Facilitating performance measurement and management through digital business strategy

Mira Holopainen, Minna Saunila and Juhani Ukko

Abstract
Purpose – This study aims to focus on the connection between digital business strategy and performance measurement and management (PMM).
Design/methodology/approach – The implications of digital business strategy and its dimensions with regard to PMM were investigated through a survey. The survey questionnaire provided 202 valid cases with a focus on senior management of small- and medium-sized enterprises. Strategic dimensions were identified from the literature on management in the context of digitalization to build a theoretical framework that highlights the mechanisms that companies should focus on when managing and implementing digital technologies successfully.
Findings – The aspects that comprise digital business strategy are grouped into five major dimensions: technological understanding, goals, resources, management and responsibilities. The study reveals a direct and positive relationship between goals and management related to digital business strategy and PMM.
Research limitations/implications – The study contributes to the existing PMM literature in the context of digitalization.
Practical implications – The results indicate that if a company has excellent goals and management with regard to its digital business strategy, it uses PMM in a more successful and effective way.
Originality/value – To the best of the authors' knowledge, this study is among the first to examine PMM in terms of managing digital business strategy by trying to determine the extent to which the elements of digital business strategy can be integrated effectively into PMM.
Keywords Performance management, Performance measurement, PMM, Digital, Business strategy

1. Introduction

Performance measurement and management (PMM) has been impacted by ongoing digitalization and the changes it has forced in the management of companies’ operations (Nudurupati et al., 2020). In the context of digitalization, PMM can be viewed as a system of systems (Bourne et al., 2013; Sardi et al., 2020) that “need to interrelate complex subsystems, different in technology, context, operation, geography, and conceptual frame” (Sardi et al., 2020), thereby affecting the use of PMM in complex and turbulent environments (Bourne et al., 2013). Digitalization built on the utilization of digital technologies is consequently affecting PMM. Digital technologies can cause transformations resulting in improvements in companies’ offerings and customer satisfaction (Tortorella et al., 2020). Such major transformations require companies to adopt a strategy that connects their technologies and businesses (Bharadwaj et al., 2013). This type of digital business strategy and its management require companies to implement success metrics, that is, PMM (Bharadwaj et al., 2013; Nasiri et al., 2020). Such PMM is
challenged by the turbulence of the external environment (Nudurupati et al., 2016) and, therefore, requires the capability to gather information that is highly volatile and fast-changing.

Despite the abundant literature on PMM practices, little research has been conducted on how the current highly volatile, uncertain and ambiguous digital environment has been affecting how organizations measure and manage performance (Nasiri et al., 2020; Nudurupati et al., 2020). Specifically, while digital transformation’s influence on companies’ strategies is widely recognized, its influence on PMM has elicited scant attention. Presumably, digital transformation and its alignment with a company’s strategic objectives exert a meaningful effect on PMM. The phenomenon – digitalization’s influence on PMM – is acknowledged in the literature, but little research has been conducted on the specific factors that influence PMM. If the company’s strategic goal is to digitalize its operations, for example by moving to e-commerce, they must find the most suitable possible solution in terms of costs, quality and goals. It is assumed that the better a company manages the various aspects of a digital business strategy, such as understanding technology, the various costs of investment and maintenance and the goals set for it, the better they will be able to link digital investment goals to company-wide strategic goals and decision-making in their PMM. This in turn positively contributes to the efficient use of PMM.

Thus, the aim of the study is to answer the question of whether digital business strategy positively influences PMM. The aspects that comprise digital business strategy are grouped into five major dimensions: technological understanding, goals, resources, management and responsibilities. The research is based on an analysis of survey results from 202 respondents. The research contributes to recent literature and practices as follows. First, it reveals the influence of the specific dimensions of digital business strategy on PMM. The results explain which digital business strategy dimensions are more effective in this sense. According to the results, goals and management related to digital business strategy should be considered with regard to supporting PMM in digital transformation. Second, this study offers a holistic framework for indicative research on digital business strategy’s influence on PMM. A better understanding of the dimensions of digital business strategy related to PMM will assist the development of a comprehensive picture of performance management in line with digital business strategy.

The paper proceeds as follows. In the literature review, prior research on PMM in the context of digitalization is reviewed. Then, in Section 2, hypotheses are developed, and a research model is presented. After this, the methodology and results of the study are outlined in Sections 3 and 4, respectively. Finally, the research results are discussed in Section 5, and a conclusion is presented in Section 6.

2. Theoretical model and hypotheses

2.1 Theoretical underpinnings

2.1.1 Performance measurement and management. Despite the abundant literature on PMM practices, little research has been conducted on how the current highly volatile, uncertain and ambiguous operating environment has been affecting how organizations measure and manage performance (Nudurupati et al., 2020). Similarly, limited effort has been made to construct a theoretical framework to understand the interplay between performance measurement and performance management, or their impact on employee engagement and performance (Bourne et al., 2013; Smith and Bititci, 2017). To understand the differences between the studied concepts, the key ideas must be defined. Ittner et al. (2003) touted a performance measurement system as a system that “provides financial and nonfinancial information that allows the firm to identify the strategies offering the highest potential for achieving the firm’s objectives, and aligns management processes, such as target setting, decision-making, and performance evaluation with the achievement of the
chosen strategic objectives." Hall (2008) defined a performance measurement system as one that "translates business strategies into deliverable results by combining financial, strategic, and operating business measures to gauge how well a company meets its targets." From an organizational control perspective, PMM can be examined through technical control and social control mechanisms (Child, 1973; Cardinal et al., 2004; Smith and Bititci, 2017). As a technical control, performance measurement refers to a process (or processes) of setting goals, developing a set of performance measures and collecting, analyzing, reporting, interpreting, reviewing and acting on performance data (Neely et al., 1995; Smith and Bititci, 2017). Performance management, in turn, refers to social controls that are conceptualized as cultural and behavioral routines that define how we use a performance measurement system to manage an organization’s performance (Bititci, 2015; Smith and Bititci, 2017). Summing up, it is suggested that the research around PMM could focus more on the co-existence and interplay between the technical and social control aspects of PMM in changing business environments.

PMM systems have also been demonstrated to be complex, adaptive systems that are evolving and constantly adjusting to transformations within an internal company environment (Okwir et al., 2018). Koufteros et al. (2014) suggested that in changing business environments, organizations can use these systems as orchestration mechanisms, not only to control and evaluate internal organizational behavior, but also to adapt to the needs of organizational renewal activities. For example, companies experience internal and external pressures to implement digital transformation, which forces them to retool their functions and operations. Renewal activities are strongly related to PMM’s social control aspect with regard to, for example, people’s behavior and organizational capabilities. Franco-Santos et al. (2012) noted that people’s behavior refers to consequences related to employees’ actions or reactions (e.g. motivation, participation) and their underlying cognitive mechanisms (e.g. perceptions). They also suggested that organizational capabilities refer to consequences associated with specific processes, activities, or competencies that enable an organization to perform and gain competitive advantages (e.g. strategic alignment, organizational learning). Nudurupati et al. (2020) also highlighted the use of more subjective, perception-based evaluation measures, in which both the multi-tier supply chain and customers are asked to evaluate an organization, often using social media and other information technology-enabled platforms. Similarly, Nasiri et al.’s (2020) findings showed that when companies digitize their operations and functions, social controls (digital-related human and collaboration capabilities) positively affect technical controls (i.e. performance measurement systems) and, further, financial performance. This indicates that changes in people’s behavior and organizational capabilities (social controls) influence PMM (technical controls) and vice versa. The discussion above indicates the need for parallel assessments in terms of both the social and technical control mechanisms of PMM, as well as the need to consider in which case (e.g. social controls) the notion of performance evaluation, rather than measurement, would be a viable alternative (cf. Bititci et al., 2012). Therefore, PMM is, all in all, an essential means of handling digital transformation.

2.1.2 Performance management and digital business strategy. To survive the intensifying competition, companies need a digital business strategy that reflects a fusion between technologies and business (Bharadwaj et al., 2013). Bharadwaj et al. (2013) defined digital business strategy as “organizational strategy formulated and executed by leveraging digital resources to create differential value”. Mithas et al. (2013) concluded that “digital business strategy is not solely a matter of optimizing firm operations internally or of responding to one or two focal competitors, but also arises strikingly from awareness and responsiveness to the digital business competitive environment”. The successful implementation of such a digital business strategy certainly causes some changes to PMM as well (Bharadwaj et al., 2013; Nasiri et al., 2020).
Comprehensive PMM facilitates the interplay between company operations and strategy (Chenhall, 2005). Digital technologies foster transformations that can result in major improvements in offerings and customer satisfaction (Tortorella et al., 2020), thereby requiring a strategy that reflects a fusion between technologies and the business (Bharadwaj et al., 2013). This type of strategy is called a digital business strategy. To manage such a strategy, companies need success metrics, that is, PMM (Bharadwaj et al., 2013; Nasiri et al., 2020). A challenge associated with this is coping with turbulence from the external environment (Nudurupati et al., 2016). Thus, PMM should possess the capability to gather information that is highly volatile and fast-changing. In response, contemporary research has defined PMM in the digital context as a system of systems (Bourne et al., 2013; Sardi et al., 2020). Consequently, it “need(s) to interrelate complex subsystems, different in technology, context, operation, geography, and conceptual frame” (Sardi et al., 2020), thereby facilitating the use of PMM in complex and turbulent environments (Bourne et al., 2013).

According to this perspective, novel directions for the utilization of PMM to foster digital business strategy are evident. These are summarized in Table 2 and described next. Contemporary PMM puts greater emphasis on evaluation, rather than on traditional measurement (Nudurupati et al., 2016; Ukko et al., 2020). This requires deep understanding about the entire process directing digital business strategy. Ravelomanantsoa et al. (2019) suggested that prior technological changes have led to the view that a company is not understood as one company, but rather as a network of companies with interconnected performances. According to them, this view elicits major changes in how PMM is constructed. Further, PMM success strongly depends on different technological capabilities, as they facilitate process transformations and promote decision-making (Vallurupalli and Bose, 2018).

The importance of goal alignment in PMM has been highlighted in prior studies (Reinking et al., 2020; Sardi et al., 2020). Nudurupati et al. (2016) concluded that companies should integrate technological developments into their strategic and performance expectations. Further, PMM is a powerful tool that can translate strategy to the lower levels of a company and assess performance against strategy. Strategic alignment is also critical to the utilization of specific PMM tools, such as dashboards. Reinking et al. (2020) studies dashboards as a tool to align company performance with strategy and found that the strategic alignment of digital dashboards enhances performance (Reinking et al., 2020). In addition to individual PMM tools, Sardi et al. (2020) highlighted the importance of defining and managing the entire PMM process in relation to utilizing digital technologies and resources in line with a company’s strategic goals. In digital transformation, PMM requires continuous updates, as the tools implemented need to keep up with changes in the external environment (Kamble et al., 2020; Chanias et al., 2019).

Targeting different types of resources is also indicated as being crucial in PMM. Nudurupati et al. (2016) stated that PMM, in the digital era, is characterized by a balance between traditional measures, with an emphasis on financial aspects and the evaluation of behavioral metrics. Kamble et al. (2020) reported similar findings in their study of smart manufacturing systems’ PMM. They concluded that PMM should incorporate effects beyond traditional performance dimensions, such as cost, quality and productivity. Thus, in addition to financial aspects, human resources should be targeted to facilitate digital business strategy. Further, Ukko et al. (2020) studied PMM in the context of digital services and highlighted the role of relational mechanisms in such a system. They stated that behavioral factors, along with technical ones, should be considered in contemporary PMM. Thus, it should not focus merely on design and data analysis, but also engage humans in the process (Ukko et al., 2020). This makes human resources crucial.

Digital transformation has elicited a greater emphasis on management facilitating PMM processes (Kamble et al., 2020; Nasiri et al., 2020). According to Nudurupati et al. (2016),
contemporary PMM should aim to enhance and support different skills and capabilities, as it is the way forward for affecting behavior and further driving cultural change. Similarly, Seele (2016) stated that the implementation of digitally unified measurement changes company processes and routines. Further, different types of management capabilities are required to manage these changes. Nasiri et al. (2020) found that companies can improve their financial performance with the assistance of PMM-facilitated human and collaboration capabilities. PMM is also an important tool for facilitating decision-making. Sahlin and Angelis (2019) studied the opportunities for the digitalization of real-time PMM and found that it can serve as a useful tool for decision-making in turbulent environments, as digitalization has facilitated much faster data access for managers.

Finally, balancing and defining different responsibilities is crucial in PMM. Ukko et al. (2020) demonstrated that inter-organizational trust and know-how development via knowledge sharing act as relational mechanisms that facilitate the relationships governed by social interactions that drive PMM. Their study, within the digital service context, classified the criticality and personalization of services to guide exploited relational mechanisms (Ukko et al., 2020). Engaging with different parties via performance-based collaboration also facilitates innovation (Nudurupati et al., 2016). Other benefits from involving actors in PMM include enhanced trust and a willingness to share information and knowledge (Ukko et al., 2020).

The above evidence indicates that PMM is influenced by different perspectives of digital business strategy. Digital business strategy is an essential motivator of actions and also acts as a determinant for firms to transform their processes and routines to manage performance. Next, hypotheses are developed by examining how PMM is driven by digital business strategy.

2.2 Hypothesis development

The objective of this study was to examine the effect of digital business strategy on PMM. A digital business strategy is a multidimensional entity that requires the consideration of various factors. In our study, digital business strategy consists of the subdimensions of technological understanding, goals, resources, management and responsibilities, which are identified from previous literature on management in the context of digitalization. Figure 1 shows the conceptual model and hypotheses guiding our research. The model suggests that digital business strategy offers the potential to influence PMM. Thus, in the digital business environment, a firm lacking strong emphasis on the five dimensions of digital business strategy is not necessarily capable of improving its PMM. In addition, control
variables are added to the research model. We propose the following hypothesis and five sub-hypotheses that are explained in more detail in the following section:

**H1.** Digital business strategy positively influences PMM.

Technological understanding in relation to digital business strategy describes whether a firm strives to gain a competitive edge through digital technology by recognizing the importance of such technology and by implementing projects based on it. McAdam et al. (2017) stated that transformations in technology challenge the connection between operations and strategy. They continued by recognizing that avoiding such misalignment requires developing dynamic capabilities built on PMM. These capabilities assist in balancing business strategy, technological strategy and technological practices (McAdam et al., 2017). This is likely to transform PMM as well. Nudurupati et al. (2016) suggested that adopting PMM in digital economies requires firms to understand the potential of technologies in terms of creating competitive advantage via strategy. Technological developments lead to greater amounts of data, and therefore, the adoption of new easy-to-use methods facilitates decision-makers (Nudurupati et al., 2016), which affects PMM. Accordingly, we hypothesize the following:

**H1a.** Technological understanding related to digital business strategy positively influences PMM.

Goals related to digital business strategy refer to the objectives pursued by the new strategic technologies. The importance of goal alignment that also includes the ambitions of the new PMM technologies has been highlighted in prior studies (Reinking et al., 2020; Sardi et al., 2020). Nudurupati et al. (2016) emphasized how companies need to integrate technological development expectations into their strategic and performance goals. Kamble et al. (2020) studied the interplay between PMM and smart manufacturing systems and found that aligning manufacturing goals with performance targets guides the adoption of new technologies. Sardi et al. (2020), in turn, emphasized the importance of defining and managing the entire PMM process for utilizing digital technologies and resources in line with a company’s strategic goals. Thus, in line with the considerations above, the following hypothesis is proposed:

**H1b.** Goals related to digital business strategy positively influence PMM.

With regard to digital business strategy, resources refer to financial resources as well as the time and skills that employees need to implement digital technologies in line with the objectives. Nasiri et al. (2020) showed that human capabilities significantly contribute to PMM. Also, Nudurupati et al. (2016) found that the workforce is crucial in the digital era in terms of managing recurring inter-organizational business turbulence and related PMM transformations. Similarly, Beer and Micheli (2018) recognized that PMM should cover both the objects (e.g. cost or quality) being measured and the mechanisms that are created and used by the subjects involved in the process. Based on these, the following hypothesis is proposed:

**H1c.** Resources related to digital business strategy positively influence PMM.

The management of digital business strategy is considered as crucial and refers to managers’ strategic capabilities, decision-making capabilities and willingness to implement changes, in addition to their experience and skills developed through technology projects (Matt et al., 2015). Managerial capabilities have been highlighted as one of the main dimensions of a digital business strategy, along with launching new technologies (El Sawy et al., 2016; Li et al., 2018). Managerial capabilities also benefit PMM (Horváth and Szabó, 2019; Frederico et al., 2020). For example, Nasiri et al. (2020) showed how personal capabilities, such as adaptable mind-sets and skill sets, together with digital know-how (El Sawy et al., 2016), have been linked to the better utilization of PMM. This new way of using PMM enables diagnoses of digitalized processes with real-time information and reveals
opportunities for improving financial performance. Horváth and Szabó (2019) suggested that an increased managerial emphasis on PMM enables increased control and permits real-time performance measurement, which in turn, promote the adoption of new technologies. Based on the notions above, managerial capabilities related to digital business strategy can influence both the adoption of new technologies and PMM by changing the culture and enabling real-time performance measurement. Thus, the following hypothesis is put forward:

\[ H1d. \text{ Management-related aspects of digital business strategy positively influence PMM.} \]

Responsibilities related to digital business strategy include the implementation of digital strategy functions and involve having sufficient experience in managing digital technology projects. These may require the development of joint platforms to share pertinent resources and skills to encourage shared continuous improvement activity via PMM (Nudurupati et al., 2016). The way responsibilities and roles are divided between individuals and groups has a significant impact on how a company operates (Tardieu et al., 2020). As distributing responsibilities in a meaningful way affects company performance, it will require changes in PMM as well. Thus, the following hypothesis is proposed:

\[ H1e. \text{ Responsibilities related to digital business strategy positively influence PMM.} \]

3. Research methodology

3.1 Sample and data collection

This research focuses on the connection between digital business strategy and PMM. The implications of strategic dimensions for PMM were investigated through a survey. The survey was conducted in September–October 2021. The questionnaire was sent to 5,665 companies by e-mail and was answered by 205 representatives. The responses were received in four waves. One week after the first mailing of the link, reminder messages were sent. The last two reminders were circulated a week after the previous reminder. Of the responses, 202 were considered to be valid cases, which provided a sufficient sample size. The research was limited to Finland with a focus on small and medium-sized enterprises. In total, 95.6% of the respondents were senior management, and the rest were middle management or lower-level employees. After the data collection, statistical analyses were conducted using SPSS and Excel software to test the hypotheses.

3.2 Survey measures and their validity and reliability

All the study scales were developed based on previous studies. The dependent variable was PMM. A scale was informed by previous research to reflect the impact of PMM on company operations (Child, 1973; Cardinal et al., 2004; Smith and Bititci, 2017; Neely et al., 1995; Bititci, 2015). It included a total of seven items, each of which was assessed with a seven-tier Likert scale (with the responses varying from totally disagree to totally agree) to find out how companies use PMM to support their businesses and operations (Chenhall, 2005). The seven items that constituted the PMM scale are presented in Table 2.

Digital business strategy, as the independent variable, was divided into five different dimensions: technological understanding, goals, resources, management and responsibilities (Table 1). All five dimensions consisted of two or three items based on recent studies (see Section 2.1.2). Technological understanding was composed of three items: the technological development of the industry, the existence of digital projects and the achievement of a competitive advantage through digital technology. The goals dimension included a company’s ability to define goals related to the use of digital technologies, to monitor the achievement of such goals and to use digital technology to achieve the defined goals. The items in the resource dimension focused on dealing with
financial resources, human resources and employee skills related to the implementation of digital projects. The management scale included three items that assessed management’s awareness of the digital technologies, its strategic capability in relation to the digital technologies and its ability to seek new opportunities through digital technologies. Finally, the responsibility scale was formed by two items that investigated the appointment and experience of the person in charge of managing digital transformation projects. Every item was assessed with a seven-tier Likert scale (with the responses varying from totally disagree to totally agree).

Control variables were used in the models to examine the effect of the variables on the results. The control variables included the customer group and industry of the respondent’s company. The customer variable included two items: business-to-business and business-to-customer. The industry variable was composed of the following items: manufacturing and service. Respondents chose one of the alternatives for each of the control variables.

The survey dimensions and item reliability and validity were tested at various stages and through different analyses. First, we tested that all the constructs were unidimensional and that all the item loadings were above the minimum limit using factor analysis (Hair et al., 2014). The loadings for all the items exceeded the required limit (> 0.50). In addition, the composite reliability (CR) and average variance extracted (AVE) were calculated to evaluate the validity and reliability of the construct of the model. All the AVE values were greater than the threshold (0.50), and the CR values were higher than 0.70, confirming the validity. Finally, the reliability of the variables was analyzed by calculating Cronbach’s alphas. All the six dimensions had Cronbach’s alpha values higher than the proposed limit (> 0.60). Thus, it can be stated that the construct of the model is reliable (De Vellis, 1991). Thus, the reliability and validity of the model construct are ensured.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>References</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding</td>
<td>Vallurupalli and Bose (2018), Ravelomanantsoa et al. (2019)</td>
<td>Interconnected performances, Technological understanding, Source of higher performance</td>
</tr>
<tr>
<td>Goals</td>
<td>Nudurupati et al. (2016), Chaniaas et al. (2019), Kamble et al. (2020), Reinking et al. (2020), Sardi et al. (2020)</td>
<td>Technological developments aligned with organizational strategic objectives, Deploying strategy to lower levels, Continuous review of performance measures</td>
</tr>
<tr>
<td>Resources</td>
<td>Nudurupati et al. (2016), Kamble et al. (2020), Ukko et al. (2020)</td>
<td>Effects beyond traditional performance dimensions (cost, quality, productivity, etc.), Behavioral factors concurrent with technical ones, Human involvement</td>
</tr>
<tr>
<td>Management</td>
<td>Nudurupati et al. (2016), Seele (2016), Sahin and Angelis (2019), Kamble et al. (2020), Nasiri et al. (2020)</td>
<td>Promoting behavior and collaboration, Driving cultural change, Transforming processes and routines</td>
</tr>
<tr>
<td>Responsibilities</td>
<td>Nudurupati et al. (2016), Ukko et al. (2020)</td>
<td>Potential for decision-making, Need for personalization, Subjects’ engagement, Trust between partners, Information sharing</td>
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</table>
To address the problem of non-response bias, an analysis of variance (ANOVA) test was performed. The respondents were distributed into two groups: first respondents and late respondents. The results revealed that there was no significant difference (at the level of \( p \leq 0.05 \)) between the two groups. Therefore, non-response bias does not have an effect.

Other sampling biases were additionally assessed to make sure that the sample was representative. The sample was randomly selected to decrease the potential of voluntary response bias. Random sampling is likely to ensure that sufficient numbers of distinct types of small- and medium-sized companies (SMEs) were included in the sample. Also, this procedure was adopted to make sure that only one response was received from each firm and respondent. As proposed by Podsakoff et al. (2003), several procedural remedies were utilized to decrease the influence of common method bias. The execution of the survey allowed anonymous responses, and the cover letter urged the respondents to reply to the

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Format of the items</th>
<th>Items</th>
<th>Loadings</th>
<th>CR</th>
<th>AVE</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding</td>
<td>The company considers and understands the impact of digital technology on the following (Totally disagree (1) – Totally agree (7))</td>
<td>1 Industry development 2 Digital projects 3 Competitive advantage</td>
<td>0.882 0.867 0.923</td>
<td>0.92 0.79 0.86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goals</td>
<td>The company has set goals related to the utilization of digital technology (Totally disagree (1) – Totally agree (7))</td>
<td>1 Setting goals 2 Monitoring goals 3 Reaching goals</td>
<td>0.934 0.921 0.901</td>
<td>0.94 0.84 0.91</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td>The company’s resources support digital projects (Totally disagree (1) – Totally agree (7))</td>
<td>1 Financial resources 2 Human resources 3 Employee skills</td>
<td>0.880 0.873 0.757</td>
<td>0.88 0.70 0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>Management-related aspects related to digital technology (Totally disagree (1) – Totally agree (7))</td>
<td>1 Awareness 2 Capability 3 Activity</td>
<td>0.936 0.882 0.837</td>
<td>0.92 0.78 0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsibilities</td>
<td>Ability of person in charge of digital projects (Totally disagree (1) – Totally agree (7))</td>
<td>1 Appointment 2 Experience</td>
<td>0.903 0.903</td>
<td>0.90 0.82 0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PMM</td>
<td>The company utilizes PMM as follows (Totally disagree (1) – Totally agree (7))</td>
<td>1 To support management 2 To provide business information 3 To link measures to strategic objectives 4 To report regularly on measurement information 5 To support strategic decisions 6 To develop ideas etc. 7 To impact the activities of the staff</td>
<td>0.919 0.892 0.887 0.857 0.839 0.834 0.824</td>
<td>0.95 0.75 0.94</td>
<td></td>
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</tbody>
</table>
questions as truthfully as possible. This is likely to decrease social desirability bias. Common method bias can also be minimized by the careful construction of the questions (taking into account the question wording and ease of understanding). The questions were reviewed by researchers familiar with the theme. Also, statistical remedies were performed to minimize the potential common method bias (Harman’s one-factor test). All the questions utilized in the analyses were loaded into the exploratory factor analysis. The unrotated solutions factor solution did not indicate the presence of one factor or that the first factor corresponded to most of the variance (Podsakoff et al., 2003). Thus, common method variance is not a problem in this case.

4. Results

The objective of this study was to examine the effect of digital business strategy on PMM. We examined digital business strategy through five dimensions: technological understanding, goals, resources, management and responsibilities. Table 3 shows the means, standard deviations and correlations of the construct.

The regression results of the relationships are shown in Table 4. The research model is significant at the \( p < 0.01 \) level \((R^2 = 0.27)\). In the model, the goals dimension is significant at the \( p < 0.05 \) level, and the management dimension is significant at the \( p < 0.01 \) level, and thus, they positively influence PMM. Technological understanding, resources and responsibilities are insignificant. Thus, the results provide support for \( H1b \) and \( H1d \), but not for \( H1a \), \( H1c \) and \( H1e \).

The results of the study reveal that if a company has excellent goals and management with regard to digital business strategy, it uses PMM in a more successful and effective way. A company’s main industry and customer group, which acted as the control variables, did not influence the implementation of PMM.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Correlation matrix</th>
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<tbody>
<tr>
<td>Dimension</td>
<td>Mean</td>
</tr>
<tr>
<td>1 Understanding</td>
<td>5.84</td>
</tr>
<tr>
<td>2 Goals</td>
<td>5.18</td>
</tr>
<tr>
<td>3 Resources</td>
<td>4.44</td>
</tr>
<tr>
<td>4 Management</td>
<td>5.11</td>
</tr>
<tr>
<td>5 Responsibilities</td>
<td>4.29</td>
</tr>
<tr>
<td>6 PMM</td>
<td>5.08</td>
</tr>
</tbody>
</table>

Note: **Correlation is significant at the 0.01 level (two-tailed)

<table>
<thead>
<tr>
<th>Table 4</th>
<th>Regression results</th>
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<tbody>
<tr>
<td>Model</td>
<td>( \beta )</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
</tr>
<tr>
<td>Customer group</td>
<td>0.217</td>
</tr>
<tr>
<td>Industry</td>
<td>-0.220</td>
</tr>
</tbody>
</table>

Main effects

| Understanding | 0.032 | 0.125 | 0.028 | | | | |
| Goals | 0.294* | 0.125 | 0.300 | | | | |
| Resources | -0.118 | 0.094 | -0.111 | | | | |
| Management | 0.406*** | 0.118 | 0.375 | | | | |
| Responsibilities | -0.066 | 0.069 | -0.083 | | | | |

Summary (Constant)

| 2.044 | 0.687 | 0.272 | 0.245 | 1.217 | 10.055 | | |

Notes: ***\( p \leq 0.001 \), **\( 0.001 < p \leq 0.01 \), *\( 0.01 < p \leq 0.05 \)
5. Discussion

The objective of this study was to examine the effect of digital business strategy on PMM. Digital transformation has been found to be effective in terms of transforming PMM across industries (Nudurupati et al., 2016; RavelomanantsOA et al., 2019; Kamble et al., 2020; Nasiri et al., 2020; Sardi et al., 2020). Digital business strategy, in particular, is influencing PMM as it is the key to managing such transformations connecting technology and business (Bharadwaj et al., 2013; Nasiri et al., 2020). This study contributes to the research in the intersection of PMM and digital transformation by demonstrating that several dimensions of digital business strategy are important factors that influence PMM. The results indicate that if a company has excellent goals and management related to digital business strategy, it uses PMM in a more successful and effective way. On the other hand, understanding, resources and responsibilities related to digital business strategy do not directly influence PMM. The main findings are discussed next.

First, the study shows that management-related aspects of digital business strategy positively influence PMM. This supports the view that the ability of companies to adopt new digital technologies has become increasingly important for competitiveness, but it is not an easy task for management due to their inherent complexity and uncertainty. The results of this study also support the idea that companies should understand how digital technology tied to a strategy can create a competitive advantage and should exploit it using relevant behavioral measures (Nudurupati et al., 2016). This requires new capabilities from management, as it should be aware of new technological opportunities, possess the necessary strategic and decision-making capabilities and actively lead technological change projects (Matt et al., 2015; Charias et al., 2019). The study reveals that, when business leaders possess these leadership skills, they are positively reflected in PMM. According to the results, the management of digital business strategy has the greatest impact on PMM during digital transformation. This is in line with previous studies, for example, Nasiri et al. (2020), who showed that personal capabilities, such as adaptable mind-sets and skill sets together with digital know-how, have been linked to the better utilization of PMM. In addition, Horváth and Szabó (2019) suggested that one of the driving forces for adopting digital technologies was increased managerial emphasis on PMM that enables increased control and permits real-time performance measurement, which in turn, promote the adoption of new technologies and improve decision-making and performance appraisal. Also, Sahlin and Angelis (2019) found that PMM can serve as a useful tool for management in turbulent environments, as digitalization has facilitated much faster data access to support decision-making. Thus, the higher the level of management capabilities related to digital business strategy, the more effectively a company can leverage PMM to support its digital transformation.

Second, the study reveals that goals related to digital business strategy positively influence PMM. Thus, the study supports the notion that digital technology alone does not add much value to a company’s operations without a connection to the company’s strategic visions and goals. Alongside management, the importance of goal alignment in PMM has been highlighted in prior studies as well (Reinking et al., 2020; Sardi et al., 2020). Nudurupati et al. (2016) concluded that companies should integrate technological developments into their strategic and performance expectations. Sardi et al. (2020) highlighted the importance of defining and managing the entire PMM process for using digital technologies and resources in line with a company’s strategic goals. In digital transformation, it is important to set goals and update them as and when required, which means that PMM will need continuous updates, as it has to keep up with changes in the external environment (Kamble et al., 2020; Charias et al., 2019). Our research is in line with these studies, as it shows that if a company sets goals for the utilization of digital technology, monitors the achievement of these goals and strives to achieve them, it can use PMM more effectively to support digital transformation.
Finally, the results indicated no direct effect of technological understanding, resources and responsibilities with regard to digital business strategy on the way companies use PMM. This is somewhat inconsistent with previous studies, which suggest that adopting PMM in digital transformation requires understanding the potential of technologies, as well as the creation of joint platforms to share pertinent resources and skills to create competitive advantage via digital business strategy (Nudurupati et al., 2016; Tardieu et al., 2020). Because the impact of all the five dimensions of digital business strategy was studied in the same model, it may be that the management and goals dimensions diluted the impact of the other three. It may also be that the dimensions of technological understanding, resources and responsibilities do not have an impact without an adequate level of the management and goals dimensions. In the future, it will be interesting to explore in more detail the technological understanding, resources and responsibilities dimensions and their relation to PMM.

6. Conclusion

6.1 Theoretical contributions

The study contributes to the existing PMM literature in the context of digitalization by examining the connection between digital business strategy and PMM. It is among the first studies to examine PMM in terms of managing digital business strategy by trying to determine the extent to which the elements of digital business strategy can be integrated effectively into PMM. Specifically, the study contributes to recent literature as follows. First, it shows the influence of the specific dimensions of digital business strategy on PMM. The results explain which digital business strategy dimensions are more effective at influencing PMM. According to the results, goals and management related to digital business strategy directly influence PMM in digital transformation. Understanding, resources and responsibilities related to digital business strategy do not directly shape PMM in digital transformation. Second, this study offers a holistic framework for indicative research on digital business strategy’s influence on PMM. A better understanding of the dimensions of digital business strategy related to PMM will assist the development of a more comprehensive picture of performance management in line with digital business strategy.

6.2 Practical contributions

Digital transformation has been found to be effective in terms of transforming PMM across industries. Digital business strategy, in particular, is influencing PMM, as it is the key to managing such transformations connecting technology and business. First, this study contributes to practice by showing that management-related aspects of digital business strategy positively influence PMM. This supports the view that the ability of companies to adopt new digital technologies has become increasingly important for competitiveness, but it is not an easy task for management due to their inherent complexity and uncertainty. Thus, the study contributes to practice by highlighting the role of managers in digital transformation. The ability of management to adapt and understand new technologies and integrate them with objectives, performance metrics and decision-making is critical to digital business strategy to be effectively integrated into PMM.

Second, the study shows that if a company sets goals for the utilization of digital technology, monitors the achievement of these goals and strives to achieve them, it can use PMM more effectively to support digital transformation. Setting goals, in forming a digital business strategy, requires the company to be able to assess the significance of technology and digital transformation for its operations. Thus, to succeed in digital transformation, companies should integrate technological developments into their strategic and performance expectations, allowing PMM to serve as an effective tool to translate digital strategy to the lower levels of a company and evaluate performance against strategy.
6.3 Research limitations

This study’s limitations are as follows. First, this study adopted a cross-sectional design. Future studies could use a longitudinal design to gain an in-depth assessment of the interconnections of the study variables over time. Second, the sample covers SMEs in one geographical district. Future research could collect data from specific industries, larger companies, or other geographical districts. This study did not target a specific type of PMM and instead looked at PMM in general. A more specific approach could be used in future studies to examine the types of PMM used. Different dimensions of digital business strategy may drive different types of PMM.

References


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