

The effects of digital business strategy on the collaboration performance of companies: the moderating effect of digitally enabled performance measurement

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Abstract

Purpose – Digital transformation shapes industries and influences the forms of collaboration between companies. This study aims to investigate digital business strategy as a key to facilitating collaboration beyond organizational boundaries.

Design/methodology/approach – The study focuses on the connection between digital business strategy and collaboration performance. The authors identify five types of digital business strategy elements based on the literature: development, objectives, resources, management capabilities, and digital leadership. The authors then studied the implications of these elements for collaboration performance using a survey. The study's empirical data were collected from manufacturing and service companies, and 202 valid responses were received. The implications of the research elements were tested through regression analysis, which included the moderating effects of digitally enabled performance measurement.

Findings – The theoretical research framework identifies digital business strategy as a key determinant of collaboration performance, thus advancing the understanding of how companies can utilize digital business strategies and achieve enhanced collaboration performance. The results also show that the effect of digital business strategy on collaboration performance may be moderated by digitally enabled performance management.

Practical implications – The results suggest that management capabilities associated with digital strategy are a crucial element in positively influencing collaboration performance. Further, digital strategy-related resources can be better managed with digitally enabled performance measurement system, which is reflected in improved collaborative performance. Thus, companies should invest in management capabilities and connect their digital business strategies and performance measurement systems to develop collaboration in digital transformation.

Originality/value – The study is among the first to translate an empirical understanding of the digital transformation of small and medium-sized companies into a conceptual framework of a digital business strategy.

Keywords Digital business strategy, Collaboration, Performance, Performance measurement, PM, Digitally enabled PM, Digital

Paper type Research paper



1. Introduction

Digital technologies are reshaping how companies are doing business, their traditional business strategies and collaboration activities. As competition becomes more challenging and customer demands increase, companies increasingly feel the urge to become more digital, thus modifying their value propositions and business operations (Holopainen *et al.*, 2023a). This change brought about by digital technologies is described as digital transformation, which is a multifaceted phenomenon that includes the development of new digital offerings and the reinforcement of an organization's identity (Wessel *et al.*, 2021; Tekic and Koroteev, 2019; Hess *et al.*, 2016). It may also require new types of capabilities and resources that can be managed and enhanced through close internal and external collaboration in companies (Liu *et al.*, 2022; Konopik *et al.*, 2022; Holopainen *et al.*, 2022). Digital transformation also requires that companies reexamine their partnership strategy and business ecosystem (Sousa-Zomer *et al.*, 2020), which leads to the development of new collaborative organization networks in which companies choose the right partners to cope with digital transformation (Senyo *et al.*, 2019; Kane *et al.*, 2017).

To succeed in the digital environment, companies need a new kind of strategic approach (Holopainen *et al.*, 2022; Matt *et al.*, 2015) and are expected to define a specific digital business strategy for themselves by integrating IT strategy with business strategy to create novel value by utilizing digital resources (Bharadwaj *et al.*, 2013; Holotiuk and Beimborn, 2017; Yeow *et al.*, 2018). The digital business strategy has been called transfunctional, crossing the organization's traditional functional areas and business processes as well as boundaries outside the company (Bharadwaj *et al.*, 2013; Matt *et al.*, 2015; Yeow *et al.*, 2018) and emphasizing collaboration to achieve a competitive advantage. However, digital business strategy and its effects on performance have only been partially studied (Bharadwaj *et al.*, 2013; Ukko *et al.*, 2019; Wang *et al.*, 2020), leaving an apparent research gap regarding its effects on collaboration performance.

Further, a performance measurement (PM) of inter-organizational collaboration is important when evaluating the functionality of collaboration and digital initiatives (Büyükköçkan and Göçer, 2018). According to Nudurupati *et al.* (2016), organizations should reexamine their measurement efforts so that their performance evaluations can be expanded in a wider network involving several different stakeholders. In addition, studies have shown that digital technologies can offer new solutions for implementing PM systems (Korsen and Ingvaldsen, 2022; Reinking *et al.*, 2020; Robert *et al.*, 2022; Sardi *et al.*, 2020). PM system combined with digital technologies enables real-time monitoring and the continuous evaluation of results to support adaptation in an ever-changing digital environment (Chanias *et al.*, 2019; Holopainen *et al.*, 2023b; Kamble *et al.*, 2020). PM also has the potential to support inter-company collaboration in the digital era, acting as a system of systems (Bourne *et al.*, 2018; Sardi *et al.*, 2020). However, there is a research gap in how digitally enabled PM can support the company's strategic operations. Thus, we studied how digitally enabled PM can serve as an excellent tool for facilitating the management of digital business strategies and thus enhancing collaboration performance.

We used a survey to examine the described research problem among Finnish manufacturing and service companies during 2021. The following research questions were proposed to answer the described research gaps: (1) Do digital business strategies positively affect collaboration performance? (2) How does digitally enabled PM positively moderate the relationship between digital business strategy and collaboration? More specifically, based on the literature, the study identifies five types of digital business strategy elements—development, objectives, resources, management capabilities and digital leadership—and elaborates on how these elements can affect collaboration performance and how the capability of digitally enabled PM can promote these effects. The results of the study show that management capabilities have a positive effect on successful collaboration. Further, a digital business strategy through the resources dimension enhances the collaboration performance between the company and its parties if the company uses digitally enabled PM effectively.

Although previous research has revealed the effect of digital business strategies on firm performance (Bharadwaj *et al.*, 2013; Ukko *et al.*, 2019; Wang *et al.*, 2020), little is understood about their connection with collaboration performance. Thus, this study theoretically contributes through a theoretical research framework that identifies digital business strategy as a key determinant of collaboration performance, thus advancing the understanding of how small and medium-sized companies (SMEs) can utilize digital business strategies and achieve enhanced collaboration performance. The study is also the first to offer empirically grounded evidence of the role of digitally enabled PM (e.g. Korsen and Ingvaldsen, 2022) in the association between digital business strategy and collaboration performance. Notably, this study translates an empirical understanding of SMEs' digital transformation into a conceptual framework of a digital business strategy. Although the literature emphasizes the essential elements of SMEs' strategic digital transformation (Bharadwaj *et al.*, 2013; Cennamo *et al.*, 2020; Holopainen *et al.*, 2022; Mithas *et al.*, 2013; Matt *et al.*, 2015), how these elements can be differentiated has not been thoroughly examined. Thus, the results of this study contribute to the literature on digital transformation, which seeks to resolve the format through which digital business strategy impacts collaboration (cf. Chi *et al.*, 2018; Matt *et al.*, 2015; Tekic and Koroteev, 2019). Further, this study proposes practical implications, suggesting that companies should invest in management capabilities and connect their digital business strategies and PM systems to strive for better collaboration performance in digital transformation.

The rest of the paper consists of the following sections. Section 2 reviews the relevant literature on the strategic approach to digital transformation and its implications for collaboration, followed by the development of the hypotheses and theoretical research framework. Section 3 describes the research methodology, and Section 4 presents the results. Section 5 discusses the results, while Section 6 presents the study's conclusion, theoretical and practical implications, limitations and suggestions for future studies.

2. Theoretical background

2.1 Strategic approach to digital transformation

Digital transformation refers to the change that occurs as a result of the utilization of digital technologies (Gong and Ribiere, 2021; Legner *et al.*, 2017), in which novel digital technologies shape strategy and operations via industries (Li, 2020). The utilization of digital technologies is a versatile phenomenon (Tekic and Koroteev, 2019), allowing the development of advanced and completely new services and products while affecting the company's culture, organizational structures, processes, capabilities and business models all the way to strategy and vision (Nadkarni and Prügl, 2021; Gurbaxani and Dunkle, 2019). The utilization of emerging digital technologies (e.g. mobile technology, analytics and social media) has also been reported to promote major business improvements, such as increasing the efficiency of operations, creating business models and advancing customer experience (Tekic and Koroteev, 2019; Fitzgerald *et al.*, 2014). Previous studies suggest that emerging digital technology cannot by itself create significant added value for the operations of a company if it is not integrated into the strategic-level visions and goals of the company (Lipsmeier *et al.*, 2020; Tabrizi *et al.*, 2019; Davenport and Westerman, 2018; Kane *et al.*, 2017). For example, according to Yeow *et al.* (2018) and Hess *et al.* (2016), digital business strategy is not isolated but must be connected to the company's strategy and other functional and operational strategies.

A digital business strategy has also been described as a continuous process, including doing and learning, implemented using digital resources to create novel value (Chaniias *et al.*, 2019). As presented above, a digital business strategy consists of the desire to develop with the assistance of digital technologies, resources, capabilities and goals that are connected to

the company's strategic objectives. Many studies have also highlighted management and leadership capabilities as crucial aspects of digital business strategies (Li, 2020; Nasiri *et al.*, 2020; Li *et al.*, 2018; El Sawy *et al.*, 2016). Matt *et al.* (2015) referred especially to the skills and experience developed by managers through technology projects, as well as their willingness to change, decision-making capabilities and strategic capabilities. These notions indicate that the promotion of a company's operations with emerging technologies is a matter of a strategic level, which significantly affects products, services, sales channels and supply chains, as well as other related business processes, all the way beyond the company's borders (Matt *et al.*, 2015; Horlach *et al.*, 2017).

2.2 Implications of digital technologies for collaboration

Digital technology often has major implications, especially for collaboration between companies (Holopainen *et al.*, 2023a; Jovanovic *et al.*, 2022; Suuronen *et al.*, 2022). These implications have been shown for various business areas, extending beyond the company's borders and affecting products, services, sales channels and supply chains (Horlach *et al.*, 2017; Matt *et al.*, 2015). Digital technologies implemented across an organization provide both internal and external stakeholders with a series of tools to enhance knowledge availability and capture (Silva *et al.*, 2021). More than a conveyor of resources, digital technology focuses on the provision of information as a type of sharing platform (Saunila *et al.*, 2022; Tao *et al.*, 2020). Digital platforms are considered one of the most relevant applications of digital technology when striving for value through collaboration (Jovanovic *et al.*, 2022; Reim *et al.*, 2023). Reim *et al.* (2023) indicated that digital platforms affect almost all industries now and in the future, revolutionizing value creation. Jovanovic *et al.* (2022) suggested that some companies utilize digital technologies to launch platforms (e.g. Airbnb, Netflix, Uber and Spotify), whereas machine manufacturers, for example, utilize them to collaboratively extend the platform value with their technology providers, suppliers, customers and rivals (e.g. BMW, Komatsu and Volvo) (Adner *et al.*, 2020; Cennamo *et al.*, 2020). Jovanovic *et al.* (2022) and Sjödin *et al.* (2020) defined digital industrial platforms as large-scale transformations that encompass the offerings, capabilities and processes of industrial companies and the related ecosystems for progressively capturing, delivering and creating multiple value for customers, resulting from a wide range of enabling digital technologies.

As indicated by these previous studies, companies should create a digital business strategy that combines the company's vision and existing strategies with technological guidelines to achieve value (Matt *et al.*, 2015; Chanias *et al.*, 2019). The increase in inter-organizational collaboration has been presented as a significant benefit that can be achieved with digital technologies because it simultaneously enables the strategic readiness of all partners to upgrade to digital operations (Holopainen *et al.*, 2022; Suuronen *et al.*, 2022). However, Reim *et al.* (2023) indicated that although collaboration is needed to successfully manage digital platforms, challenges arise, especially in the manufacturing industry, due to the need for large investments and the sharing of sensitive data. This indicates that the utilization of digital technologies in accordance with the digital business strategy must also be able to be measured and managed. For example, Jovanovic *et al.* (2022) stressed the need for collaboration platform management, measurement and governance at every stage of industrial digital platform development to expand the value of the platform through monitoring, optimization and independent service development. Korsen and Ingvaldsen (2022) suggested that the creative use of technologies (big data, IoT, etc.) should be implemented in the existing PM frameworks of organizations.

Several other studies have also suggested that the implementation of digital technologies, such as IoT and big data, affects PM and should therefore be connected to it (Bhimani, 2020; Ravelomanantsoa *et al.*, 2019; Nudurupati *et al.*, 2016, 2021). Bredmar (2017) showed the need

for concepts that integrate digital technologies (e.g. IoT and big data) with organizational challenges, especially organizational control, such as PM. Aheleroff *et al.* (2021) showed that digital technologies, such as dashboards using IoT, combined with PM and data, enable strategy implementation through remote monitoring, forecasting and management of real-time. All of these elements can be connected to PM, providing considerable development potential for organizational and inter-organizational agility and performance via real-time data-driven intelligence and fast decisions (Parmar *et al.*, 2020; Min *et al.*, 2019; Oh and Jeong, 2019; Wesche and Sonderegger, 2019). In summary, to fully exploit digital technologies in the development and improvement of collaboration, a company must have a digital business strategy connected to the PM of the company.

2.3 Hypothesis development

2.3.1 *Digital business strategy, its elements and effects on collaboration performance.* Digital technology, considered a strategic issue, has a huge influence beyond organizational borders by affecting business processes, supply chains, sales channels, etc. (Kraus *et al.*, 2021; Tortorella *et al.*, 2020; Matt *et al.*, 2015). It transforms existing operations to build links with the surrounding environment and opportunities for collaboration (Tekic and Koroteev, 2019). Horlach *et al.* (2017) suggested that digitalization changes the communication channels, sales and product/service offerings of companies, all of which have an impact on organizations' functions, including new ways of customer collaboration (Matt *et al.*, 2015). For example, Bharadwaj *et al.* (2013) proposed that digital business strategies have enabled the democratization of business-related content shared by companies in digitalizing business environments and on distinct digital platforms. Thus, companies can utilize digital business strategies to grow business and sales by offering customers more variation in their offerings (Holopainen *et al.*, 2023a; Grover and Kohli, 2013). Bharadwaj *et al.* (2013) also suggested that companies using digital business strategies can revise their operations and offerings based on customer preferences. By allowing customers to choose and customize their purchases, digital business strategies can advance product launches (Bharadwaj *et al.*, 2013).

When the adoption of digital technology becomes a strategic issue—that is, followed by a digital business strategy—it enables quick adaptation through collaboration that crosses company boundaries (Holotiuk and Beimborn, 2017). Digital collaboration promotes the influence of digital business strategies on performance (Chi *et al.*, 2018). Therefore, this study proposes that a digital business strategy is key to facilitating collaboration beyond organizational boundaries. Thus, the following hypotheses were set:

- H1. A digital business strategy positively affects collaboration performance. Hence,
 - H1a. Development, relative to digital business strategy, positively affects collaboration.
 - H1b. Objectives, relative to digital business strategy, positively affect collaboration.
 - H1c. Resources, relative to digital business strategy, positively affect collaboration.
 - H1d. Management capability, relative to digital business strategy, positively affects collaboration.
 - H1e. Digital leadership, relative to digital business strategy, positively affects collaboration.

2.3.2 *Digitally enabled PM as a moderator.* Implementing digitality in business requires that skills must be developed to deal with digital tools and to have digital mind-sets, as well as to be ready to move toward digitality (Wessel *et al.*, 2021; Gong and Ribiere, 2021; Kache and Seuring, 2017; El Sawy *et al.*, 2016). The development of the technology is vital to exploit it with the aim of boosting decision-making (Nudurupati *et al.*, 2016; Parida *et al.*, 2015;

Srivastava and Shainesh, 2015). Therefore, development, objectives, resources, management and leadership rank among the most important elements of digital business strategy; however, applied inappropriately any of these elements causes challenges in operating in the digital business era (Kache and Seuring, 2017). Simultaneously, digital technologies authorize the prediction, control and remote monitoring of strategy implementation, utilizing different types of data, IoT-enabled dashboards and real-time performance measures (Aheleroff *et al.*, 2021). All of these elements are facilitated by PM and offer the possibility of improving organizational agility through real-time data-based intelligent decisions (Holopainen *et al.*, 2022; Parmar *et al.*, 2020; Min *et al.*, 2019; Oh and Jeong, 2019; Wesche and Sonderegger, 2019). Bredmar (2017) suggested that some new data analytical PM systems could even alter goals and targets as the organization learns and has new experiences (Bredmar, 2017). Thus, to manage a digital business strategy, companies require measures of performance (Reinking *et al.*, 2020; Nasiri *et al.*, 2020; Bharadwaj *et al.*, 2013), because digitally enabled PM can allow deeper analysis (Korsen and Ingvaldsen, 2022; Sardi *et al.*, 2020; Nudurupati *et al.*, 2016) to attain collaboration performance.

Based on this background, we propose that digitally enabled PM becomes effective in boosting digital business strategy implementation and eventually facilitating collaboration performance. We therefore expect the liaison between digital business strategy, together with its elements and collaboration performance to be moderated by digitally enabled PM. Thus, we hypothesize:

- H2. Digitally enabled PM positively moderates the relationship between digital business strategy and collaboration. Hence,
 - H2a. Digitally enabled PM positively moderates the relationship between development relative to digital business strategy and collaboration.
 - H2b. Digitally enabled PM positively moderates the relationship between objectives relative to digital business strategy and collaboration.
 - H2c. Digitally enabled PM positively moderates the relationship between resources relative to digital business strategy and collaboration.
 - H2d. Digitally enabled PM positively moderates the relationship between management capability relative to digital business strategy and collaboration.
 - H2e. Digitally enabled PM positively moderates the relationship between digital leadership relative to digital business strategy and collaboration.

2.4 Theoretical research framework: digitally enabled PM in facilitating the implications of elements of digital business strategy

This study focuses on five types of digital business strategy elements and their effects on the performance of collaboration between companies. Companies formulate, implement and develop a digital business strategy with the aim of improving their business performance (Kraus *et al.*, 2021; Li, 2020; Verhoef *et al.*, 2021; Bharadwaj *et al.*, 2013; Mithas *et al.*, 2013). This new kind of strategic approach requires companies to focus on novel kinds of capabilities and ways of operating (Holopainen *et al.*, 2022; Nasiri *et al.*, 2020). When forming a digital business strategy, different factors should be taken into account. Based on previous literature, we identify these elements as follows: development, goals, resources, management capabilities and digital leadership (Table 1). Further, studies have shown that digital transformation has resulted in the development of new collaborative organizational networks (Senyo *et al.*, 2019). Companies must be able to manage the operation of this collaboration, for which digitally enabled PM has been found to be the appropriate tool (Robert *et al.*, 2022; Reinking *et al.*, 2020; Nudurupati *et al.*, 2016).

Table 1.
Respondents'
information

Information	Categories	No.	%
The turnover of the company	Small (0–2 million)	18	8.8%
	Medium (2–10 million)	139	67.8%
	Large (>10 million)	48	23.4%
	No response	0	
The main industry of the company	Service	106	51.7%
	Manufacturing	97	47.3%
	No response	2	1.0%
The company's main customer group	B2B (business-to-business)	172	83.9%
	B2C (business-to-customer)	28	13.7%
	No response	5	2.4%

Source(s): Authors' own work

Thus, this study focuses specifically on the influence of these five elements on collaboration performance and the capability of digitally enabled PM to promote these effects. The theoretical research framework is shown in [Figure 1](#).

3. Methodology

3.1 Data collection and sample description

The research data were collected using a survey conducted in September and October 2021. The survey was sent to 5,665 manufacturing and service companies in Finland. The survey was sent in four waves. Initially, randomly selected companies were sent an email with a link to the survey; thereafter, reminder messages were sent weekly for 3 weeks to enable a sufficient sample size. Overall, 205 companies responded, of which 202 were valid. Of these respondents, 96% worked in the top management of the company, and the rest in lower-level positions. The respondents' detailed information is described in [Table 1](#).

3.2 Survey instruments

The research focused on digital business strategy and its effects on collaboration performance. The instruments of the study were built based on previous literature, as

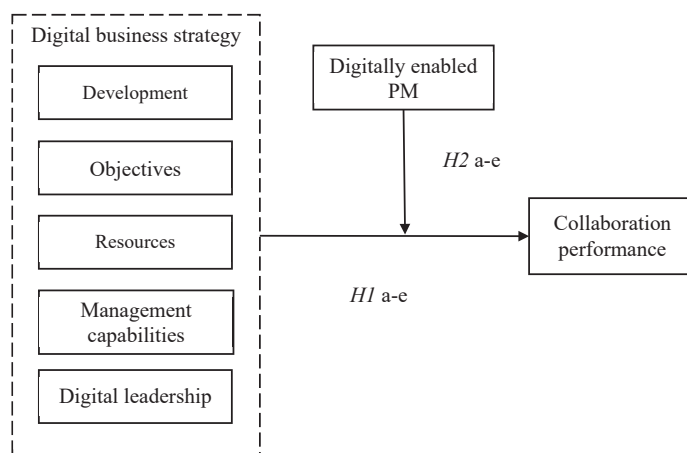


Figure 1.
Theoretical research
framework

Source(s): Authors' own work

presented in Table 2. The independent variable was digital business strategy, which included five elements (development, objectives, resources, management capabilities and digital leadership). These five elements contained two to three items each and were measured using a 1–7-point scale. The dependent variable was collaboration performance measured using a 1–4 point scale, and the moderator was digitally enabled PM measured using a 1–7 scale. Both contained only one item to assess the element, and control variables were used to evaluate their effects on the results. These included the company’s turnover (small, medium and large), the company’s industry (service and manufacturing) and the company’s customer groups (B2B and B2C) (see Table 1).

Elements	Description of the items	References
<i>Assessment of the argument on a scale of 1–7 points</i>		
Development	1 Our company has recognized the importance of digital technology in relation to the development of industry	Konopik <i>et al.</i> (2022), Sousa-Zomer <i>et al.</i> (2020), Vial (2019), Kane <i>et al.</i> (2017)
	2 Our company has ongoing projects related to digital technology	
	3 Our company strives to achieve a competitive advantage with the help of digital technologies	
Objectives	1 Our company has defined objectives related to the utilization of digital technology	Reinking <i>et al.</i> (2020), Tabrizi <i>et al.</i> (2019), Chaniias <i>et al.</i> (2019), Nudurupati <i>et al.</i> (2016)
	2 Our company follows the realization of the objectives defined for digital technologies	
	3 Our company has the ability to utilize digital technology in achieving strategic objectives	
Resources	1 Our company has the financial resources to make digital technology investments	Holopainen <i>et al.</i> (2022), Sousa-Zomer <i>et al.</i> (2020), Mittal <i>et al.</i> (2018), Matt <i>et al.</i> (2015)
	2 Our company’s employees have time to implement digital technology projects	
	3 Our company’s employees have the know-how to implement digital technology projects	
Management capabilities	1 The management of our company is aware of and follows the changes brought about by digital technology in the industry	Konopik <i>et al.</i> (2022), Holopainen <i>et al.</i> (2022), Li (2020), Nasiri <i>et al.</i> (2020), Sousa-Zomer <i>et al.</i> (2020)
	2 Our company’s management has the ability to form a digital strategy	
	3 The management of our company is actively looking for opportunities brought by digital technology	
Digital leadership	1 Our company has appointed a person who is responsible for implementing digital strategic activities	Vial (2019), Chaniias <i>et al.</i> (2019), Matt <i>et al.</i> (2015)
	2 In our company, the responsible persons have the knowledge, skills and experience to manage projects related to digital technology	
Digitally enabled PM	1 Our company’s performance measurement is combined with our company’s digital strategy/ digital operations	Reinking <i>et al.</i> (2020), Bhimani (2020), Kamble <i>et al.</i> (2020), Nudurupati <i>et al.</i> (2016)
<i>Assessment of the argument on a scale of 1–4 points</i>		
Collaboration performance	1 Over the last three years, how do you assess your company in terms of collaboration with external parties?	Konopik <i>et al.</i> (2022), Reim <i>et al.</i> (2023), Senyo <i>et al.</i> (2019), Büyüközkan and Göçer (2018), Kane <i>et al.</i> (2017)

Table 2.
The research elements,
items and references to
the literature

Source(s): Authors’ own work

3.3 Testing the validity, reliability and bias of the study

We verified the reliability and validity of the results using various tests (in Table 3). First, a factor analysis was conducted to ensure that the constructs were unidimensional and that the loadings of each item exceeded the critical limit of greater than 0.50 (Hair *et al.*, 2014). Second, utilizing the results of these tests, the average variance extracted (AVE) and composite reliability (CR) were calculated to ensure the validity and reliability of the construct. The results of the calculations exceeded the limit values (AVE > 0.50 and CR > 0.70) determined in the literature (Hair *et al.*, 2014; Fornell and Larcker, 1981), thus guaranteeing the validity and reliability of the study structure. Third, a reliability analysis of the instruments was performed. We confirmed the instruments' reliability by calculating Cronbach's alpha values, which were higher than the proposed limit (0.70) (Taber, 2018). These tests were performed to guarantee the validity and reliability of the instruments and constructs resulting from the calculations.

Fourth, an analysis of variance (ANOVA) test was executed to solve the problem of non-response bias. The test was performed by dividing the respondents into early and late respondents and comparing the *p*-values of these groups. With this, no significant deviation in the values was found. Differences between groups were at the level of $p \leq 0.05$, so the outcomes of the test showed that there was no problem with non-response bias. Fifth, Harman's single-factor test was performed to check common method variance. Based on this analysis, all items loaded on more than one factor; however, the first factor explained 51.56% of the variance. According to Podsakoff and Organ (1986), common method bias is a possible and well-known problem when the same respondents answer the entire survey. Thus, other methods can also be used to reduce common method bias: the survey was answered anonymously, reducing the social desirability problem, the research questions were carefully formulated, ensuring their clarity and the research sample was chosen randomly (Podsakoff *et al.*, 2003). Thus, the results of these statistical tests and other methods confirmed that the effects of research bias were minimized and ensured.

4. Analysis and results

The correlation analysis of the study is presented in Table 4, which shows the mean and standard deviation of the study's items. The results showed that the mean of the responses was the highest in the development element and the lowest in the digital leadership element, considering only items on a scale of 1–7 points.

Elements	Loadings	α	AVE	CR
Understanding	0.882	0.86	0.79	0.92
	0.867			
	0.923			
Goals	0.934	0.91	0.84	0.94
	0.921			
	0.901			
Resources	0.880	0.79	0.70	0.88
	0.873			
	0.757			
Management	0.936	0.85	0.78	0.92
	0.882			
	0.837			
Responsibilities	0.903	0.77	0.82	0.90
	0.903			

Table 3.
Structural validity and
reliability calculations

Source(s): Authors' own work

The hypotheses were tested through regression analysis, and the results of the analysis are presented in Table 5. In the main effects model, digital business strategy through management capability had a statistically significant and positive effect on collaboration performance. By contrast, development had a statistically significant but negative influence on collaboration performance. No significant effect was found for the other elements. Thus, H1d was supported, but H1a, H1b, H1c and H1e were not supported.

The collaboration performance of companies

Elements	Mean	St. Dev	1	2	3	4	5	6	7
1 Development	5.85	1.23	1						
2 Objectives	5.19	1.44	0.808**	1					
3 Resources	4.44	1.31	0.488**	0.656**	1				
4 Management capability	5.11	1.29	0.703**	0.761**	0.629**	1			
5 Digital leadership	4.27	1.76	0.481**	0.586**	0.579**	0.654**	1		
6 Digitally enabled PM	4.41	1.69	0.495**	0.574**	0.342**	0.552**	0.387**	1	
7 Collaboration performance	2.76	0.67	0.022	0.115	0.090	0.167*	0.080	0.100	1

Note(s): **Significant at the 0.01 level (2-tailed); *Significant at the 0.05 level (2-tailed)
Source(s): Authors' own work

Table 4. Correlations of the digital business strategy and its elements, digitally enabled PM and collaboration

Variables	Main effects model			Full model		
	β	St. β	t	β	St. β	t
<i>Controls</i>						
Company's industry	-0.093	-0.070	-0.881	-0.041	-0.031	-0.393
Company size	0.034	0.028	0.368	0.038	0.031	0.421
Company's customer	0.029	0.015	0.202	0.069	0.036	0.491
<i>Main effects</i>						
Development	-0.161*	-0.288	-2.311	-0.212	-0.378	-1.260
Objectives	0.077	0.164	1.068	0.076	0.162	0.473
Resources	-0.022	-0.043	-0.426	-0.295	-0.572	-2.259
Management capability	0.139*	0.264	2.065	-0.015	-0.029	-0.089
Digital leadership	-0.028	-0.073	-0.737	0.351	0.914	2.954
Digitally enabled PM	0.024	0.059	0.642	-0.147	-0.363	-1.146
<i>Interaction effects</i>						
Development				0.024	0.448	0.647
Digitally enabled PM						
Objectives				0.002	0.034	0.051
Digitally enabled PM						
Resources				0.055*	0.859	2.010
Digitally enabled PM						
Management capability				0.018	0.323	0.478
Digitally enabled PM						
Digital leadership				-0.076***	-1.359	-3.411
Digitally enabled PM						
<i>Model summary</i>						
F	1.385			2.114*		
R^2		0.064			0.143	
Adjusted R^2		0.018			0.075	

Note(s): *** $p \leq 0.001$, ** $0.001 < p \leq 0.01$, * $0.01 < p \leq 0.05$
Source(s): Authors' own work

Table 5. The results of the regression analysis

The second regression test analyzed the moderating effect of digitally enabled PM. The results indicated that digital business strategy through the resources element enhanced the collaboration performance between the company and its parties if the company used digitally enabled PM effectively, thus supporting H2c. However, the results also demonstrated that digitally enabled PM moderated a significant but negative effect between the company's digital business strategy through digital leadership and collaboration performance. Other significant results were not detected. Thus, Hypothesis 2 was partly supported (H2c) and partly not supported (H2a, H2b, H2d, H2e). Lastly, the control variables were found to have no effect on either model.

5. Discussion

Digital transformation is shaping industry, influencing the forms of collaboration between companies (Jovanovic *et al.*, 2022; Li, 2020; Silva *et al.*, 2021; Suuronen *et al.*, 2022). The findings of this study contribute to previous research on digital transformation that seeks to resolve the format through which digital business strategy impacts collaboration (cf. Chi *et al.*, 2018; Matt *et al.*, 2015; Tekic and Koroteev, 2019). We investigated whether a digital business strategy is key to facilitating collaboration beyond organizational boundaries in different industries. The results elucidated some interesting findings. Next, the key findings of the main effect model are presented.

First, the results showed that management capabilities, as an element of digital business strategy, had a positive effect on collaboration performance. This is in line with previous studies that have highlighted management capabilities as crucial aspects of digital business strategy (Matt *et al.*, 2015; El Sawy *et al.*, 2016; Li, 2020; Nasiri *et al.*, 2020). Managers with digital skills and experience are likely to be better equipped to carry out the continuous renewal required by the digital age (Sousa-Zomer *et al.*, 2020). The study contributes to previous research by highlighting an important role for management capabilities in the success of collaboration performance. Managers are required to have new capabilities, be aware of and follow the changes brought about by digital technology in the industry, and thus integrate these technological expectations into strategic objectives (Holopainen *et al.*, 2022; Nasiri *et al.*, 2020; Li, 2020; Nudurupati *et al.*, 2016).

Second, the results revealed that the development element of digital business strategy negatively influences collaboration performance. These results contradict the existing literature (Konopik *et al.*, 2022; Sousa-Zomer *et al.*, 2020), which has suggested that developing digital transformation capabilities might reflect positively on a company's performance. For example, Sousa-Zomer *et al.* (2020) noted that companies creating performance improvement through digitality invest heavily in increasing digital intensity through digital partnerships, technology-based acquisitions and investments. However, digital transformation often creates industry-specific difficulties for companies that challenge managers to achieve performance impacts (Li, 2020; Nadkarni and Prügl, 2021; Tabrizi *et al.*, 2019). The study findings support Reim *et al.*'s (2023) view that the utilization of digital platforms in industrial cooperation can be challenging due to large investments and the sharing of sensitive data. In contrast to the original hypothesis, our results demonstrated that if the company's internal development capabilities and operations are well developed, it can be reflected in an imbalance of collaboration between companies, and thus weaken the collaboration performance. This is a new perspective and is in line with a previous study that emphasized the importance of collaboration in concurrently improving the strategic readiness of partners and customers for digital operations (Holopainen *et al.*, 2022). Thus, the study contributes to previous research arguing that if the digital leap is unbalanced between partners, it can have a negative effect on collaboration performance.

Digital transformation influences methods of collaboration and their management (Li, 2020; Büyüközkan and Göçer, 2018). Senyo *et al.* (2019) stated that it was important to consider the strategic direction of digital platforms for the benefit of all participants. Jovanovic *et al.* (2022) stressed the need for collaboration platform management, measurement and governance at every stage of industrial digital platform development. The study assessed whether digitally enabled PM can act as a promoter to foster the liaison between a digital business strategy—along with its elements—and collaboration performance. In what follows, we discuss the key findings from the full model of the study.

First, the results indicated that a digital business strategy through the resources dimension enhanced the collaboration performance between the company and its parties if the company used digitally enabled PM effectively. This is in line with Nudurupati *et al.* (2016), who stated that performance evaluation can be expanded to the network level, taking into account the importance of digital technologies in creating a competitive advantage combined with strategy, and leading these with appropriate and behavioral measures. Further, digital technologies, such as dashboards using IoT, combined with PM and data, enable strategy implementation through remote monitoring, forecasting and management of real-time data (Aheleroff *et al.*, 2021; Reinking *et al.*, 2020; Kamble *et al.*, 2020; Chanias *et al.*, 2019). The study agrees with previous studies that companies should integrate digital technologies into their PM systems to achieve performance effects (Aheleroff *et al.*, 2021; Korsen and Ingvaldsen, 2022; Nudurupati *et al.*, 2016; Reinking *et al.*, 2020). However, the study contributes to the literature by suggesting that with digitally enabled PM, the resources related to digital strategy are better managed, which is reflected in improved collaboration performance.

Second, the results demonstrated that digitally enabled PM moderated a significant but negative influence on the relationship between digital leadership and collaboration performance. The previous literature emphasizes the creation of new leadership roles (Vial, 2019; Chanias *et al.*, 2019; Matt *et al.*, 2015). According to Vial (2019), hiring a chief digital officer to communicate the strategic nature of digital transformation to the organization can ensure continuing the task of maintaining the proper utilization of digital technology and its alignment with strategic goals. However, contrary to the original hypothesis, the results show that digitally enabled PM can be perceived as too controlling, negatively affecting collaboration performance. The challenges of collaboration have also been noted in previous studies (e.g. Holopainen *et al.*, 2022; Reim *et al.*, 2023). Thus, this study is in line with Nudurupati *et al.* (2021) and contributes to the literature emphasizing the need to move away from command and control to more empowering management, including the participatory use of PM to achieve better collaboration performance.

Lastly, the results showed that digitally enabled PM did not enhance the effects of other elements (development, objectives and management capabilities) of the digital business strategy on collaboration performance. This contradicts previous research, which concluded that PM has the potential to support inter-company collaboration in a digital era, acting as a system of systems (Bourne *et al.*, 2018; Sardi *et al.*, 2020). The results may reflect the assumption that although digital development is taking place in companies, goals and measures have not necessarily been set from the perspective of collaboration. This may be reflected in the finding that the effects of the development element on collaboration performance remained invisible in the entire model of this study.

According to Robert *et al.* (2022), going digital allows companies to collect real-time PM information through transparent indicators across the supply chain, and to utilize the gathered information to enhance operations, and offerings through instant feedback. The study showed that if no goals or measures have been set for collaboration, the effects of the objective element on collaboration performance are not concretized. According to Tabrizi *et al.* (2019), managers often have a certain digital technology or tool selected in

their minds, although digital transformation should be directed by a broader business strategy and should define concrete goals before making any investments. Finally, from the perspective of management, managing digital strategy and collaboration performance is a new and difficult entity for managers to handle (Li, 2020; Fitzgerald *et al.*, 2014), requiring a new kind of expertise and understanding. According to Li (2020), digital transformation requires new management skills related to the ability to manage novel digital technologies, strategies and operating models in order to achieve performance growth. Together, these findings show that managers do not know how to connect these topics to their PM systems to support the improvement of collaboration performance. Thus, the study contributes to practice by suggesting that companies should invest in management capabilities and connect their digital business strategies and PM systems to develop collaboration in digital transformation.

6. Conclusion

6.1 Theoretical implications

This study provides the consequent theoretical implications for the literature. First, the theoretical research framework identifies digital business strategy as a key determinant of collaboration performance, thus advancing the understanding of how SMEs can utilize digital business strategies and achieve enhanced collaboration performance. The empirically grounded validation of the theoretical research framework contributes to the stream of research on strategic change; therefore, this study departs from previous research that principally provides conceptual evidence of the implications of digital business strategies.

Second, the results show that the effects of digital business strategies and their elements on collaboration performance may be moderated by digitally enabled PM. To our understanding, the current research is the first to offer empirically grounded evidence of the role of digitally enabled PM in the association between digital business strategy and collaboration performance.

Third, the study identifies five types of digital business strategy elements: development, objectives, resources, management capabilities and digital leadership. It is among the first to translate an empirical understanding of SMEs' digital transformation into a conceptual framework of a digital business strategy. Although prior research has emphasized the essential elements of SMEs' strategic digital transformation, how these elements can be differentiated has not been thoroughly examined before.

6.2 Practical implications

The study also suggests a number of implications from a practical perspective. To facilitate collaboration performance through digital business strategy, companies must invest in their practical knowledge of the development of digital technologies and their ability to create digital strategies and look for new opportunities with the help of digital technologies. This can mean, for example, as versatile training and motivation as possible that companies offer to their managers and employees at different levels. Although the development element of the digital business strategy was considered to hinder collaboration performance, it may be possible to compensate for this by developing companies' capabilities. Thus, through advanced capabilities, a company can better identify the possibilities of utilizing digital technologies, the competitive advantage that can be achieved, and, eventually, choose the most suitable projects that utilize digital technologies. In this way, the development element of digital business strategy becomes a driver instead of a hindrance when aiming for higher collaboration performance.

Further, to achieve higher collaboration performance, companies must ensure that digitally enabled PM is connected to the use of a variety of digital technology-related

resources. This is because financial resources for investments in digital technologies and, importantly, the time and know-how to implement them are resources whose impact on collaboration performance can be improved when they are connected to digitally enabled PM. However, digitally enabled PM should not be too detailed or linked to monitoring the individual activities of persons responsible for introducing and experimenting with digital technologies, as this will lead to a negative impact on collaboration performance. When trying out new technologies, learning often happens through mistakes and excessive monitoring can feel controlling, which prevents, for example, the utilization and experimentation of new technologies outside company borders.

6.3 Limitations and future directions

This study has certain methodological and theoretical limitations that provide opportunities for future studies. The first limitation is related to the selected research sample. The study focused mainly on Finnish SMEs (76.6%) and their management. Thus, in the future, the research could be expanded to cover a larger geographical area. Further, focusing mainly on management's views may have influenced the results of the study. In the future, we suggest that the research can be extended more to large companies, and from the top level to the lower levels. Future study samples could also include large companies to determine whether digitally enabled PM supports the effects of digital business strategies on collaboration between different departments within the company.

Notably, the instruments of the study were built based on previous literature, as presented in Table 2. The digital business strategy included five elements (development, objectives, resources, management capabilities and digital leadership) to investigate the effects of collaboration. Given that we explored the effects of these five elements in the same framework, it is possible that this has shaped our results. Thus, we encourage the evaluation of the impact of the different independent elements, for example, common objectives between companies, more precisely in the future.

Finally, the study did not address a specific PM system or its implementation. In the future, it would be informative to consider how the effects of digital strategies and their elements on collaboration could be enhanced by choosing different measurement systems. In addition, in-depth case studies could be conducted related to the formulation and implementation of a digital strategy and the related digitally enabling PM system. Thus, empirical experiences on the research topic should be studied.

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