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Strategic and organisational factors for advancing knowledge in intelligent automation

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ABSTRACT

This study explores the determinants of intelligent automation implementation within organisations and their implications for strategic value and technological adoption. Grounded in diffusion of innovation theory, this study examines how digital competencies, technology absorptive capacity, and strategic value influence the adoption of intelligent automation. Using a quantitative approach, the findings reveal that digital competencies do not directly impact intelligent automation implementation, but exert an indirect influence through technology absorptive capacity and strategic value. Technology absorptive capacity emerges as a critical enabler facilitating the assimilation and application of the external knowledge necessary for intelligent automation integration, whereas strategic value plays a significant role in aligning intelligent automation adoption with organisational goals. These results emphasise the importance of absorptive and strategic capacities in bridging the gap between digital readiness and intelligent automation. This study highlights that successful intelligent automation adoption requires a multifaceted approach that integrates technological, organisational, and strategic considerations. Although intelligent automation offers substantial potential to improve operational efficiency and competitiveness, its adoption remains resource-intensive, necessitating investments in digital capabilities, training, and stakeholder engagement. This research also underscores the need for a human-centric approach to address employee concerns and align intelligent automation with broader organisational strategies. This study contributes to the literature on digital transformation and automation by providing empirical evidence of the determinants of intelligent automation implementation and their interplay. These findings offer insights for managers, policymakers, and researchers and pave the way for more effective and sustainable adoption strategies for intelligent automation. Future research should explore additional factors that influence the adoption of intelligent automation across diverse sectors and organisational contexts.

Introduction

The advent of the Fourth Industrial Revolution, characterised by the fusion of digital, physical, and biological systems, has profoundly transformed the landscape of modern business. Among the most significant developments in this era is the emergence of intelligent automation, a technology that integrates artificial intelligence (AI), robotic process automation (RPA), and business process management (BPM) to automate complex tasks in the exclusive domain of human workers (Ghobakhloo et al., 2023). Intelligent automation represents a paradigm shift in operational efficiency, allowing organisations to streamline processes, reduce costs, and enhance decision-making capabilities by simulating human intelligence and enabling systems to learn, adapt, and make autonomous decisions (Zhang et al., 2023). As organisations face the challenges and opportunities of the new technological frontier, the implementation of intelligent automation has become both a strategic priority and a necessity to maintain a competitive advantage in an ever more digital world.

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The drive to implement intelligent automation originates from the need to uphold operational efficiency and accomplish strategic goals in volatile market conditions. Intelligent automation provides a range of advantages that go beyond automation alone; it allows organisations to shift human resources from mundane tasks to critical activities that stimulate innovation and growth (Schwartz, 2022). By enhancing the accuracy and speed of decision-making processes, intelligent automation contributes to significant improvements in productivity and overall business performance (Singh, 2021). Nevertheless, despite its clear advantages, effectively incorporating intelligent automation into current business models is a multifaceted undertaking that necessitates technological knowledge and the establishment of resilient organisational abilities. These competencies are essential for overcoming the challenges associated with intelligent automation implementation, including issues related to system integration, data security, and the management of human-automation interaction.

In this context, the organisational aspects of its implementation remain underexplored in academic literature. Much of the existing research focused on technological advancements that underpin intelligent automation, such as developments in machine learning, deep learning, and natural language processing (Lee & Lee, 2023). While these studies significantly advanced our understanding of the technical capabilities of intelligent automation, they often overlook the critical role of organisational and managerial factors in facilitating intelligent automation adoption. This oversight has created a significant gap in the literature, particularly regarding how organisations can effectively leverage intelligent automation to achieve their strategic goals. One area that requires further investigation is the role of digitalisation competencies—the technical skills and organisational knowledge necessary for integrating digital technologies into business processes (Wang, 2022). Digitalisation competencies are crucial for ensuring that intelligent automation implementation is not only technically feasible, but also strategically aligned with the organisation's broader objectives.

Another critical, yet underexplored factor in intelligent automation implementation is technology-absorptive capacity. Technology absorptive capacity refers to an organisation's ability to recognise the value of new external knowledge, assimilate it, and apply it commercially (Cohen & Levinthal, 1990). Technology absorptive capacity is particularly relevant in the context of intelligent automation because it determines how effectively an organisation can integrate and leverage new automation technologies to enhance its capabilities (Mahmood & Mubarik, 2020). Organisations with high technological absorptive capacity are better positioned to continuously innovate by incorporating external knowledge into their existing processes, thereby maximising the potential benefits of intelligent automation (García-Morales et al., 2020). However, the specific impact of technology absorptive capacity on intelligent automation implementation has not been sufficiently explored, leaving a critical gap in our understanding of the mechanisms that enable successful digital transformations. This study addresses this gap by examining how technology absorptive capacity facilitates the relationship between digitalisation competencies and intelligent automation implementation, thereby providing a more comprehensive understanding of the factors that drive successful intelligent automation adoption.

The strategic value of intelligent automation, including benefits such as improved productivity, scalability, and enhanced customer engagement, is another key driver of intelligent automation adoption. Intelligent automation can provide competitive advantages by improving organisational efficiency and responsiveness to market changes (Ransbotham et al., 2022). However, the extent to which organisations perceive and realise these strategic benefits can vary depending on their existing capabilities and strategic priorities. Despite the recognised importance of strategic value in driving technology adoption, empirical research examining how these perceptions influence intelligent automation implementation is lacking. Addressing this aspect is essential for comprehending the motivational factors that prompt organisations to invest in intelligent automation technologies and for formulating tactics to optimise the return on these investments.

The theoretical foundation of this study is diffusion of innovation theory, which provides a robust framework for understanding how new technologies are adopted and diffused within an organisation. The diffusion of innovation theory posits that the adoption of innovation is influenced by several factors, including the perceived attributes of the innovation, characteristics of the social system, and communication channels used to disseminate information about the innovation (Rogers, 2003). In the context of intelligent automation, the diffusion of innovation theory can clarify the factors that affect the rate and extent of intelligent automation adoption within organisations. By integrating the diffusion of innovation theory with the concepts of digitalisation competencies, technology absorptive capacity, and strategic value, this study develops a comprehensive model of intelligent automation adoption and implementation, offering a holistic view of the factors that influence the organisational adoption of these transformative technologies. This study addresses the following research questions.

I. How do digitalisation competencies affect the implementation of intelligent automation?
II. How does technology absorptive capacity facilitate the implementation of intelligent automation?
III. How does the strategic value of intelligent automation influence its adoption and integration into organisational processes?

In an era in which digital transformation is becoming increasingly critical for organisational survival and success, understanding the factors influencing intelligent automation adoption is essential. Therefore, this study may have practical implications for managers and policymakers by offering a deeper understanding of the organisational capabilities required for successful intelligent automation implementation.

Literature review

Intelligent automation: an evolutionary leap in process automation

Intelligent automation has emerged as a pivotal technological advancement in the digital transformation landscape and represents a significant evolution from traditional automation technologies. Often referred to as cognitive automation, intelligent automation integrates artificial intelligence (AI), business process management (BPM), and robotic process automation (RPA) to automate, streamline, and scale business processes in a manner that extends beyond mere task automation (Ghobakhloo et al., 2023). The unique capability of intelligent automation to simulate human decision-making and autonomously manage complex workflow positions is a transformative force in the modern business environment (Zhang et al., 2023).

Unlike conventional process automation, which concentrates on automating discrete, repetitive tasks, intelligent automation addresses the entire workflow lifecycle, from data acquisition to decision making and execution. This holistic approach allows organisations to not only increase operational efficiency, but also enhance the accuracy and consistency of business processes (Lee & Lee, 2023). The integration of AI within intelligent automation frameworks enables systems to analyse large volumes of structured and unstructured data, generate insights, and make real-time data-driven decisions. This cognitive capability distinguishes intelligent automation from earlier automation technologies, and makes it particularly valuable in today's fast-paced, data-rich business environments (Schwartz, 2022).

Intelligent automation adoption is often regarded as a pivotal move in attaining hyperautomation, a comprehensive approach that employs diverse technologies such as digital twins and advanced analytics to automate nearly all operational facets of an organisation (Ransbotham et al., 2022). However, it is important to note that intelligent automation is not synonymous with hyper automation; rather, it is a foundational

element that organisations can build upon as they move towards more comprehensive automation strategies (Wang, 2022). Intelligent automation serves as an intermediary phase where businesses transition from traditional process automation to more advanced integrated systems capable of handling complex and dynamic business processes.

One of the most significant advantages of intelligent automation is its ability to enhance organisational agility and resilience (Mubarik et al., 2022). By implementing intelligent automation, organisations can automate decision-making processes and respond to business disruptions in real-time, allowing them to proactively address challenges and capitalise on opportunities as they arise (Singh, 2021). For example, during the COVID-19 pandemic, many organisations leveraged intelligent automation to adapt to sudden shifts in market demand and workforce availability, thereby maintaining continuity and competitiveness in the face of unprecedented challenges (Zhang et al., 2023). This ability to respond rapidly to external changes is critical in today's volatile business environment, where the speed and accuracy of decision-making can determine an organisation's success or failure.

Moreover, intelligent automation contributes to significant cost savings by reducing reliance on human labour for routine tasks, thereby freeing up resources for strategic initiatives. This both improves productivity and enhances the quality of outputs by minimising human errors and ensuring consistency across processes (Schwartz, 2022). The integration of BPM and RPA within intelligent automation frameworks further amplifies these benefits by optimising process workflows and automating back-office functions such as accounting and customer service, which are traditionally resource-intensive (Huang et al., 2022).

Despite its numerous advantages, the implementation of intelligent automation remains challenging. The integration of advanced technologies, such as AI, BPM, and RPA, requires a high level of technical expertise and organisational readiness. Factors such as IT infrastructure, management support, and regulatory compliance are crucial in determining the success of intelligent automation implementation (Cohen & Levinthal, 1990). Additionally, the complexity of intelligent automation systems can significantly disrupt the adoption phase, particularly if the organisation lacks the necessary digital competencies and absorptive capacity to effectively integrate these technologies into existing workflows (García-Morales et al., 2020).

Furthermore, the adoption of intelligent automation raises important ethical and social considerations, particularly regarding its impact on workforce. Although intelligent automation can augment human capabilities and improve productivity, it also brings the risk job displacement and increased income inequality if these technologies are not implemented with careful consideration of their social implications (Ransbotham et al., 2022). Therefore, organisations must strike a balance between leveraging the benefits of intelligent automation and addressing the potential challenges it poses to workers and society.

Theoretical background

The diffusion of innovation theory, developed by Rogers in 1962, provides a comprehensive framework for understanding how new technologies and innovations are adopted and spread across organisations and societies (Rogers, 1962). This theory posits that the adoption of innovation follows a process influenced by factors such as the characteristics of the innovation, the social system in which it is introduced, communication channels, and the time taken for the innovation to be adopted (Rogers, 2003). Studies, such as Ghobakhloo et al. (2023), investigated the automation's context with the lens of the technology, organisation, and environment (TOE) framework in terms of micro and macro organisational and social sustainability-related factors. Similarly, Chatterjee et al. (2021) focused on technology acceptance model (TAM) by investigating technological factors in the manufacturing context. Likewise, Pillai et al. (2022) undertook a resource-based view (RBV) and considered intelligent technologies as critical internal sources for firms. However, in this study, the diffusion of innovation serves as a critical lens through which the adoption and implementation of intelligent automation technologies can be analysed and understood. At its core, the diffusion of innovation identifies five key attributes that significantly influence the rate of adoption: (i) relative advantage, (ii) compatibility, (iii) complexity, (iv) trialability, and (v) observability (Rogers, 2003). These attributes provide a structured approach for examining how organisations perceive and adopt intelligent automation technologies, such as AI, BPM, and RPA.

Relative advantage refers to the degree to which an innovation is perceived to be superior to the technology it replaces. Intelligent automation could involve the perceived benefits of automating complex business processes, improving decision-making speed, enhancing accuracy, and reducing operational costs compared to traditional manual processes (Ng et al., 2021). Organisations that perceive a high relative advantage in adopting intelligent automation are more likely to implement these technologies rapidly. For instance, Lacity and Willcocks (2021) found that organisations that recognise the strategic benefits of intelligent automation, such as enhanced efficiency and competitive advantage, are more inclined to invest in and adopt intelligent automation solutions. Compatibility is the degree to which an innovation aligns with the existing values, past experiences, and needs of adopters. For intelligent automation, compatibility involves the integration of these technologies with the existing IT infrastructure, organisational workflows, and corporate culture (Coombs et al., 2020). The seamless integration of intelligent automation with current systems is crucial for its successful adoption. If intelligent automation technologies are perceived as compatible with an organisation's existing operations, the likelihood of adoption increases. Attaran (2023) emphasised that organisations with a high level of digital maturity and compatible infrastructure are better positioned to adopt intelligent automation technologies effectively.

Similarly, complexity pertains to the perceived difficulty of understanding and using innovation. Intelligent automation technologies, which involve sophisticated AI algorithms, advanced BPM tools, and RPA, can be perceived as complex, especially in organisations that lack digital competencies (Rogers, 2003). High perceived complexity can act as a barrier to adoption, as organisations may be reluctant to invest in technologies that are difficult to implement and manage. To mitigate this, organisations often rely on pilot projects or gradual implementation strategies to reduce the perceived complexity of intelligent automation (Ghosh, 2021). Trialability refers to the degree to which an innovation can be tested on a limited basis before full-scale implementation. This attribute is particularly relevant for intelligent automation because organisations often seek to test these technologies in specific departments or processes before committing to a broader rollout (Ng et al., 2021). Trialability allows organisations to assess the potential benefits and challenges of intelligent automation in a controlled environment, thereby reducing the risks associated with large-scale adoption. Coombs et al. (2020) noted that organisations that can experiment with intelligent automation on a small scale are more likely to recognise its value and proceed to full adoption. Finally, observability refers to the extent to which innovation results are visible to others. In the context of IA, observable outcomes may include improved efficiency, reduced costs, and enhanced decision-making capabilities. When the benefits of intelligent automation are easily observable both within the adopting organisation and in other organisations that implemented similar technologies, the rate of adoption is likely to increase (Rogers, 2003). Nevertheless, Attaran (2023) reported that organisations that could clearly observe the positive impacts of intelligent automation in other firms were more motivated to adopt these technologies. Therefore, the adoption and implementation of intelligent automation extend the diffusion of innovation by considering organisational and strategic factors.

Hypothesis development

Digitalisation competencies and intelligent automation

Digitalisation competencies, which encompass the technical skills, knowledge, and organisational capabilities required to integrate digital technologies into business processes, are crucial for the successful implementation of intelligent automation (Steens et al., 2024). These competencies enable organisations to effectively manage and leverage advanced technologies, which are integral components of intelligent automation (Ng et al., 2021). The positive impact of digitalisation competencies on intelligent automation can be attributed to several factors, including the ability to seamlessly integrate new technologies with existing systems, the capacity to manage the complexities of digital transformation, and organisational readiness to adopt and optimise these technologies (Ghobakhloo et al., 2023).

Research has shown that organisations with strong digitalisation competencies are more likely to successfully implement intelligent automation, leading to significant improvements in operational efficiency, decision-making accuracy, and overall business performance (Coombs et al., 2020; Hameed et al., 2024). These competencies enable firms to navigate the challenges associated with the adoption of intelligent automation, such as technical integration, data management, and workforce adaptation. To support this point of view, Lacity and Willcocks (2021) reported that firms with high digitalisation competencies could better align intelligent automation technologies with their strategic objectives, resulting in more effective and efficient automation processes. Moreover, digitalisation competencies facilitate the development of a digital culture within organisations, promoting innovation and continuous improvement (Mubarik et al., 2024; Pilkova et al., 2021). This cultural shift is essential for the successful adoption of intelligent automation because it encourages employees to embrace new technologies and processes. Similarly, Ghosh (2021) emphasised that organisations that invest in developing their digitalisation competencies are better positioned to leverage the full potential of intelligent automation, thereby achieving a competitive advantage in the market. Thus, we formulate the following:

Hypothesis 1. *Digitalisation competencies positively impact intelligent automation.*

Digitalisation competencies and technology absorptive capacity

Technology absorptive capacity refers to an organisation's ability to recognise the value of new external knowledge, assimilate it, and apply it commercially (Cohen & Levinthal, 1990). Digitalisation competencies are instrumental in enhancing technology absorptive capacity as they equip organisations with the necessary skills, knowledge, and infrastructure to effectively absorb and utilise new technologies (Xie et al., 2024). The relationship between digitalisation competencies and technology absorptive capacity is particularly relevant in the context of intelligent automation, where the integration of advanced technologies requires a high level of absorptive capacity. In addition, organisations with strong digitalisation competencies are better equipped to identify and evaluate new technological opportunities, such as AI and RPA, and to integrate these innovations into their existing processes (Ghosh, 2021). These competencies enable firms to effectively manage the complexities of digital transformation, including the assimilation of new knowledge and adaptation of existing processes to accommodate new technologies (Mubarik et al., 2023). Consequently, organisations with higher digitalisation competencies tend to exhibit greater *technology absorptive capacity*, allowing them to stay ahead of technological trends and maintain a competitive edge in the market.

Empirical studies also demonstrated that digitalisation competencies positively impact technology absorptive capacity by enhancing an organisation's ability to learn from external sources, such as industry best practices, technological advancements, and collaborative networks (Ng et al., 2021; Mubarak et al., 2023). This enhanced absorptive capacity facilitates the successful implementation of intelligent automation technologies, as firms can more effectively integrate and leverage these innovations to achieve strategic goals. Furthermore, the development of digitalisation competencies fosters a culture of continuous learning and innovation within organisations. This cultural shift supports the ongoing development of technology absorptive capacity, enabling firms to remain agile and responsive to technological changes. Coombs et al. (2020) highlight that organisations with strong digitalisation competencies are more likely to invest in ongoing training and development, further enhancing their absorptive capacity and ability to capitalise on new technologies. In this context, we formulate the following hypothesis:

Hypothesis 2. *Digitalisation competencies positively influence technology absorptive capacity.*

Digitalisation competencies and strategic value

The perceived strategic value of a technology refers to the extent to which an organisation believes that the technology will contribute to its strategic goals, such as improving competitive advantage, enhancing productivity, or fostering innovation (Coombs et al., 2020). Digitalisation competencies are closely linked to the perceived strategic value of intelligent automation because they enable organisations to better understand, evaluate, and realise the benefits of these technologies. Organisations with strong digitalisation competencies are more likely to perceive intelligent automation as strategically valuable because they enhance their ability to assess the potential impact of intelligent automation on their operations and strategic objectives (Ng et al., 2021). Firms with advanced digital skills can better align intelligent automation technologies with their strategic goals, leading to a more favourable perception of the value that intelligent automation can deliver. This alignment is crucial for driving the adoption and successful implementation of intelligent automation, as it ensures that technology is used in ways that directly support the organisation's strategic priorities.

Moreover, digitalisation competencies enable organisations to effectively communicate the strategic value of intelligent automation to key stakeholders, including senior management, employees, and external partners (Mubarak et al., 2021). This communication is essential for gaining buy-in and support for intelligent automation initiatives as it helps build a shared understanding of the technology's benefits and strategic importance (Lacity & Willcocks, 2021; Xie et al., 2024). Organisations that can clearly articulate the strategic value of intelligent automation are more likely to secure the resources and commitment required to successfully implement and optimise these technologies. Empirical research shows that the perceived strategic value of intelligent automation is a significant determinant of its adoption and success (Ghosh, 2021). Organisations with higher digitalisation competencies are better positioned to identify and leverage the strategic value of intelligent automation, leading to more successful outcomes. This relationship underscores the importance of investing in digital skills and capabilities to enhance the perceived strategic value of intelligent automation and drive its adoption in an organisation. Thus, we formulated the following hypotheses:

Hypothesis 3. *Digitalisation competencies positively improve perceived strategic value.*

Technology absorptive capacity and strategic value

Organisations with a high technology absorptive capacity are better equipped to recognise the potential benefits of intelligent automation and integrate this knowledge into their strategic frameworks, thereby increasing the perceived value of the technology (Cohen & Levinthal, 1990). This process is particularly important in dynamic environments where technological advancements occur rapidly and the ability to absorb and utilise external innovations can provide a significant competitive edge. Several empirical studies showed that technology absorptive capacity directly influences how organisations perceive the

strategic value of technology. For example, Arcidiacono et al. (2022) demonstrated that firms with strong absorptive capacities are more likely to view new technologies as strategically valuable, because they can more effectively align these technologies with their organisational goals. Likewise, this alignment enhances the strategic utility of intelligent automation by ensuring that it contributes to key performance indicators such as operational efficiency, customer satisfaction, and innovation capacity (Mehmood & Mubarik, 2020). Moreover, technology absorptive capacity enables organisations to better assess the long-term benefits and potential risks associated with intelligent automation, leading to a more informed and strategic evaluation of its value (Ghobakhloo et al., 2022). By effectively integrating external knowledge, organisations can anticipate how intelligent automation can be leveraged to achieve competitive advantage, thereby enhancing their perceived strategic value. This process also involves transforming external knowledge into actionable insights that can guide decision-making processes at the strategic level (Zahra & George, 2002; Kastelli et al., 2024). Additionally, organisations with a high technology absorptive capacity are better positioned to communicate the strategic value of intelligent automation to key stakeholders, including senior management and external partners. This communication is crucial for securing the resources and commitments necessary for intelligent automation initiatives. The ability to articulate the strategic benefits of IA, supported by a deep understanding of its potential, further reinforces its perceived value within the organisation (Lichtenthaler, 2009). Based on these arguments, we hypothesise the following:

Hypothesis 4. *Technology absorptive capacity positively effects perceived strategic value.*

Technology absorptive capacity and intelligent automation

Technology absorptive capacity is a critical enabler of successful intelligent automation adoption that enables the identification, assimilation, and application of external technological knowledge, which is essential for integrating complex intelligent automation technologies into organisational processes (Chatterjee et al., 2021). Organisations with high technology absorptive capacity are better equipped to overcome the challenges associated with intelligent automation implementation, such as technical integration, data management, and adaptation of existing workflows to accommodate new technologies. Other studies demonstrate that technology absorptive capacity positively impacts the adoption and optimisation of intelligent automation by enhancing an organisation's ability to effectively integrate external technological innovations (Ghobakhloo et al., 2022). For instance, organisations with strong absorptive capacities are more likely to successfully implement intelligent automation technologies because they can more effectively assimilate new knowledge and apply it to improve business processes (Zahra & George, 2002). This ability to integrate external knowledge is particularly important in the context of intelligent automation, where the rapid evolution of technology requires organisations to continuously update their capabilities to remain competitive.

Moreover, technology absorptive capacity supports the continuous improvement and optimisation of intelligent automation technologies within organisations. By facilitating the assimilation of external knowledge, technology absorptive capacity enables firms to refine and enhance their intelligent automation systems over time, thereby leading to better performance outcomes (Lichtenthaler, 2009). This continuous improvement process is essential for maximising the benefits of IA, as it ensures that the technology remains aligned with organisational goals and adapts to changing business environments. The empirical evidence also suggests that technological absorptive capacity plays a significant role in mitigating the risks associated with intelligent automation. For example, firms with high absorptive capacity can better anticipate and address potential challenges during the intelligent automation adoption process, such as resistance to change and technical integration issues (Arcidiacono et al., 2022). This proactive approach to managing intelligent automation implementation not only improves the chances of successful adoption but also enhances the overall effectiveness of technology.

Hypothesis 5. *Technology absorptive capacity positively improves intelligent automation.*

Strategic value and intelligent automation

The perceived strategic value of a technology is a critical determinant of its adoption and success within an organisation (Mubarak et al., 2024). Strategic value refers to the extent to which intelligent automation contributes to an organisation's long-term goals, such as improving efficiency, fostering innovation, and gaining a competitive advantage (Coombs et al., 2020). Organisations that perceive intelligent automation as strategically valuable are more likely to invest in its implementation and integration into their business processes.

Research has shown that the perceived strategic value of intelligent automation significantly influences its adoption and optimisation within organisations. For instance, organisations that recognise the strategic benefits of intelligent automation, such as enhanced decision-making capabilities, improved operational efficiency, and better customer experiences, are more likely to prioritise its implementation (Ng et al., 2021). This prioritisation often leads to increased investment in intelligent automation technologies and the development of the necessary infrastructure and competencies to support its successful adoption. Furthermore, the strategic value of intelligent automation enhances its integration into organisational processes by ensuring that the technology is aligned with the company's strategic objectives. This alignment is crucial for maximising the benefits of intelligent automation, as it ensures that technology is used in ways that directly support the organisation's long-term goals (Lacity & Willcocks, 2021). For example, companies that view intelligent automation as a key driver of innovation are more likely to implement it in areas in which it can have the greatest impact, such as product development or customer service.

The strategic value of intelligent automation is critical in securing stakeholder support. When senior management and other key stakeholders perceive intelligent automation as strategically valuable, they are more likely to provide the necessary resources and commitment to ensure its successful implementation (Coombs et al., 2020). This support is essential for overcoming the challenges associated with intelligent automation adoption, such as resistance to change or the need for significant organisational restructuring. Extant studies confirmed that the perceived strategic value of intelligent automation is a significant predictor of successful adoption and implementation (Ghobakhloo et al., 2023). For instance, Ghosh (2021) found that organisations that perceive intelligent automation as strategically valuable are more likely to invest in its development and optimisation, leading to better performance outcomes. This relationship underscores the importance of aligning intelligent automation with organisational strategies to ensure successful adoption and integration.

Hypothesis 6. *Intelligent automation positively improves intelligent automation.*

The hypotheses of this study are presented in the research framework shown in Fig. 1.

Research methodology

This study employed a quantitative research method, which is characterized by the collection and analysis of numerical data to identify patterns, test hypotheses, and determine relationships between variables. The research followed a deductive approach, which involves developing hypotheses based on existing theories and then testing these hypotheses through empirical data. The population of this study consists of multinational firms, as these organizations possess the resources and capabilities necessary to adopt advanced technological initiatives, such

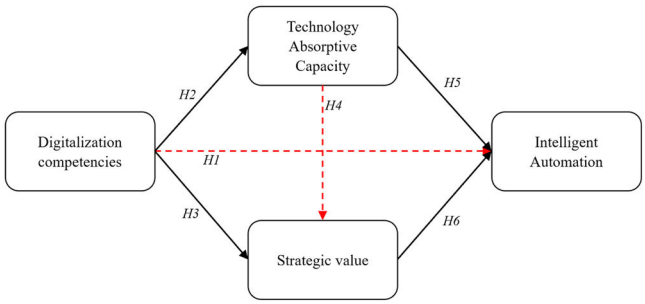

Fig. 1. Conceptual framework of study.

as intelligent automation. In contrast, small and medium-sized enterprises (SMEs), due to resource constraints, often rely on collaborations with other firms of similar scale or with larger organizations to leverage shared assets and expertise. This distinction underscores the unique capacity of multinational firms to independently drive the implementation of intelligent automation.

The data for this study was collected using a structured questionnaire designed to measure four key variables: technology absorptive capacity, digital competencies, strategic value, and intelligent automation. Each variable was operationalized through specific indicators, ensuring the validity and reliability of the measures by drawing on established scales from the literature. Technology absorptive capacity was measured using four indicators based on the work of Müller et al. (2021) and ul Zia et al. (2023), focusing on the organization's ability to identify, assimilate, and apply external technological knowledge. Digital competencies were also measured with four indicators, adapted from Pillai et al. (2022) and Ghobakhloo et al. (2022), capturing the skills and capabilities necessary for effectively managing digital technologies, which are critical for the successful adoption of intelligent automation. The strategic value of intelligent automation was assessed using five indicators derived from the frameworks of Chatterjee et al. (2021) and Ghobakhloo and Ching (2019), evaluating how organizations perceive intelligent automation as contributing to their strategic objectives, such as enhancing efficiency and competitive advantage. Lastly, the extent of intelligent automation implementation was measured with three indicators from the studies of Ghobakhloo and Ching (2019) and Chatterjee et al. (2021), reflecting the degree of integration of intelligent automation technologies like AI, BPM, and RPA into operational processes. Respondents rated each indicator on a Likert scale, providing quantifiable measures for each variable. The use of validated indicators from reputable sources ensures that the instrument is robust and accurately captures the relevant aspects of each construct as they pertain to the adoption and strategic impact of Intelligent Automation. The details of instrument of study are given in Table 1.

The sampling frame for this study comprised multinational manufacturing companies. These companies were chosen because they are typically leaders in adopting new technological innovations and are more likely to be acquainted with the concept of intelligent automation implementation. The focus on multinational firms also enhances the generalizability of the study's findings. We collaborated with an international research consortium and industrial partners to identify a list of 685 multinational manufacturing companies, complete with their contact information. The survey was administered online in 2022. To improve data reliability and mitigate the risk of method bias, we utilized a multiple informant technique. The use of multiple informants is widely recognized in organizational studies, especially when the survey instrument measures various contextual factors. This approach provides a more comprehensive understanding of the organizational context and reduces the potential for bias in responses. Following the administration of the online survey and subsequent follow-up activities, we received 177 usable responses, yielding a response rate of 25.84 % which is acceptable for analysis in social sciences.

Results

Assessments of the measurement model

The measurement model was evaluated using established criteria for convergent validity and reliability. The constructs analyzed in this study – *technology absorptive capacity, digital competencies, strategic value, and intelligent automation* – demonstrated robust psychometric properties, as outlined in Table 2. The convergent validity was assessed through the average variance extracted (AVE), with values ranging from 0.643 technology absorptive capacity to 0.724 digital competencies. All AVE values exceeded the recommended threshold of 0.50 (Hair et al., 2019), indicating that each construct explains a significant portion of the variance in its indicators. These results confirm that the constructs are appropriately capturing the intended dimensions of the underlying latent variables. Moreover, the internal consistency of the constructs was evaluated using composite reliability (CR) and Cronbach's alpha (CB Alpha). CR values ranged from 0.831 digital competencies to 0.890 technology absorptive capacity, exceeding the acceptable threshold of 0.70, which suggests high reliability of the constructs (Sarstedt et al., 2020). Similarly, Cronbach's Alpha values ranged from 0.810 digital competencies to 0.889 technology absorptive capacity, further supporting the internal consistency and reliability of the measurement model (Henseler et al., 2016). Likewise, the factor loadings ranged from 0.737 to 0.893 across all constructs, surpassing the acceptable threshold of 0.70 (Ringle et al., 2018). This indicates strong correlations between the indicators and their respective constructs, further reinforcing the robustness of the measurement model. The results are shown in Table 2.

According to the Fornell-Larcker criterion, discriminant validity is established when the square root of the AVE of a construct is greater than its correlations with other constructs. The diagonal elements in the table represent the square root of the AVE for each construct, while the off-diagonal elements represent the correlations between the constructs. For technology absorptive capacity, the square root of the AVE is 0.802, which is higher than its correlations with digital competencies (0.303), strategic value (0.330), and intelligent automation (0.371). Similarly, digital competencies have a square root of the AVE of 0.851, which is greater than its correlations with strategic value (0.369) and intelligent automation (0.342), supporting the discriminant validity of digital competencies. For strategic value, the square root of the ave is 0.807,

Table 1
Instrument of data collection.

Variables	Indicators	Sources
Technology absorptive capacity	4	Müller et al. (2021), ul zia et al. (2023)
Digital competencies	4	Pillai et al. (2022), Ghobakhloo et al. (2022)
Strategic value	5	Chatterjee et al. (2021), Ghobakhloo and Ching (2019)
Intelligent automation	3	Ghobakhloo and Ching (2019), Chatterjee et al. (2021)

Table 2
Assessments of measurement model.

Variables	Convergent validity and reliability			Factor loadings range
	AVE	CR	CB Alpha	
Technology absorptive capacity	0.643	0.890	0.889	*0.753 to 848*
Digital competencies	0.724	0.831	0.810	*0.817 to 0.893*
Strategic value	0.651	0.847	0.821	*0.737 to 0.865*
Intelligent automation	0.655	0.832	0.824	*0.773 to 0.861*

which exceeds its correlations with technology absorptive capacity (0.330), digital competencies (0.369), and intelligent automation (0.379). Lastly, intelligent automation exhibits a square root of the ave of 0.809, which is higher than its correlations with technology absorptive capacity (0.371), digital competencies (0.342), and strategic value (0.379). These results confirm that intelligent automation is distinct from the other constructs. In addition, the variance inflation factor (VIF) values for each construct, ranging from 1.621 to 2.662, are well below the commonly accepted threshold of 5, indicating that multicollinearity is not a concern in this study (Hair et al., 2019). This further supports the robustness of the discriminant validity findings. The results of discriminant validity are shown in Table 3.

Results of the structural model

The results of the structural model provide important insights into the relationships among digital competencies, technology absorptive capacity, strategic value, and intelligent automation. The findings highlighted varying levels of significance for the hypothesised relationships, as detailed below.

The relationship between digital competencies and intelligent automation ($\beta = 0.111$, t value $= 1.435$, p value $= 0.151$) was found to be positive but not statistically significant. This suggests that, while digital competencies may play a role in enabling the adoption of intelligent automation, other factors might exert a stronger influence on the implementation process. This finding aligns with prior research indicating that digital competencies often need to be complemented by other organisational capabilities to drive automation success (Ng et al., 2021). Conversely, digital competencies significantly influence technology absorptive capacity ($\beta = 0.303$, t value $= 4.295$, p value $= 0.000$). This indicates that organisations with robust digital capabilities are better positioned to acquire, assimilate, and apply external technological knowledge. This supports the theory of absorptive capacity, which emphasises the critical role of foundational skills and infrastructure in fostering innovation adoption (Cohen & Levinthal, 1990). The impact of digital competencies on strategic value ($\beta = 0.175$, t value $= 1.931$, p value $= 0.054$) approaches statistical significance, suggesting that organisations with advanced digital competencies may recognise the strategic benefits of intelligent automation, such as fostering innovation and enhancing competitiveness. However, borderline significance indicates potential contextual or mediating factors that may affect this relationship (Chatterjee et al., 2021). The relationship between technology absorptive capacity and strategic value ($\beta = -0.020$, t value $= 0.216$, p value $= 0.829$) was not supported, indicating that absorptive capacity does not directly influence the perceived strategic value of intelligent automation in this context. This finding suggests that the translation of technological capabilities into strategic insights may depend on additional organisational factors such as strategic alignment or leadership priorities (Zahra & George, 2002). In contrast, the relationship between technology absorptive capacity and intelligent automation ($\beta = 0.327$, t value $= 4.496$, p value $= 0.000$) is both positive and statistically significant. This highlights the critical role of absorptive capacity in facilitating the integration and optimisation of automation technologies. Organisations with a higher absorptive capacity are better equipped to implement intelligent automation effectively, emphasising the importance of developing robust technological capabilities (Lichtenthaler, 2009). Finally, strategic value significantly influences intelligent automation ($\beta = 0.312$, t value $= 4.424$, p value $= 0.000$), underscoring the importance of aligning automation initiatives with organisational strategic goals. Organisations that perceive intelligent automation as strategically valuable are more likely to invest in and successfully implement these technologies, which is consistent with findings in the literature on technology adoption and strategic management (Coombs et al., 2020). The R^2 value for intelligent automation was 0.285, indicating that 28.5 % of the variance in intelligent automation was explained by the independent variables in the model. While this suggests a moderate explanatory power, it also highlights the potential influence of other unmeasured factors on intelligent automation adoption. The results of the structural model are listed in Table 4.

Table 3
Discriminant validity by Fornell-Larcker criterion.

Variables	1	2	3	4
Technology absorptive capacity (1)	0.802			
Digital competencies (2)	0.303	0.851		
Strategic value (3)	0.330	0.369	0.807	
Intelligent automation (4)	0.371	0.342	0.379	0.809

Discussion

The findings provide an understanding of the digital transformation phenomenon through the diffusion of innovation by examining how digitalisation competencies, technology absorptive capacity, and strategic value shape intelligent automation implementation. This study reveals that digitalisation competencies do not have a significant direct impact on intelligent automation implementation. Instead, technological absorptive capacity and strategic value mediate its influence, highlighting an indirect pathway. This finding suggests that, while digital competencies provide the foundational skills and infrastructure necessary for intelligent automation adoption, they are not sufficient on their own to drive implementation. This aligns with prior studies, such as Ghobakhloo et al. (2023), who emphasised that digital competencies must be integrated into organisational processes and strategic objectives to unlock their full potential for technological adoption. The indirect effect of technology absorptive capacity signifies that digital skills enhance an organisation's capacity to absorb and utilise external knowledge, thereby facilitating the integration of automation systems. Furthermore, the influence of strategic value underscores the importance of aligning digital initiatives with perceived strategic benefits, such as operational efficiency and competitive advantage (Cohen & Levinthal, 1990; Chatterjee et al., 2021). These findings challenge the conventional view that digitalisation alone drives the adoption of automation. Instead, they highlighted the need for firms to complement their digital capabilities with absorptive and strategic capacities to achieve meaningful intelligent automation integration.

Furthermore, absorptive capacity emerged as a pivotal determinant of intelligent automation implementation, reinforcing its role as an enabler of technological integration. Firms with a higher absorptive capacity are better positioned to assimilate external innovations and align them with internal capabilities, thereby facilitating the seamless adoption of intelligent automation. This finding resonates with Arcidiacono et al. (2022), who demonstrate that absorptive capacity significantly enhances firms' ability to adopt smart manufacturing technologies. Technology absorptive capacity also serves as a mediating factor through which digitalisation competencies influence intelligent automation, underscoring its importance in bridging the gap between technological readiness and operational implementation. However, the

Table 4
Results of the structural model.

Hypotheses	Beta value (β)	Standard deviation (STDEV)	T statistics	p values	Decision
DC → IA	0.111	0.078	1.435	0.151	Rejected
DC → TAC	0.303	0.071	4.295	0.000	Supported
DC →SV	0.175	0.091	1.931	0.054	Borderline
TAC→SV	−0.020	0.095	0.216	0.829	Rejected
TAC→IA	0.327	0.073	4.496	0.000	Supported
SV→IA	0.312	0.071	4.424	0.000	Supported

Abbreviations: DC – Digitalization competencies; IA – Intelligent automation; TAC – Technology absorptive capacity; SV – Strategic value.

lack of a direct impact of technology absorptive capacity on strategic value highlights the critical nuance that absorptive capacity is essential for the technical aspects of intelligent automation integration and that its strategic implications depend on other factors such as leadership, cultural alignment, and external stakeholder engagement. This finding aligns with the notion that the interplay between human, organisational, and technological contexts shapes innovation outcomes (Chatterjee et al., 2021; Yusof et al., 2008).

In addition, we find that strategic value plays a significant role in determining intelligent automation implementation, highlighting the importance of aligning automation initiatives with organisational objectives. Organisations that perceive intelligent automation as strategically valuable are more likely to prioritise its adoption and allocate the necessary resources for implementation. This finding is consistent with that of Coombs et al. (2020), who identified perceived strategic value as a critical factor in the adoption of advanced technologies. The strong relationship between strategic value and intelligent automation underscores the importance of communicating the tangible benefits of automation such as enhanced efficiency, innovation, and customer satisfaction to gain stakeholder buy-in and support. Moreover, the indirect impact of digitalisation competencies on intelligent automation through strategic value suggests that digital competencies play a critical role in shaping an organisation's strategic outlook, enabling firms to recognise and capitalise on the potential benefits of automation.

In addition, the moderate explanatory power of the model for intelligent automation implementation indicates that digitalisation competencies, technology absorptive capacity, and strategic value are significant but not exhaustive determinants of digital transformation. This finding highlights the potential influence of unmeasured variables, such as regulatory pressures, industry-specific dynamics, and organisational culture, which warrant further investigation in future studies. This relatively modest explanatory power suggests that the adoption of intelligent automation is a multifaceted process influenced by the complex interplay of technological, organisational, environmental, and human factors. Ghobakhloo et al. (2023) emphasised the role of external pressures and stakeholder engagement in shaping automation adoption, which could be explored further to enhance the predictive power of the model.

Conclusions

This study aimed to explore the relationships among digitalisation competencies, technology absorptive capacity, strategic value, and their impact on the implementation of intelligent automation. By empirically testing the proposed model, this study provides new insights into the dynamics of intelligent automation adoption, emphasising the interplay among technological capabilities, absorptive capacities, and strategic alignment. The findings indicate that digitalisation competencies do not directly influence intelligent automation implementation, challenging the assumptions in prior literature that emphasise the direct role of digitalisation in driving automation. Instead, digitalisation competencies were found to indirectly affect intelligent automation through technology absorptive capacity and strategic value, highlighting the mediating roles these constructs play. Specifically, technology absorptive capacity has emerged as a critical enabler that facilitates the integration of external knowledge into internal processes to support intelligent automation adoption. This finding underscores the importance of building absorptive capacities within organisations to leverage digital competencies effectively.

Similarly, strategic value was shown to be a significant driver of intelligent automation implementation, demonstrating that organisations are more likely to adopt intelligent automation when its strategic benefits such as operational efficiency and competitive advantage are well recognised. These results emphasise the importance of aligning automation initiatives with broader organisational goals to maximise their perceived value and operational impact. While the relationships between digitalisation competencies, technology absorptive capacity, strategic value, and intelligent automation are supported, the absence of a significant direct effect of technology absorptive capacity on strategic value suggests that technical capabilities alone may not shape strategic perspectives. This finding points to the influence of other organisational factors such as leadership, cultural alignment, and stakeholder engagement in determining how intelligent automation's strategic value is perceived and leveraged.

These results hint at the necessity of a multifaceted approach to intelligent automation adoption, in which firms must not only invest in digital skills but also develop absorptive and strategic capacities. Organisations can better position themselves to successfully adopt and integrate intelligent automation solutions by fostering an alignment between technological, organisational, and strategic elements. This study contributes to the literature on digital transformation and automation by providing a theoretical framework and empirical evidence to explain the determinants of the implementation of intelligent automation. These findings are expected to guide practitioners in designing strategies for the adoption of intelligent automation and inform policymakers about creating supportive ecosystems for digital innovation. Future research should investigate additional contextual and external factors such as competitive pressures and regulatory frameworks to enhance the understanding of intelligent automation adoption dynamics.

Theoretical implications

This study advances the theoretical understanding of intelligent automation adoption by leveraging the diffusion of innovation theory to explain how organisations integrate intelligent automation into their operations. Intelligent automation, which is characterised by the convergence of AI, BPM, and RPA, is a transformative technology that reshapes business processes and decision-making systems. As intelligent automation gains traction as a near-term practical solution for process automation, understanding the factors that influence its implementation becomes critical.

This study enriches the embryonic intelligent automation literature by offering empirical evidence on the determinants of intelligent automation implementation and addressing the gaps in the existing research. By examining the interplay between digitalisation competencies, technology absorptive capacity, and strategic value, this study identifies the pathways through which these constructs influence intelligent automation adoption, aligning with the innovation decision process outlined in the diffusion of innovation's framework. Specifically, the study highlights the critical role of technology absorptive capacity and strategic value as mediators, demonstrating that the successful diffusion of intelligent automation technologies depends not only on technological readiness, but also on the organisation's ability to absorb, assimilate, and strategically align innovations. Furthermore, the findings contribute to the diffusion of innovation frameworks by emphasising the indirect influence of digitalisation competencies on intelligent automation. While prior studies on the diffusion of innovation often consider technological competencies to be direct enablers of innovation adoption, this study reveals that such competencies achieve their full potential when integrated into absorptive and strategic capacities. This nuanced understanding extends the applicability of the diffusion of innovation theory to complex, multi-component technologies, such as intelligent automation, which require organisations to navigate technical, operational, and strategic challenges simultaneously. This study also highlighted the strategic importance of perceiving intelligent automation as a value-generating innovation. Consistent with the diffusion of innovation's emphasis on relative advantage as a key driver of adoption, the results suggest that firms are more likely to implement intelligent automation when strategic benefits such as enhanced efficiency and competitiveness are well articulated.

By grounding its analysis in diffusion of innovation theory, this study

provides a robust theoretical foundation for studying intelligent automation adoption, offering a framework for future studies exploring additional determinants, including cultural, regulatory, and environmental factors. The insights generated here not only validate the diffusion of innovation relevance in the context of intelligent automation but also extend its theoretical boundaries to account for the complexity of disruptive automation technologies. This study contributes to the broader field of digital transformation research by integrating the diffusion of innovation theory with empirical evidence, providing a comprehensive understanding of the drivers of and barriers to intelligent automation adoption. These results create a path for upcoming research to enhance and broaden the theoretical structures employed to investigate developing technologies in everchanging organisational settings.

Practical implications

The findings of this study have several practical implications for managers, policymakers, and industry stakeholders with the aim of successfully implementing intelligent automation. However, successful adoption requires a multifaceted approach that goes beyond technological readiness. The study emphasises that, while digital competencies are foundational for intelligent automation adoption, their impact is largely indirect. To fully leverage their potential, organisations must supplement these competencies with absorptive capacity and strategic alignment. To ensure that digital capabilities are effectively integrated with long-term organisational objectives, managers should encourage a culture of learning and continuous skill development. Furthermore, communicating the strategic value of intelligent automation to both internal and external stakeholders is crucial for securing buy-ins and support. In this context, technology related absorptive capacity emerged as a key determinant of intelligent automation implementation, underlining the importance of organisations' ability to assimilate and apply external knowledge. Firms should actively enhance their absorptive capacity by engaging in technological advancements, fostering collaboration with industry peers, and maintaining awareness of emerging opportunities. This capacity facilitates intelligent automation integration and strengthens an organisation's overall innovation capabilities. Moreover, strategic value plays a significant role in driving intelligent automation adoption, highlighting the need for organisations to articulate the business benefits of intelligent automation clearly. Firms that align intelligent automation initiatives with their strategic goals, such as enhancing customer satisfaction, increasing process efficiency, and fostering innovation, are more likely to prioritise and successfully implement technology. Managers should ensure that intelligent automation is positioned as a value-generating innovation that aligns with an organisation's broader objectives.

These findings underscore the resource-intensive nature of intelligent automation, including the need for software and hardware, employee training, and management of potential disruptions during the integration phase. Furthermore, a human-centric approach is essential to address employee concerns related to automation, such as fear of job displacement and reduced autonomy. Transparent communication and active employee involvement in the intelligent automation integration process can alleviate these concerns and foster a collaborative environment. Intelligent automation offers a strategic tool for organisations to enhance their competitiveness and resilience, particularly in the face of market uncertainty and disruption. Firms should view intelligent automation as a mechanism for improving agility, optimising processes, and maintaining a competitive edge in dynamic business environments. Policymakers and industry leaders also play a critical role in fostering intelligent automation adoption by providing supportive ecosystems including training programs, subsidies, and regulatory frameworks that address ethical and workforce adaptation challenges. Collaboration among governments, academic institutions, and technology providers can bridge the resource and knowledge gaps that hinder intelligent automation implementation.

Limitations and future research

This research is grounded in the diffusion of innovation theory and focuses on the relationships among digital competencies, technology absorptive capacity, strategic value, and intelligent automation. Although this approach offers valuable insights, the study did not explore the potential moderating or mediating relationships beyond the identified pathways. Future research could expand on these findings by integrating constructs such as organisational culture, regulatory pressures, and leadership support, which may influence intelligent automation adoption dynamics. Second, the data were drawn primarily from a specific sample of large multinational firms operating in relatively mature technological environments. Smaller firms or businesses in less technologically advanced settings may not have access to resources and a well-established digital infrastructure, unlike these organisations. Researchers should examine how smaller firms or organisations in developing economies navigate intelligent automation adoption, potentially encountering different challenges and opportunities shaped by resource constraints and external pressures. Third, although the study highlighted the critical roles of technology absorptive capacity and strategic value in mediating the impact of digital competencies on intelligent automation, it did not consider potential variations across industries or sectors. Intelligent automation adoption may vary between sectors, depending on their distinct operational needs, competitive landscape, or regulatory obligations. Future studies could explore sector-specific drivers and barriers to intelligent automation implementation to provide a more nuanced understanding of adoption patterns. Finally, the present research assumes a static perspective on intelligent automation implementation, analysing the factors influencing adoption at a particular point in time. Intelligent automation is a constantly evolving technology and its implementation may occur through various stages, influenced by advancements in technology and organisational priorities. Subsequent research could implement a longitudinal methodology to capture the progressive changes in the adoption of intelligent automation and its enduring influence on organisational performance and sustainability outcomes.

Availability of data and materials

Confidential and not available.

CRediT authorship contribution statement

Mobashar Mubarik: Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Saule Maciukaite-Zviniene:** Writing – review & editing, Funding acquisition, Data curation, Conceptualization. **Muhammad Faraz Mubarak:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Morteza Ghobakhloo:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Anna Pilkova:** Conceptualization, Investigation, Validation, Writing – review & editing.

Declaration of competing interest

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