



Steering digitalization and management control maturity in small and medium enterprises (SMEs)

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ABSTRACT

This paper aims to study the effects (benefits) of digitalization on management control systems and explore the factors affecting the relationship between digitalization and management control systems in small and medium enterprises (SMEs). The study is based on a survey administered to a sample of 132 Italian companies, mainly comprising small and medium enterprises. The findings provide evidence of the significant benefits of digitalization related to company performance improvements and internal and external communication. Furthermore, results reveal that top management, human resources, and financial resources are the main drivers leading to digitalization. Finally, medium-sized companies are found to be more active in digital transformation. The paper addresses the critical point that training people in digitalization, especially in SMEs, is key to getting a more mature Management Control System (MCS) and reaching a higher level of performance. Secondly, widespread digitalization in many company processes is a critical success factor. The originality of the current research lies in the focus on investigating the relationship between digitalization and management control systems in Italian SMEs. Finally, the research sheds light on the drivers and barriers that can lead to or impair improvement in the maturity level of management control systems.

1. Introduction

Currently, many companies are struggling to integrate digitalization into their processes to increase competitiveness and growth (Annarelli et al., 2021; Chouaibi et al., 2022; Manita et al., 2020; Matalamäki and Joensuu-Salo, 2022), as it is increasingly becoming evident that digitalization as an enabler affects the traditional method of entrepreneurship and managerial decision-making and impacts almost every business aspect in companies due to its pervasive influence on businesses and societies, causing mass-level changes across all functions of organizations (Schivone et al., 2021; Zeng et al., 2022).

Due to its setting, digitalization is often defined as converting analog data into digital information (Hina et al., 2023; McFarlane et al., 2022; Nobach, 2019), but it's much more than that. Digitalization improves corporate efficiency by incorporating digital technology into everyday operations (Mehrotra and Agarwal, 2023; Sun et al., 2023; Fähndrich, 2023). Organisationally, "digitalization" changes a company's structure

and boosts value output (Bhimani, 2020). This transformation has streamlined processes, increased efficiency, and tailored customer experiences using data (Awan et al., 2021; Henke and Jacques Bughin, 2016). Digitalization is essential for firms to function better and more efficiently in today's technologically sophisticated environment (Agarwal and Mehrotra, 2020; Sharma et al., 2023; Pfister and Lehmann, 2023; Webb, 2020).

Several researchers (Ciasullo and Lim, 2022; Torriero et al., 2022; Truant et al., 2021) corroborated that to fully harness the potential benefits of digitization, a fundamental change in business operations is required with the adoption of new business models to promote broader innovation (Leitner-Hanetseder et al., 2021). Moreover, digitalization impacts several business processes within an organization, with management accounting or management control system (MCS) being particularly affected and, thus, being a relevant process in influencing performance improvements, it is at the forefront of this effect (Grima et al., 2022; Ruggeri et al., 2023). Indeed, MCS is the process in which

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managers efficiently gather and utilize resources to achieve the organization's goals. This, in turn, enhances organizational management and capabilities by supporting business plans to gain a competitive advantage and achieve higher performance (Lino et al., 2023; Pargmann et al., 2023).

Management control system (MCS) is a crucial area of the digital revolution, boosting organizational capabilities by providing information to assist managers do their jobs and build and sustain productive behavioral patterns (Bhimani, 2020; Fährdrich, 2023; Pfister et al., 2023). Consequently, digitalization in management control systems enables real-time data collection, processing, and analysis, leading to improved decision-making, faster market response, and identification of inefficiencies (Bienkowska and Tworek, 2022; Knudsen, 2020; Biswas and Akroyd, 2022; Laguir et al., 2022; Truant et al., 2021; Möller et al., 2020).

Therefore, some accounting literature is emerging in response to these digitalization trends (Bhimani, 2020; Bienkowska and Tworek, 2022; Knudsen, 2020; Ulrich et al., 2022) and the link between technology and management control system (MCS) has piqued interest in the accounting literature (Bresciani et al., 2023; Oluyisola et al., 2022; Ghasemi et al., 2019). However, despite a decent body of literature on the impact of technology on management control systems, several researchers underlined relevant gaps to be filled.

Firstly, some scholars (Daff, 2021; Fährdrich, 2023; Möller et al., 2020) shed light on the fact that the existing studies concentrate on outdated technologies or are too narrow from a management control system perspective. Critics argue, in particular, that because technology is constantly evolving and operates like a living organism, there is a need for more study on the influence and the impact that it has on management control systems (Agostino et al., 2022; Alam and Hossain, 2021; Awang et al., 2022; Coman et al., 2022; Jans et al., 2022; Möller et al., 2020), thus concretely pointing out the underlying dynamics.

Second, Möller et al. (2020) editorial highlighted a notable gap that has to be addressed regarding the influence of digitalization capabilities on management control systems. They asked for further research and studies to be conducted to debate the suitability of management control systems in a digital setting and how they should be modified to fit the digital environment. They also highlighted that most works are conceptual, with few case studies and empirical research. Moreover, they underlined that consultants and practice pioneers (such as McKinsey and Deloitte) dominate the field, and they asked academics to pay attention to this relevant development of digitalization and management control. The academic side needs a field overview, structuration, conceptual concepts, and reflection.

Third, researchers (Alam and Hossain, 2021; Möller et al., 2020) have identified a significant gap in digital management control systems studies. This emphasizes the need for further research to understand the factors related to the digitalization of management control systems and how management control systems should be adjusted to incorporate digital capabilities.

In light of the highlighted gaps, this study's primary goal is to analyze the factors that either promote or inhibit the adoption of digitalization in management control systems. In addition, the purpose of this research is to investigate the elements that have an impact on the connection between digitalization and management control systems. Thus, the study contributes to a comprehensive analysis of the aforementioned link, which has been inadequately analyzed and has received limited attention from researchers but which serves as the basis for successfully incorporating digitalization capabilities in MCS (Yang et al., 2021; Depaoli et al., 2020; Möller et al., 2020).

The research is conducted in the context of SMEs for two main reasons. *First*, SMEs represent the most relevant portion of companies in the economy of every country in the world (Broccardo and Zicari, 2020; Bigliardi and Galati, 2013; Menrad, 2004), and they are increasingly attracting the attention of policymakers in terms of the need to incorporate digitalization capabilities. *Second*, only “17% of SMEs have

successfully integrated digital technologies into their businesses,” and the European Commission's projects are related to facilitating SMEs in integrating digital innovations (Chatzistamoulou, 2023; Nemeş and Fierbinteanu, 2023). This evidence represents a relevant opportunity for researchers to support SMEs' digital transformation (Aramburu et al., 2021; Chaudhary et al., 2024; Depaoli et al., 2020; Matalamäki and Joensuu-Salo, 2022; Singh et al., 2021).

Additionally, the digital transformation in SMEs is underexplored, particularly in the area of management control systems, and there is a need for additional research (Eller et al., 2020; Garzoni et al., 2020). Indeed, some scholars (Eller et al., 2020; Garzoni et al., 2020) underlined a significant knowledge gap in the SME context, referring to digitalization and MCS, where SMEs' managers – owners, with significant influence on strategic choices, are increasingly enticed to employ technology if they see tangible benefits.

The relevance of the analysis conducted in SMEs is also enriched by the fact that when SMEs are analyzed, the size, an impactful variable on MCS (Garengo et al., 2005), is also taken into consideration, making the understanding more robust and relevant.

Thus, to overcome the gaps in previous studies related to the lack of analysis of the different aspects of management accounting systems in SMEs (Javed et al., 2022) and limited studies on the adoption of digital technology capabilities in management control systems of SMEs (Cleary et al., 2022; Javed et al., 2022; Pelz, 2019), our study proposes to answer the following research questions (RQs):

RQ 1: What are the digitalization capability benefits accruing to management control systems in SMEs?

RQ 2: What factors affect the relationship between the incorporation of digitalization capabilities and management control systems in SMEs?

The originality of our research lies in the intersection of digitalization capabilities and management control systems in the context of SMEs. Moreover, by filling the gap in understanding the relationship between digitalization capabilities and management control systems with a specific focus on SMEs, the contributions of this study are twofold and prized. On the one hand, it contributes in great detail to shed light on the effects of digitalization capabilities on management control systems (and the level of maturity of these systems) in small and medium-sized enterprises. More precisely, when management control systems are suited to the digital environment, it has been seen that the maturity in technological advancement has an influence on the maturity and evolution of management control systems. This, in turn, leads to an improvement in the performance of the organization. On the other hand, the contribution is valuable in identifying the drivers and obstacles that impact the relationship between the incorporation of digitalization capabilities and management control systems in the context of SMEs, also showing the impact on performance.

The remainder of this paper is organized as follows. *Section 2* examines existing literature on digitalization and management control systems. *Section 3* describes the research method adopted in our study. Subsequently, *Section 4* presents the relevant results, and *Section 5* discusses the study's findings, conclusions, implications, and future research avenues.

2. Theoretical background

With growing competition across the globe, small and medium-sized organizations are increasingly facing several new challenges every day (Hina et al., 2022; Sahu et al., 2022; Yoshino and Taghizadeh Hesary, 2016). SMEs may function on a more level playing field with their larger competitors with enhanced digitalization capabilities by offering SMEs new opportunities, such as improved access to skills and talent, expanded market reach, increased availability of financial resources, enhanced communication and collaboration, greater access to

technologies and applications, broader product development capabilities, and a reduction in bureaucratic barriers (Lee and Falahat, 2019; Radicic and Petković, 2023; Thrassou et al., 2020). The long-term benefits of embracing digitalization equip SMEs to manage the changing business landscape, stay competitive, and capture new possibilities in the digital economy.

Unfortunately, although increasing opportunities and benefits can be acquired by digitalization, small and medium-sized enterprises are still encountering obstacles and difficulties in their path toward digitalization (Garzoni et al., 2020; Möller et al., 2020). Indeed, despite the fact that SMEs can innovate and evolve at a faster rate than larger firms due to their cohesive culture and adaptability (Beliaeva et al., 2019), allowing them to foster positive values and norms regarding digitalization, digital transformation remains a significant concern for SME managers and policymakers (Morgan-Thomas, 2016).

The reason can be sought in the owners, who possess a significant influence over the company's strategic choices. They are concerned about possible barriers such as investment costs and digital skill shortages (Cleary et al., 2022; Javed et al., 2022; Truant et al., 2021; Zamani, 2022) and the resulting impact on performance. This significant knowledge gap regarding investments and skills and the impact on performance influence SMEs' digital transformation, and owners may be more inclined to be better involved in the digitalization phenomenon if they perceive evident benefits from it.

The highlighted issue is that the decision-making and control activities of SMEs are not supported by appropriate management accounting information (Ratmono et al., 2023). Management accounting is essential for aiding management decision-making through the capture, processing, and presentation of relevant company information. The widespread use of computers and the fast development of information technology have improved the effectiveness of management accounting as a decision-making tool (Ratmono et al., 2023). Consequently, if SMEs delay or fail to adapt management control systems to the digitalization context, the risk is that all business processes suffer from poor performance.

Therefore, our research aims to participate in the previous debate, offering its contributions and empirical evidence, also considering that research on small and medium-sized enterprises on this topic is really limited (Eller et al., 2020). Additionally, the process of technology adoption and the related dynamics in management accounting have received relatively less attention in academic research despite, as previously underlined, the influence of digital innovation on the organizational and business process management and performance of small and medium-sized enterprises is increasingly being considered to be significant (Cleary et al., 2022; Eze et al., 2019; Li et al., 2018).

Indeed, the majority of research that has been conducted about digitalization and small and medium-sized enterprises (SMEs) is too narrow, and it has generally concentrated on the overall performance of the organization while paying little attention to the assessment of business processes (Ramdani et al., 2022), that can contribute in an organization to gain improvements in performance.

Due to a lack of concreteness and overly generalized studies on this topic, we chose to analyze the impact of digitalization capabilities on the management control system in small and medium-sized enterprises (SMEs) as a distinct business process because of this system's relevance in managing a business (Rehman et al., 2023) and improving performance.

2.1. Management control systems and SMEs: is digitalization underway?

Management control system (MCS) is the branch of accounting that develops and gives managers information to plan, control, and make decisions (Oppi and Vagnoni, 2020) wherein these systems link strategies and business functions or processes to achieve competitive advantage and support entrepreneurship in a dynamic business environment (Cheffi et al., 2023). Digitalization and other societal, institutional, and

corporate factors affect management control systems by enabling the production and analysis of massive amounts of data to improve organizational performance (Beusch et al., 2022). Thus, as corporate processes become more digital, management control systems must also incorporate digital capabilities to improve practices and processes for enhanced performance (Bhimani, 2020; Fähndrich, 2023; Truant et al., 2021).

The operational dynamics of Small and Medium-sized Enterprises (SMEs) are significantly influenced by Management Control Systems (MCS), which offer an organized structure for strategy planning, performance assessment, and decision-making (Rodriguez Serna et al., 2023). Since SMEs have limited resources, efficient management control is crucial to maximizing productivity and accomplishing organizational goals (Gomez-Conde et al., 2023). In order to ensure alignment with strategic goals, MCS in SMEs entails the design and implementation of processes that monitor and direct actions. These systems support budgeting, performance evaluation, and financial management, giving SMEs a way to adjust to shifting market conditions and improve overall organizational efficacy (Chakma et al., 2021; Malodia et al., 2023a; Wided, 2023). Although resource restrictions may prevent the adoption of sophisticated MCS, control systems that are customized to the unique requirements and size of SMEs can promote flexibility, responsibility, and long-term growth by making them better equipped to overcome obstacles, make wise decisions, and build resilience in a fast-paced business environment when management control systems are used wisely (Frare et al., 2022). Moreover, there are certain unique features of SMEs that provide advantages to SMEs as a result of greater flexibility and adaptability, which can aid them in facing new challenges, such as adopting digitalization in their processes (Chakma et al., 2021; Malodia et al., 2023a; Wided, 2023).

However, research indicates that SMEs are not ready to deal with digital transformations in management accounting due to several constraints related to financial resources and required skills (Möller et al., 2020). Firstly, keeping up with technological developments requires enormous investment and responsibility as companies require software for new accounting systems and online portal service subscriptions and have to also deal with several bureaucratic issues (Depaoli et al., 2020). Another constraint pertains to the lack of required expertise as many SMEs are primarily characterized by employees with only anachronistic accounting knowledge, raising difficulties in training people in terms of both time and (economic) resources (Daff, 2021; Roe et al., 2022).

The described picture highlights the significance of SMEs adopting digitalization in management accounting to improve overall business process management. However, constraints on resources restrict the extent to which digitization can be applied, leading to the following proposal about SMEs and digitalization in MCS.

Proposition 1. MCS is not yet reached by digital transformation in SMEs.

2.2. Digitalization influences MCS: how does it occur?

Management accounting is under the influence of social, institutional, and business elements such as digitalization, which impacts how organizations work, particularly in the production and analysis of big data as part of control systems (Bhimani, 2020) and, during the last decades, information technologies (IT) turned a relevant booster for MCS (Amato et al., 2024).

The use of Information Technology (IT) is not new to management accounting. Computers and enterprise resource planning (ERP) systems have been in use since the 1970s. Spreadsheets and business intelligence, relational databases, and data warehouses began to make their way into the accounting department a decade later. More specifically, decision support/analytical applications, such as executive information systems or planning applications, were stuck in the context of MCSs, source applications were developed for transactional processing and

reporting systems, and integration systems, such as data warehouses (DWHs), are useful to enable information integration and information sharing between applications (Schelp and Winter, 2006, p. 134).

In particular, digitalization influences management control practices, thus pushing its development and maturity through some mechanisms mainly represented by real-time data availability, data-driven decision-making, enhanced transparency and visibility, automation and efficiency, remote monitoring and control, customization and flexibility, collaboration and communication (Fähndrich, 2023).

More specifically, for example, digitalization improved ERP system performance, functionality, and use because of the real-time multidimensional analyses and reporting evaluations with massive data sets that may be done without replicating data in several data warehouses (Carlsson-Wall et al., 2021). Furthermore, digitalization has made business intelligence systems and reporting front-end technologies more affordable and customizable, making them more accessible to MC (Youssef and Mahama, 2021). As a result of digitalization, a slew of new methods and technologies for use in businesses have emerged, serving as a catalyst for the latter.

Moreover, the digitalization mechanisms boost MC practices, and MCS can focus more on value-creating activities and become integrated into decision-making processes (Möller et al., 2020). Digitalization also improves the efficiency and speed of activities, boosting the quality of instruments (Bhimani and Willcocks, 2014), thus leading to a decentralization of decision-making inside MC organizations (Fähndrich, 2023) and reducing information asymmetries in management control (Abernethy et al., 2013).

The digitalization - MCS relation is growing and becoming relevant when managing an organization, especially in the SME context, due to their lack of resources and their need to be more and more competitive. Also, if this relation is underinvestigated, academics have systematically advised adopting maturity or stage models (both terms are used interchangeably in the literature) as roadmaps to evaluate future e-business investments (Johnston et al., 2007).

2.3. Digital maturity and the impact on management control systems

As underlined, the influence of digitalization and technology on business operations is significant, particularly with the rise of concepts like Big Data and business analytics in recent years. These concepts have had a notable effect on the field of management accounting and control (Bhimani, 2020; Broccardo et al., 2023; Ulrich et al., 2022) and Cinquini et al. (2022) underlined as digitalization significantly affects resource-intensive tasks like reporting and budgeting. The modern business landscape is shaped by the convergence of Digital Maturity and Management Control Systems (MCS), which is a critical development (Reinking and Resch, 2023). When combined with MCS, digital maturity refers to an organization's capacity to use digital technology across a range of dimensions in an efficient manner, strengthening both operational and strategic control mechanisms (Frare et al., 2022). In this research, the term digital maturity refers to the status of a company's management control digital transformation and indicates what a company has already achieved with regard to transformation efforts in the management control system.

Digital maturity influences management control and the organization's own development and maturity.

In particular, the maturation of digital technology, such as some initiatives underlined in Section 2.2 (improved ERP system performance, business intelligence systems, and reporting front-end technologies more affordable), not only makes MC possible to gather, analyze, and make decisions in real-time, but it also provides a framework for management control systems that is more adaptable and dynamic (MacLean and Titah, 2023). According to Santos et al. (2023), as businesses become more digitally mature, the conventional boundaries of MCS expand to incorporate data-driven insights, automation, and connection. Because of this synergy, it is feasible to discover

performance metrics, react more rapidly to changes in the market, and strategically align with the objectives of the organization (Beusch et al., 2022).

Accordingly, the maturity of digitalization boosts the management control system and influences its own maturity, thus requiring models of analysis that include maturities from both digitalization and management control sides to be analyzed.

2.4. Management control systems (MCS) maturity model

Scholars in the fields of accounting and management control propose utilizing maturity or stage models, which are frequently used interchangeably, to analyze potential investments in e-business (Carvalho et al., 2019; Wagire et al., 2021; Malmi et al., 2023). According to Rafael et al. (2020) and Santos and Martinho (2020), these models provide businesses with a benchmark that allows them to evaluate their experiences at each step of digital transformation. Furthermore, they highlight features that may either facilitate or impede the adoption of digital initiatives.

However, it is necessary to identify maturity models that are accomplished by including both aspects related to management control and digitalization because some maturity models exhibit a tendency to concentrate on individual MCS domains, disregard an IT standpoint, and lack a robust, methodical framework.

Marx et al. (2012) constructed a theoretical framework derived from empirical analysis, utilizing questionnaires known as the MCS maturity model, to assess the extent of integration between the management control system and information technology. This model is based on the fact that MCSs continue to provide difficulties, both in large and SMEs, in terms of determining the right configuration, and systematic guidance is required in order to align reporting, planning, and consolidation from the standpoint of the functional, organizational, and especially information technology aspects.

In particular, this model identifies five different levels of the management control system and IT development: i) basic and external driven MCS, based on short-term goals supported by spreadsheets (level 1), ii) balanced MCS, with long-term financial data, supported by an application to aggregate data from IT point of view (level 2), iii) comprehensive MCS, also if still a financially oriented planning system, supported by a concept-oriented planning application (level 3), iv) MCS with a strong strategic focus, supported by advanced planning applications (level 4) and v) IT enabled level concerned with streamlining the grown planning system through part plan integration and strong IT support (level 5).

The present study adopts the Marx et al. (2012) model to measure the maturity of MCS and digitalization. Considering the theoretical underpinning of the maturity model and the SME's issues in setting MCS and digitalization, as previously described, we expect that SMEs are placed at low levels, as our hypothesis states.

Proposition 2. SMEs belong to the low level of MCS and digitalization maturity.

2.5. Digitalization and MCS evidence: SMEs size and effects

Given the significance of the relationship between management control systems and digitalization and its possible evolution and maturity, SMEs must have a deeper understanding of the relationship between digitalization and MCS and its effect on performance (Lee and Falahat, 2019; Ramdani et al., 2022; Truant et al., 2021).

Observing the link between digitalization and MCS in SMEs, it is possible to perceive different nuances in this relation depending on their size and inherent characteristics, varying if they are micro, small, or medium (Lassnig et al., 2022).

Microenterprises and small SMEs often grapple with challenges related to limited financial resources and technological expertise. However, their simplicity and flexibility can facilitate the relatively

swift adoption of foundational digital tools, such as online presence and basic data management in management control (Reim et al., 2022). In contrast, medium-sized SMEs with greater resources at their disposal may face challenges related to scalability and complexity. This category of businesses is better positioned to invest in advanced digital technologies like CRM systems and analytics tools to increase the information process for management accounting. Irrespective of size, global competition necessitates SMEs to adopt digital technologies to stay competitive, access international markets, and efficiently manage supply chains (Malodia et al., 2023a, 2023b, 2023c). In essence, the size of an SME plays a pivotal role in shaping its approach to digitalization and management control, with both challenges and opportunities inherent in the process.

Therefore, the consequences of digitalization on management control systems in SMEs must be understood in a better manner to further interpret the consequent relationship with performance as well as to gain an insight into the associated benefits.

The benefits associated with the digitalization of management control are generally related to cost savings, increased transparency, more accurate and readily available information, shorter processing times, and more controllable information content (Alsharari et al., 2020; Pashkevich et al., 2023; Singh et al., 2021; Yang et al., 2021; Zeng et al., 2022). Moreover, the benefits of digitalization in management control systems and different behaviors can be observed in relation to the differing sizes of the company's Fields (Buer et al., 2021; Ruel et al., 2023). In particular, the size of SMEs limits the benefits that they can derive from digitalization, depending on resource scarcity and low managerial capabilities, because of the reduction of the success probability of their digital investments. (Elhusseiny and Crispim, 2022; J. Li et al., 2022; Lu et al., 2022; Malodia et al., 2023b).

Consequently, this evidence leads to the formulation of the third proposition of the current study.

Proposition 3. Digitalization benefits vary depending on the size of the organization.

Overall, it is important to emphasize that the evolving nature of businesses requires organizations to compete in an environment characterized by vast amounts of data, which will continue to change the nature of different business processes, including management control systems (Cleary et al., 2022; Etienne Fabian et al., 2023; Grima et al., 2022). The current study was, thus, undertaken to explore the factors affecting the relationship between digitalization and management control systems to gain an in-depth understanding of and more effectively manage such relationships.

3. Research method

In order to answer the research questions, an empirical investigation based on the questionnaire method of 132 Italian SMEs was conducted. Data collection, sample, statistical analysis, and measurement variables are described in the following paragraphs.

3.1. Data collection: research questionnaire

Using the survey method of data collection based on a structured questionnaire, data was collected from a sample of Italian SMEs as an important part of the Italian economy (Broccardo and Zicari, 2020; Bigliardi and Galati, 2013). This method is particularly useful when it is necessary to shape the sample and capture the frequency of activities or practices. It is also an effective instrument for investigating the issues surrounding a specific topic (Rahi et al., 2019).

Online surveys to gather qualitative and quantitative data were conducted using Google Survey, as many researchers underlined this tool as the most suitable in data collection because of barriers in the absence of time and space (Evans and Mathur, 2018). The questionnaire was pre-tested by two academicians and one subject expert to ensure the

accuracy, suitability, and clarity of the instrument. Moreover, a pilot questionnaire was conducted in five SMEs to ensure the final quality (Ruel et al., 2016). In terms of firm size and industry, there were no statistically significant differences between early and late respondents. The alpha for the mean difference was set at 0.05.

The Investor Relations Office was the initial point of contact with the companies, and they were asked to complete the questionnaire at the management control office or administration office. According to Kitleson's (1997) follow-up recommendations for Internet-based surveys, the first reminder was emailed one week after the initial request, and the second reminder was sent one week later. The e-mail provided by investor relations was related to the management control office or the administration office of the organization to ensure that the questionnaire was addressed properly and answered by the correct individual, which was also confirmed during the solicitation process. Recall and solicitation were employed to achieve the greatest response rate feasible. Moreover, to ensure the quality, data collection was personally run by researchers.

The questionnaire included a short introduction declaring the scope of the investigation and the anonymity of the participants, plus three main sections. The first section had questions referring to general company information (7 questions), and financial information was integrated using AIDA databank; the second section had 11 questions concerned with digitalization (processes involved, IT tools, operational technology tools adopted, benefits, drivers and obstacles, performance improvements, and digitalization integration); and the last section (13 questions) explored digitalization adopted in the management control system (specific digital technologies adopted in management control, benefits, impact on business organization, cost management, the role of the controller, the maturity level of management control, and IT). Questions were mainly formulated as closed-ended, using a Likert scale or providing a list of possible answers (in the form of a drop-down menu) to avoid the risk of subjectivity and misunderstanding (Rowley, 2014). A few of the questions were open-ended, with the possibility of adding comments that would enable the capturing of new insights. Moreover, additional 'test questions' were added to the questionnaire to check answer consistency, and questions with dependent and independent variables were placed in different sections of the questionnaire, also mixing items in different questionnaire constructs (Podsakoff et al., 2003) to diminish bias.

The items of the questionnaire were proposed on the basis of intense and integrated analysis of some previous empirical and theoretical articles (Marx et al., 2012; Verhoef et al., 2021; Rikhardsson and Yigitbasoglu, 2018; Björkdahl, 2020), as presented in Table 1 and by participating in a digital transformation forum organized and attended by major consulting companies.

The duration of data collection was four months (January–April 2023). A total of 132 answers were collected, and sample details are presented in the following section.

3.2. Sampling

The initial sample consisted of Italian companies randomly selected from the Aida Databank (Bureau of Van Dijk Database), excluding banks and insurance companies and focusing on other services, manufacturing, and trade companies. The databank used covers the reclassified financial statements of more than one million Italian companies, enabling companies to be screened by industry, geographical area, size, and processing of financial company data.

The total number of companies randomly contacted was 1281, equally distributed in terms of size and geographical area (northern, southern, and central Italy). The number of returned questionnaires was 135, representing 10.54 % of the response rate, in line with existing literature (Lund, 2023), which indicates that this percentage is a reasonably valid response rate (Zhang et al., 2017). Three questionnaires were unusable and incomplete, so the final sample consisted of

Table 1

List of papers to generate closed-ended questions.

Bhimani, A., & Willcocks, L. (2014). Digitisation, 'Big Data' and the transformation of accounting information. *Accounting and Business Research*, 44(4), 469–490.

Björkdahl, J. (2020). Strategies for digitalization in manufacturing firms. *California Management Review*, 62(4), 17–36.

Brands, K., & Holtzblatt, M. (2015). Business Analytics: Transforming the Role of Management Accountants. *Management Accounting Quarterly*, 16(3).

Cardona, M., Kretschmer, T., & Strobel, T. (2013). ICT and productivity: conclusions from the empirical literature. *Information Economics and Policy*, 25(3), 109–125.

Chen, Y., Wang, Y., Nevo, S., Jin, J., Wang, L., & Chow, W. S. (2014). IT capability and organizational performance: the roles of business process agility and environmental factors. *European Journal of Information Systems*, 23, 326–342.

Enríquez, L. A., Cuevas-Vargas, H., & Adame, M. G. (2015). The impact of information and communication technologies on the competitiveness: Evidence of manufacturing SMEs in Aguascalientes, Mexico. *International Review of Management and Business Research*, 4(3), 758.

Lenka, S., Parida, V., & Wincnet, J. (2017). Digitalization capabilities as enablers of value co-creation in servitizing firms. *Psychology & marketing*, 34(1), 92–100.

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Marx, F., Wortmann, F., & Mayer, J. H. (2012). A maturity model for management control systems. *Business & information systems engineering*, 4(4), 193–207.

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132 companies.

The sample is composed of 41 % of companies located in the north of Italy, 20 % belong to central Italy, 39 % from the south of Italy, 28 % of organizations with revenues between 2 and 10 million euros, and 34 % of the sample with revenues between 10 and 50 million of euros. Moreover, 42 % of organizations have employees ranging from 10 to 50 and 23 % from 51 to 249 characteristics.

The features of the sample, in terms of size and industry and digital transformation involvement, are listed in [Table 2](#).

As underlined in the previous table, a large part of the sample is mainly composed of small and medium-sized organizations, primarily involved in the manufacturing and trade industry, thus underlining the features of the Italian economy and reflecting the entrepreneurial environment in Italy. Moreover, 82,70 % of the sample is involved in the digital transformation process, thus affirming the suitability of the sample and the relevance of this research.

3.3. Statistical analysis

The descriptive statistic, to elaborate tables from 4 to 9, was conducted using two types of tests. In the case of categorical variables, binomial tests were carried out, and two percentages were compared to verify that the observed difference was not only the result of chance but was also significant and effective in the population. The z-test was used to compare quantitative variables. In particular, the two means were compared in two independent samples, and in this case, it was verified

Table 2
Sample characteristics.

	Company size				Total
	Micro	Small	Medium	Large	
Number	14	59	47	12	132
%	10 %	45 %	36 %	9 %	100 %
	Industry				Total
	Trade	Manufacturing	Service		
Nr.	43	64	25		132
%	33 %	48 %	19 %		100 %
	Total	Company size			
		Micro	Small	Medium	Large
Digital disruption (%)	17.3	33.3	25.0	9.1	
Digital transformation (%)	82.7	66.7	75.0	90.9	100.0
Total cases (nr. of companies)	81	6	36	33	6
No answer (nr. of companies)	51				

that the difference observed in the sample was not an effect of chance.

Moreover, after data collection, a PLS model was estimated, wherein a measurement model was created, and the relationships between the manifest and latent variables were described. Furthermore, the structural model was generated to analyze the relationships between the latent variables and to explore the factors that influence digitalization and management control system relations ([Tables 10 to 13](#)).

PLS models are particularly suitable for this type of study, as they do not require starting assumptions and can work even with low numbers, particularly for this type of management accounting study, as suggested by [Cleary et al., 2022](#). Therefore, PLS models are often used for exploratory purposes ([Hair et al., 2019](#)), and it is a robust modeling method. First, it checks measurement models for qualification. It then evaluates reliability, validity (convergent and discriminant), and model fitness. Finally, the coefficient of determination (R square) measures the model's strength and expected relevance.

The model, as detailed and represented in [Section 4.3](#), was obtained using the "plspm" package.

3.3.1. Measurement variables

A number of variables were taken into consideration for the current study. A brief of each of the variables is summarized in the following table ([Table 3](#)). Moreover, the descriptive statistics of MCS Maturity ([Table 6](#)), Digital tools adopted in MCS ([Table 5](#)), and Drivers and Obstacles ([Table 9](#)) are analyzed and presented by size.

Company Size. The sample was mainly composed of small and medium companies, wherein the companies in the sample were categorized as micro, small, or medium, following the EU criteria (based

Table 3
Constructs and sources.

Constructs	No of items	Items	Sources
Company Size	4	(1) Micro, (2) small, (3) medium (4) large	Garengo et al., 2005
MCS Maturity	5	(1) Basic, (2) balanced, (3) comprehensive, (4) strategic, and (5) IT-enabled MCS	Marx et al., 2012
Digital tools adopted in MCS	5	(1) Generic application, (2) source systems (ERP), (3) integration systems (DWH), (4) concept-oriented, and (5) others	Marx et al., 2012
Drivers and Obstacles	6	(1) Company culture; (2) IT department; (3) financial resources; (4) human resources; (5) top management; and (6) others	Dremel et al., 2017
Performance	3	(1) Return on sale (ROS), (2) return on equity (ROE), (3) return on investments (ROI)	Wiech et al., 2022

on the number of employees, annual turnover, and annual balance sheet total). More precisely: i) Micro companies are those that have less than ten employees and an annual turnover or annual balance sheet total of <2 million euros; ii) Small companies have <50 employees and an annual turnover or annual balance sheet total of <10 million euros; iii) Medium-sized companies have <250 employees and an annual turnover of <50 million euros or an annual balance sheet of <43 million euros.

As per our sample, these companies represent 81 % of the total number of companies and are mainly operating in the trade (33 %) and manufacturing sectors (48 %). Overall, this is a balanced sample, well representing the Italian economic scenario where approximately 95 % of companies are SMEs (Istat, 2021). In the development of this study, the data are presented at the SME level, breaking down the evidence into Micro, Small, and Medium companies.

MCS Maturity. We followed the proposition of Marx et al. (2012) in measuring a company's MCS maturity level. Specifically, we asked companies to choose from the following options: (1) basic, (2) balanced, (3) comprehensive, (4) strategic, and (5) IT-enabled MCS, framed and specified in the theoretical background. Hence, we created a variable called MCS_Maturity, which ranged from 1 to 5.

Drivers and Obstacles. To map obstacles and drivers, the proposed options were the following variables (potentially a driver or an obstacle): (1) company culture; (2) IT department; (3) financial resources; (4) human resources; (5) top management; and (6) others, identified from previous studies (Chen et al., 2014; Lenka et al., 2017). In the questionnaire, organizational culture in the context of digital transformation was defined as data-sharing and data-driven corporate culture (Dremel et al., 2017) and open corporate culture that is welcoming toward innovation and novelty while allowing for change in rules and norms.

Digital tools adopted in MCS. To understand the main digital tools adopted in management control, the proposed options were: (1) generic application, (2) source systems (ERP), (3) integration systems (DWH), (4) concept-oriented, and (5) others, as identified by Marx et al. (2012).

Performance. Finally, performance was measured using the traditional profitability ratios (Wiech et al., 2022), such as Return on sale (ROS), Return on equity (ROE), and Return on investments (ROI) extracted from the Bureau of Van Dijk Database.

4. Findings

This section presents the main findings related to the relationship between digitalization and management control systems in SMEs. In particular, a more general descriptive overview is first presented, followed by an analysis of the relationship between digitalization and management control systems to answer the research questions of the study.

4.1. Digitalization and its impact on management control system: an overview

The study primarily examined the various processes that are associated with and impacted by digitalization (Table 4).

Analysis of the sample reveals that digitalization places greater emphasis on the processes that facilitate the execution of strategies, such as management control and administrative processes, as opposed to the processes that foster innovation, such as the development of new products. Furthermore, it is observed that digitalization predominantly occurs in medium-sized enterprises, with the management control system being particularly impacted by this transformation. Furthermore, there is a varying level of interest in digitization among logistic and manufacturing processes, which differs from the level of interest observed in administration and management control processes. It is worth noting that the marketing process exhibits limited interest in this

Table 4
Business processes and digitalization.

Please note that the total % is not 100 % (including all the processes) because companies were allowed to select more than one process	Total	Company size			
		Micro	Small	Medium	Large
Administration process (%)	63.3	69.2	72.4	56.5	36.4
Management control process (%)	47.7	38.5	46.6	58.7	18.2
Financial management process (%)	40.6	46.2	44.8	41.3	9.1
Sales process (%)	40.6	46.2	41.4	43.5	18.2
Logistics.in process (%)	39.1	30.8	36.2	47.8	27.3
Procurement process (%)	39.1	30.8	36.2	47.8	27.3
Logistic.out process (%)	36.7	30.8	31.0	52.2	9.1
Production process (%)	35.9	23.1	29.3	47.8	36.4
Production planning process (%)	31.2	23.1	22.4	43.5	36.4
Human.resources management process (%)	26.6	15.4	31.0	21.7	36.4
Marketing process (%)	26.6	23.1	24.1	32.6	18.2
Maintenance process (%)	21.1	15.4	12.1	32.6	27.3
New product development process (%)	14.8	15.4	13.8	17.4	9.1
Other	7.8	23.1	3.4	8.7	9.1
Total cases (number of companies)	128	13	58	46	11
Skipped answer (number of companies)	4				

Source: own elaboration.

particular issue.

Consequently, Proposition 1, “MCS is not yet reached by digital transformation in SMEs,” is not confirmed but with nuances. In small and medium-sized organizations, the management control system is involved in digital transformation; however, the extent of this engagement varies and is influenced by the size of the company. Medium enterprises are the ones that include this process in digitalization more than small enterprises.

Following our scope, the digital tools adopted in the management control system were explored and presented in Table 5.

Based on Marx et al.'s (2012) research, digital tools for management control systems are categorized into concept-oriented applications (e.g., strategy management, integrated planning, and integrated planning application), generic-oriented applications (e.g., spreadsheet application, report application), integration systems (e.g., data warehouse (DWH)), and source systems (e.g., ERP systems) (Marx et al., 2012).

The widespread use of generic applications emerged across the entire sample, independent of the size of the company, and it was seen to be mainly focused on the use of spreadsheets. Source systems, such as ERP, also represent a widespread technological tool being used mainly in medium and large companies and, surprisingly, somewhat in micro-companies as well. It is also worth noting that medium-sized companies are intensifying the implementation of source systems.

Finally, Marx et al.'s (2012) model was examined to map the state-of-the-art management control maturity level. Both degrees of

Table 5
Management control and the main digital tools adopted.

Please note that the total % is not 100 % (including all the digital tools) because companies were allowed to select more than one digital tool	Total	Company size			
		Micro	Small	Medium	Large
Generic applications (Excel) (%)	84.3	90.0	82.7	81.4	100.0
Source system (ERP) (%)	40.9	40.0	19.2	67.4	40.0
Integration systems (DWH) (%)	11.3	10.0	11.5	14.0	
Concept-oriented (%)	3.5		3.8	4.7	
Other (%)	2.6		1.9	4.7	
Total cases (nr. of companies)	115	10	52	43	10
No answer (nr. of companies)	17				

development of management control systems and information technology are taken into consideration and embraced by this model. These levels are classified into five distinct ones (1. Basic, 2. Balanced, 3. Comprehensive, 4. Strategic, 5. Enabled), each of which is determined by the concurrent advancements in management control systems and technology. The results are summarized in Table 6.

The findings indicate that the companies in the sample mainly stand between Levels 2 and 3. More specifically, Level 2 is represented by companies in which reporting and managerial analysis serve both corporate and organizational units, and the first data warehouse is implemented as an information platform. At Level 3, the reporting process is well-designed and automated, supported by advanced analysis tools, and implemented through information portals. Consequently, it is possible to affirm that, overall, a decent level of management control system was developed across the companies, supported by information portals and data warehouses. The concentration of micro and small companies is higher at levels 1 and 2, while medium and large companies are more concentrated at levels 2 and 3 of the management control system and IT maturity models, highlighting the need to push for enhanced adoption of digital tools among the micro and small companies.

Consequently, our Proposition 2 - SMEs belonging to the low level of MCS and digitalization maturity - is partially confirmed, as the medium-sized companies belong to the 2 and 3 levels, in contrast to small ones.

4.2. Exploring digitalization and management control system relationship in SMEs

After illustrating some descriptive elements of the sample, this study underlines the main effects of digitalization on management control systems, thereby answering the first research question: “What are the digitalization capability benefits accruing to management control systems in SMEs?”

The benefits of digitalization in management control systems are studied from two perspectives. The first one refers to the degree of digitalization of the business processes (classified from one to five, i.e., from “not existing” to “excellent”). According to Marx et al. (2012), the second perspective relates to the maturity level of management control. Table 7 presents the benefits of digitalization associated with these two perspectives.

General benefits derived from digitalization are mainly represented by performance improvements (68.9 %), internal and external communication improvements (50 %), cost savings (50 %), and faster decisions (45.3 %).

Upon examining the benefits of digitalization (I) and the digitalization degree of business processes (II), the primary finding is that when the digitalization degree in the business processes ranges from fair to excellent, the main benefits of digitalization are obtained in terms of

Table 6
Management control system maturity level.

	Total	Company size			
		Micro	Small	Medium	Large
Level 1 - Basic, external-driven management control (%)	21.1	28.6	30.0	14.3	
Level 2 - Balanced management control IT (%)	32.2	28.6	27.5	34.3	50.0
Level 3 - Comprehensive management control (%)	25.6	14.3	17.5	34.3	37.5
Level 4 - Strategic management control (%)	13.3	14.3	12.5	14.3	12.5
Level 5 - Enabled management control (%)	7.8	14.3	12.5	2.9	
Total (%)	100	100	100	100	100
Total cases (nr. of companies)	90	7	40	35	8
No answer (nr. of companies)	42				

performance improvement (see bold numbers in Table 7). Moreover, examination of the benefits of digitalization (I) and the maturity level of the management control system and IT (III) indicates that it emerges at the comprehensive level (Level 3), characterized by a financially oriented planning system supported by a concept-oriented planning application. It is possible to achieve digitalization benefits at this level that not only improve performance (see bold numbers) but also lead to internal and external communication improvements (see bold numbers).

Further analysis can be detailed on the basis of the size of the companies, as reported in Table 8.

As can be seen from Table 8, when companies are at the micro level, the main benefit is faster decisions because of the increased amount of data and information available, which facilitates the decision-making process; however, when moving to medium and large sizes, the main benefit is performance improvements.

Consequently, our third proposition - Digitalization benefits vary depending on the size of the organization - is confirmed, showing how benefits vary depending on the size of the organization.

This means that when decisions are fast and well addressed while considering the fast-paced changes taking place in the environment, it is also possible to benefit from an increase in performance that leads to the growth of the business and finally helps in achieving a return on profit after investing in digitalization.

In addition to analyzing the relationship between digitalization and management control systems and its benefits, particularly in terms of performance improvements, the factors affecting this relationship were also scrutinized, answering the second research question, “What factors affect the relationship between incorporation of digitalization capabilities and management control system in SMEs?”

An analysis of the drivers and obstacles affecting the digitalization process was carried out to understand the factors that must be taken into consideration to better manage digitalization. The reported results are shown in Table 9.

Top management (43 %), human resources (38.3 %), and financial resources (37.4) emerged as drivers that lead the digitalization process. In medium-sized companies, top management is the most relevant factor that positively affects the digitalization adoption process. Some obstacles, such as lack of readiness to change in organizational culture (55.3 %) and lack of skilled human resources (39.8 %), were also identified which must be taken care of to promote digital adoption. The main evidence again refers to medium companies, indicating that organizational culture non-readiness to change (67.6 %) is high in medium-sized companies.

Finally, to better contribute to answering the second research question and deepen the digitalization and management control maturity relation, a model based on PLS was prepared.

4.3. Measurements model

The PLS model elaboration includes drivers, obstacles, and size as independent variables to scrutinize the impact on the dependent variables, such as maturity level, IT, and Digital tools adopted in MCS, with effects on performance.

A first assessment examined missing values, outliers, mean median, standard deviation, and data normality before data processing. Missing numbers and mistakes are absent from the analysis. Data were normally distributed.

As proposed by Hair et al. (2012), data reliability, using Cronbach alpha (CA) composite reliability (CR) was tested, and Table 10 shows that all measurement models are reliable since their CA and CR values are well above the desired 0.70, 0.60, values (Hair et al., 2016). The measuring model's convergent validities were also assessed to assure validity. Using AVE and values >0.5, as shown in Table 10, the convergent validity is assured.

Furthermore, to assess discriminant validity, we used the Fornell-Larcker criteria, as shown in Table 11.

Table 7
The main benefits of digitalization.

Benefits of digitalization (I)	Total	Digitalization degree into the business processes (II)					Management control maturity level (III)				
		1 (not existing) (%)	2 (scarce) (%)	3 (fairly) (%)	4 (good) (%)	5 (excellent) (%)	Level 1 - Basic, external-driven MC (%)	Level 2 - Balanced MC IT (%)	Level 3 - Comprehensive MC (%)	Level 4 - Strategic MC (%)	Level 5 - Enabled MC (%)
Other (%)	2.8	50.0 B	5.3			16.7		3,6		8.3	
Revenues increase (%)	17.0		21.1	17.8	13.8	33.3	11.1	17.9	18.2	8.3	28.6
Customer satisfaction increase (%)	19.8		21.1	13.3	31.0	16.7	11.1	10.7	18.2	33.3	28.6
More precise decisions (%)	36.8		31.6	42.2	41.4	33.3	38.9	42.9	31.8	58.3	
Faster decisions (%)	45.3	50.0	31.6	42.2	58.6	33.3	50.0	39.3	50.0	58.3	28.6
Performance improvement (%)	68.9	50.0	47.4	75.6 B	75.9 B	100.0 B	55.6	60.7	95.5 A B E	75.0	57.1
Internal and external communication improvement (%)	50.0		47.4	48.9	62.1	33.3	50.0	32.1	68.2 B	75.0 B	42.9
Risks reduction (%)	22.6	50.0	10.5	26.7	31.0		16.7	25.0	27.3	41.7	14.3
Cost saving (%)	50.0	50.0	36.8	51.1	62.1	33.3	44.4	46.4	45.5	58.3	57.1

Table 8
The main benefits of digitalization by size.

Please note that the total % is not 100 % (including all the benefits) because companies were allowed to select more than one benefits	Total	Company size			
		Micro	Small	Medium	Large
Performance improvement (%)	68.9	45.5	57.8	85.4	77.8
Cost saving (%)	50.0	63.6	46.7	46.3	66.7
Better internal and external communication (%)	50.0	54.5	48.9	48.8	55.6
Faster decisions (%)	45.3	72.7 C	46.7	39.0	33.3
More precise decisions (%)	36.8	36.4	33.3	41.5	33.3
Risks reduction (%)	22.6	9.1	20.0	29.3	22.2
Customer satisfaction increase (%)	19.8	18.2	17.8	24.4	11.1
Revenues increase (%)	17.0	18.2	17.8	19.5	
Other (%)	2.8		2.2	4.9	
Total cases (number of companies)	106	11	45	41	9
Skipped answer (number of companies)	26				

Discriminant validity was conducted using the [Fornell and Larcker \(1981\)](#) approach. The square root of AVE is higher than the constructs correlation. Consequently, the discriminant validity is acceptable.

Finally, the proposed relationships highlighted in [Fig. 1](#) are tested using path coefficients and the level of significance (t-value).

All the estimation parameters are significant; therefore, it is possible to affirm that there are no useless predictors.

Moreover, the R² value measures the predictive capacity of the dependent variables included in the model ([Hair et al., 2016](#)).

The following figure shows the factors acting on the digitalization–management control system relationship to shed light on how to manage this relationship.

In particular, size (0.429) and drivers (0.323) act on the type of digital tools adopted in the management control system, with positive effects on performance (0.286). Drivers (0.484) and obstacles (0.289) influenced the maturity level of the management control system, with a consequent positive effect on performance (0.217). The highlighted relationships were found to be moderate.

Table 9
Drivers and obstacles in the digitalization process.

Drivers	Total	Company size			
		Micro	Small	Medium	Large
<i>Drivers</i>					
<i>Please note that the total % is not 100 % because companies were allowed to select more than one options</i>					
Opened organizational culture (%)	31.8			4.8	
IT Department pushes to digitalization (%)	22.4	44.4	29.8	28.6	44.4
Financial resources (%)	37.4	11.1	17.0	26.2	44.4
Human resources (%)	38.3	22.2	36.2	40.5	44.4
Top management pushes digitalization process(%)	43.0	33.3	25.5	64.3	44.4
Other	1.9				
Total cases (nr. of companies)	107	9	47	42	9
No answer (nr. of companies)	25				
<i>Obstacles</i>					
<i>Please note that the total % is not 100 % because companies were allowed to select more than one options</i>					
Organizational culture not ready (%)	55.3	27.3	53.1	67.6	55.6
IT Department does not push to digitalization (%)	3.9		4.1	2.9	11.1
Lack of Financial resources (%)	39.8	54.5	46.9	26.5	33.3
Lack of Human resources (%)	29.1	27.3	26.5	29.4	44.4
Top management does not push digitalization process (%)	18.4	9.1	20.4	14.7	33.3
Other (%)	1.9	9.1		2.9	
Total cases (nr. of companies)	103	11	49	34	9
No answer (nr. of companies)	29				

5. Discussion and implications of the study

5.1. Discussion of results

The research addressed two research questions: exploring the benefits of digitalization capabilities for management control systems in SMEs and identifying factors that influence the link between digitalization capabilities and management control systems in SMEs.

The previous goals led to revealing some relevant aspects in this relation, such as size, digital tools, and some factors that can act as drivers or obstacles in influencing the maturity of digitalization and

Table 10
Reliability, consistency, and validity.

	Cronbach's alpha (CA)	Composite reliability (CR)	Average variance extracted (AVE)
Drivers	0.8827184	0.9145678	0.6591364
Obstacles	0.9157291	0.9452788	0.8539167
Size	0.9056412	0.9673255	0.7397126
Digital tools adopted in MCS	0.8236874	0.8625132	0.6873451
Maturity levels and IT	0.8942781	0.9334467	0.6894624
Performance	0.8728685	0.8962451	0.6457515

management control relation, thus also affecting performance, as highlighted by the model.

5.1.1. Size and digital tools in MCS

The findings indicate that the size of an organization influences the type of digital tools used in management control systems.

In particular, the results indicate that medium-sized enterprises exhibit the highest level of engagement in digital transformation initiatives. These organizations exhibit a distinct digitalization capability by placing a high priority on the digitization of processes that aid in the attainment of strategic objectives, including administrative operations and management control systems, not confirming our first proposition. This is a relevant aspect, especially in medium organizations, because management control can become overburdened if, for example, the digitalization of the production or sales and marketing process is prioritized in an unbalanced manner compared to MCS. Indeed, in this situation, the enormous volume of data must be manually processed by MC, thus slowing down management and losing sight of truly strategic data, also negatively impacting the performance of the organization.

Focusing on SMEs' digital tools employed in MCS, the most adopted digital tools remain spreadsheets, but with a significant diffusion of ERP systems, especially in medium companies, that can enhance integration among different processes and functional areas in the organization, with a positive effect on performance. This evidence highlights, also considering the limited financial and human resources in SMEs, the need to understand how to better customize the SMEs' digitalization in MC (Gomez-Conde et al., 2023) and not to invest in standard digitalization, mainly proposed by large IT companies offering expensive and rigid digitalization solutions.

Indeed, digitalization has enabled real-time multidimensional analyses and reporting assessments of enormous data sets, improving ERP system performance, functionality, and usability (Carlsson-Wall et al., 2021), and it has also made business intelligence tools and reporting front-end technologies cheaper and more flexible for MC (Youssef and Mahama, 2021). It turns out that digitalization has spurred commercial innovation with new methodologies and technology, making them more accessible and viable for SMEs.

This evidence highlights how digital maturity in small and medium-sized enterprises must be intended. It is emphasized how digital maturity is not determined by sophisticated digital tools in Management Control Systems but by an organization's capacity to effectively incorporate digital technology in various aspects, mainly enhancing operational and strategic control mechanisms (Frare et al., 2022), thus

Table 11
Discriminant validity.

	Drivers	Obstacles	Size	Digitalization	MCS	Performance
Drivers	0.72261361					
Obstacles	0.40607387	0.70146741				
Size	0.34650275	0.58859484	0.664821			
Digitalization	0.57343521	0.42523091	0.5430377	0.7397147		
MCS	0.67290386	0.59028356	0.217087	0.52992282	0.7135463	
Performance	0.63301475	0.61250191	0.384653	0.65827806	0.3137827	0.7455463

determining the advancement and the maturity in MC. In this sense, micro and small-sized companies can mainly implement basic data management in management control (Reim et al., 2022), and medium companies can work on better customized ERP systems, contributing to better setting the management control system, really focused on the value added for the company.

Indeed, if resource limitations in SMEs may hinder the implementation of advanced digital tools and management control systems, tailored digitalization and control systems designed to fit the specific needs and scale of small and medium-sized enterprises can enhance adaptability, accountability, and sustainable development. This customization can empower SMEs to effectively navigate challenges, make informed decisions, and cultivate resilience in a dynamic business landscape when management control systems are utilized effectively (Frare et al., 2022); also, some aspects related to innovation must be improved in SMEs.

Actually, medium-sized companies tend to allocate fewer resources toward digitalizing processes that foster innovation and have the potential to induce strategic changes. Indeed, the data indicate that

Table 12
Structural model assessment.

Structural model assessment				
	Estimate path coefficient	Std.error	t value	Pr(> t)
Digital tools adopted in MCS				
Intercept	-8.54E-18	0.08418673	-1.01E-16	1.00E+00
Drivers	3.23E-01	0.09053853	3.57E+00***	5.94E-04
Size	4.29E-01	0.09053853	4.74E+00***	8.36E-06
Maturity levels and IT				
Intercept	-7.27E-17	0.08911674	-8.16E-16	1.00E+00
Drivers	4.84E-01	0.08911744	5.43E+00***	5.06E-07
Obstacles	2.89E-01	0.08911744	3.24E+00***	1.68E-03
Performance				
Intercept	1.87E-17	0.09828617	1.90E-16	1
Digital tools adopted in MCS	2.86E-01	0.10403627	2.75E+00*	0.007299584
Maturity levels and IT	2.17E-01	0.10403627	2.08E+00**	0.040384314

* Significant at $p \leq 0.10$.
 ** Significant at $p \leq 0.05$.
 *** Significant at $p \leq 0.01$.

Table 13
 R^2 variance amount.

	Type	R2
Drivers	Exogenous	0
Obstacles	Exogenous	0
Size	Exogenous	0
Digital tools adopted in MCS	Endogenous	0.3904831
Maturity levels and IT	Endogenous	0.3170058
Performance	Endogenous	0.1692253

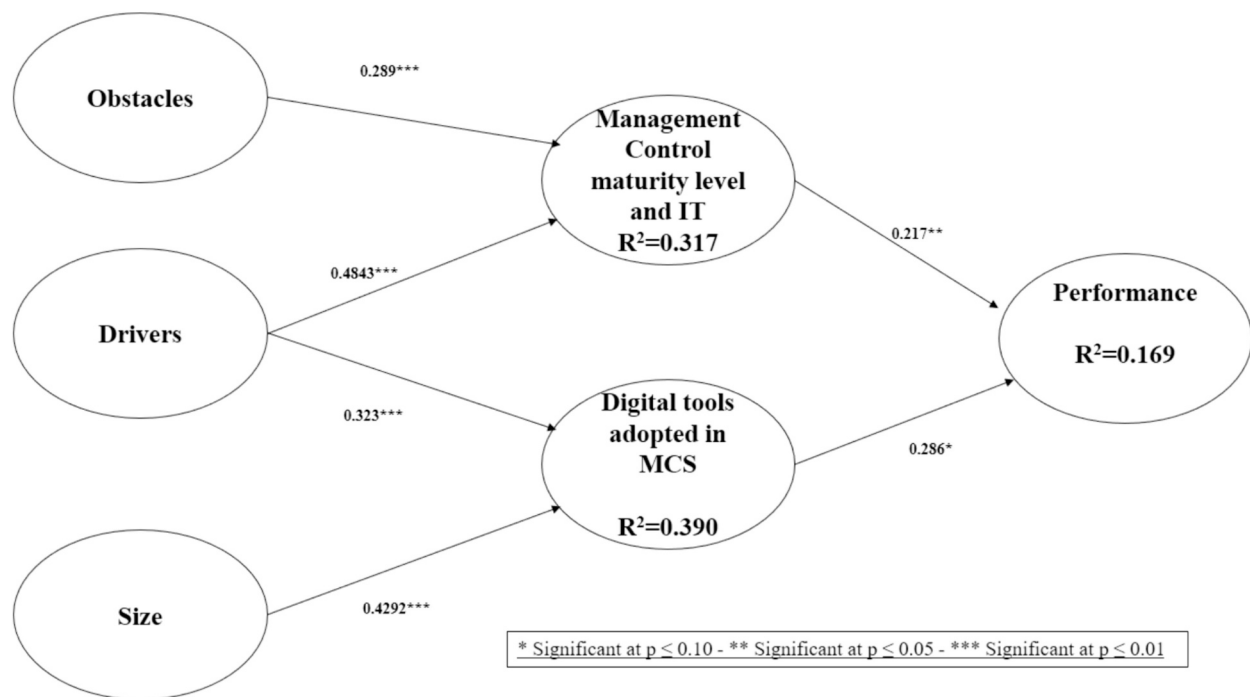


Fig. 1. Factors acting on digitalization – management control system relationship.

medium-sized organizations involved in supporting implementation strategy tend to overlook the importance of validating the strategy and underestimate the significance of processes that may foster innovation and drive strategic change, particularly in a volatile environment.

In conclusion, the development of digitalization in management control systems is influenced by the factor of size, also corroborated by the resistance exhibited by managers and owners, as well as the dearth of skills in this area. However, during the transition from small to medium-sized enterprises, it is evident that it becomes imperative to carefully select the appropriate form of digitalization in order to manage such organizations effectively, thus developing customized digitalization capability and supporting management control. This finding adds to the previous researches that identify the limitations of SMEs in adopting digitalization (L. Li et al., 2018; Thrassou et al., 2020; Yoshino and Taghizadeh Hesary, 2016).

Furthermore, this evidence helps collaborate with our second study proposition, which highlights that SMEs belong to the low levels of MCS and digitalization maturity but shedding light on the possibility of advancing the level of digitalization and management control maturity by investing in tailored digitalization and management control systems, designed on real needs by company size, thus gaining improvements in performance.

Moreover, these results also support our third research proposition, which emphasizes that the benefits of digitalization differ in proportion to the size of the organization, ameliorating the speed of decisions in small-sized companies and performance when medium-sized, thus also highlighting a decentralization process that allows the reduction of information asymmetries (Bhimani and Willcocks, 2014). This can be seen as a growth process where fast and correct decisions allow the company to grow, moving from small to medium size and then impacting on improving performance,

According to Marx et al. (2012), the relationship between management control systems and information technology sheds light on the MCS levels of the companies in the sample. These MCS levels are characterized by the presence of a data warehouse platform that supports strategic and operational decisions at the corporate and organizational unit levels, sometimes in an automated manner. This highlights the fact that there is room for improvement, particularly for small and medium-

sized businesses that are in the process of growing and are most affected by increasing complexity and environmental uncertainty. The current study contributes to the body of research related to Marx's maturity model, which has been suggested by a number of scholars (Kucińska-Landwójtowicz et al., 2024; Williams et al., 2022).

Despite the findings highlighting the need for new advances and developments, the emerging benefits of digitalization are evident and growing, especially in terms of performance improvements (Raef Lawson and CSCA, 2019) when the company goes from a fair to an excellent degree of digitalization. Additional benefits, such as improved internal and external communication, must be highlighted when management control and IT maturity reach a comprehensive level (third level). The benefit of faster decision-making is mainly observed in micro-companies because they are experiencing digitalization for the first time, wherein, because of the lack of resources and experience, digitalization integration does not perform as well as expected. Improvement measures are required, especially in medium-sized companies; whereas operational complexity increases, the quality and speed of information are relevant for their growth plans and in order to fully implement the designed strategy. Consequently, digitalization is not neutral in management control systems across companies and, thus, merits more attention than has been given in previous studies (Ramdani et al., 2022; Ruel et al., 2023; Zamani, 2022), also considering the new capability that an organization has to develop in the actual context.

Finally, answering the first research question, the model clearly brings forth that digitalization capability benefits accrue to management control systems in SMEs, affecting the overall performance of the SMEs wherein the size of the organization and drivers, as well as obstacles of digitalization, influence the maturity level of the management control system of SMEs with a consequent positive effect on performance.

5.1.2. Factors affecting digitalization and management control maturity

Accordingly, the second research question was taken care of as the responses of the participants helped in identifying the factors, such as organization culture, resources, and top management, that affect the relationship between the incorporation of digitalization capabilities and management control systems in SMEs.

This relation is affected by the highlighted factors that act both as

drivers and barriers.

According to the findings, the variables that are responsible for leading the process of digitization include top management, human resources, and financial resources. Top management, particularly in medium-sized enterprises, has a crucial role in influencing the adoption of digitization in MC owing to their significant impact on the company's strategic decisions. It is essential to address constraints related to investment costs and digital talent shortages to overcome owners' concerns, as highlighted by several studies (Cleary et al., 2022; Javed et al., 2022; Truant et al., 2021; Zamani, 2022).

Nonetheless, SME owners and top management must be aware of additional obstacles beyond the lack of human and financial resources. Indeed, the research results underlined a dearth of desire to change in corporate culture that needs to be addressed in order to stimulate digital adoption. These difficulties were acknowledged as obstructions that need to be addressed. The major data, which once again refers to medium-sized organizations, indicates that there is a high level of organizational culture non-readiness to change in medium-sized enterprises.

Additionally, in order to successfully support the relationship between digitalization and management control, owners of small and medium-sized enterprises (SMEs) need to gain confidence in the advantages that digitalization brings to management control, also considering the advancements in MC maturity. They should also make an effort to overcome the challenges that have been mentioned by moving toward customized digitalization and management control tools.

5.2. Theoretical implications

Theoretically, this study sheds light on the relationship between management control systems and digitalization, thus focusing on this topic, as proposed by previous studies (Daff, 2021; Yang et al., 2021; Möller et al., 2020) and showing how digitalization impacts on MC systems (Agostino et al., 2022; Coman et al., 2022). In particular, the research sheds light on the dynamics of digitalization and the manner in which it is controlled within the realm of management control, which has only been addressed on a general level up to this point (Fähndrich, 2023).

Moreover, by studying the relationship in the context of SMEs, we also contribute to filling the research gap, as highlighted by some scholars (Eller et al., 2020; Garzoni et al., 2020) pointing out the need for further studies that analyze digitalization in SMEs and provide an increased understanding of how to concretize digitalization throughout management control systems (Depaoli et al., 2020; Raef Lawson and CSCA, 2019). The Marx et al. (2012) maturity model was useful in highlighting size as a relevant variable in studying such relationships. The study also underscores that in SMEs, organizational culture, human resources, top management, IT departments, and financial resources are the main factors that affect the implementation of digitalization, sometimes acting as drivers and sometimes as obstacles, also underlining the effect of digitalization on organizational performance. This contributes to bridging an additional research gap identified in the literature (Alam and Hossain, 2021; Yang et al., 2021; Depaoli et al., 2020; Möller et al., 2020), which underscored the necessity for additional studies to comprehend the determinants associated with the digitalization of management control systems and, by extension, to investigate the manner in which digital functionalities ought to be integrated into management control systems.

Our findings enrich the Möller et al. (2020) editorial request, thus shedding light on understanding how digitalization affects management control systems from the academic point of view, adding knowledge by highlighting how management control systems must adapt to more effectively meet the environmental changes and the changing dynamics of business processes. In particular, source systems and a lean approach have been identified as key instruments supporting the level progression

of companies as per the maturity model, contributing to overcoming the narrow approach of the literature in studying digitalization and management control systems (Rîndașu et al., 2023; Torriero et al., 2022).

Furthermore, the study emphasizes how digitalization can boost competitiveness by strengthening the management control system, resulting in financial and non-financial for organizations (Matalamäki and Joensuu-Salo, 2022). The study also contributes to related literature by underscoring the role played by top management and organizational culture in clarifying why accounting results assume a certain configuration (Bhimani, 2020).

Future research can further enrich the model developments by adding specific aspects of management control systems in SMEs. Thus, our study complements earlier studies that did not adequately focus on analyzing the relationship between management control systems and digitalization (Cleary et al., 2022; Pelz, 2019).

5.3. Practical implications

This study has several practical implications that can support SMEs' digital transformation (Aramburu et al., 2021; Depaoli et al., 2020; Matalamäki and Joensuu-Salo, 2022; Singh et al., 2021).

Firstly, the study highlights that with an emphasis on advancing their competitive strategy, small and medium-sized businesses should focus on introducing digitalization across different processes, ensuring a proper balance between operational and support processes, such as management control, to ensure the collection and elaboration of strategic data. The effectiveness of an organization's existing strategy can be validated by digitalization, which solves the performance and competitiveness issue, although rapid environmental changes can affect this. Thus, the procedures that must manage data and information for the decision-making processes are those that are most significantly impacted by digitalization. However, organizations should keep in mind that innovation is at the heart of competitive advantage and for sustained performance and survival, particularly in a chaotic environment. As a result, businesses need to carefully analyze and balance the procedures that will be part of their digitalization initiatives. In particular, our research shed light on how SME managers and owners must set, realize, and push the digitalization and management control systems relation and its advancement and maturity: not investing in standard solutions, but selecting the most fitting tools and investing in customizing them. This could instill confidence in the owners, who might be more inclined to embrace the digitalization phenomenon in MC due to their increased knowledge.

Our study also highlights the impact of digitalization on performance, thus making it imperative for organizations to implement this process with careful attention to avoid any negative repercussions. Furthermore, small and medium-sized companies are at the forefront of the digital transformation processes; hence, they must be particularly vigilant about managing this change. When examining the relationship between management control systems and digitalization, the study aids in identifying the key drivers, such as the role of top management and organizational culture, that can enhance this relationship. The former can facilitate a shift in organizational culture by recognizing that a cultural shift in SMEs demands considerable effort, such as sharing data at lower levels and introducing new tools like remote work. The second driver can support digital changes and overcome related challenges by focusing on digital training of human resources to make them better qualified in handling the changes occurring in how processes would be carried out. Our study further underscores that when the relationship between digitalization and management control systems is well balanced, it is possible to achieve both financial and non-financial benefits, enhancing an organization's competitiveness and facilitating its growth. This evidence should encourage organizations not to abandon digitalization after a failed initial attempt but rather to rationally plan this process, utilizing the insights gained from this study regarding factors that can sometimes act as drivers or obstacles. To provide

concrete support to managers and practitioners, it is important to emphasize that source systems and a lean approach serve as catalysts for improving the relationship between management control systems and digitalization. Furthermore, while a coherent relationship exists between management control systems and digitalization, it is essential to remember that merely digitizing specific processes is insufficient, but a specific digitalization capability must be nurtured. For instance, focusing solely on production while excluding other strategic aspects of the entire organization, such as the management control system, would be a mistake; instead, all business processes should be involved in the process of digitalization. Without proper support for the management control process, all data generated by digitizing the production process would go to waste. Along these lines, by understanding the systematic connection between management control systems and digitalization, it is crucial to identify those responsible for digitalization investments. Additionally, adopting a step-by-step approach to integrate digitalization into all business processes is advisable.

5.4. Policy implications

Based on the results of this study, policymakers can facilitate healthy business growth by supporting small and medium-sized enterprises. They can provide funding to enable SMEs to invest in digitalization to build lean and more effective systems, which are instrumental in enhancing the management of the company's most strategic processes. This financial support can compensate for the typical lack of resources among SMEs, thus avoiding the phenomena of funds dedicated only to finance the acquisition of plants and machinery under the banner of Industry 4.0, which, on the other hand, is not connected with data processing support processes, resulting in the loss of data and information necessary for strategic management.

Furthermore, funding is essential for training employees, owners, and top managers in the culture of digitalization integration. This will enable them to acquire the necessary skills in management control systems and digitalization, fostering the inclusion of all business processes within a comprehensive system. It helps overcome the misconception that digitalization is merely an investment in technology and emphasizes its integration into the organization.

5.5. Limitations and future developments

Despite its relevant theoretical and practical implications, this study has some limitations. Firstly, the current study focuses only on small and medium-sized companies; hence, future research can be carried out to compare the effect of digitalization on different processes in medium vs. large organizations. Secondly, the generalizability of results might be constrained by factors such as the specific industries or regions under investigation. Hence, similar studies can be conducted to investigate different sectors in different countries. The third limitation arises from the rapidly evolving nature of digital technology, which can make the study's findings outdated relatively quickly. Therefore, the study should be repeatedly carried out after regular intervals to update findings and to keep track of developments taking place in the field of investigation. Moreover, the complex and multifaceted nature of management control systems and digitalization makes it challenging to isolate and measure the individual impact of different factors accurately. This can be tackled by carrying out more focused studies analyzing the effect of specific factors. Despite these limitations, such studies remain invaluable in shedding light on the evolving landscape of business management in the digital age and in providing valuable insights for both academicians and practitioners.

Lastly, the research emphasizes a moderate correlation between digitalization and performance; however, it does not address how excellence requires the softer components, such as human resources, which would necessitate the inclusion of report elements more closely associated with competencies and skills.

6. Conclusion

In conclusion, the study explores the crucial nexus, as underlined in the literature (Grima et al., 2022; Ruggeri et al., 2023), between maturity in management control and directing digitization among small and medium-sized businesses. It is clear from a thorough analysis of the potential problems and existing environment that SMEs are negotiating a difficult path toward improved managerial control systems and digital transformation. The results highlight the mutually beneficial relationship between technology adoption in MCS and organization performance, underscoring the necessity of strategic alignment between digital initiatives and management control systems. SMEs may break through current obstacles and open up new opportunities for growth and competitiveness in the always-changing digital landscape by adopting this comprehensive approach. This report offers insightful analysis and helpful suggestions to steer SMEs, with a focus on MCS, toward a future where digitization and management control maturity interconnect for long-term success as the digital world continues to unsettle business models.

CRedit authorship contribution statement

Laura Broccardo: Writing – original draft, Visualization, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Andrea Tenucci:** Validation, Supervision, Project administration, Investigation, Formal analysis, Conceptualization. **Reeti Agarwal:** Writing – review & editing, Writing – original draft, Visualization, Validation. **Safiya Mukhtar Alshibani:** Writing – review & editing.

Declaration of competing interest

The author(s) declare no conflict of interest with respect to the research, authorship, and/or publication of this article.

Data availability

Data will be made available on request.

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