products and services quickly is no longer just a competitive advantage, it is a necessity. By integrating Agile methodologies into the development process, organizations can foster a culture of continuous improvement and responsiveness to customer needs. The emphasis on cross-functional collaboration and iterative feedback loops in Agile helps companies align product development efforts with user expectations, resulting in products that are more likely to succeed in the market [23]. Additionally, the flexibility inherent in Agile allows organizations to pivot quickly when faced with unexpected challenges or shifts in the market, further strengthening their position in an increasingly competitive landscape [24].

The adoption of Agile methodologies in digital innovation not only accelerates TTM but also aligns with several key Sustainable Development Goals (SDGs). Specifically, it supports SDGs 9 (Industry, Innovation, and Infrastructure) by fostering innovation and enhancing technological capabilities, which helps create more sustainable products and resilient industries. Agile's emphasis on efficiency and adaptability also contributes to SDGs 8 (Decent Work and Economic Growth), as it enables businesses to respond quickly to emerging market opportunities, boosting productivity, and generating job growth within the tech sector. Moreover, Agile practices contribute to SDGs 12 (Responsible Consumption and Production) by promoting iterative testing, continuous improvement, and resource efficiency, leading to products that better align with customer needs while minimizing waste.

2. LITERATURE REVIEW

2.1. Agile Methodologies and Their Evolution

Agile development represents a shift from traditional project models toward iterative and flexible workflows that emphasize collaboration, continuous delivery, and rapid responsiveness, which are increasingly critical in AI driven innovation environments. From the perspective of innovation management theory, Agile practices enable organizations to adapt quickly to technological change while supporting the experimental and data-intensive nature of AI development, where continuous model refinement and validation are required. Frameworks such as Scrum, Kanban, and Lean offer structured but adaptive approaches that contrast sharply with the traditional Waterfall model, which follows fixed sequential stages and provides limited flexibility for AI experimentation and iterative learning [25]. Scrum supports time-boxed sprints and clearly defined roles that facilitate frequent testing of AI components, Kanban enhances transparency and flow in data and model pipelines, and Lean emphasizes value maximization through the reduction of waste in computational and development resources. During the past five years, empirical studies indicate that Agile methodologies have expanded beyond software development to sectors such as finance, healthcare, and manufacturing, particularly where AI technologies are embedded in operational and decision-making systems, due to their effectiveness in improving productivity, flexibility, and stakeholder participation [26, 27].

Agile methodologies, initially designed to address the limitations of traditional project management approaches, have evolved substantially since their emergence in the early 2000s and have become increasingly relevant in AI driven development contexts. Agile emphasizes flexibility, iterative progress, and collaboration among cross-functional teams, which align closely with the experimental and data intensive nature of AI systems that require frequent model training, validation, and refinement. While Scrum and Kanban remain the most widely adopted frameworks, other Agile methodologies such as Extreme Programming (XP) and Lean Software Development also play an important role in accelerating AI-enabled delivery cycles by promoting continuous improvement, waste reduction in computational and development resources, and close alignment

with user and data requirements [28]. Over the past decade, Agile has extended beyond software development into industries such as finance, healthcare, and manufacturing, where AI technologies are increasingly embedded in operational and decision-making processes. This expansion of Agile adoption highlights its growing relevance for organizations seeking to manage the complexity, uncertainty, and rapid iteration demands characteristic of AI-oriented digital innovation.

2.2. Research on Agile Practices in Digital Product Development

Empirical studies over the last five years indicate that Agile practices significantly improve delivery speed, product quality, and team collaboration in digital product development, particularly in projects involving AI and data-driven technologies. Agile adoption enables organizations to deliver incremental value through frequent releases and to respond more effectively to evolving customer and data requirements, which is essential in AI systems that depend on continuous learning and iterative model enhancement [29]. At the same time, existing literature highlights persistent challenges in large-scale Agile implementation, especially in AI-intensive environments, including resistance to cultural change, limited organizational readiness, and difficulties in aligning Agile frameworks with corporate governance and AI oversight structures. Successful Agile transformation in such contexts typically requires strong leadership commitment, sustained training in both Agile and AI competencies, and the adoption of hybrid process models that balance flexibility with the governance and control needed to ensure reliability, ethical compliance, and long-term system stability.

A significant body of research has explored how Agile adoption impacts organizational culture. One of the key benefits of Agile methodologies is their ability to create a collaborative, transparent, and adaptable work environment. Agile methods foster a culture of continuous improvement and innovation. By focusing on team autonomy, self-organization, and cross-functional collaboration, Agile practices empower employees to make decisions that drive product development forward. This shift towards empowerment and collaboration not only reduces bottlenecks in decision-making but also enhances organizational agility. The result is an organization that can better align with customer expectations, respond quickly to market changes, and maintain a competitive edge [30].

2.3. Time-to-Market definition and Significance

TTM is defined as the duration between the initial concept of a product and its release to customers. In a digital business environment characterized by rapid technological change, TTM has become a critical performance metric. A shorter TTM allows firms to capitalize on emerging opportunities, strengthen market position, and achieve faster revenue generation. Moreover, TTM directly influences innovation efficiency, as organizations that can deliver products faster are more likely to iterate based on user feedback and stay ahead of competitors in fast-moving markets [31, 32]. The relationship between Agile practices and reduced TTM has been explored in various studies. Research has demonstrated that Agile methodologies can significantly shorten TTM by fostering more frequent iterations, providing quick feedback loops, and aligning product development with customer needs from the outset. Agile teams typically adopt sprints, which are short, time-boxed intervals that allow for focused progress and immediate delivery of valuable product increments. By breaking down large projects into smaller tasks, Agile enables teams to make faster decisions, adapt quickly to changes, and deliver working products at each iteration, thereby accelerating time-to-market. Furthermore, continuous integration and testing allow early identification and resolution of issues, further speeding up the development cycle [33].

2.4. Time-to-Market Impact on Competitive Advantage and Customer Satisfaction

While prior studies emphasize that reducing TTM leads to competitive advantage, this paper provides novel contributions by comparing Agile adoption's impact on TTM across various industries, specifically software, fintech, and e-commerce, providing more granular insights into the practices that reduce TTM. Companies capable of rapidly delivering digital products can better align offerings with user expectations and adapt to market fluctuations. Faster release cycles also facilitate continuous improvement and validation of market assumptions. Nevertheless, research cautions that speed alone does not guarantee success quality assurance, user-centered design, and sustainable development practices must accompany accelerated delivery to ensure long-term customer trust and brand equity [34].

Despite the many advantages of Agile, its widespread adoption comes with challenges, particularly in scaling Agile practices across large, complex organizations. Resistance to change, lack of experienced Agile practitioners, and misalignment between Agile practices and traditional organizational structures are common obstacles. Moreover, larger organizations often face difficulties in integrating Agile with legacy systems and

processes, which can lead to inconsistency in Agile implementation [35, 36]. Overcoming these challenges requires strong leadership, continuous training, and careful adaptation of Agile frameworks to the specific needs of the organization. These barriers to scaling Agile highlight the importance of organizational culture in successful Agile adoption.

2.5. Link Between Agile and Time-to-Market

Recent evidence demonstrates a strong correlation between Agile adoption and reduced TTM. Agile teams benefit from iterative planning, continuous delivery, and cross-functional collaboration, enabling faster feedback loops and decision-making. Case studies across industries reveal that companies implementing Agile frameworks have significantly shortened their product development cycles and increased release frequency. However, the literature emphasizes that Agile's impact on TTM depends heavily on organizational maturity, cultural alignment, and supporting technologies such as automation and DevOps integration. Overall, the integration of Agile practices not only accelerates digital innovation but also fosters resilience and adaptability in dynamic market environments [37].

In the context of the digital economy, Agile methodologies are particularly effective in driving innovation. With the rapid pace of technological advancements and shifting customer demands, organizations need to continuously innovate to stay competitive. Agile provides a framework that supports this constant innovation by facilitating faster feedback loops, continuous product testing, and closer alignment between business goals and product development [38]. The emphasis on iterative development and frequent delivery allows companies to respond quickly to changes in customer preferences, market trends, or technological advancements. This ability to innovate rapidly gives organizations an edge in fast-moving markets where staying ahead of competitors requires constant improvement and adaptation.

Beyond the adoption of Agile practices, organizational readiness and maturity play an important role in determining Agile outcomes. Agile maturity refers to the extent to which Agile principles are consistently embedded in organizational routines, decision-making processes, and team behaviors. Organizations with higher Agile maturity tend to demonstrate better coordination, clearer role definitions, and more effective feedback utilization.

Organizational readiness, including leadership support, cultural openness, and employee competencies, further shapes the success of Agile implementation. Without sufficient readiness, Agile adoption may remain superficial, limiting its potential impact on TTM. This perspective reinforces the importance of viewing Agile not merely as a methodology, but as an organizational transformation process [39].

3. METHODOLOGY

3.1. Research Design and Case Selection

This study employs a qualitative multiple-case study design to examine how Agile adoption influences TTM in digital innovation projects, particularly those involving AI enabled systems. A qualitative approach is appropriate because the research focuses on understanding organizational practices, development workflows, and decision making processes that shape AI driven innovation rather than testing hypotheses through statistical models. The multiple case design enables comparison across different organizational contexts, allowing the identification of recurring patterns as well as contextual variations in Agile implementation and delivery performance [40]. Cases were selected using purposive sampling to ensure empirical relevance, with organizations required to have adopted Agile methodologies for at least one year and actively applied Agile practices in the development of digital products or services incorporating data driven or AI-based components. The selected cases operate in technology intensive sectors such as software development, fintech, and e-commerce, where AI capabilities, rapid innovation cycles, and short delivery timelines are critical. This selection strategy ensures that each case provides meaningful insight into the relationship between Agile practices and TTM performance in AI-oriented digital innovation environments [41].

3.2. Data Collection and Sources

Data were collected from both primary and secondary sources to strengthen the credibility of the findings. Primary data were obtained through semi-structured interviews with key stakeholders directly involved in Agile projects, including product managers, software developers, and Agile practitioners [42, 43]. Semi-structured interviews were chosen to maintain consistency across cases while allowing flexibility for participants to elaborate on their experiences, challenges, and perceived outcomes of Agile adoption. Each interview

lasted approximately 45 to 60 minutes and was recorded and transcribed to support systematic analysis.

Secondary data consisted of internal project documentation such as sprint plans, delivery schedules, progress reports, and performance records related to development cycle time. These documents were used to complement interview data and provide objective evidence of changes in delivery speed before and after Agile adoption. The combination of interview data and project documentation enabled a more comprehensive understanding of how Agile practices influenced TTM [44].

3.3. Data Analysis and Research Rigor

The data analysis employed a thematic analysis approach to examine how Agile practices support TTM acceleration in AI-driven digital innovation projects. Interview transcripts and secondary documents were systematically analyzed to identify recurring concepts related to Agile enabled development processes, particularly those supporting iterative experimentation, data-driven decision making, and rapid delivery of AI components. These concepts were then synthesized into broader analytical themes, including iterative development, cross-functional collaboration between engineering and data teams, continuous feedback mechanisms, and delivery predictability. A cross-case comparison was conducted to identify similarities and differences across organizations, enabling the study to capture how contextual factors such as Agile maturity, organizational culture, and AI capability integration influenced TTM outcomes [45]. To enhance the trustworthiness of the findings, data triangulation was applied by comparing interview insights with secondary documentation and delivery metrics associated with AI-enabled projects. Ethical considerations were addressed through informed consent and anonymization of organizational and individual identities [33, 46]. Although the qualitative design limits statistical generalization, the systematic use of multiple cases and thematic analysis supports analytical generalization and provides robust insights into the role of Agile adoption in accelerating AI oriented digital innovation.

4. RESULTS AND DISCUSSION

The results of this study demonstrate that the adoption of Agile methodologies plays a significant role in reducing time-to-market in digital innovation projects, particularly those involving AI enabled systems. Across the examined cases, organizations consistently reported substantial improvements in delivery speed following the transition from traditional, plan-driven development models to Agile based workflows. In AI oriented projects, these improvements were not driven solely by technical practices, but rather emerged from the integration of process restructuring, cross-functional collaboration between engineering and data teams, and adaptive decision-making supported by Agile principles. This combination enabled organizations to manage the uncertainty, experimentation, and continuous learning inherent in AI development more effectively, leading to faster and more predictable delivery outcomes [47, 48].

A key finding relates to the impact of iterative development cycles on delivery efficiency in AI-driven environments. Agile teams organized work into short iterations, allowing AI components such as data pipelines, models, and system features to be developed, tested, and refined incrementally. This approach reduced dependence on extensive upfront planning and minimized delays caused by late-stage changes in data availability, model performance, or user requirements. Unlike linear development models, where changes often result in costly rework, Agile iterations supported continuous refinement of AI components without significantly disrupting delivery timelines. These findings reinforce the view that iterative development functions as a critical mechanism through which Agile accelerates time-to-market in innovation contexts characterized by high uncertainty, rapid technological change, and evolving AI capabilities.

Table 1. Summary of Agile Practices and Time-to-Market Outcomes Across Cases

Case	Industry Sector	Agile Practices Applied	Observed Impact on Time-to-Market
Case A	Software Development	Scrum, Iterative Sprints, Daily Stand-ups	Significant reduction in delivery cycle time
Case B	Fintech	Kanban, Continuous Integration	Improved delivery predictability and faster releases
Case C	E-commerce	Scrum, Cross-functional Teams	Shortened development cycles and faster market entry

Table 1 summarizes the implementation of Agile practices across the examined cases and their observed impact on time-to-market performance. The table illustrates how organizations operating in different industry sectors adopted specific Agile frameworks and practices, such as Scrum, Kanban, iterative sprints, and continuous integration, to improve delivery efficiency. Despite contextual differences, all cases demonstrate a consistent pattern in which Agile adoption is associated with faster development cycles, improved delivery predictability, and earlier market entry. The comparative presentation highlights that while the specific Agile practices applied may vary across organizations, their combined effect contributes to a reduction in time-to-market, reinforcing the role of Agile as a flexible and adaptable approach to accelerating digital innovation.

Another important result relates to cross-functional collaboration. Agile adoption reshaped interaction patterns among development teams, product owners, and business stakeholders [49]. Regular coordination routines, such as sprint reviews and planning sessions, facilitated shared understanding of project goals and priorities. This alignment reduced communication gaps and decision-making latency, which are common contributors to project delays. The findings indicate that improved collaboration not only enhances operational efficiency but also strengthens strategic coherence between technical development and business objectives, thereby supporting faster and more predictable product delivery [50–52].

The study also highlights the role of continuous feedback and adaptability in shaping time-to-market outcomes. Agile practices enabled organizations to incorporate feedback from users and stakeholders throughout the development process rather than at the final delivery stage. This early and continuous feedback reduced the risk of misaligned features and minimized post-development revisions. From a broader perspective, adaptability emerged as a key capability, allowing organizations to respond proactively to changing market conditions and technological requirements without extending development cycles.

Despite these positive effects, the results reveal that the benefits of Agile adoption are contingent on organizational readiness and maturity. Organizations with more mature Agile practices exhibited greater reductions in time-to-market, while those at earlier stages of adoption experienced transitional challenges. These challenges included resistance to cultural change, incomplete implementation of Agile principles, and limited experience among team members. Such findings suggest that Agile adoption should be understood as an organizational transformation rather than a purely procedural change, where long-term benefits depend on sustained commitment and learning.

From a theoretical standpoint, the findings contribute to the understanding of Agile as an enabler of organizational agility in digital innovation contexts. Agile practices facilitate faster sensing and responding to environmental changes, supporting dynamic adaptation in volatile markets. Practically, the results underscore that organizations aiming to reduce time-to-market should focus not only on adopting Agile frameworks, but also on strengthening collaborative cultures, investing in Agile capabilities, and aligning Agile practices with strategic objectives.

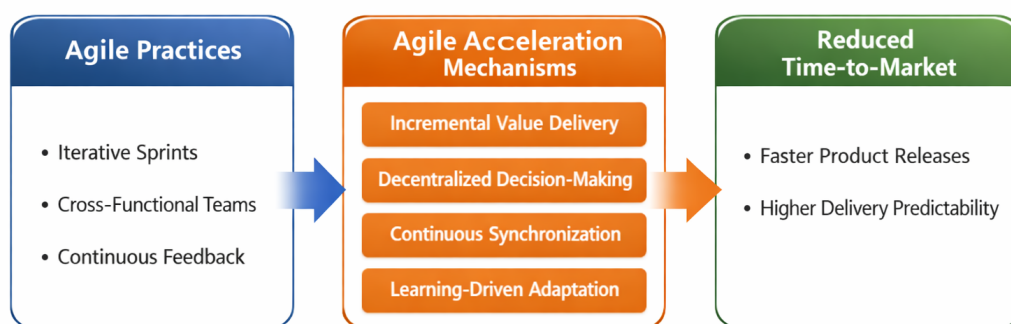


Figure 1. Agile Adoption Mechanisms Influencing TTM

Figure 1 illustrates how Agile adoption accelerates time-to-market in digital innovation projects by showing the relationship between Agile practices, organizational mechanisms, and delivery outcomes. The figure demonstrates that core Agile practices, such as iterative sprints, cross-functional collaboration, and continuous feedback, act as the foundation that reshapes traditional development workflows. These practices activate key acceleration mechanisms, including incremental value delivery, decentralized decision-making, continuous synchronization between technical and business functions, and learning-driven adaptation. Through

these mechanisms, organizations are able to reduce development delays, respond more quickly to changing requirements, and improve coordination across teams. The combined effect of these processes leads to reduced time-to-market, reflected in faster product releases and higher delivery predictability, highlighting that Agile adoption functions as an integrated organizational system rather than a collection of isolated techniques.

Overall, the integrated results and discussion confirm that Agile adoption can significantly accelerate time-to-market in digital innovation projects, while also emphasizing that the effectiveness of Agile depends on contextual and organizational factors. These insights extend existing knowledge by illustrating how Agile practices operate in practice and under what conditions they deliver the greatest impact.

While Agile adoption generally contributes to faster time-to-market, the findings indicate that its effectiveness is strongly influenced by organizational conditions. Differences in organizational structure, leadership support, and team experience shaped how Agile practices were enacted across cases. Organizations with flatter structures and supportive leadership were able to leverage Agile principles more effectively, enabling faster decision-making and smoother coordination across teams.

In contrast, organizations with rigid hierarchies experienced slower benefits from Agile adoption, particularly during early implementation stages. Decision-making delays and partial adherence to Agile principles limited delivery acceleration. These findings suggest that Agile methodologies do not operate independently of organizational context. Instead, time-to-market improvements emerge when Agile practices are supported by appropriate organizational conditions, including cultural openness, leadership commitment, and continuous learning capabilities.

This study contributes to the growing body of research on Agile methodologies by providing empirical insights into how Agile practices accelerate time-to-market in digital innovation contexts. Rather than treating Agile as a set of technical tools, the findings highlight Agile as an organizational capability that enables rapid adaptation, learning, and coordination.

The results extend existing perspectives on Agile by emphasizing the role of acceleration mechanisms, such as incremental delivery and decentralized decision-making, in shaping delivery outcomes. This mechanism-based explanation helps bridge the gap between descriptive studies of Agile adoption and theoretical discussions on organizational agility and innovation speed. By illustrating how Agile operates under different organizational conditions, this study offers a more nuanced understanding of Agile effectiveness in dynamic digital environments.

5. MANAGERIAL IMPLICATIONS

The findings of this study provide several important managerial implications for organizations seeking to reduce time-to-market in digital innovation projects through Agile adoption:

5.1. Prioritize Agile as an organizational capability, not merely a methodology

Managers should view Agile adoption as a broader organizational transformation rather than merely a set of technical practices or development routines. Successful time-to-market acceleration depends on the alignment of Agile principles with organizational culture, leadership commitment, and well-defined decision-making structures that empower teams. When Agile values are embedded across managerial and operational levels, organizations are better positioned to respond to change, reduce bottlenecks, and deliver value more rapidly and consistently.

5.2. Empower cross-functional teams to accelerate decision-making

The results indicate that decentralized decision-making plays a significant role in reducing delivery delays by minimizing procedural bottlenecks. Managers are therefore encouraged to grant greater autonomy to Agile teams, allowing them to respond more quickly to technical challenges and evolving requirements without excessive hierarchical approval. This autonomy supports faster problem resolution, enhances team accountability, and ultimately contributes to more efficient and timely product delivery.

5.3. Invest in Agile maturity and continuous learning

Organizations with higher levels of Agile maturity achieved more consistent and sustainable reductions in time-to-market, indicating that Agile effectiveness develops progressively rather than instantly. Managers should therefore support continuous training, coaching, and regular retrospectives to strengthen team capabilities, reinforce learning, and embed Agile principles into daily operations. This ongoing support helps teams adapt more effectively, improve collaboration, and maintain performance improvements over time.

5.4. Strengthen collaboration between technical and business functions

Agile practices are most effective when strong alignment exists between technical and business functions, enabling shared understanding and coordinated action. Managers should facilitate regular synchronization forums, such as sprint reviews, planning sessions, and cross-functional check-ins, to ensure that development priorities remain closely aligned with strategic objectives and evolving market demands. This alignment helps reduce miscommunication, accelerates decision-making, and ensures that delivered features generate tangible business value.

5.5. Leverage incremental delivery to gain early market feedback

Managers should encourage incremental releases instead of waiting for full product completion to deliver value. Early and frequent delivery allows teams to validate solutions with the market more quickly, gather timely feedback, and identify necessary adjustments at an earlier stage. This approach helps reduce rework, manage risks more effectively, and improve the overall predictability and reliability of product launches.

5.6. Assess organizational readiness before scaling Agile

The findings suggest that Agile benefits vary depending on organizational conditions. Managers should evaluate structural flexibility, leadership commitment, and cultural openness before scaling Agile practices across multiple teams or departments.

6. CONCLUSION

This study examines the impact of Agile adoption on time-to-market in digital innovation projects and provides empirical insights into how Agile practices support faster and more predictable product delivery, particularly in AI-driven development environments. The findings indicate that Agile adoption consistently contributes to time-to-market reduction by enabling iterative development, strengthening cross-functional collaboration between engineering and data teams, and facilitating continuous feedback throughout the development lifecycle. In the context of AI enabled systems, these capabilities are critical for managing experimentation, data dependency, and frequent model refinement. Rather than functioning solely as a project management technique, Agile emerges as an organizational approach that reshapes development workflows and supports rapid adaptation in dynamic and data-intensive digital environments.


Beyond confirming the positive relationship between Agile adoption and time-to-market, this study identifies the underlying mechanisms through which these improvements occur in AI-oriented projects. Incremental value delivery enables early deployment of AI components, decentralized decision-making reduces delays in model iteration and system adjustment, and continuous synchronization between technical and business functions ensures alignment between algorithmic capabilities and organizational objectives. In addition, learning-driven adaptation supports continuous improvement based on performance feedback and data insights. The findings further demonstrate that the effectiveness of Agile adoption is influenced by organizational context and maturity, indicating that sustained time-to-market improvements in AI development require more than formal Agile implementation and depend on broader organizational readiness and cultural alignment.

From an academic perspective, this study contributes to the literature on Agile, AI, and digital innovation by offering a mechanism-based explanation of how Agile accelerates time-to-market across diverse organizational contexts. From a practical standpoint, the findings provide actionable guidance for organizations seeking to enhance AI delivery speed by emphasizing collaborative structures, capability development, and continuous learning practices. While the qualitative research design limits statistical generalization, the use of multiple case studies supports analytical generalization and establishes a solid foundation for future research on Agile adoption, organizational maturity, and long-term AI-driven innovation performance.

7. DECLARATIONS

7.1. About Authors

Susy Alestiani Sibagariang (SA)  <https://orcid.org/0009-0009-1890-5442>

Farisha Andi Baso (FA)  <https://orcid.org/0000-0003-2114-9771>

Nugroho Prihantoni (NP)  <https://orcid.org/0009-0000-7345-794X>

Noah Rangi (NR)  <https://orcid.org/0009-0004-6616-956X>

7.2. Author Contributions

Conceptualization: SA; Methodology: FA; Software: NP; Validation: NR and SA; Formal Analysis: FA and NP; Investigation: NR; Resources: SA; Data Curation: FA; Writing Original Draft Preparation: NP and NR; Writing Review and Editing: SA and FA; Visualization: NP; All authors, SA, FA, NP and NR have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7.4. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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