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Information technology capability, digital transformation strategy and digital innovation performance: Basis for digital transformation development framework

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Abstract

Building a solid foundation for digital transformation success requires a comprehensive understanding of the factors influencing innovation performance. This study examines the synergy between IT capabilities and digital transformation strategies, laying the groundwork for the development of a novel digital transformation maturity framework that empowers organizations to assess, refine, and optimize their digital journey. Through a data-driven approach, this unveil the key levers for crafting effective digital transformation initiatives and unveil a practical framework for organizations to navigate their unique path to digital maturity. The study used quantitative research design and a survey questionnaire was used to collect data from 400 employees of top five traditional manufacturing companies in Beijing China. The data was analyzed using descriptive statistics and correlation analysis. The findings revealed that the respondents moderately agreed in the companies IT capabilities in terms of digital product innovation performance, digital process innovation performance and IT human resource performance. They displayed moderate agreement with the digital transformation strategy, with slightly higher support for the business process component compared to the organizational transformation and business model process. Agreement on digital innovation performance varied, with productivity seeing the highest satisfaction, followed by growth and profitability. A very weak negative relationship was found between the business model process and productivity, it differed significantly from the weak positive relationship observed between digital product innovation performance and both business model process and productivity.

Keywords: information technology capability, digital transformation strategy, digital innovation performance, digital transformation maturity framework

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1. Introduction

In the fast-paced era of digitalization, where technology evolves at breakneck speed, organizations face the constant pressure to adapt and thrive. Digital transformation (DT) has become the key differentiator, enabling businesses to create new value propositions, optimize operations, and gain a competitive edge. However, navigating the complexities of DT requires a holistic approach that considers not just the technology itself, but also the underlying capabilities, strategic vision, and innovation practices. Using an empirical study of Bangladeshi SMEs, Akter et. al., find a strong positive relationship between DT capability and firm performance. Their findings highlight the importance of investing in IT infrastructure, upskilling the workforce, and fostering a supportive organizational culture for successful DT implementation in emerging markets.

At the heart of any successful DT initiative lies a strong IT foundation. This encompasses not just the hardware and software infrastructure, but also the skills, processes, and governance structures that enable the effective deployment and utilization of technology. Having a modern and scalable IT infrastructure is essential for supporting digital initiatives. This includes cloud computing, data management systems, cybersecurity solutions, and robust communication networks. Building a workforce equipped with the necessary digital skills is crucial. This involves ongoing training and development programs to upskill employees in areas such as data analysis, cloud computing, and Agile methodologies. Implementing efficient IT processes and governance structures ensures optimal technology utilization. This includes robust project management, data governance frameworks, and clear decision-making mechanisms. Mithas et. al., find a strong positive relationship between IT capability and both operational and financial performance measures. Moreover, the study identifies moderators that strengthen or weaken the relationship, such as industry context, firm size, and IT governance practices. This comprehensive analysis provides valuable insights for organizations seeking to leverage IT capability for improved performance.

A well-defined DT strategy acts as the roadmap for an organization's digital journey. It articulates the organization's vision for the future, identifies key priorities, and outlines the specific actions needed to achieve desired outcomes. Setting a clear vision for the future state of the organization in the digital realm is crucial. This vision should be aligned with overall business goals and supported by SMART objectives (Specific, Measurable, Achievable, Relevant, and Time-bound). Prioritizing and sequencing various digital initiatives ensures efficient resource allocation and maximizes return on investment. This roadmap should consider factors such as technological feasibility, business impact, and organizational readiness. Effective DT requires embracing change. A robust change management strategy helps navigate organizational resistance, foster employee engagement, and ensure successful implementation of digital initiatives. Nambisan et. al., (2019) identify four key stages in digital transformation strategy formulation: initiating, crafting, formalizing, and implementing. They further propose a research agenda outlining gaps and opportunities for future research, focusing on aspects such as dynamic capabilities, ecosystem orchestration, and measurement of digital transformation success.

Continuous innovation is the engine that drives digital maturity. Organizations need to cultivate a culture of innovation that encourages experimentation, embraces risk-taking, and fosters the development of new ideas and solutions. Fostering a culture of creativity and collaboration is key to unlocking innovation potential. This involves implementing initiatives that encourage idea generation, cross-functional collaboration, and open communication. Leveraging data to inform decision-making is crucial for driving effective digital innovation. This involves investing in data analytics capabilities, utilizing insights to guide product development, and optimizing marketing campaigns. Embracing an agile approach to experimentation allows

organizations to test new ideas quickly and adapt to changing market dynamics. This fosters a culture of continuous learning and improvement. Gebauer et. al., proposes a mixed-methods framework for measuring digital innovation performance, combining quantitative indicators with qualitative assessment methods. The authors identify six key dimensions of digital innovation performance: digital strategy, digital infrastructure, digital assets, digital processes, digital culture, and digital outcomes. They validate their framework through an empirical study of German companies, demonstrating its effectiveness in providing a comprehensive understanding of an organization's digital innovation capabilities.

China's manufacturing sector, once synonymous with low-cost production lines churning out basic goods, finds itself at a crossroads. The winds of digital transformation are sweeping across the global landscape, and Chinese manufacturers, the titans of yesteryear, face an existential question: adapt or fade away. For too long, China's reliance on cheap labor and low-tech operations masked weaknesses in its IT infrastructure. Silos of data, outdated software, and a lack of skilled IT personnel hampered efficiency and stifled innovation. However, a wave of awareness has washed over the manufacturing landscape. Companies are investing heavily in modernizing their IT infrastructure, embracing cloud computing, and adopting advanced data analytics tools. This digital infrastructure upgrade is fostering greater automation, optimizing supply chains, and enabling data-driven decision-making. However, the journey is far from over. Smaller players still wrestle with limited financial resources and a workforce unprepared for the digital shift, widening the IT capability gap within the sector.

Recognizing the imperative of digital transformation, Chinese manufacturers are devising strategies to navigate the new terrain. Flagship companies like Huawei and ZTE are spearheading the charge, establishing dedicated digital transformation offices and formulating well-defined roadmaps. These strategies often target key areas like smart manufacturing, artificial intelligence integration, and e-commerce platforms. However, not all companies are strategizing with equal clarity. Many smaller players lack the resources or knowledge to formulate comprehensive plans, resorting to piecemeal initiatives or simply mimicking larger competitors. This raises concerns about the effectiveness and sustainability of their transformation efforts.

While China produces a staggering volume of goods, true innovation has often been elusive. Companies like Xiaomi and DJI are leading the charge, developing cutting-edge technology in their respective fields. This nascent innovative spirit is fueled by increased R&D spending and a growing pool of STEM graduates. However, systemic challenges remain. Intellectual property protection issues discourage investment in groundbreaking technologies, and a cultural preference for risk aversion stifles creative exploration. Additionally, the focus on replicating existing models leaves many companies trapped in a cycle of low-value innovation. The legacy of China's manufacturing sector is undeniable. However, its future rests on its ability to adapt and evolve. By leveraging its strengths, embracing digital transformation, and nurturing innovation, China's manufacturing giants can not only survive but thrive in the new digital age, rewriting their story from mere producers to pioneers of the future.

In the digital age, success hinges on the ability to navigate the complexities of DT. By leveraging the right IT capabilities, implementing a strong DT strategy, and fostering a culture of innovation, organizations can achieve higher levels of digital maturity and thrive in the ever-evolving digital landscape. A robust DTMM provides a valuable tool for organizations to assess their progress, define their goals, and ultimately, transform into digital leaders.

This paper uncovers how traditional manufacturing companies match their technological and social attribute resources to successfully implement a digital transformation strategy. Specifically, determined IT capabilities in terms of digital product innovation performance, digital process innovation performance and IT human resource performance; determined the digital transformation strategy in terms of business model process, business process and organizational transformation; assessed the digital innovation performance in terms of productivity, profitability and growth; test the significant relationship between information technology capability, digital

transformation strategy and digital innovation performance and develop digital transformation development framework.

2. Methods

Research Design - The study adopted a mixed-methods approach, combining a literature review for theoretical grounding and variable definition with a quantitative data collection phase. Using the "Questionnaire Star" platform, the research employed questionnaires to gather data. These questionnaires were designed and implemented following established quantitative research practices. The analysis included descriptive statistics, correlation analysis, and regression analysis to explore the relationships between variables and address the research objectives. The in-depth literature review, conducted through academic databases like JSTOR, ScienceDirect, and EBSCOhost, critically analyzed existing research on digitalization. This analysis served to identify knowledge gaps and limitations, ultimately informing the development of the thesis's research questions and setting the stage for the subsequent quantitative data collection phase.

To inform the questionnaire design, this study conducted in-depth interviews with managers from manufacturing companies. These interviews helped establish the research questions and areas of focus for the subsequent online questionnaire survey, distributed to gather data from a larger sample. Leveraging SPSS software, the researcher conducted a comprehensive multivariate analysis of the questionnaire data. This included descriptive analysis to summarize key data characteristics, correlation analysis to explore relationships between variables, and regression analysis to identify significant predictors of performance.

Participants of the Study - To gain insights from a range of perspectives within the traditional manufacturing sector, the questionnaire was distributed via the internet to employees in five leading companies across diverse industries like automotive, electronics, and textiles within Beijing, China. Convenience sampling was utilized, targeting individuals in various departments including production, engineering, and management. A total of 500 questionnaires were sent, resulting in a response rate of 80%. The respondents represented a range of job titles and seniority levels, but were primarily concentrated in production and engineering roles. While this provides valuable insights into the perceptions of these key personnel, it's important to note that further research with a more diverse sample could be necessary for broader application of the findings.

Instrument of the Study - Data were collected through a self-administered questionnaire with a four-point Likert scale response format. The questionnaire consisted of three sections: (1) Demographic information to filter participant data (e.g., age, industry experience), (2) Measurement of the three key variables: information technology capability, digital transformation strategy, and digital innovation performance using validated questions designed to capture specific aspects of each construct, and (3) Open-ended questions to collect in-depth feedback on respondents' experiences. The questionnaire underwent pilot testing and was subjected to Cronbach alpha analysis for internal consistency reliability (Table 1). The results showed acceptable alpha values for all domains (0.75 or higher), indicating strong internal consistency and reliability of the instrument.

Data Gathering Procedures - This study adopted a rigorous approach to questionnaire development. Initially, the instrument was built based on an extensive literature review and integrated valuable insights from expert consultations. Subsequently, a pre-survey was conducted online through the Questionnaire Star platform to gather feedback. Based on the pre-survey results and the advisor's guidance, the questionnaire was revised and enhanced before being distributed online via WeChat and email. Table 1 details the reliability and validity analysis results of the final questionnaire. Following the initial questionnaire design, the researcher conducted a rigorous pre-test with twenty experts. This valuable feedback allowed for refinement of the questionnaire structure and language expression, enhancing its clarity and effectiveness. The pre-test results provided evidence of strong internal consistency, with Cronbach's α and CR values for each variable exceeding 0.77. Satisfied with the questionnaire's reliability, the researcher prepared a formal letter of intent to request data collection from the target respondents.

Table 1

Reliability Results

Variables	No. of Items	α value	Interpretation
Information Technology Capabilities			
Digital product innovation performance	5	0.723	Acceptable
Digital Process Innovation Performance	5	0.731	Acceptable
IT Human Resource Performance	5	0.710	Acceptable
Overall	15	0.721	Acceptable
Digital Transformation Strategy			
Business Model Process	5	0.713	Acceptable
Business Process	5	0.749	Acceptable
Organizational Transformation	5	0.773	Acceptable
Overall	15	0.745	Acceptable
Digital Innovation Performance			
Profitability	5	0.702	Acceptable
Productivity	5	0.764	Acceptable
Growth	5	0.720	Acceptable
Overall	15	0.727	Acceptable

Data Analysis - Weighted mean and rank were used to determine IT capabilities in terms of digital product innovation performance, digital process innovation performance and IT human resource performance; to evaluate the digital transformation strategy in terms of business model process, business process and organizational transformation; and to assess the digital innovation performance in terms of productivity, profitability and growth. The result of Shapiro-Wilk Test showed that p-values of all variables were less than 0.05 which means that the data set was not normally distributed. Therefore, Spearman rho was used as part of the non-parametric tests to determine the significant relationship. All analyses were performed using SPSS version 28. The use of the above tools was based on research goals. In addition, all data were processed using the statistical PASW version to analyze the research results.

Ethical Consideration - This study adheres to high ethical standards and prioritizes transparency throughout the research process. The researcher-designed questionnaire, informed by existing literature, clearly communicated research objectives and anonymization procedures. To ensure informed consent and data security, confidentiality reminders were sent during the survey and the questionnaire avoided collecting any identifying information. Missing data or invalid responses were assigned unique identifiers (e.g., "number 0") to preserve anonymity while enabling data analysis. By implementing these rigorous measures, the research upholds its commitment to ethical data collection and responsible research practices.

3. Results and discussion

Table 2

Summary Table on Information Technology Capabilities

Key Result Areas	Composite Mean	VI	Rank
Digital Product Innovation Performance	3.26	Agree	1
Digital Process Innovation Performance	3.07	Agree	3
IT Human Resource Performance	3.09	Agree	2
Grand Composite Mean	3.14	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 2 shows summary of the information technology capabilities. It shows that all factors in assessing information technology capabilities are agreed with the composite mean of 3.14. Among the three domains digital product innovation performance got the highest composite mean of 3.26. High scores in this domain could indicate a strong focus on understanding and catering to customer needs through innovative products and features. This can lead to increased market share, customer satisfaction, and revenue growth. Innovative products can create a competitive advantage by differentiating the organization from its competitors. This can lead to higher profit margins and a stronger market position. Successful product innovation can enhance the

organization's brand image, attracting talent, partnerships, and investment opportunities.

Wang et. al., (2018) investigates the relationship between leadership behaviors in digital transformation and digital product innovation performance, examining the mediating role of IT human resource management practices. It argues that effective leadership in digital transformation can drive innovation success through the implementation of appropriate IT HR practices. A strong digital culture fosters the development of relevant skills and behaviors in IT employees, enhancing talent acquisition, performance management, and knowledge sharing effectiveness (Zhang et. al., 2022). This implies that the positive impact of a digital culture on innovation performance is primarily driven by the effective implementation of appropriate information technology human resource management practices. Different dimensions of Digital Culture have specific effects on ITHRM practices. For example, collaboration strengthens knowledge sharing, while risk-taking encourages the implementation of performance management systems that reward innovation.

The unanimous agreement that is manifested of a grand composite mean of 31.14 validates the importance of considering all three domains as interconnected pillars of effective digital transformation strategy. This suggest a high degree of alignment among stakeholders regarding the organization's digital transformation vision and goals. This implies clarity, effective communication, and shared understanding of the intended changes across different levels and units. Agreement on all domains indicates a recognition of the need for a comprehensive approach to digital transformation. This goes beyond technology adoption and acknowledges the importance of adapting business models, processes, and the organization itself to thrive in the digital age. Strong consensus can foster buy-in, commitment, and collaboration throughout the transformation process. This can potentially lead to smoother implementation, higher adoption rates, and ultimately, a greater chance of achieving desired outcomes. If the agreement stems from genuine understanding and participation in the strategy development process, it can create a sense of shared ownership and responsibility for the transformation journey. This can motivate employees and stakeholders to actively contribute to its success.

Table 3

Summary Table on Digital Transformation Strategy

Key Result Areas	Composite Mean	VI	Rank
Business Model Process	3.19	Agree	1
Business Process	3.08	Agree	3
Organizational Transformation	3.16	Agree	2
Grand Composite Mean	3.14	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

The classic book by Kotter (2019) outlines eight essential steps for leading successful organizational change, emphasizing the importance of building a guiding coalition and communicating the vision effectively. He suggests that leaders need to involve key stakeholders in the change process, ensuring alignment and buy-in across different levels and functions. Successful digital transformation requires leaders to embrace paradoxes, including the tension between alignment and flexibility. They argue that leaders need to balance the need for shared vision and goals with the ability to adapt to changing realities, fostering continuous dialogue and engagement with stakeholders (Sambamurthy et al., 2017).

Table 4

Summary Table on Digital Innovation Performance

Key Result Areas	Composite Mean	VI	Rank
Productivity	3.29	Agree	1
Profitability	3.21	Agree	3
Growth	3.22	Agree	2
Grand Composite Mean	3.24	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

As reflected in Table 4 the respondents unanimously agree on all domains of Digital Innovation Performance - Productivity, Profitability, and Growth – this presents a potentially positive outcome with diverse interpretations and nuances to consider: Unanimous agreement suggests a strong collective understanding of what constitutes successful digital innovation and its impact across key performance areas. This fosters clear communication, alignment of efforts, and accountability across the organization. Agreement on all domains implies a commitment to a balanced approach to digital transformation, ensuring it drives improvements in productivity, profitability, and growth simultaneously. This can lead to long-term success and sustainable competitive advantage. Effective digital initiatives that improve productivity, profitability, and growth simultaneously can lead to accelerated success, market expansion, and enhanced performance across all metrics. Demonstrating a comprehensive roadmap for digital-driven performance improvements can boost investor confidence, attract better funding opportunities, and potentially increase the organization's market valuation.

Focusing solely on these three domains might overlook other vital aspects of digital innovation, such as brand reputation, environmental impact, or long-term social responsibility. This can lead to short-sighted decisions and potential ethical concerns. Prioritizing all three domains simultaneously can lead to internal conflicts or trade-offs between departments or projects. Clarifying priorities and fostering collaboration is crucial for success. Accurately measuring and attributing specific digital initiatives to all three domains can be challenging. Inflating or manipulating metrics for immediate gains can lead to unrealistic performance expectations and potential ethical issues. Maintaining consistency across all domains requires ongoing monitoring, learning, and adaptation to evolving market dynamics and technological advancements.

Seddon et al. (2015) outlines a practical framework for successful digital transformation, emphasizing the importance of aligning people, processes, and technology across the organization. This aligns with the potential meaning of unanimous agreement on the mentioned domains. On the other hand, Yoo et al., (2017) examines the concept of ambidexterity in digital transformation, highlighting the need for organizations to balance exploration of new opportunities with exploitation of existing processes. Unanimous agreement across all domains could indicate respondents' understanding of this balance.

Table 5

Relationship Between Information Technology Capability and Digital Transformation Strategy

Variables	Rho	p-value	Interpretation
Digital Product Innovation Performance			
Business Model Process	0.096	0.095	Not Significant
Business Process	0.083	0.149	Not Significant
Organizational Transformation	0.132*	0.022	Significant
Digital Process Innovation Performance			
Business Model Process	-0.028	0.632	Not Significant
Business Process	0.195**	0.001	Significant
Organizational Transformation	-0.244**	0.000	Highly Significant
IT Human Resource Performance			
Business Model Process	-0.043	0.462	Not Significant
Business Process	0.043	0.454	Not Significant
Organizational Transformation	-0.023	0.693	Not Significant

*. Correlation is significant at the 0.05 level /**. Correlation is significant at the 0.01 level

As seen in the table, the computed rho-values ranging from 0.083 to 0.132 indicate a very weak direct relationship between digital product innovation performance and digital transformation strategy. There was a statistically significant relationship between digital product innovation performance and organizational transformation strategy because the obtained p-value was less than 0.05. Rho-values between 0.083 and 0.132 indicate a very weak direct relationship, suggesting that changes in the digital transformation strategy might not directly translate into significant improvements in digital product innovation performance. This raises questions about the effectiveness of the implemented strategy or potential inconsistencies in its execution. The digital

transformation strategy might not comprehensively address all critical aspects of digital product innovation, such as idea generation, development processes, talent, or technology adoption. The significant relationship between digital product innovation performance and organizational transformation suggests that changes in how the organization operates and functions internally can have a more direct and positive impact on product innovation outcomes.

This finding highlights the importance of organizational culture, talent development, collaboration practices, and risk-taking attitudes in fostering successful digital product innovation. The computed rho-value of -0.028 indicates a very weak indirect relationship between digital process innovation performance and business model process. Also, the computed rho-value of -0.244 indicates a weak indirect relationship between digital process innovation performance and organizational transformation. While the computed rho-value of 0.195 indicates a very weak direct relationship between digital process innovation performance and business process. There was a statistically significant relationship between digital process innovation performance and sub variables of digital transformation strategy namely business process and organizational transformation because the obtained p-values were less than 0.01.

Negative rho-values (-0.028 and -0.244) suggest that changes in business model process and organizational transformation might not be effectively translating into improved digital process innovation performance through indirect pathways. This raises questions about how these aspects are being implemented and their alignment with other elements of digital transformation strategy. Possible explanations for weak indirect relationships: Misalignments betweenn strategy and execution: Changes in business model and organization might not be effectively cascading down to actual process innovations within operations. Lack of critical resources: Adequate investment in talent, technology, and training might be missing to support the realization of potential process innovations stemming from business model and organizational changes. External factors: Unexpected market shifts, competitor actions, or technological disruptions could be overshadowing the potential impact of implemented changes on process innovation.

Despite weak indirect relationships, statistically significant correlations with business process and organizational transformation (p-values < 0.01) suggest that these sub-variables have some direct impact on digital process innovation performance. This highlights the importance of focusing on specific aspects within these broader elements. Further investigation into the specific business process changes and organizational transformation practices directly linked to digital process innovation success can reveal valuable insights for improvement. Overall, these findings suggest that while implementing changes in business model and organizational transformation is important, their effectiveness for driving digital process innovation might require further refinement and a stronger focus on specific sub-variables and their direct connection to process innovation practices. By addressing the potential reasons for weak indirect relationships and investigating further through additional research, you can gain valuable insights for crafting and implementing more effective digital transformation strategies that significantly enhance your organization's digital process innovation performance.

The computed rho-value of -0.043 indicates a very weak indirect relationship between IT human resource performance and business model process. Likewise, the computed rho-value of -0.023 indicates a very weak indirect relationship between IT human resource performance and organizational transformation. While the computed rho-value of 0.043 indicates a very weak direct relationship between IT human resource performance and business process. There was no statistically significant relationship between IT human resource performance and digital transformation strategy because the obtained p-values were greater than 0.01.

The very weak negative rho-values (-0.043 and -0.023) for indirect relationships suggest that improvements in IT human resource performance might not be effectively translating into improved business model processes or organizational transformation, and consequently, not impacting to the companies overall digital transformation strategy. This could be attributable to misaligned investments: investment in IT human resource development might not be targeted towards skills and capabilities directly relevant to supporting business model innovation or

organizational transformation. Limited influence: IT human resources might not be sufficiently empowered or involved in critical decision-making processes related to business model or organizational changes, hampering their ability to translate their capabilities into impactful outcomes. And external factors: unforeseen market shifts, competitor actions, or technological disruptions could be overshadowing the potential impact of IT human resource performance on broader strategic goals.

The very weak positive rho-value (0.043) for the direct relationship between IT human resource performance and business process suggests a marginal impact might exist. Further investigation is needed to understand the nature of this relationship and identify specific areas where improved IT human resource performance could directly contribute to better business processes. Overall, these findings suggest that optimizing IT human resource performance for successful digital transformation requires a strategic and targeted approach. Focusing on aligning skills development with critical digital transformation needs, empowering IT human resources, and understanding the specific ways they can directly contribute to process improvements will be crucial for amplifying the impact of your IT workforce on your overall digital transformation journey.

In their study, Sabherwal et al. (2015) examines the relationship between information technology (IT) capability and competitive advantage through the lens of the resource-based view of the firm. It argues that IT capability, encompassing infrastructure, human resources, and process, is a valuable and rare resource that can lead to a sustained competitive advantage. The study provides empirical evidence from Indian firms to support its theoretical framework. Meanwhile Wang et al. (2016) investigates the interplay between IT capability, digital transformation strategy, and firm performance. It proposes a framework that links IT capability to digital transformation strategy through two mediating factors: digital business agility and business model innovation. The study finds that IT capability positively influences digital transformation strategy and firm performance, with the mediating factors playing significant roles.

Table 6

Relationship Between Information Technology Capability and Business Performance

Variables	Rho	p-value	Interpretation
Digital Product Innovation Performance			
Productivity	0.186**	0.001	Significant
Profitability	0.100	0.084	Not Significant
Growth	0.174**	0.003	Significant
Digital Process Innovation Performance			
Productivity	0.195**	0.001	Significant
Profitability	-0.135*	0.019	Significant
Growth	0.004	0.950	Not Significant
IT Human Resource Performance			
Productivity	-0.070	0.225	Not Significant
Profitability	-0.070	0.224	Not Significant
Growth	-0.052	0.372	Not Significant

*. Correlation is significant at the 0.05 level /**. Correlation is significant at the 0.01 level

As seen in the table 6, the computed rho-value ranging from 0.100 to 0.186 indicate a very weak direct relationship between digital product innovation performance and business performance. However, there was a statistically significant relationship between digital product innovation performance and sub variables of business performance namely productivity and growth because the obtained p-values were less than 0.01.

Rho-values ranging from 0.100 to 0.186 indicate very weak direct relationships, suggesting that improvements in digital product innovation performance might not automatically translate into significant overall business performance improvements. This calls for further investigation into potential mediating factors and implementation gaps. This may suggest that the impact of digital product innovation on business performance may take time to materialize, requiring longer-term studies to capture the full effect.The impact might be conveyed through specific sub-variables of business performance, such as productivity and growth, rather than directly driving overall performance. Unforeseen market shifts, competitor actions, or

economic changes could be overshadowing the potential impact of digital product innovation on overall business outcomes.

Statistically significant correlations with productivity and growth (p-values < 0.01) highlight the importance of focusing on specific aspects within business performance when assessing the impact of digital product innovation. This suggests that digital product innovation enhances operational efficiency and contributes to market expansion, positively impacting specific business performance metrics. Overall, these findings suggest that while a direct link between digital product innovation and overall business performance might be initially weak, focusing on specific sub-variables like productivity and growth and understanding the mediating factors can reveal the true value of these innovations. By addressing the potential reasons for the weak direct relationship and focusing on targeted interventions and measurement strategies, you can optimize your digital product innovation efforts to drive sustained and impactful improvements in specific business performance metrics, even if the overall impact might take time to fully materialize.

The computed rho-value of 0.195 indicates a very weak direct relationship between digital process innovation performance and productivity. Likewise, the computed rho-value of 0.004 indicates a very weak direct relationship between digital process innovation performance and growth. While the computed rho-value of -0.135 indicates a very weak indirect relationship between digital process innovation and profitability. There was a statistically significant relationship between digital process innovation performance and productivity because the obtained p-value was less than 0.01. Also, there was a statistically significant relationship between digital process innovation performance and profitability because the obtained p-value was less than 0.05. Weak direct relationships with productivity (0.195) and growth (0.004) suggest that improvements in digital process innovation may not automatically translate into significant, observable gains in these areas. This emphasizes the need to investigate potential mediating factors or implementation gaps hindering the full impact of process innovation. Negative indirect relationship with profitability (-0.135) further complicates the picture, suggesting that some process innovations might even have a detrimental short-term impact on profitability before yielding long-term benefits.

Despite the weak direct relationships, the statistically significant correlations with both productivity ($p < 0.01$) and profitability ($p < 0.05$) hint at potential value in these areas. This suggests that digital process innovation may contribute to specific aspects of these KPIs even if the overall impact is initially muted. Overall, these findings suggest that while the direct impact of digital process innovation on your key KPIs might be initially subtle, focusing on specific sub-variables and understanding the mediating factors can reveal its true value. By conducting further research, implementing targeted interventions, and carefully measuring outcomes over time, you can optimize your digital process innovation efforts to drive sustained and impactful improvements in your organization's performance.

The computed rho-values ranging from -0.052 to -0.070 indicate a very weak indirect relationship between IT human resource performance and business performance. It shows that there was no statistically significant relationship between IT human resource performance and business performance because the obtained p-values were greater than 0.05. Rho-values between -0.052 and -0.070, indicating very weak indirect relationships, suggest that even if IT human resources perform well, it might not automatically translate into significant improvements in overall business performance. This lack of clear correlation requires further investigation into potential mediating factors and implementation gaps. The absence of a statistically significant relationship (p-values > 0.05) further emphasizes the need for deeper exploration into the underlying dynamics. This may be due to misalignment between IT HR and business strategy: The skills and capabilities developed within IT human resources might not be aligned with the demands and priorities of your broader business strategy, hindering their ability to contribute effectively. Limited influence and decision-making: IT human resources might lack sufficient involvement in crucial business decisions or initiatives, limiting their ability to leverage their expertise for strategic impact. External factors: Unforeseen market shifts, competitor actions, or economic changes could be overshadowing the potential impact of IT human resource performance on overall

business outcomes.

Overall, these findings challenge the assumption of a direct link between IT human resource performance and business success. By focusing on aligning skills with business needs, empowering IT human resources, and analyzing the specific ways they can directly contribute to business outcomes, you can bridge the gap and unlock the true potential of your IT workforce for driving impactful business performance improvements. Ngai et al. (2015) examines the relationship between information technology (IT) governance and firm performance, emphasizing the moderating role of environmental dynamism. It finds that effective IT governance, encompassing strategic alignment, resource management, and performance measurement, strengthens the positive impact of IT on firm performance, especially in dynamic environments. On the other hand, Mithas et al. (2016) investigates the interplay between IT governance, agility, and firm performance through the lens of organizational ambidexterity. It proposes that effective IT governance enables both exploitation of existing resources and exploration of new opportunities, enhancing organizational agility and leading to improved financial performance.

Table 7

Relationship Between Digital Transformation Strategy and Business Performance

Variables	Rho	p-value	Interpretation
Business Model Process			
Productivity	-0.008	0.886	Not Significant
Profitability	-0.027	0.641	Not Significant
Growth	0.050	0.389	Not Significant
Business Process			
Productivity	0.100	0.084	Not Significant
Profitability	0.165**	0.004	Significant
Growth	0.361**	0.000	Highly Significant
Organizational Transformation			
Productivity	0.247**	0.000	Highly Significant
Profitability	0.453**	0.000	Highly Significant
Growth	0.509**	0.000	Highly Significant

**. Correlation is significant at the 0.01 level

As seen in the table, the computed rho-value of -0.008 indicates a very weak indirect relationship between business model process and productivity. Likewise, the computed rho-value of -0.027 indicates a very weak indirect relationship between business model process and profitability. While the computed rho-value of 0.050 indicates a very weak direct relationship between business model process and growth. It shows that there was no statistically significant relationship between business model process and sub variables of business performance since the obtained p-values were greater than 0.01.

Very weak indirect relationships with productivity (-0.008) and profitability (-0.027) suggest that changes in your business model process might not be effectively translating into tangible improvements in these areas. Weak direct relationship with growth (0.050) further complicates the picture, indicating a potentially negligible direct impact. The absence of statistically significant relationships (p-values > 0.01) reinforces the need for deeper exploration to understand the underlying reasons for the disconnect. This may suggest Misaligned business model elements: Different components of your business model (e.g., value proposition, revenue streams, channels) might not be effectively integrated or aligned with the revised business model process, hindering its impact on performance. Implementation gaps: The changes outlined in the business model process might not be properly implemented or adopted within the organization, limiting their potential to translate into improved outcomes. Time factor: It's possible that the impact of the business model process changes needs more time to manifest, requiring long-term studies to reveal potential future improvements. External factors: Unforeseen market shifts, competitor actions, or economic changes could be overshadowing the potential impact of the business model process on performance.

Overall, these findings suggest that optimizing the impact of your business model process on performance

requires a deeper understanding of the underlying dynamics and potential barriers. By focusing on alignment, implementation, timeframes, and external factors, you can refine your approach and unlock the true potential of your business model process for driving meaningful improvements in productivity, profitability, and growth. The computed rho-value of 0.100 indicates a very weak direct relationship between business process and productivity. Likewise, the computed rho-value of 0.165 indicates a very weak relationship between business process and profitability. While the computed rho-value of 0.361 indicates a weak direct relationship between business process and growth. It shows that there was a statistically significant relationship between business process and sub variables of business performance namely profitability and growth since the obtained p-value was less than 0.01.

Weak direct relationships with productivity (0.100) and profitability (0.165) suggest that improvements in business process alone might not automatically translate into significant, observable gains in these areas. This emphasizes the need to investigate potential mediating factors or implementation gaps hindering the full impact of business process optimization. The statistically significant correlation with growth ($p < 0.01$) and a weak but positive direct relationship (0.361) indicate that optimized business processes may contribute to market expansion and revenue generation. This suggests focusing on specific aspects of business process improvement that directly influence growth. Overall, these findings suggest that while the direct impact of business process optimization on all key KPIs might be initially subtle, focusing on specific sub-variables like growth and understanding the mediating factors can reveal its true value. By conducting further research, implementing targeted interventions, and carefully measuring outcomes, you can optimize your business process improvement efforts to drive sustained and impactful improvements in your organization's performance.

The computed rho-value of 0.247 indicates a weak direct relationship between organizational transformation and productivity. Meanwhile, the computed rho-value of 0.453 indicates a moderate direct relationship between organizational transformation and profitability. Likewise, the computed rho-value of 0.509 indicates a moderate direct relationship between organizational transformation and growth. There was a statistically significant relationship between digital transformation strategy and business performance because the obtained p-values were less than 0.01. Increased productivity (0.247): While the relationship with productivity is weak, it indicates a positive impact of organizational transformation on efficiency and output. This suggests potential benefits from improved workflows, collaboration, and employee engagement. Enhanced profitability (0.453): The moderate direct relationship with profitability highlights the potential of organizational transformation to drive financial value. This could come through cost optimization, revenue generation through new business models, or improved customer satisfaction leading to increased sales. Boosted growth (0.509): The moderate direct relationship with growth offers the strongest evidence of organizational transformation's impact. This suggests that it effectively contributes to market expansion, customer acquisition, and overall success in capturing new market opportunities.

The statistically significant p-values for all relationships ($p < 0.01$) confirms a genuine and noteworthy connection between your digital transformation strategy and overall business performance. This validates the value of your transformation efforts and suggests further exploration of the specific mechanisms at play. Overall, these findings paint a positive picture of the potential for organizational transformation to drive significant improvements in your organization's performance. By focusing on understanding the mediating factors, exploring different transformation approaches, and continuously measuring and adapting based on ongoing research, you can optimize your strategies to maximize the impact of your digital transformation journey on all aspects of your business. Cao et al. (2019) explores the relationship between digital transformation and firm performance in two stages. It finds that digital transformation initiatives directly impact operational efficiency and then indirectly influence financial performance through cost reduction and revenue growth. Ngaiet al., (2020) examines the research on Industry 4.0, a specific type of digital transformation, and its impact on operational performance. It identifies different dimensions of Industry 4.0 and suggests various ways in which they can contribute to efficiency, customer satisfaction, and cost reduction.

Information technology capability, this dimension assesses the ability of a business to use information technology to support its operations. Digital strategy, this dimension assesses the business's overall digital strategy and how well it is aligned with its overall business goals. Digital transformation, this dimension assesses the business's ability to execute its digital strategy and to make changes to its operations in order to take advantage of new digital technologies. Digital performance, this dimension assesses the business's results from its digital transformation efforts and Organizational transformation, this dimension assesses the business's ability to change its culture and organization to support its digital transformation efforts. The framework also includes four key performance indicators (KPIs) that can be used to measure progress in each of the five dimensions. These KPIs are: Digital product innovation: This KPI measures the business's ability to develop and launch new digital products and services. Digital process innovation: This KPI measures the business's ability to use digital technologies to improve its existing processes. Business process performance: This KPI measures the efficiency and effectiveness of the business's core business processes. Profitability: This KPI measures the financial performance of the business. By using the digital transformation maturity framework, businesses can gain a better understanding of their current state of digital maturity and identify areas where they can improve. The framework can also be used to track progress over time and to measure the impact of digital transformation efforts. It is important to note that there is no one-size-fits-all approach to digital transformation. The right approach for a business will vary depending on its industry, size, and stage of development. However, the digital transformation maturity framework can be a valuable tool for helping businesses to assess their progress and identify areas for improvement.

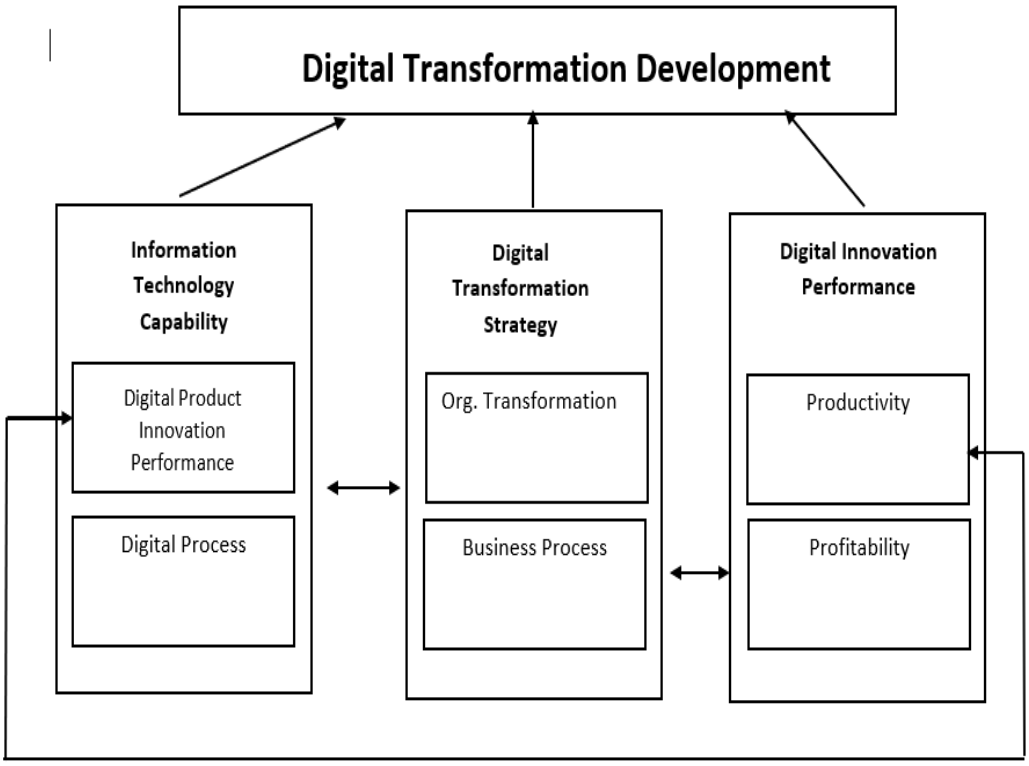

Figure 1. Digital Transformation Maturity Framework

4. Conclusion and recommendation

Results revealed that the respondents moderately agreed in the companies IT capabilities in terms of digital product innovation performance, digital process innovation performance and IT human resource performance. Respondents displayed moderate agreement with the digital transformation strategy, with slightly higher support

for the business process component compared to the organizational transformation and business model process. Agreement on digital innovation performance varied, with productivity seeing the highest satisfaction, followed by growth and profitability. A very weak negative relationship was found between the business model process and productivity, it differed significantly from the weak positive relationship observed between digital product innovation performance and both business model process and productivity. Developed digital transformation development framework.

Senior management may compare the organization's IT capabilities against industry benchmarks or competitor performance to identify areas where they might fall behind. The Human Resource Department may equip leaders with the skills and knowledge necessary to navigate and champion the digital transformation, provide training and support for employees to adapt to new processes, technologies, and mindsets. Senior leaders may encourage a culture of continuous learning and experimentation with new technologies and approaches to digital innovation. Department heads may consider piloting the framework in a selected department to assess its effectiveness and gain user feedback before wider implementation. For future researchers, they may conduct further research to validate and refine the framework through testing in different organizations and industries. This could involve exploring additional dimensions, adjusting scoring mechanisms, and investigating correlations with specific performance indicators.

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