

Special Issue

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Management Control



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**Management
Control**

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Accounting in a challenging world

*Paolo Collini, Graziano Coller**

Accounting has always been a fundamental tool for managing the complexities of the business world. In mercantile Italy of the 1400s, when modern double-entry bookkeeping was developed, the need to manage business partnership arrangements led to the definition of methods and tools for recording business events and calculating profits. Double-entry bookkeeping had responded to the specific needs of a business world characterized by the spread of new payment systems, the role of external lenders, the internationalization of trades, and the specialization of roles within the value chain. Luca Pacioli gathered the knowledge in accounting that had gradually consolidated, defining its method and tools in his famous book.

The world has kept changing over the centuries, and accounting has sought to evolve and respond to the new needs emerging at different times. As a response to the increased complexity caused by the rise of the industrial system (Fleischman and Tyson, 2006), there is a gradual separation between accounting for internal management purposes and accounting for external use. Later, with the development of large American companies (Chandler, 1962), we see the emergence of the fundamental characteristics of management accounting, from standard costs to variance analysis, and the development of planning and programming tools (Sloan, 1964).

Similarly, management accounting responded to the changing competitive environment and the spread of new models of industrial production at the end of the last century (Johnson and Kaplan, 1987), with the performance movement (Eccles, 1991) and the shift in focus to the non-financial dimension incorporating a strategic perspective (Bergamin Barbato, 1991; Kaplan and Norton, 1992). Along with that, globalization phenomena were pushing for an internationalization of accounting, whose rules were gradually becoming supranational (Nobes, 2014).

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Nowadays, the arena in which significant changes occur has widened, crossing the enterprise's borders involving the whole world community. The enterprise must act within a context of significant transformations forced to react and adapt. Technological evolution, particularly digitalization, potentially disrupts the management accounting domain by changing the organization's landscape and affecting accounting and the role of the controller and overall financial management (Möller, Schäfer, and Verbeeten, 2020). Digitization changes the role and activities of controllers by significantly affecting the skills required, radically changing the role of repetitive and standardized tasks (Pargmann, Riebenbauern, Flick-Holtsch, and Berding, 2023).

Of great importance is also the impact of the wide availability of data and information on the processes of business performance management and evaluation (Agostini, Chiucchi, and Giuliani, 2020). The paper by Culasso, Giacosa, Crocco, and Giordino contributes to this theme, investigating how computer information systems have transformed the management accountant profession. The authors draw on hundreds of job postings featuring management accounting positions across Europe to identify a set of critical competencies and tasks employers require for modern-day accountants. Applying topic modeling, a statistical model for discovering hidden semantic assemblies in textual data, the authors assess the role of reporting in daily tasks, the alignment between employer expectations and accounting education, and the importance of IT literacy among the competencies of modern accountants. The study gives management accountants a comprehensive overview of expected competencies and tasks. It also offers educators and policymakers insights into the current job market, aiding them in refining educational and professional programs. Also dealing with the issue of technological transformation, Berardi and Mook investigate how new technologies may help Social Economy Organizations (SEOs) fulfill their Social Impact Assessment (SIA) needs. With a systematic literature review, the authors analyze the intersection of SIA and digitalization within the context of SEOs. The paper discusses the state of the art of research in this field: the paper identifies emerging themes and trends in this area and proposes suggestions for further research.

At the same time, the natural environment poses the challenge of sustainability to businesses and Society, forcing companies to revise their performance measurement models by incorporating environmental externalities directly into the evaluation of results. The United Nations' Sustainable Development Goals (SDGs) definition has structured a shared vision of the multidimensional notion of sustainability. The issue of sustainability has been expanded to include the social dimensions and, on the other hand, setting a working agenda the enterprises must follow. The impact on performance reporting, measurement, and evaluation

systems is substantial (Bebbington and Unerman, 2020). The conceptual framework defined by SDGs has generated a great deal of attention from scholars who see it as a clear reference for constructing performance measurement and assessment systems. Mio and Oranges Cezarino investigate the skills and competencies accountants require to successfully deal with Sustainable Development Goals (SDGs) disclosure and reporting. Employing the Delphi method (a qualitative research technique that seeks a consensus regarding a specific definition or concept), the authors analyze the answers of a sample of experts composed of senior accountants of Brazilian municipalities involved in projects related to SDGs. Results are presented following a model that describes the competencies required according to four variables: Knowledge, Skills, Attitudes, and Purposes. For each variable, the required competencies are discussed. Besides identifying required competencies, the authors propose an educational model for public accountants that can contribute to improving SDG performance, disclosure, and reporting.

Within the same domain, but with a clear focus on Data Science and Artificial Intelligence as enabling technologies, Demartini and Pagliei aim to examine the quality and reliability of ESG data provided by companies and the accuracy of ESG ratings produced by sustainability rating agencies (SRAs). Through a systematic literature review and bibliometric analysis, the authors identify eight relevant clusters of contributions concerning the source used to produce ESG information, the message's destination (e.g., responsible investors, financial providers), and the encoding/decoding process of ESG information.

The research then focuses on the relationship between ESG ratings and Artificial Intelligence (AI). Traditionally, ESG ratings were exclusively produced by human research analysts based on companies' disclosures and other released documents. However, the recent development of AI led to a novel type of ESG rating provider capable of collecting and processing a vast amount of data from internet sources. The integration of AI can enable efficient analysis of extensive data, holding crucial information for ESG investing. While computer algorithms can process data effectively, managers and investors need to understand the potential and limitations of AI. Additionally, scholars are urged to propose advancements for research in these areas.

Significant changes require complex and articulated responses, and integrated reporting (Dumay, Bernardi, Guthrie, and Demartini, 2016) represents a critical avenue to try to reinforce the role of reporting in providing a fair and complete view of business performance. Galeotti, Lombardi, Principale, and Sura examine the effects of the EU/2014/95 directive on corporate reporting practices and communication. The directive imposed to integrate financial and non-financial aspects like environmental, social, and governance (ESG) issues in corporate reporting systems. Building on case studies, the paper investigates how integrated

data management relates to corporate reporting and whether the Directive has influenced the adoption of integrated systems. Results show that the Directive's impact on corporate control and data management varies based on companies' prior sustainability reporting experience. The results show that integrated data management is necessary to collect and process qualitative and quantitative information. Moreover, the study provides evidence of the internal effects of non-financial reporting regulation. The study highlights the importance of an integrated approach in helping companies identify and manage risks, improve their decision-making processes, and enhance their reputation and stakeholder trust.

Changes appear interrelated among each other in a context of mutually inter-related effects. As summarized well with the so-called “butterfly effect” (Lorenz, 1963), connections within the ecosystem are unpredictable and small changes can be amplified. The environmental challenge calls for an energy crisis, which is also fueled by major geopolitical upheavals. Policymakers and regulators play an essential role in a market characterized by a low-price elasticity of demand (von Homeyer, Oberthür, and Jordan, 2021). Aliu investigates whether electric and gas utilities use regulatory information (i.e., the information the regulatory body asks all utilities to provide regularly) for their internal decision-making and control processes. The paper builds on data from questionnaires and complementary interviews with Italian electric and gas utilities. Findings reveal different behaviors according to the size and operating activity of the firms. On the one hand, large utilities and energy distributors use regulatory information for performance monitoring, benchmarking analysis, and investment prioritization strategies. On the other hand, small utilities and energy traders produce the information solely for regulatory compliance and do not use it in their day-to-day activities. The study also finds that coercive pressure from the regulatory environment affected the MCS of energy utilities either radically or incrementally, underlining the role of ARERA (the Italian market regulator) as a driver for controlling and improving performance.

As an example of connections between different phenomena, health crises, propelled by globalization and aging society, pose a significant challenge that, as demonstrated by the SARS-COV-2 pandemic, can rapidly overwhelm the entire planet. Paoloni, Manzo, and Procacci address the issue of digitalization of Small and Medium-sized Enterprises (SMEs) and how the COVID-19 pandemic affected their digitalization process. The authors employ a twofold approach to address this issue. First, with a structured literature review, they analyze the extant literature on the effects of the COVID-19 pandemic on the digitalization process of SMEs. Second, focusing on Italy, where the digital transition is constrained by the structural limits of its conservative entrepreneurial environment, the authors analyze two case studies to understand (1) the needs

arising in different firms to address the pandemic and (2) how the digitalization process evolves in these circumstances. Results show that the pandemic crisis positively impacted the digitalization of SMEs, inducing a more intense use of available technologies and acquiring new technological tools. The needs arising from the COVID-19 pandemic refer to flexibility, security, and connectivity. The study shows that the digitalization process followed to address these needs depends on the business model adopted, such that companies active in the same sector may show differing development needs and digitalization processes.

In these change processes, the issue of scarce resources is more critical. Accounting must enforce its role in driving public choices in a world increasingly crowded with an aging population.

Candio deals with the relationship between cost-effectiveness and accounting. Cost-effectiveness refers to the achievement of optimal allocation of limited resources, and its ultimate purpose is to support rational decision-making. While cost-effectiveness principles are fundamental to financial reporting and managerial accounting frameworks, semantic issues and norms can hinder their explicit characterization within accounting literature.

The review by Candio reveals that Cost-effectiveness principles have been invoked in both financial and managerial accounting research. However, only a limited number of empirical studies have quantified evidence of cost-effectiveness and formally applied its analytical methods. The article highlights a research gap that pertains to the need for interdisciplinary frameworks and analytical methods capable of formally integrating the concept of cost-effectiveness and cost-benefit analyses into accounting research.

Finally, Cardoni, Parisi, and Hiebl remind us that the development of theory and the evolution of managerial practices do not always follow parallel paths. Their structured literature review provides an up-to-date overview of the existing scholarly literature concerning the implementation phase of management accounting in Small and Medium-sized Enterprises (SMEs). The authors highlight a decline in the publication frequency of theoretical contributions related to management accounting implementation. The review highlights that over the past fifteen years, the structural gap between theoretical concepts and practical application in implementing management accounting in SMEs seems to have widened. As a result, smaller companies lack practical academic guidance and proposals to address the emerging challenges in management control. These results underscore the need for more robust academic support to assist SMEs in navigating the evolving landscape of management accounting.

References

- Agostini M., Chiucchi M.S., Giuliani M. (2020), Big Data e Analytics: Impatto sul sistema aziendale e performance, In R. Lombardi, M. S. Chiucchi, D. Mancini (Eds.), *Smart technologies, digitalizzazione e capitale intellettuale. Sinergie e opportunità*, Milano, Franco-Angeli.
- Bebbington J., Unerman J. (2020), Advancing research into accounting and the UN Sustainable Development Goals, *Accounting, Auditing & Accountability Journal*, 33(7), pp. 1657-1670. Doi: 10.1108/AAAJ-05-2020-4556.
- Bergamin Barbato M. (1991), *Programmazione e controllo in un'ottica strategica*, UTET.
- Chandler J.A.D. (1962). *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*, Beard Books.
- Dumay J., Bernardi C., Guthrie J., & Demartini P. (2016), Integrated reporting: A structured literature review, *Accounting Forum*, 40(3), pp. 166-185. Doi: j.accfor.2016.06.001.
- Eccles R. G. (1991, January 1), The Performance Measurement Manifesto, *Harvard Business Review*. Doi: 1991/01/the-performance-measurement-manifesto.
- Fleischman R., & Tyson T. (2006), The History of Management Accounting in the U.S. In C. S. Chapman, A.G. Hopwood, & M.D. Shields (Eds.), *Handbooks of Management Accounting Research* (Vol. 2, pp. 1071-1089). Elsevier. Doi: 10.1016/S1751-3243(06)02022-0.
- Johnson H.T., Kaplan R.S. (1987). *Relevance Lost: Rise and Fall of Management Accounting*, Harvard Business School Press.
- Kaplan R.S., Norton D.P. (1996), *The Balanced Scorecard: Translating Strategy into Action* (1st edition), Harvard Business Review Press.
- Lorenz E.N. (1963), Deterministic Nonperiodic Flow. *Journal of the Atmospheric Sciences*, 20(2), pp. 130-141. Doi: 10.1175/1520-0469.
- Möller K., Schäffer U., Verbeeten F. (2020), Digitalization in management accounting and control: An editorial, *Journal of Management Control*, 31(1), pp. 1-8. Doi: 10.1007/s00187-020-00300-5.
- Nobes C. (2014). The international evolution of accounting. In C. Nobes, *Accounting: A Very Short Introduction* (1st ed., pp. 13-27), Oxford, Oxford University Press. Doi: 10.1093/actrade/9780199684311.003.0002.
- Pargmann J., Riebenbauer E., Flick-Holtsch D., Berding F. (2023), Digitalisation in accounting: A systematic literature review of activities and implications for competences, *Empirical Research in Vocational Education and Training*, 15(1), 1. Doi: 10.1186/s40461-023-00141-1.
- Sloan A. (1964). *My Years with General Motors*. Garden.
- von Homeyer I., Oberthür S., Jordan A. J. (2021). EU climate and energy governance in times of crisis: Towards a new agenda, *Journal of European Public Policy*, 28(7), 959-979. Doi: 10.1080/13501763.2021.1918221.

Modern day Management Accountants: A latent Dirichlet allocation investigation

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*Daniele Giordino**

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Abstract

The emergence of computerized information systems has provided management accountants with an unprecedented array of possibilities when it comes to data analysis. Nevertheless, it has progressively changed the profession as we know it. Thus, a need for research to clearly define the modern management accountant profile in terms of skills and tasks expected by their employers has been echoed by several authors. Our study draws on a set of 841 job postings featuring management accounting positions across Europe to define a set of critical competencies and tasks of modern-day accountants. Topic modeling is applied to the dataset to identify and extract the information needed to answer the research question. From a theoretical standpoint, the proposed contribution strives to fill in multiple research gaps in accounting literature, namely the incidence of reporting in a management accountant's daily schedule, the gap between employers' expectations and current accounting education programs, and the importance of IT literacy. From a practical perspective, the study provides management accountants with an extensive overview of the competencies and tasks they are expected to perform. Additionally, our empirical evidence informs educators, and policymakers with an insight into today's job market to use as a potential benchmark for their educational and professional programs.

Keywords: Management Accounting, Latent Dirichlet Allocation, Skills, Tasks, Job Descriptions

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1. Introduction

Accounting has a rich history and traditions, yet it has experienced several changes throughout the decades. According to Littleton (1928), since 1494, when the bookkeeper's first printed book appeared, the underlying principles of accounting based on double-entry are supposedly not subject to change due to their fundamental nature. However, in today's landscape, the combination of technology and innovation has drastically changed the accounting profession and will continue to do so for the foreseeable future. While the accounting world is complex and rapidly changing (Lombardi, 2021), the significant challenges accountants face are as follows: evolving innovative and digital technology, continued globalization of reporting/disclosure standards, and new forms of regulation.

The same changes apply to management accounting, generally referred to as a branch of accounting that generates and delivers information to the internal decision-makers of an organization (Anthony, 1965; Macintosh, 1985). Management accounting relies heavily on information and data (Oppi & Vagnoni, 2020; Wolf *et al.*, 2020). Management accountants help business operations by, among other tasks, gaining information on costs to prepare internal financial reports and records and support managers' decision-making process in achieving business goals (Richardson *et al.*, 2015; Sorensen, 2009). Due to its data-dependent nature, management accounting is inevitably affected by the rapidly changing technological landscape. For instance, modern management accountants should handle big data from their information management systems and help top management translate that data into clear and rational strategic decisions (Wadan *et al.*, 2019).

The paper aims to investigate the current literature and its trends in the management accounting profession. The work environment of management accountants has drastically changed over recent years, as modern technology has disrupted both the tasks required of accounting professionals and, subsequently, the skill set required by employers worldwide. While the body of literature on IT capabilities is growing concomitant with the one on digital transformation (Munir *et al.*, 2022), it is still unclear what exactly is required from modern management accountants in terms of tasks and skills (Pilipczuk, 2020). Given the importance of management accounting in current times and the need for companies and professionals to better understand the complex job market they operate in, the research questions (RQ) driving this study are therefore twofold:

RQ1: What capabilities are required by organizations for management accountants?

RQ2: What are modern management accountants' tasks in their organizations?

Finding an answer to the above questions is vital to ascertain the current state of management accounting as a profession. Additionally, by answering the two questions above, we could effectively profile the current job market for management accountants, which would provide valuable insights to both companies and practitioners.

Our study draws on 841 job postings featuring management accounting positions across Europe to define a set of critical competencies and tasks of modern-day accountants. First, the vast dataset was scraped from major job postings outlets. Subsequently, topic modeling will be applied to the dataset to identify and extract the information needed to answer the research question. More specifically, the authors propose the use of latent Dirichlet allocation, which is a Bayesian statistics-based algorithm for topic modeling. Through latent Dirichlet allocation (LDA), the authors aim to extract information on competencies and tasks required from modern-day, newly appointed management accountants across the globe. Via topic modeling, it will be possible to clearly define the universal profile of the modern-day management accountant more extensively and comprehensively than through qualitative approaches. In addition, it will also be possible to highlight the emerging differences across countries in how each of the dimensions is distributed.

The study comes with several implications for both theory and practice. From a theoretical standpoint, the proposed contribution strives to fill in multiple research gaps in accounting literature, namely the evolution of management accounting as a profession and the modern competencies and skills required by today's management accountants. From a practical perspective, the study aims to profile the modern management accounting profession, which is helpful for practitioners to both identify current market demands and opt for proper skill development actions to meet modern requirements.

The paper is organized as follows. In the next section, we examine the evolving role of management accountants to highlight modern challenges, the impact of digital transformation, and their role in tasks and critical competencies. Further, we delineate the gap in knowledge regarding the skills required from today's management accountants and the current job market's expectations of them. In the third section, we describe the research design chosen for the study and the rigorous step-by-step process required by LDA

topic modeling. Subsequently, we present the results of our analysis, divided into skills and tasks for clarity. Finally, we discuss the results of our study, draw conclusions, and suggest implications for research and practice.

2. Literature Review

2.1 The evolution of Management Accounting

Historically, management accountants have progressively evolved from being central to enacting management control in organizations (Anthony, 1965; Macintosh, 1985) to, more recently, broadening their range of action to accommodate strategic perspectives (Simons, 1995). In other words, management accountants have progressively become more involved in decision-making over the decades, integrating financial and non-financial information on operational and strategic levels (Byrne & Pierce, 2007). Thus, they have often been referred to as moving away from the traditional “bean counter” image toward a “business partner” of the management (Richardson *et al.*, 2015; Sorensen, 2009). Today, scholars agree that management accountants hold a significant strategic role in companies (Magnacca & Giannetti, 2023), as they act as the organizational conjunction of pure accounting and strategic consulting. However, some recent developments have started to question the “business partner” nature, investigating the dilemma as to how a business partner role can be enacted when management accountants find themselves between independence and involvement (Tillema *et al.*, 2022).

According to the Institute of Management Accountants (IMA) (2008), management accounting “[...] involves partnering in management decision making, devising planning and performance management systems, and providing expertise in financial reporting and control to assist management in the formulation and implementation of an organization’s strategy.” Additionally, in some European countries, management accountants are labeled as “controllers” and the interchangeable use of the two terms is commonly found in the literature as well (Chiucchi & Gatti, 2015). Definitions and labels aside, the management accountant’s identity is far from universally agreed upon and is the object of academic debate today (Oppi & Vagnoni, 2020; Wolf *et al.*, 2020). In addition to what has been discussed in the previous paragraph, the scientific debate has seen the role of management accountants progressively change to embrace their business partners nature (Byrne & Pierce, 2007; IMA, 2008; CIMA, 2018), as well as a more recent, decentralized, ‘hybrid’ role (Hoozée & Mitchell, 2017). Decentralization, in

particular, sees management accountants working directly for or with individual managers, for the sake of enhancing their sensitivity to managers' information needs.

Furthermore, in today's hyper-competitive world, the field of management accounting is constantly evolving, and there is an increasing interest in the description of current and future models of management accountant skills. This interest is due to the extensive and radical changes caused by the digital transformation of businesses worldwide that have led to a more strategic and integrated role of management accounting, as accountants are now more than ever expected to partake in the strategic decision making process of their companies (Magnacca *et al.*, 2023; Tillema *et al.*, 2022). Thus far, academic literature has extensively focused on the changing role of information technologies for management accountants. Therefore, the above perspective is helpful when trying to profile management accountants' past, present, and future roles, along with the implications of digital transformation for management accounting.

Digital transformation is a complex and pervasive phenomenon, driven by both the adoption of disruptive technologies and the adoption of said technologies in the organizational workflow (Heinzlmann, 2019). We mentioned digital transformation being pervasive because 'no aspect of business today remains untouched by digital technologies.' (Bhimani & Willcocks, 2014). Hence, much like all the functional areas, modern accounting is actively influenced by these transformations. A few specific literature gaps remain, however, despite the growing relevance and consequent levels of scientific output found in management accounting research (Cavélius *et al.*, 2020). The first question remaining partially unanswered has to do with a growing public awareness for corporate sustainability among companies, resulting in management accountants integrating sustainability assessments in their usual tasks (Cheffi *et al.*, 2021; Jusoh *et al.*, 2021). The second research direction is tied to the increasingly relevant role of information technologies in management accounting, which requires professionals to adjust their skill sets regularly to keep up with the fast-changing environment (Oppi & Vagnoni, 2020; Wolf *et al.*, 2020).

Both themes spark the debate on the challenges faced by modern-day accountants, as they are simultaneously required to redefine their role as the coordinators of processes for the management of sustainability information and learn how to work with technology (Paulsson, 2012). The above is true, for instance, regarding the role of business intelligence and big data reporting in Enterprise Resource Planning systems. In other words, when questioned about the future of management accounting as a profession, scholars agree

that they emphasize the increasing role of information technologies and the importance of interpersonal (Jakobsen *et al.*, 2019) and technical skills development (Goretzki & Strauss, 2017). Additionally, the authors seem to agree that future management accountants will be asked to coordinate in managing sustainability information (Cheffi *et al.*, 2021; Jusoh *et al.*, 2021). The above trend and the increasing role of reporting in managerial accounting pave the way for a future in which sustainability reporting and predictive accounting will play a significant role (Ascani *et al.*, 2021; Schaltegger *et al.*, 2017).

In the above described climate of uncertainty, turbulence and digital disruption, several calls have been made to understand management accountants' multiple identities and identity conflicts (Wolf *et al.*, 2020). However, to this day, a clear, universal depiction of what a management accountant is and what they are expected to do is still somewhat missing (Oppi & Vagnoni, 2020), or limited to few exploratory studies on limited samples (Budding *et al.*, 2022; Siriwardane *et al.*, 2015). The study of ten Rouwelaar *et al.* (2021), for instance, calls for researchers to expand upon their preliminary findings by analyzing a more general population of management accountants, possibly across multiple countries.

2.2 Modern-Day Management Accountants in terms of Skills and Tasks

In today's ever-changing digital environment, it is important for management accountants to continuously develop their technical skills to keep up with technological advancements, all the while possessing a multifaceted professional identity composed of both hard and soft skills. The Global Management Accounting Principles published by the Chartered Institute of Management Accountants (CIMA) (2018), identifies strategic thinking, communication, and digital literacy as critical competencies for management accountants to possess. The study of Brown & Cooper (2019) corroborates the need for modern-day management accountants to possess a varied set of skills, including emotional intelligence, adaptability, and problem-solving skills. More recently, Ott (2022) stressed the need for management accountants to possess strong analytical thinking, more than what is required from financial accountants.

Additionally, Webb (2020) noted that while today's management accountants are well versed in older digital technologies such as spreadsheets, they find the relatively newer technological issues such as blockchain and coding somewhat challenging, despite their obvious potential for accounting

practice. This area of research has great potential for accounting practice, as modern technology can actively enhance decision-making for competitive performance and cultivate business values that enhance innovation performance (Mikalef *et al.*, 2019). Lawson *et al.* (2014) goes as far as to say management accountants in today's era act as a bridge between data scientists, analysts, and business executives. To expand upon this notion, data scientists possess significant technical knowledge, yet often lack understanding of contextual business factors surrounding the data (Wadan *et al.*, 2019). On the other end of the spectrum, business executives may not fully understand the true potential of data analytics. In the context above, management accountants can act as a bridge between these two business functions. They can simultaneously interpret and analyze data, highlighting its implications for managerial decision making (Král *et al.*, 2021; Paulsson, 2012).

Still on IT literacy, previous studies have unveiled the general importance of electronic spreadsheet skills in management accounting (Bradbard *et al.*, 2014). For instance, Rai *et al.* (2010) rated spreadsheet skills as the second most important IT skill for a management accountant to possess out of 30. Similarly, Beaman and Richardson (2007) highlighted how spreadsheets were deemed the most important skills for accountants tasked with helping management with operative decision making. Additionally, literature on management accounting education has focused on the importance of communication skills, especially in educating future management accountants as business partners rather than bean counters (Jakobsen *et al.*, 2019). Previous studies have revealed how communication skills are a close second to intellectual skills when analyzing what it takes to become a management accountant (Hung *et al.*, 2019). The above results are backed by empirical evidence, such as the study conducted by Spraakman *et al.* (2015). They emphasized the importance of Microsoft tools proficiency for newly appointed management accountants, with the Excel spreadsheet tool deemed the most important in their skill set.

In addition to a solid IT background for management accountants, a lively academic debate has developed around communication skills. Siriwardane *et al.* (2015) tackled the topic with a critical perspective, as they highlighted the mismatch between the level of communication skills expected by the employers and the supposed lack of communication specific training in accounting education programs. The same issue was brought back into academic light by Webb & Chaffer (2016), who criticized accounting educators for not stressing the importance of generic soft skills, communication included. Same sentiment has been echoed by previous researchers and has been the

center of attention for a decades long debate, which is still ongoing (Bui & Porter, 2010; Jackling & de Lange, 2009; Kavanagh & Drennan, 2008).

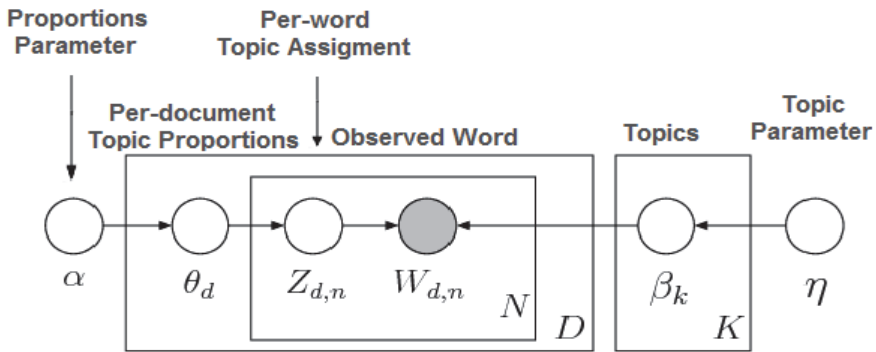
Granted that the management accountant’s identity is evolving, especially in the dawn of digital transformation and Industry 4.0 (Oppi & Vagnoni, 2020; Wolf *et al.*, 2020), researchers have yet to find a universal agreement of what a management accountant is expected to do and to be in modern times. Siriwardane *et al.* (2015), for instance, called for larger empirical datasets to better frame the topic.

3. Methodology

LDA topic modeling is at the core of the present study’s research design, as it allows the processing of significant amounts of data from textual documents. Topic modeling is a statistical model for discovering hidden semantic assemblies in textual data. Advances in computational social science have expanded researchers’ ability to extract information from online sources. Accounting scholars are increasingly taking advantage of these methods (Culasso *et al.*, 2023; Nielsen, 2022), as the tools allow for a clear, transparent, and replicable way to extract information from large volumes of data. More specifically, natural language processing (NLP) has been successfully applied in analyzing a wide range of data, including social media content, websites, and collections of textual documents.

While NLP is increasingly common in social science research, LDA has been underutilized, despite its advantages compared to other NLP approaches. The LDA algorithm is based on Bayesian statistics principles and extracts topics or themes from documents based on the co-occurrence of text. In other words, the premise of LDA is that a collection of distinct and unique textual documents feature a shared set of topics that are distributed heterogeneously throughout the sample. Co-occurrence of words is used to discern and extract topics. LDA is the best fit for the present study’s research design because it treats documents as containing varying proportions of topics. Thus, a single text may be 30 percent of one topic, 10 percent of another, and 60 percent of a third topic. Thus, when applied to a corpora of several job postings, the LDA algorithm effectively identifies the multitude of organizational capabilities and individual skills mentioned. Figure 1 provides a visual representation of how the LDA algorithm works.

Fig. 1 - Latent Dirichlet Allocation algorithm



More specifically, three characteristics of LDA highlight its advantages for studying modern management accounting job postings compared to other methods. First, LDA does not impose a predefined coding structure on text and extracts topics inductively based on word frequencies and co-occurrences. In other words, unlike many forms of sentiment analysis, LDA features a free-form approach to textual documents, with no preconstructed coding structures. Second, LDA allows for measuring the multidimensionality of topics by highlighting the varying degrees each topic contributes to the documents included in the sample. Multidimensionality is critical in management accounting research, as previous research has highlighted modern accounting professionals’ multifaceted nature in terms of tasks and skill sets. Additionally, LDA allows for comparative cross-cultural analyses by separating data from each nation into distinct documents, comparing the topic distribution in each country/document and highlighting emerging differences among them. Finally, LDA also retains many strengths of NLP more generally, such as focusing on texts as valid conveyors of modern accounting themes and the capability to analyze a large amount of data from multiple online sources, as opposed to focusing on single case studies or qualitative interviews.

3.1. Source and Pre-Process Text Data

Given the inductive nature of LDA, particular care should be taken when selecting a corpus of text that conveys the information we look for. For this purpose, job postings from major job search sites were used. Job postings have been extensively used as a source of data for business and social science research (Ge *et al.*, 2022), due to them featuring extensive depictions of the

core competences required along with the list of tasks expected to be performed by the newly appointed candidate, therefore making them a valuable source of information in regards to our original research questions. Furthermore, these descriptions are intended to be accurate, since companies are interested in finding specific profiles to suit their needs. The data was further pre-processed for analysis using MATLAB. The textual corpus was then processed. First, we performed tokenization, which consists in segmenting a document into its atomic elements. In our case, we tokenise our sample to words, thus removing any other element from the set of data we have gathered. Subsequently, stopwords were removed from the corpus as well. The definition of stopword is flexible, yet it generally includes words that are meaningless to a topic model. For instance, conjunctions such as “for” or “and” do not add any relevant meaning to the model, thus it is best to remove them from the token list.

Data was collected from several job posting sites, namely LinkedIn, Indeed and Glassdoor. We integrated the dataset with job postings found via Google and featured directly on the company website. We specifically looked for postings featuring “management accountant.” In the case of a low amount of records retrieved ($n < 20$), we integrated the search with the local language equivalent. For instance, in the case of Sweden we integrated the sample with records found using “förvaltningsrevisor,” accurately translated with the help of professionals. During the above described phase, we paid particular attention to duplicates and removed them when found, as companies tend to post the same description on multiple platforms to broaden their reach. Additionally, drawing on Papoutsoglou *et al.* (2022), we performed an extensive, qualitative review of each job description in order to filter out job descriptions not fitting the scope of our research. We set a first exclusion criteria, namely the brevity of the job description itself when totalling less than 150 words. Additionally, we filtered out job descriptions purely consisting of bullet points, as LDA topic modeling performs best when mining long-form text. Finally, we proceeded with the removal of job descriptions not fitting with the conceptual scope of what a management accountant is, according to our literature review. This step was deemed necessary due to the varied terminology used in management accounting job postings, occasionally referred to as “control” or “controller”. The final corpus included 841 job postings from 10 different European countries. Table 1 summarizes the process, with the details on how many records were extracted from each source. We note that Glassdoor and Google are both to be considered in the “Others” section.

Table 1 - Job Postings from each source

	UK	FR	GER	IT	DK	NL	NW	SW	SP	SD
Indeed	1271	65	280	121	72	189	67	74	136	301
LinkedIn	1091	36	301	89	156	321	57	405	72	194
Others	151	20	15	12	8	21	15	12	10	17
Duplicates	597	34	180	75	65	156	40	63	51	162
Qualitative Filter	1460	30	346	147	171	375	99	428	167	350
Total	456	57	70	55	54	16	27	61	44	21

Once we achieved a general agreement on the overall sample, we divided the data into two distinct subsamples, one featuring the competences and another featuring the tasks to be performed. With the corpus of job postings, LDA was used to identify dominant dimensions in terms of skills and tasks. In order to identify the ideal number of topics to be extracted from the two corpora, model fit statistics were compared across several LDA models with varying topics. While a more complete overview of the model fit statistics can be found below, probabilistic coherence score was used to determine the model selection, as it is generally considered the most efficient way to represent the interpretability of topics. Coherence is calculated on the difference between the probability of a set of words occurring together in a topic and their probability of occurring in the full corpus. In other words, models with a high coherence score feature a low degree of shared words between topics, thus making each topic as distinct as possible. Figure 2 reports the coherence score for each corpus using 1 through 20 topics. Regarding the skills corpus, the ideal model featured 4 topics, as after the 5th topic is added improvements are less substantial and inconsistent. Similarly, a 3 topics model was deemed the most fit for the tasks' corpus.

Topic coherence (Fig. A1) was deemed the most useful statistic to consider because it best represents the interpretability of topics. Log-likelihood test was also conducted in order to further validate the choice. As depicted

in figure 2, featuring the log-likelihood of individual words being found in the assigned topic, we find diminishing returns to model fit beyond the models chosen for the study.

Fig. 2 - Topic Coherence Scores

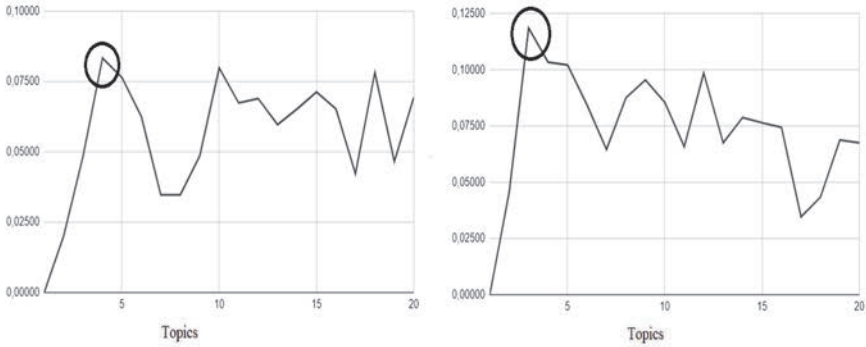
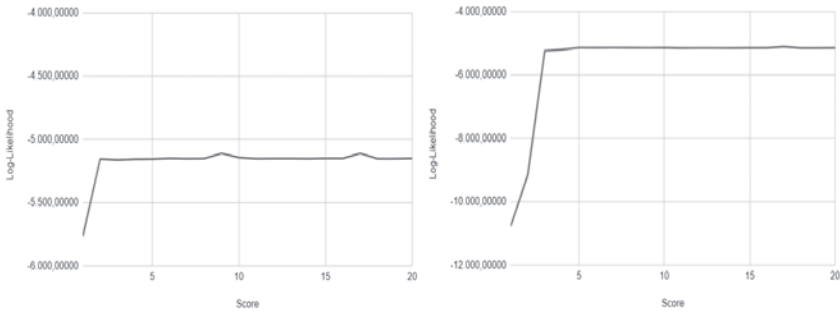


Fig. 3 - Log-likelihood Scores



4. Findings

4.1. LDA Topics

The authors took two steps to optimize the data extraction process and validate the results. First, they ran model fit statistics to determine the ideal dimensions for both corpora. Second, they performed semantic analysis via Leximancer on both samples and compared the results with the ones obtained from LDA topic modeling for consistency. Leximancer allows to perform

both semantic (relational) and thematic (conceptual) analysis of the data, through two stages of nonlinear machine learning. Its approach differs from traditional LDA topic modeling, as there is no focus on the relationship between documents, rather purely on the themes and concepts featured in them. Thus, Leximancer is a valid tool to perform a distinct analysis and validate the results obtained through LDA topic modeling, as a control methodology of some sort. We discussed model fit statistics earlier when Figure 3 was presented. It is important to note that topic meaning should be left to qualitative interpretation based on the words featured in each topic and their overall distribution (Schouten & Frasincar, 2016). Since LDA generates topics based on co-occurrences, rather than emphasizing individual items, it is up to the authors to label each dimension with a term they deem the most appropriate. Asmussen and Møller (2019) point out that the labeling of topics is highly subjective and left to the researchers' discretion. To minimize subjectivity biases and provide the strongest theoretical base possible to extract data, they suggest reviewing the most frequent words for each topic and a title review to lower the risk of incorrectly labeling topics. In doing so, using a theoretical framework to guide the interpretation of data is highly recommended. Thus, we used the framework elaborated by Lawson *et al.* (2014) to extract and label the dimensions in the most theoretically sound way possible.

4.2. Management Accountants' Skills

Four distinct topics have been identified among the skills corpus, each corresponding to an individual trait that characterizes the ideal management accountant profile. Figure 4 features the most common word stems for each dimension, ranked in order of probability of each word stem being found in a topic and are sorted with highly weighted words located at the top of each list.

Fig. 4 - Words distribution among the skills corpus

Topic 1	Topic 2	Topic 3	Topic 4
Skills	Software	Local	Learn
Working	Experience	Tasks	Fluent
Work	Knowledge	GAAP	Knowledge
Experience	Excel	IFRS	Solid
Management	Years	Completion	Staff
Finance	Good	Excel	Independently
Ability	Professional	Controller	Talk
Strong	MS (Microsoft)	VAT	Concepts
Team	Programming	Group	Communicate
Role	Fluent	Returns	Social
Degree	Training	Tables	Speaker
Financial	German	Department	Best
Excellent	Office	Function	Number
International	English	Accurate	Banks
Seniority	IT Skills	Technical Skills	Interpersonal Skills

4.2.1 Seniority

Words most frequent in the Seniority dimension include a collection of items pertaining to career advancements (“Experience”, “Ability”, “Strong”), along with words relating to excellence standards required for such positions (“Excellent”, “Degree” and “International”). Examining the distribution of this dimension across countries, reveals that oftentimes a minimum of 2 years of experience is required, while 5 years of experience seems to be preferred. Overall, when ranking the dimensions by their numerical dominance in the corpus, we find Seniority to be the most prominent one. This result is somewhat to be expected, due to the non-entry-level nature of most management accounting positions, that instead require significant work experience and relevant education.

4.2.2. IT Skills

The next topic contains high frequencies of words related to knowledge of IT systems, particularly the Microsoft Office suite (“MS,” “Office,” and “Excel”). Strong knowledge of Microsoft Excel, as expected, is essential for modern management accountants, yet what is interesting about this dimension is the presence of word stems concerning specific accounting software,

as well as basic programming skills (“Software” and “Programming”). Again, Oracle, Epicor, and SAP are the most often cited tools for accounting suites, with a few companies going as far as to mention their proprietary software solutions. Notably, the IT skills dimension is somewhat relevant regarding numerical dominance in the corpus, being the second most dominant topic. While this result is not interpreted as IT skills being more relevant than accounting and business skills, it is still representative of the importance of IT background in modern-day management accounting professionals.

4.2.3. Technical Skills

The “Technical Skills” dimension shares some similarities with the “Seniority” dimension, most notably regarding accounting and business knowledge. What differentiates the two is the emphasis on the temporal perspective seen in the “Seniority” dimension, which stresses the importance of multiple years of experience, whereas “Technical Skills” focuses on the accounting-specific knowledge required from the position (“GAAP,” “IFRS,” “Returns” and “VAT”). An interesting peculiarity of this perspective is the lack of references to sustainability and sustainability reporting, thus suggesting that management accountants are not expected to possess their specific know-how. On the contrary, deep knowledge of national and international accounting standards appears to be necessary.

4.2.4. Interpersonal Skills

The “Interpersonal Skills” dimension has high frequencies of word stems related to the interaction with co-workers. Being able to communicate effectively with people around them appears to be highly valuable for management accountants (“Fluent,” “Communicate,” “Talk,” and “Speaker”). This result corroborates the dialogic nature of the position, often required to act as a bridge between the accounting department and decision-makers among the top management. Most companies stress the need for management accountants to possess excellent communication skills and be team players.

4.3. Management Accountants’ Tasks

Three distinct topics have emerged from the analysis of management accountants’ tasks. Figure 5 features the most common word stems for each dimension, ranked in order of probability of each word stem being found in a topic and sorted with highly weighted words at the top of each list.

Fig. 5 - Words distribution among the tasks corpus

Topic 1	Topic 2	Topic 3
Reporting	Management	Support
Accounts	Finance	Ensure
Financial	Role	Ensuring
Accounting	Team	Group
Business	Business	Role
Monthly	Technology	Projects
Management	Pivotal	Monitor
Preparation	Providing	Company
Analysis	Key	Improvement
Payment	Duties	Review
Tax	Journals	Expected
Support	Holders	Accurate
Ensure	Centre	Proposal
Reporting	Business	Monitor

4.3.1 Reporting

The most numerically dominant dimension of the tasks’ corpus concerns reporting, and processes associated with it (“Reporting,” “Analysis,” “Monthly,” and “Preparation”). In the same dimension, we find word stems related to management accounting (“Accounting,” “Accounts,” and “Management”), thus implying a solid linkage between accounting and reporting, as noted earlier throughout our literature review. It is important to note that occasionally job descriptions use the term “reporting” to depict the professional figure management accountants are expected to refer to, not actual reporting tasks. For instance, a job posting reads: “Management Accountants are expected to report to the Chief Financial Officer...”. The above represents a limitation of LDA as an algorithm: the method cannot discern the

context within which words are used, only their frequencies with other words. Despite this limitation, a manual review of the sample corroborates the relevance and validity of reporting as a dimension.

4.3.2 Business

The second dimension of numerical dominance is connected to management accountants' "Business Partner" nature. In other words, the dimension depicts the management accountant as a strategist who can provide strategic advice to top management and influence their decisions ("Business," "Pivotal," and "Management"). Several job descriptions cite the term "Business Partner" literally, further testifying to the evolving role of management accountants. An exciting result within this dimension is the strong presence of the "Technology" word stems, signaling an ever-growing interest in opportunities stemming from digital technologies and digital transformation. While management accountants are hardly the sole ones responsible for a company's strategic direction, our empirical examination strongly reinforces their role as business partners and, more broadly, carriers of strategic business knowledge.

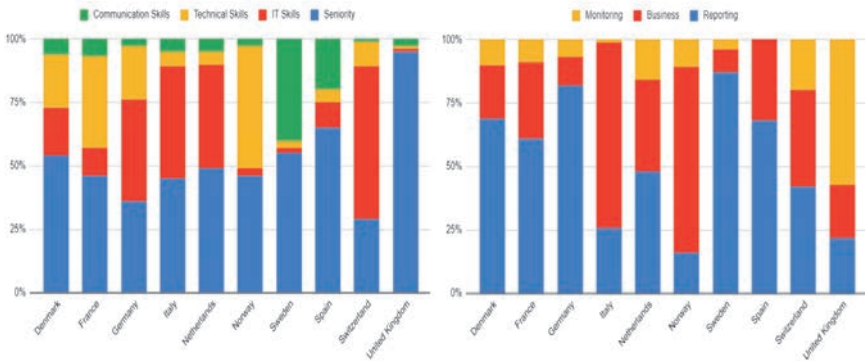
4.3.3 Monitor

Monitoring can be defined as an ongoing process, usually directed by management, to ensure processes are working as intended. At the same time, it does share some common ground with the "Reporting" dimension; the fundamental difference between the two lies in their temporal perspective. Among the "Monitor" dimension, we find word stems stressing the responsibility of management accountants, often asked to make specific processes go as planned ("Monitor," "Projects," and "Expected"). What is interesting about this dimension is the proactive nature of management accountants as they do not limit themselves to the monitoring of processes and instead play a somewhat coordinating role in making sure multiple actors and activities are carried out correctly ("Support," "Ensure," "Ensuring" and "Group"). Furthermore, we often find the words "Ensure" and "Ensuring" near words related to deadlines and time constraints, signaling the need for management accountants to guarantee the efficiency and timely delivery of the processes they are appointed to monitor.

4.4 Geographical Distribution of the Topics featured in the sample

LDA allows cross-cultural dataset analysis by dividing the sample into several separate documents, each belonging to a different country. In other words, the algorithm uncovers the distribution of each topic in correlation to the country they belong to, thus making comparisons between nations possible. Figure 6 illustrates the results by showing the percentage of each dimension from a cross-country perspective.

Fig. 6 - Distribution of skills and tasks dimensions by country



While the present study is not primarily designed to explain the discrepancies between countries in terms of tasks and skills, Figure 6 sheds light on the somewhat multifaceted nature of management accountants across Europe, further corroborating the hybrid nature of the profession as depicted in previous literature. In other words, Figure 6 evidences the fact management accountants are tailored around their employers’ needs, with a consequent variety in skills and tasks (Byrne & Pierce, 2007; IMA, 2008; CIMA, 2018). Currently, there is no scientific evidence that could aid us in theoretically interpreting Figure 6, aside from the assumption that country-specific developments in management accounting have possibly led to differences in theory and practice (Thaller et al., 2023). In other words, we cannot safely assume cultural reasons as to why the required skills would significantly differ from country to country. Thus, Figure 6 should be read as a prompt for future research to expand upon, granted its exploratory nature due to the lack of scientific evidence. Future studies could possibly adopt a cross-cultural approach meant to delve deeper into country-specific developments and the differences they might have caused, if any.

5. Discussion

Over the years, management accounting as a profession has evolved, thus prompting a continued change in the skills required from newly appointed management accountants and the tasks companies expect them to perform (Cavélius *et al.*, 2020). Moreover, in a world now driven by digital technology, the role of the management accountant has changed significantly to incorporate not only technical accounting competence but the ability to also understand the implications of digital transformation for business (Munir *et al.*, 2022). While the disruptive changes brought about by digital technology continue to reshape the global job market, several studies have highlighted the need for research to unveil the current nature of management accountants to understand better how the role has evolved and, consequently, how the future of the profession will be shaped (Cavélius *et al.*, 2020).

To achieve this goal, drawing on previous research on management accountants as a theoretical foundation for the study, we used machine learning techniques to collect and analyze job postings from all over Europe. Several themes have emerged from the analysis, both in terms of competencies and tasks to be performed. Moreover, the emerging themes have allowed us to depict a universal and updated archetype of the management accountant role, thus, bridging several gaps that remained unexplored by previous research (van der Steen, 2022).

We first unveiled the IT competencies needed for management accounting positions. Consistently with previous research, we highlight the use of business intelligence software to create customized reports, spreadsheet functions, and flowcharts using specialized software tools (Pilipczuk, 2020). Additionally, we find management accounting professionals to be more users of IT than their creators, thus being expected to possess proficiency in a vast array of tools and suites rather than overseeing their implementation or development (Král *et al.*, 2021).

We further contribute to the endless debate on the bean counter and business partner roles of management accountants (Paulsson, 2012; Král *et al.*, 2021; Carlsson-Wall *et al.*, 2022) by unveiling the hybrid nature of today's role that requires a broader set of knowledge and skills than traditional accounting positions. More specifically, we note the need for management accountants' soft skills, such as oral and written communication, to work in mixed teams with managers and specialists (Paulsson, 2012). This result not only contributes to the already existing scientific debate on management accounting (Král *et al.*, 2021; Carlsson-Wall *et al.*, 2022) but also expands upon recent exploratory research that delves into the hybrid nature of the position

(Budding *et al.*, 2022; ten Rouwelaar *et al.*, 2021) and answers the call for a clearer depiction of its identity (van der Steen, 2022).

Additionally, we find the increasing role of reporting in managerial accounting positions consistent with a recently developed stream of research investigating the topic (Bhimani, 2020; Nita, 2016; Schaltegger *et al.*, 2017). Today's management accountants are expected to be able to timely prepare reports and communicate them effectively with people around them. Surprisingly enough, however, we find a minimal presence of sustainability-related word stems in the sample, thus suggesting that companies are not actively looking for sustainability reporting-specific competencies. This finding somewhat contradicts extant research (Ascani *et al.*, 2021), and it is worth exploring further, possibly determining whether companies prioritize ad-hoc sustainability “experts” or, more simply, take these competencies for granted when appointing a management accountant.

In conclusion, we address RQ1 and RQ2 as follows. Regarding RQ1, we have identified several critical competencies from newly appointed management accountants. We find a hybrid blend of seniority, core accounting competencies, IT literacy, and communication skills. While accounting literacy can be considered a somewhat expected result, the numerical significance shown in the IT and communication skills dimensions unveils the need for management accountants to diversify their skillsets accordingly. This result bridges several gaps in the extant literature. It acts as an empirical follow-up for a few exploratory studies with limited sample size, but the results are consistent with ours.

Regarding RQ2, our study identified a series of recurrent tasks to be performed by today's management accountants (Byrne & Pierce, 2007). First, we find management accountants to be a hybrid blend of “bean counters” and “business partners,” as they are expected to not only keep up with the information inflow in a timely and efficient manner but also to interpret the data and proactively communicate their conclusions to management (Richardson *et al.*, 2015; Sorensen, 2009). We find an increasing need for management accountants to curate reporting, although we find little to no evidence on sustainability reporting precisely (Wolf *et al.*, 2020). Finally, we find several references to digital transformation amid the “Business” dimension of management accountants' tasks. The above implies that digital transformation has changed the entry requirements for management accounting positions and influenced their “business partners” nature. In other words, management accountants are now expected to look into the chances created by digital technologies and how future business avenues could potentially explore them (Chiucchi & Gatti, 2015).

6. Conclusions, Implications and Future Research Directions

In conclusion, our empirical findings unveil the multifaceted nature of the modern management accountant profession. From a task perspective, we witness management accountants shifting towards a blended role between data analysts and traditional accountants (Richardson *et al.*, 2015; Sorensen, 2009). They are asked to oversee, report, be accountable, and effectively communicate information to people around them (Hung *et al.*, 2019). Consequently, the skills required from modern management accountants mirror the multifaceted nature of their role, as they need to possess a hybrid mixture of IT skills (Bradbard *et al.*, 2014; Rai *et al.*, 2010), accounting-specific knowledge, and interpersonal skills to tie it all together (Jakobsen *et al.*, 2019).

Our research makes several contributions to the literature, both theoretical and practical. First, from a theoretical perspective, our study complements the literature that examines what management accountants do by unveiling a snapshot of the current job marketplace. In doing so, we complement the literature that examines what management accountants do by enriching actual exploratory knowledge with a large dataset of empirical evidence from multiple countries (Bui & Porter, 2010; Jackling & de Lange, 2009; Kavanagh & Drennan, 2008). Results reinforce the multifaceted nature of modern management accounting jobs and their role as coordinators of processes for the management of information (Oppi & Vagnoni, 2020; Wolf *et al.*, 2020). Second, we shed light on the professional skills expected from newly appointed management accountants by illustrating the importance of a tripartite blend of pure accounting, IT, and communication skills, along with solid seniority often required for top management positions where a significant level of responsibility and decision-making is involved (Král *et al.*, 2021; Paulsson, 2012). Finally, our results speak to the literature on accounting and digital transformation by unveiling how the former is influenced by the latter in terms of specific skill requirements in the modern workplace (Goretzki & Strauss, 2017).

Additionally, our study features several practical implications. One implication is that organizations can now more effectively approach the job marketplace when it comes to recruiting management accountants, as they now have a better understanding of the ideal modern profile for the profession (Hung *et al.*, 2019). Similarly, organizations could invest in reskilling already appointed management accountants to meet the skill set required for the modern workplace. The above applies to potential future candidates as well since they could use the empirical findings of our research as a blueprint

for additional training in specific skills they deemed lacking in their profile to become more marketable to future employers (Jakobsen *et al.*, 2019). Finally, this study is relevant for higher education institutions and, more broadly, for accounting educational programs, as it unveils the multifaceted nature of modern-day management accounting jobs and the consequent need for a more varied conceptual background featuring not only pure accounting skills but also IT knowledge and interpersonal communication skills.

As with all LDA-based studies, the results should be interpreted with certain limitations (Culasso *et al.*, 2023; Nielsen, 2022). First, topic modeling allows for a “snapshot” of the current job marketplace, thus limiting the perspective. Future studies could employ a longitudinal approach to unveil how management accountants have evolved by comparing data from multiple periods. Second, we purposefully attempted to include as many job postings as possible by extracting data from different countries. While we took all the precautions necessary to work with text originally elaborated in different languages, a certain degree of “human error” remains in the translation process. Additionally, while LDA allows for the comparative study of management accounting job postings, it cannot decipher the context in which words are used. The above introduces some errors in the measurement, as the algorithm could mistakenly group words referring to different topics due to their textual proximity. A further set of limitations comes with the LDA algorithm itself. One of its primary disadvantages is the assumption that topics and documents are independent with one another, which is not always the case, thus resulting in possible inaccuracies when it comes to comprehensively capture the topic structure of a corpus. To expand upon the limitations of LDA topic modeling, we suggest future research to combine textual analysis with the experience of accounting professionals, possibly through a mixed, qualitative and quantitative approach. Alternatively, scholars could replicate the study with different topic models, such as the structural topic model (Roberts *et al.*, 2019) and the embedded topic model (Dieng *et al.*, 2020).

A further limitation of the study comes with the perspective we employed for the analysis. More specifically, since job descriptions are generally formulated by the employer, our study is not able to rule out selection bias, as the competencies and tasks explored in the study are dictated by the job postings. Additionally, our research draws from the current job marketplace, thus leaving out the point of view of already employed professionals, and features postings biased by the current needs of companies, which may vary depending on their sector or their life cycle stage. Future research could expand upon said limitations by exploring the perspective of management accountants themselves, possibly through qualitative research, in order to gather further

insights on the matter. In conclusion, our study features a few pathways for future research. First, we presented a descriptive overview of how the distribution of topics differs across countries. However, at this specific time, we have minimal knowledge of the motives behind the emerging differences. Future research could employ a cross-cultural approach to compare management accountants' profiles in multiple countries, including non-European nations. Additionally, future studies could further explore the topic of sustainability reporting and management accounting from a competency perspective to better understand the skills companies look for in newly appointed management accountants or whether they prioritize sustainability "experts" with a different background.

References

- Anthony R.N. (1965), *Planning and Control Systems: A Framework for Analysis*, Harvard Business School Press.
- Ascani I., Ciccola R., Chiucchi M.S. (2021), A structured literature review about the role of management accountants in sustainability accounting and reporting. *Sustainability*, 13(4), 2357. Doi: 10.3390/su13042357.
- Asmussen C.B., Møller C. (2019), Smart literature review: a practical topic modelling approach to exploratory literature review, *Journal of Big Data*, 6(1). Doi: 10.1186/s40537-019-0255-7.
- Beaman I., Richardson B. (2007), Information technology, decision support and management accounting roles, *Journal of Applied Management Accounting Research*, 5, pp. 59-68.
- Bhimani A. (2020), Digital data and management accounting: why we need to rethink research methods. *Journal of Management Control*, 31(1-2), pp. 9-23. Doi: 10.1007/s00187-020-00295-z.
- Bhimani A., Willcocks L. (2014), Digitisation, 'Big Data' and the transformation of accounting information, *Accounting and Business Research*, 44(4), pp. 469-490. Doi: 10.1080/00014788.2014.910051.
- Bradbard D.A., Alvis C., Morris R. (2014), Spreadsheet usage by management accountants: An exploratory study, *Journal of Accounting Education*, 32(4), pp. 24-30. Doi: 10.1016/j.jaccedu.2014.09.001.
- Brown D., Cooper D. (2019), Skills for the future? The changing role of the management accountant. *Accounting, Auditing & Accountability Journal*, 32(1), pp. 64-83.
- Budding T., de Jong G., Smit M. (2022), New development: Bridging the gap-analysis of required competencies for management accountants in the public sector, *Public Money & Management*, pp. 1-4. Doi: 10.1080/09540962.2022.2068862.
- Bui B., Porter B. (2010), The expectation-performance gap in accounting education: an exploratory study, *Accounting Education*, 19(2), pp. 23-50.
- Byrne S., Pierce B. (2007), Towards a more comprehensive understanding of the roles of management accountants. *The European Accounting Review*, 16(3), pp. 469-498. Doi: 10.1080/09638180701507114.

- Carlsson-Wall M., Goretzki L., Hofstedt J., Kraus K., & Nilsson C.-J. (2022), Exploring the implications of cloud-based enterprise resource planning systems for public sector management accountants, *Financial Accountability and Management*, 38(2), pp. 177-201. Doi: 10.1111/faam.12300.
- Cavélius F., Eendenich C., Zicari A. (2020), Back to basics or ready for take-off? The tensions on the role of management controllers in the digital age, *Comptabilité - Contrôle - Audit*, Tome 26(2), pp. 89-123. Doi: 10.3917/cca.262.0089.
- Chartered Institute of Management Accountants (CIMA) (2018), *Global management accounting principles: Driving better business through improved performance*, London, CIMA.
- Cheffi W., Abdel-Maksoud A., Farooq M. O. (2021), CSR initiatives, organizational performance and the mediating role of integrating CSR into management control systems: Testing an inclusive model within SMEs in an emerging economy, *Journal of Management Control*, 32(3), pp. 333-367. Doi: 10.1007/s00187-021-00323-6.
- Chiucchi M.S., Gatti M. (2015), Editoriale. L'evoluzione degli studi di management control: un percorso nel segno della varietà, *Management Control*, 1, pp. 5-8, Milano, FrancoAngeli. Doi: 10.3280/maco2015-001001.
- Culasso F., Gavurova B., Crocco E., Giacosa E. (2023), Empirical identification of the chief digital officer role: A latent Dirichlet allocation approach, *Journal of Business Research* (Vol. 154, 113301). Elsevier BV. Doi: 10.1016/j.jbusres.2022.113301.
- Dieng A.B., Ruiz F.J.R., Blei D.M. (2020), Topic Modeling in Embedding Spaces, *Transactions of the Association for Computational Linguistics* (Vol. 8, pp. 439-453), MIT Press - Journals. Doi: 10.1162/tacl_a_00325.
- Ge C., Shi H., Jiang J., Xu X. (2022), Investigating the demand for blockchain talents in the recruitment market: Evidence from topic modeling analysis on job postings, *Information & Management*, 59(7), 103513. Doi: 10.1016/j.im.2021.103513.
- Goretzki L., Strauss E. (2017), Introduction, *The Role of the Management Accountant* (pp. 1-6), Routledge.
- Heinzelmann R. (2019), Digitalizing Management Accounting, *Controlling – Aktuelle Entwicklungen und Herausforderungen* (pp. 207-226). Springer Fachmedien Wiesbaden.
- Hoozee S., Mitchell F. (2017), Who Influences the Design of Management Accounting Systems? An Exploratory Study, *Australian Accounting Review* (28(3), pp. 374-390). Wiley. Doi: 10.1111/auar.12193.
- Hung S.K., Ching P.S., Fen L.A. (2019), Accounting students' perception on skills and attributes required becoming management accountant. Proceedings of the 2019 2nd International Conference on E-Business, Information Management and Computer Science.
- Jackling B., De Lange P. (2009), Do accounting graduates' skills meet the expectations of employers? A matter of convergence or divergence, *Accounting Education*, 18(5), pp. 369-385.
- Jakobsen M., Mitchell F., Nørreklit H., Trenca M. (2019), Educating management accountants as business partners: Pragmatic constructivism as an alternative pedagogical paradigm for teaching management accounting at master's level, *Qualitative Research in Accounting & Management*, 16(4), pp. 517-541. Doi: 10.1108/qram-10-2017-0099.
- Jusoh R., Yahya Y., Zainuddin S., Asiaei K. (2021), Translating sustainability strategies into performance: does sustainability performance management matter?, *Meditari Accountancy Research*, ahead-of-print(ahead-of-print). Doi: 10.1108/medar-02-2021-1203.
- Kavanagh M. H., Drennan L. (2008), What skills and attributes does an accounting graduate need? Evidence from student perceptions and employer expectations, *Accounting & Finance*, 48(2), pp. 279-300.

- Král B., Mikołajewicz G., Nowicki J., Šoljaková L. (2021), Management accountants' professional competences: Requirements in the Czech Republic and Poland, *The normative approach and business practice. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 69(3), pp. 379-393. Doi: 10.11118/actaun.2021.035.
- Lawson R.A., Blocher E.J., Brewer P.C., Cokins G., Sorensen J. E., Stout D.E., Sundem G.L., Wolcott S.K., & Wouters M.J.F. (2014), Focusing accounting curricula on students' Long-Run careers: Recommendations for an integrated competency-based framework for accounting education, *Issues in Accounting Education*, 29(2), pp. 295-317. Doi: 10.2308/iace-50673.
- Littleton A.C. (1928), Reviews and notices. *The Bulletin of the National Tax Association*, 14(1), pp. 30-32. Doi: 10.1086/bullnattax41786071.
- Lombardi R. (2021). Le dimensioni della conoscenza aziendale. Profili di investigazione tra crisi pandemica ed economia digitale, *Management Control*, 3, pp. 5-14, Doi: 10.3280/maco2021-003001.
- Macintosh N.B. (1985), *The Social Software of Accounting and Information Systems*. Wiley.
- Magnacca F., Giannetti R. (2023), Management accounting and new product development: a systematic literature review and future research directions, *Journal of Management and Governance*, Doi: 10.1007/s10997-022-09650-9.
- Mikalef P., Boura M., Lekakos G., Krogstie J. (2019), Big data analytics and firm performance: Findings from a mixed-method approach, *Journal of Business Research*, 98, pp. 261-276. Doi: 10.1016/j.jbusres.2019.01.044.
- Munir S., Abdul Rasid S. Z., Aamir M., Jamil F., Ahmed I. (2022), *Big data analytics capabilities and innovation effect of dynamic capabilities, organizational culture and role of management accountants*. Doi: 10.1108/fs-08-2021-0161.
- Nielsen S. (2022), Management accounting and the concepts of exploratory data analysis and unsupervised machine learning: a literature study and future directions, *Journal of Accounting & Organizational Change*, ahead-of-print(ahead-of-print). Doi: 10.1108/jaoc-08-2020-0107.
- Nita B. (2016), The State and Development Trends of Management Accounting in the Global Environment, *Wsb Univ. Pozn. Res. J*, 66, pp. 107-117.
- Oppi C., Vagnoni E. (2020), Management accountants' role and coercive regulations: evidence from the Italian health-care sector, *Qualitative Research in Accounting & Management*, 17(3), 405-433. Doi: 10.1108/qram-02-2019-0040.
- Ott C. (2022), The professional identity of accountants – an empirical analysis of job advertisements. In *Accounting, Auditing & Accountability Journal* (36(3), pp. 965-1001). Doi: 10.1108/aaaj-08-2021-5389.
- Papoutsoglou M., Rigas E. S., Kapitsaki G. M., Angelis L., Wachs J. (2022). Online labour market analytics for the green economy: The case of electric vehicles, *Technological Forecasting and Social Change* (Vol. 177, p. 121517), Elsevier BV. Doi: 10.1016/j.techfore.2022.121517.
- Paulsson G. (2012), The role of management accountants in new public management: The role of management accountants, *Financial Accountability and Management*, 28(4), pp. 378-394. Doi: 10.1111/j.1468-0408.2012.00552.x.
- Rai P., Vatanasakdakul S., Aoun C. (2010). Exploring perception of IT skills among Australian accountants: An alignment between importance and knowledge. -- <http://aisel.aisnet.org/amcis2010/153>.
- Richardson P., Dellaportas S., Perera L., Richardson B. (2015). Towards a conceptual framework on the categorization of stereotypical perceptions in accounting. *Journal of Accounting Literature*, 35, pp. 28-46.

- Roberts M.E., Stewart B.M., Tingley D. (2019), STM: An R Package for Structural Topic Models, *Journal of Statistical Software*, 91(2). Doi: 10.18637/jss.v091.i02.
- Schaltegger S., Etzeberria I.A., Ortas E. (2017), Innovating Corporate Accounting and Reporting for Sustainability-Attributes and Challenges. *Sustain. Dev.*, 25, pp. 113-122.
- Schouten K., Frasinca F. (2016), Survey on aspect-level sentiment analysis, *IEEE Transactions on Knowledge and Data Engineering*, 28(3), pp. 813-830. Doi: 10.1109/tkde.2015.2485209.
- Simons R. (1995), *Levers of control: how managers use innovative control systems to drive strategic renewal*, Harvard Business School.
- Siriwardane H.P., Low K.-Y., Blietz D. (2015), Making entry-level accountants better communicators: A Singapore-based study of communication tasks, skills, and attributes, *Journal of Accounting Education*, 33(4), pp. 332-347. Doi: 10.1016/j.jaccedu.2015.08.001.
- Sorensen J.E. (2009), Management accountants in the United States: Practitioner and academic views of recent developments, *Handbook of Management Accounting Research* (pp. 1271-1296), Elsevier.
- Spraakman G., O'Grady W., Askarany D., Akroyd C. (2015), Employers' perceptions of information technology competency requirements for management accounting graduates, *Accounting Education*, 24(5), pp. 403-422. Doi: 10.1080/09639284.2015.1089177.
- ten Rouwelaar H., Schaepkens F., Widener S.K. (2021), Skills, influence, and effectiveness of management accountants, *Journal of Management Accounting Research*, 33(2), 211-235. Doi: 10.2308/jmar-18-048.
- Thaller J., Duller C., Feldbauer-Durstmüller B., Gärtner B. (2023), Career development in management accounting: empirical evidence, *Journal of Applied Accounting Research*, Doi: 10.1108/jaar-03-2022-0062.
- Tillema S., Trapp R., van Veen-Dirks P. (2022), Business Partnering in Risk Management: A Resilience Perspective on Management Accountants' Responses to a Role Change*, *Contemporary Accounting Research*, 39(3), pp. 2058-2089, Doi: 10.1111/1911-3846.12774.
- van der Steen M. P. (2022), Identity work of management accountants in a merger: The construction of identity in liminal space, *Management Accounting Research*, 56, 100792, Doi: 10.1016/j.mar.2022.100792.
- Wadan R., Teuteberg F., Bensberg F., Buscher G. (2019), Understanding the changing role of the management accountant in the age of industry 4.0 in Germany, *Proceedings of the 52nd Hawaii International Conference on System Sciences*.
- Webb J., Chaffer C. (2016), The expectation performance gap in accounting education: a review of generic skills development in UK accounting degrees, *Accounting Education*, 25(4), pp. 349-367. Doi: 10.1080/09639284.2016.1191274.
- Wolf T., Kuttner M., Feldbauer-Durstmüller B., Mitter C. (2020), What we know about management accountants' changing identities and roles – a systematic literature review, *Journal of Accounting & Organizational Change*, ahead-of-print(ahead-of-print). Doi: 10.1108/jaoc-02-2019-0025.

Do electric and gas utilities use regulatory information for decision-making and control? An exploratory study from Italy

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Abstract

The aim of this paper is two-fold. First, it examines whether electric and gas utilities use regulatory information for internal decision-making and control. Second, it adopts an institutional lens to explore the extent to which the regulatory information imposed by the Italian Regulatory Authority for Energy, Networks, and Environment (ARERA) and used for decision-making and control influence the management control systems (MCS) of electric and gas utilities.

Based on data from 33 questionnaires and eight complementary interviews with Italian electric and gas utilities, findings reveal different behaviors according to the size and operating activity of the firms. Large utilities and energy distributors use regulatory information for performance monitoring, benchmarking analysis, and investment prioritization strategies. On the contrary, small utilities and energy traders produce the information solely for regulatory compliance and do not use it in their day-to-day activities. Additionally, this study reveals that coercive pressure stemming from the regulatory environment affected the MCS of energy utilities either radically or incrementally. The findings underline the role of ARERA as a driver for controlling and improving performance.

Keywords: management accounting information, decision-making, control, MCS, institutional theory, energy industry

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1. Introduction

Management accounting systems (MAS) provide valuable accounting information that helps managers in the process of internal decision-making, planning and control (Anthony, 1965; Simons, 1995; Otley, 2001; Zimmerman, 2005; Ahrens and Chapman, 2007; Marchi, 2011; Marchi 2015; Casas-Arce *et al.*, 2022). The information provided by these systems is instrumental in performance evaluation, benchmarking, and monitoring analysis (Mia and Chenhall, 1994; Ferragina, 2007; Marchi, 2011). Moreover, it contributes to generating knowledge within managerial work (Hall, 2010; Presti *et al.*, 2021). Despite the acknowledged importance of management accounting information, there is a need for more research to understand its use by managers (Hall, 2010; Casas-Arce *et al.*, 2022), particularly within the context of public utilities where studies are limited.

This paper addresses this gap by focusing on the Italian energy sector, which is an interesting context to look at for two main reasons. First, the privatization initiatives of the mid-1990s affected electric and gas utilities leading to major changes in their financial and accounting information systems (Tsamenyi *et al.*, 2006). Second, Italian electric and gas utilities are directly impacted by ARERA requirements and therefore must produce extensive quantitative and qualitative accounting information for regulatory purposes (hereafter, regulatory information). According to institutionalists (DiMaggio and Powell, 1983), this put coercive pressure on the companies. However, companies have different ways of responding to this pressure (Oliver, 1991). They can either conform to the requirements by introducing management accounting information and using it internally, or they can decouple by producing the necessary information solely for regulatory compliance without utilizing it internally (Meyer and Rowan, 1977; Scott, 2001; Boxenbaum and Jonsson, 2017).

Against this background, this paper sheds light on whether Italian electric and gas utilities use regulatory information for decision-making and control (*RQ1*). Coherently with prior studies (Conrad, 2005; Tillema, 2005; Tsamenyi *et al.*, 2006; Nor-Aziah and Scapens, 2007; Culasso *et al.*, 2016), the paper adopts an institutional lens to explore the extent to which the regulatory information imposed by ARERA and used for decision-making and control influence the MCS of electric and gas utilities (*RQ2*).

The findings reveal different behaviors according to the size and operating activity of the firms. Large-sized utilities and energy distributors fully conform with regulatory requirements by introducing management accounting information and using it to monitor their internal performance, conduct

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benchmarking analysis and make investment decisions. By contrast, smaller utilities and energy traders adopt a passive compliance approach, indicating a divergence between formal structures and their actual behaviors. This difference in behaviour may be due to the lower managerial culture that characterize smaller firms (Busco *et al.*, 2007) or it may result from differing viewpoints among energy traders who, unlike ARERA, prioritize individual customer profitability.

The findings also reveal that those utility firms that use regulatory information for internal management purposes experienced a significant or incremental influence on their MCS due to ARERA requirements. Specifically, these requirements affected their cost accounting systems and contributed to the formation of internal routines, policies, and procedures. The ARERA requirements also motivated these companies to continually monitor their performance, facilitating efficient decision-making and continuous improvements in their operations.

This paper contributes in two ways. First, it adds to the management accounting literature by exploring whether electric and gas utilities use regulatory information for decision-making and control. To the best of my knowledge, this paper is the first to explore the internal use of regulatory information in the Italian energy industry. Second, this study enriches the institutional management accounting research by showing that external regulatory pressure has a radical or incremental influence on the MCS of electric and gas utilities. The findings highlight the regulator's role as a driver of performance control and improvement within the energy industry.

This paper is structured as follows. The next section depicts the Italian energy sector. Section 3 reviews the literature and describes the theoretical framework. Section 4 explains the methodology. Section 5 and 6 describe and discuss the findings based on the theoretical framework. The final section concludes the paper and offers suggestions for further research.

2. The energy sector in Italy

As in many other countries, the Italian energy sector has been subject to regulatory changes over the last twenty years. Originally, it was based on large and vertically integrated monopolies. From 1962-1999, the state-owned ENEL (Ente Nazionale per l'Energia Elettrica) became the incumbent monopoly for electric power in Italy, whereas the leading gas company was ENI (Ente Nazionale Idrocarburi). The existence of incumbent

companies resulted in inefficiencies, leading to a wave of privatization initiatives in the mid-1990s (Gilardoni, 2020).

The electricity and gas industry privatization began in 1999. Following the European directives (96/92/CE, 98/30/CE), the so-called Bersani and Letta Decrees were adopted with the aim of breaking down national monopolies and promoting competition (Luciani and Mazzanti, 2006). The state-owned electric company ENEL was required to reduce its production capacity from 80 to 50 percent, as *“from 1.01.2003, no company is allowed to produce or import, directly or indirectly, more than 50% of the total energy produced and imported in Italy”* (D.Lgs. 79/1999, art. 8, comma 1). Consequently, ENEL began a disinvestment process, and its capacity was split into three generation companies: Eurogen, Elettrogen, and Interpower. The same occurred in the gas sector, prompting the diversification of gas importers and reducing the state-owned ENI’s dominance in the market (Gilardoni, 2020). On the one hand, the European reforms of the 1990s opened up the energy sector to market competition. On the other hand, independent authorities were introduced to control costs, monitor the quality of the service, and ensure that the public interest was served. Thus, private operators are allowed to generate and sell energy in the free market, while local distributors and transmission companies are rate-regulated.

ARERA (Autorità di Regolazione per Energia, Reti e Ambiente) is the Italian authority responsible for regulating and monitoring electricity, gas, and, more recently, water and waste. The supervisory role of ARERA aims to manage the trade-off between operators’ need for financial profitability and consumers’ need for cost-effectiveness and adequate service quality. Among its functions, ARERA defines tariffs for regulated activities and ensures compliance with regulatory requirements. It disposes of control, inspection, and sanctioning powers (Gilardoni, 2020). Recently, ARERA has developed a reward/penalty system aiming to reward/punish firms that exceed/fail to achieve specific targets set by the authority.

ARERA requires electric and gas companies to produce quantitative and qualitative documentation for regulatory purposes, generally containing much more extensive information than those disclosed in annual financial statements. The regulatory information requirements are mandatory. Some of them affect all the actors involved in the energy chain, others are specifically addressed per field of activity (production, transport, distribution, sale). The required information is compiled and uploaded by firms on the web portal of ARERA and is not accessible to the public. However, every year ARERA releases an Annual Report providing aggregate information

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about regulatory activities and the state of all public utility services of its competence (electricity, gas, water, waste).

The main regulatory requirements include Accounting Unbundling, investments, operating costs, information about prices and quality of the service. First, all electric and gas utilities must produce annual regulatory accounts (Accounting Unbundling) consisting of (i) an income statement broken up by activity, (ii) a balance sheet broken up by activity, (iii) an explanatory note describing the type of accounting tool used, and (iv) supplementary physical and monetary measurements. Electric and gas utilities must reclassify financials by differentiating costs and revenues deriving from the electric/gas business from those unrelated to the energy sector and then going into a more detailed segment classification. Smaller firms are allowed to produce simplified regulatory accounts composed of income statements broken down by activity type¹, as well as changes in tangible and intangible fixed assets. It is worth noting that ARERA may introduce changes in Accounting Unbundling reporting from year to year, requiring firms to disclose extra information. All this information and more serves to limit cross-subsidization between firms' divisions and check if there are any extra profits (TIUC, delibera 137/2016/R/com)

In addition, firms that provide infrastructure services, namely distributors and transport companies, must submit investments (Capex) and operating costs (Opex) incurred in the previous year and the preliminary ones for the current year (delibera 568/2019/R/eel; 570/2019/R/gas). Conversely, firms that provide service in free markets, namely energy producers and traders, are required to disclose quarterly information about prices (per activity, type of customer) and a distinguished list of cost components (supply costs, grid connection charges, metering costs, renewable energy support costs, general system charges, taxes) (delibera ARG/com 151/11).

The need for information rises beyond financial accounting data. Electric and gas utilities must provide ample non-financial information concerning the quality of the service provided (punctuality of service, electrical outages, gas losses) as well as customer-oriented data (unpaid ratio, churn ratio, new customer acquisition rate, customer satisfaction). The above regulatory requirements are meant to foster transparency in public utility firms (documento per la consultazione pubblicato da ARERA il 16 marzo 2006, atto nr. 08/06).

¹ Accounting Unbundling is mandatory for electric and gas utilities with more than 100,000 customers. A simplified form is allowed for companies with less 100,000 customers and 1,000-5,000 GWh of energy sold.

3. Literature and theoretical framework

3.1. Managerial uses of accounting information

MAS provide valuable information that is primarily used by management for decision-making and control (Anthony, 1965; Simons, 1995; Zimmerman, 2005; Ahrens and Chapman, 2007; Marchi, 2011; Cinquini *et al.*, 2015; Marchi, 2015; Casas-Arce *et al.*, 2022). The use of management accounting information helps managers to make informed decisions and manage uncertainty and complexity of events (Gordon and Narayanan, 1984; Chenhall and Morris, 1986). According to Marchi (2003), data alone does not inherently have value, but rather value is generated through the processing, organization, and contextualization of data, as well as its connection to other relevant information. When interpreted and used proactively and intentionally by decision-makers, information becomes valuable (Marchi, 2003). The importance of using MAS for decision-making has grown due to increased market competition, technological advancements, deregulation of economies, and privatization of state-owned companies. Traditionally, MAS relied on historical internal data to monitor organisational performance. However, many organizations are adopting a more future-oriented approach that incorporate both internal and external information (Marchi, 2011).

MAS provide benchmarking and monitoring information to support managers in identifying industry changes and competitors' strategies and implementing best practices and competitive strategies. More precisely, managers use benchmarking information to compare their organization's metrics, such as price, costs, productivity, customer service, quality, and profitability with those of competitors (Kaplan, 1983). This information can inform strategic decision-making and help organizations maintain a competitive position in a turbulent market (Mia and Chenhall, 1994; Ferragina, 2007; Marchi, 2011; Mancini, 2016). Monitoring information is used to "know what is going on" and gain feedback to formulate appropriate strategies (Nicolò, 2013). By continuously monitoring key variables, managers can detect deviations from plans and past trends and perform a thorough analysis of the causes and necessary interventions (Ezzamel and Robson, 1995; Marchi, 2003; Marchi *et al.*, 2003). The use of benchmarking and monitoring information can also help to identify potential crises at an early stage, facilitating strategic planning and the creation of conditions for risk mitigation (Migliaccio and Arena, 2021).

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In addition to benchmarking and monitoring analysis, the information provided by MAS is used for performance evaluation, measurement, and target setting (Merchant and Van der Stede, 2017). Performance evaluation is particularly important for companies with a divisional organisational structure. This process involves the use of both financial and non-financial information to measure performance. Financial metrics include profitability-related indicators such as return on assets, return on sales, and return on investments, while non-financial metrics relates to non-monetary qualitative measurements such as customer satisfaction and product quality (Abnerthy and Brownell, 1997). After evaluating performance, companies typically set performance targets as part of the control process to encourage continuous improvements. Setting targets provide a clear direction for the organizations and motivates employees towards achieving specific goals (Chenhall and Langfield Smith, 1998).

Another use of managerial accounting information is for organizational learning and knowledge generation (Hall, 2010; Presti *et al.*, 2021). Accounting information plays a crucial role in developing knowledge within the managerial work environment (Hall, 2010), and facilitate the creation of policies, procedures, routines, and corporate culture. Additionally, it can reveal problems that are not immediately apparent from everyday activities, providing managers with valuable insights into what is happening (Simon *et al.*, 1954). For instance, Van der Veecken and Wouters (2002) noted that information on estimated and actual costs was vital for senior managers to understand which projects were causing problems.

Despite the acknowledged importance of management accounting information, there is a need for more research to understand its use by managers (Hall, 2010; Casas-Arce *et al.*, 2022), especially in the context of public utilities where studies are limited. Among the few existing studies, Wanderley and Cullen (2012) investigated the impact of privatization in management accounting practices of a Brazilian electricity distribution company. Their findings revealed that privatization led to changes in the use of budget systems and management accounting information. Specifically, budgetary information and performance measurement systems were adopted for decision-making purposes only after the company was privatised. Other studies have also shown that privatization have driven changes in accounting and financial information systems of electric and gas utilities (Conrad, 2005; Tsamenyi *et al.*, 2006).

Some papers focused on the role of management accounting practices in improving organizational efficiency. For example, Barrios Álvarez (2021) examined management accounting practices by a state-owned Colombian

multi-utility. The study revealed that the accounting-budgeting-financial planning triad was employed as a management accounting tool rather than just a legal requirement. The authors concluded that management accounting practices actively contribute to enhancing efficiency within the organization, which is consistent with earlier research showing how public utilities achieve greater efficiency through the application of management accounting (Conrad, 2005; Nor-Aziah and Scapens, 2007). However, Saukkonen *et al.* (2018) outlined a number of constraints associated with the use of management accounting information within an energy company. These limitations include lack of managerial expertise in using management accounting tools, limited reflections during managerial interaction, divergent preferences among managers in using accounting information and process, structures ignoring managerial viewpoints.

This paper differs from the above studies in two ways. First, instead of examining how management accounting information has changed, it seeks to explore whether electric and gas firms use the accounting information, that have to submit as mandatory requirements to the regulatory authority, for internal management purposes. Second, while prior studies have a single-company focus, this research draws on evidence from the Italian electric and gas sector. The Italian electric and gas sector provides an interesting setting because it requires firms to produce detailed quantitative and qualitative accounting information for regulatory purposes that could also be employed for internal management purposes. This gives rise to the first research question:

RQ1: Do electric and gas utilities use regulatory information for internal decision-making and control?

3.2. Institutional theory and management accounting practices

This paper uses the theoretical lens of the New Institutional theory (NIS) to explain the extent to which the regulatory requirements imposed by ARERA and used for decision-making and control influence the MCS of electric and gas utilities. The institutional perspective is particularly suitable in this case since the Italian energy industry is heavily regulated at European and national level.

NIS view organizations as part of a broad inter-organizational network and cultural system rather than as standalone entities (Scott, 1987; Scott and Meyer, 1994; Selznick, 1996). Its fundamental tenet is that companies operate in an ‘institutional context’ characterized by rules, norms, and beliefs that enforce socially acceptable organizational practices (DiMaggio

and Powell, 1983; Barley and Tolbert, 1997; Oliver, 1997). Emphasis is placed on the external environment (political, economic, cultural, technological, social) which exerts pressure on organizations affecting their organizational practices, including accounting practices. NIS is centred around the notion of institutional isomorphism which posits that organizations face pressure to conform to a set of established norms, practices and routines, resulting similar or isomorphic (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; 1991). DiMaggio and Powell (1983) identify three forms of institutional isomorphism: coercive, mimetic, and normative. *Coercive isomorphism* refers to organizations adopting practices in response to laws, rules, and regulations imposed by external regulatory bodies or the state. *Mimetic isomorphism* occurs when organizations copy other organizations they perceive as most successful or legitimate in their field. *Normative isomorphism* refers to pressure exerted by professional training institutions, such as universities and associations.

Organizations respond to external pressures in varied ways depending on their available resources (financial resources, reputation) and their ability and willingness to comply with such pressures (Oliver, 1991). They can either conform or decouple to varying degrees from the institutional field. Oliver (1991) identified five organizational responses to institutional pressure, including acquiescence, compromise, avoidance, defiance, and manipulation. Institutional theorists suggest that organizations may not always align their daily operations with the institutional pressure they face (Meyer and Rowan, 1977; Scott, 2001). Firms may comply with such pressure to present an image of efficiency and rationality to external parties as ‘a ceremonial response’ but without actually applying the information internally (Abernethy and Chua, 1996). Institutional theorist refers to this contrast between formal structures and actual practices as ‘decoupling’ (Meyer and Rowan, 1977; Scott, 2001; Boxenbaum and Jonsson, 2017). More specifically, decoupling can be tight coupling, loose coupling and counter-coupling depending on the level of consistency between formal structures and actual behaviors (Orton and Weick, 1990; Lukka, 2007). Tight coupling is typical of rational decision-making, while institutional complexities may require loose coupling. Counter-coupling involves contradictions amongst communication, actions, decision-making and organizational legitimacy.

The institutional approach has grown in popularity as a means of analyzing management accounting practices (Scapens, 1994; Granlund and Lukka, 1998; Goretzki *et al.*, 2013; Quagli and Francioli, 2021). Lately, it has been adopted to provide an understanding of management accounting

practices within public service organizations (Collier, 2001; Conrad, 2005; Tillema, 2005; Tsamenyi *et al.*, 2006; Nor-Aziah and Scapens, 2007; Leotta and Ruggeri, 2012; Culasso *et al.*, 2016; Macchia, 2021). Collier (2001) found that financial management reforms were implemented in a UK local police force in response to institutional demands for better effectiveness. The authors suggested that NIS theory is a useful theoretical framework to analyze how the police force handled external pressure. Conrad (2005) analyzed organizational and management control changes brought by privatization in the UK's largest gas company. Similarly, Tsamenyi *et al.* (2006) found that the interplay between the regulatory environment, market forces, and intra-organizational power relations influenced the accounting and financial information systems of a leading electric company in Spain. In another study, Nor-Aziah and Scapens (2007) analyzed a Malaysian public utility and observed that over time budgets caused conflict between operation managers and accountants. As a result, budgets became loosely coupled to other organizational activities. Leotta and Ruggeri (2012) adopted a hybrid institutional perspective to explain how performance measurement systems changed in response to normative pressure to increase efficiency in healthcare organizations. Similarly, Culasso *et al.* (2016) adopted a hybrid institutional theory to explore whether utility firms have integrated enterprise risk management into their management accounting practices.

Coherently with prior contributions, this paper uses the theoretical lens of the institutional theory to understand the extent to which regulatory requirements imposed by ARERA and used for decision-making and control influence the MCS of energy utilities. Thus, this paper addresses the second research question:

RQ2: To what extent do regulatory information imposed by ARERA and used for internal decision-making and control influence the MCS of electric and gas utilities?

4. Methodology

Data for this paper is gathered through an online survey and follow-up interviews. The survey method is particularly suitable for exploratory studies (Zikmund *et al.*, 2013). Interviews were conducted to complement the survey and ensure a comprehensive exploration of the research topic.

The questionnaire is organized to primarily collect information regarding (i) the *use* of regulatory information for decision-making and control and (ii) the *influence* of regulatory requirements on the MCS of the electric

and gas utilities that use regulatory information for decision-making and control. The questionnaire particularly focuses on the internal use of Accounting Unbundling, operating costs, investments, and price data, which are the main accounting information that electric and gas utilities must produce for regulatory purposes. For the identification of the regulatory requirements, reference is made to the ARERA website at the time of the investigation. Management control is an internal process that is managed and used for internal purposes within a company (Marchi, 2011). In this context, a holistic view of control is adopted rather than focusing on just one aspect (Malmi and Brown, 2008).

The survey includes dichotomic, closed, and open-ended questions. For some questions, respondents can choose multiple answers and add extra elements. Additionally, the questionnaire includes some general questions related to the main characteristics of respondents. As part of the survey, respondents are given the option to indicate the name of their company and their availability for an interview on the research topic. The length of the questionnaire sections is carefully considered placing the easiest questions at the start and the end to reduce the effects of errors (Andrews, 1984). Moreover, each possible answer is distributed randomly throughout the questionnaire to avoid possible biases. The questionnaire is evaluated and pilot-tested with two experienced academics and one expert in the field to obtain suggestions and improve its face validity.

Based on prior research (Lukka and Granlund, 1996), management accountants of middle-sized and large firms were chosen as the target group of this study since these firms have systematic cost accounting systems and are expected to utilize information for managerial purposes. Management accountants are the leading providers and interpreters of management accounting information (Wagenhofer, 2006). An initial list of 396 firms was obtained from the AIDA database (Bureau Van Dijk)². Out of the 396 utility firms, 324 had an available mailing address. On 12 April 2022, an email was sent to these firms containing a link to the online survey asking them to address the email to the Management Control office. The respondents were encouraged to participate in the survey and informed that they could receive a summary of the results if they wished. An invitation with a link to the survey was also posted on LinkedIn.

² I identified active Italian companies (1st April 2022) belonging to the energy industry (ATECO 2007 code 3511-3513-3514-3521-3522-3523) with annual revenue greater than 10 million EUR.

Survey responses are collected from 12 April to 30 June 2022, with an email invitation sent on 12 April 2022, and two reminders sent on 21 April and 6 June 2022 as a follow-up procedure (Dillman, 2011). Of 324 emails, 33 returned with delivery problems due to invalid email addresses. In total, 291 valid invitations were sent. A number of 40 questionnaires (13.75%) returned correctly completed, but only 33 questionnaires (11.34%) were useable.³ The final response rate compares well with those reported in previous studies (Robinson *et al.*, 2010; Nowotny *et al.*, 2022).

To complement the survey findings, follow-up semi-structured, in-depth interviews were conducted with a group of respondents who expressed their willingness to contribute further to the research (Boyce and Neale, 2006). Specifically, eight participants volunteered to participate in an interview by indicating their availability in the survey. Small numbers of interviews are particularly suitable when the research has an exploratory character (Farneti and Guthrie, 2009; Gates and Langevin, 2010; Barone *et al.*, 2013). Interviews were conducted online via Microsoft Teams from June 2022 to September 2022, each lasting approximately 35 minutes. To maintain confidentiality, the interviews were transcribed and coded. Interviews allowed for in-depth discussions with survey participants, providing more ample responses compared to the online survey (Rubin and Rubin, 1995).

Table 1 offers an overview of the respondents’ characteristics. Most of them are involved in the sale of energy (61%). Regarding size, in terms of sales revenue, most of respondents can be classified as large companies.

Table 1 - Respondents characteristics

	<i>N</i>	%
Panel A: Operating activity		
Distribution	13	39.39
Trade	20	60.61
Total	33	100.00
Panel B: Size (sales revenues)		
10-50 EUR million	12	36.36
> 50 EUR million	21	63.64
Total	33	100.00

³ I excluded 5 LinkedIn questionnaires from firms with revenue under 10 million EUR and kept the questionnaire from the Group controller of a firm that had sent 3 responses.

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5. Results

5.1 Use of regulatory information for decision-making and control

This section focuses on the internal use of regulatory information among electric and gas utilities. According to the findings, nearly 70% of respondents use regulatory information for decision-making and control, whereas 30% state that they do not use the information produced for ARERA internally but rather follow a “tick box” approach to comply with the requirements. However, a more varied picture emerges according to the size and operating activity of the surveyed firms (Table 2).

Large-sized firms are more likely to utilize internally the information produced for ARERA compared to smaller utilities (76.2% versus 58.3%). Looking at the operating activities, I found that regulatory information is predominately used by energy distributors (92.3%) compared to energy traders (55%). Pearson’s Chi-Square and Fisher’s exact test confirm these results at a 5% significant level (degree of freedom=1, p-value < 0.05).

Table 2 - Use of regulatory information for decision-making and control

	Total		By Size				By Operating Activity			
			Large		Medium		Distribution		Trade	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Yes	23	69.7	16	76.2	7	58.3	12	92.3	11	55.0
No	10	30.3	5	23.8	5	41.7	1	7.7	9	45.0
Total	33	100.0	21	100.0	12	100.0	13	100.0	20	100.0

Respondents are classified by size and operating activity. ‘Large’ includes companies with more than 50 EUR million in sales revenue. ‘Medium’ includes firms with 10-50 EUR million in sales revenue. ‘Distribution’ includes firms that distribute electricity/gas, while ‘Trade’ includes companies that sell electricity/gas.

When asked how electric and gas utilities used the regulatory information internally, the results suggest that, above all, utilities use regulatory information for performance monitoring and benchmarking analysis. Specifically, they use the data generated for ARERA to monitor their own performance internally and compare it against the benchmarks established by the regulatory authority. Based on this analysis, energy utilities may revise their existing internal decisions or make new ones to meet or exceed ARERA’s expectations. Some examples follow:

“We see how we perform on the performance indicators that ARERA deems most important and internally with a continuous feedback loop say ‘if ARERA is asking for that indicator is because in the future it wants to change the tariff regulation. So, let us shift the focus from Capex to efficiently driving operational costs.’” (Firm 11)

“We use regulatory information to compare our performance to ARERA’s targets and educate ourselves on what ARERA expects from us in terms of accountability and cost-efficiency. We then adjust our internal decisions to meet or exceed ARERA’s expectations.” (Firm 28)

According to respondents, performance monitoring and benchmarking analysis is particularly relevant because ARERA adopts a reward/penalty regulation scheme to assess the economic performance and service quality of energy utilities compared to the established targets. Under this system, companies with good/poor performance incur significant financial profits/losses. The potential for adverse consequences (financial losses) motivates utilities to implement monitoring control systems in order to limit risks and prevent possible punishments from the authority:

“We use performance measurement to track our adherence to the KPIs set by the authority. Our team of experts employ simulation models to predict ex-ante premiums or penalties that could impact our cash flows.” (Firm 15)

Also, Firm 19 states:

“Our goal is to receive recognition from the authority. By internally analyzing the regulatory information and examining our KPIs, we identify opportunities to improve our processes and earn economic rewards.”

Additionally, the respondents highlighted the importance of feedback in facilitating their monitoring of investments, which are a key driver of value in this specific industry. By receiving feedback, electric utilities can rectify errors, resulting in better performance and identify opportunities to enhance efficiency and effectiveness in investment prioritizations. For example:

“Once we prepare the information for ARERA, we see how things are going and say, ‘This year we did really bad. Here it has deteriorated 100%. We have not invested enough in this area. Why?’ Then we call the responsible and have a meeting to choose an appropriate strategy.” (Firm 20)

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“If we are not too efficient in terms of kWh consumption, then we decide to make investments that go in the direction of energy efficiency.” (Firm 21)

Smaller utilities and energy traders tend to adopt a more passive approach. They often view regulatory information as a compliance requirement and do not use it for internal analysis. As one respondent noted:

“For us, it is pure compliance. We do not use regulatory information for internal analysis. Our analysis focus on other issues. We have organized ourselves to provide the information requested by the authority, but, internally, it is not used.” (Firm 13)

The main issue these firms highlight is that some regulatory information requirements (e.g., arrearage in final customers) are requested by ARERA at a level of detail and aggregation that differs from those used in their MAS. This can make it difficult for smaller firms to effectively use regulatory information for internal management purposes. Moreover, there may be a discrepancy between ARERA and the utility firms' viewpoints, with ARERA requesting a large amount of data to monitor the whole market, whereas energy traders prioritize their own customer profitability.

“Sometimes the way the information is (dis)aggregated is not very meaningful for our specific situation.” (Firm 9, 12)

“ARERA does not take into account any deferment payment agreements with customers that are currently overdue. It only requires us to report the amount that should have been collected and the amount that went into arrears.” (Firm 13)

Finally, when asked about which regulatory information requirement is reputed as most beneficial for their internal needs, the survey revealed that large utilities (78%) and energy distributors (93%) find Accounting Unbundling and investment reporting to be essential for their internal decision-making and business operations. Conversely, energy traders place more importance on price data (68%).

5.2 Influence of regulation on the MCS of electric and gas utilities

Survey results reveal that the top factors affecting the MCS in energy utilities are regulatory pressure (42%), followed by forward-looking culture and awareness (33%) and technology advancement (18%). On the side of internal factors, respondents indicated the importance of being able to ap-

appropriately use and interpret accounting data. As prior studies have shown (Quagli, 2004; Cadez and Guilding, 2008; Goretzki *et al.*, 2013; Avallone *et al.*, 2015; Culasso *et al.*, 2016), forward-looking information is critical for enabling management accountants to make informed strategic decisions. Almost all managers surveyed underlined the crucial role of planning and control in the energy industry given its uncertain and volatile nature. On the side of external factors, participants pointed to the growth in ARERA requirements as one of the main factors affecting their MCS.

This section focuses on the impact of ARERA requirements on the MCS of electric and gas utilities. Survey results indicate that almost all firms that use regulatory information for decision-making and control have been affected by ARERA requirements (91.3%) independently of their size and operating activity (Table 3). This conclusion is supported by Pearson's Chi-Square and Fisher's exact test (degree of freedom of 1 and p-value greater than 0.05). Table 3 shows that these companies have experienced either an incremental (61%) or a radical influence (30%) in their MCS resulting from complying with ARERA requirements. The influence of ARERA was found to be predominately incremental for medium-sized electric firms. Only two firms (9%) reported no influence from regulatory pressure, likely due to their pre-existing managerial culture that prioritized the use of information for decision-making and control within their organization.

Table 3 - Influence of ARERA requirements on the MCS of energy utilities (only firms that use information for decision-making and control)

	Total		By Size				By Operating Activity			
			Large		Medium		Distribution		Trade	
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%
Significant	7	30.4	6	37.5	1	14.3	6	50.0	1	9.1
Incremental	14	60.9	8	50.0	6	85.7	4	33.3	10	90.9
No influence	2	8.7	2	12.5	0	0.0	2	16.7	0	0.0
Total	23	100.0	16	100.0	7	100.0	12	100.0	11	100.0

Respondents are classified by size and operating activity. 'Large' includes companies with more than 50 EUR million in sales revenue. 'Medium' includes firms with 10-50 EUR million in sales revenue. 'Distribution' includes firms that distribute electricity/gas, while 'Trade' includes companies that sell electricity/gas.

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When asked how the ARERA requirements have influenced their MCS, electric and gas utilities reported that they had to overhaul their cost accounting systems and introduce more sophisticated accounting tools to meet specific reporting requirements (i.e., Accounting Unbundling). To comply with regulation, companies have revised their chart of accounts and modified their reporting systems to align them with the regulatory requirements. As one respondent noted:

“Accounting Unbundling requirements helped us to speed up the creation of a cost accounting system and management reporting forms.” (Firm 31).

The main changes mentioned include the segmentation of costs and “*periodic adjustments of cost centre allocations*” (Firm 12). Indeed, coercive pressure is put on more detailed classifications, with a shift from the segmentation of costs into activities towards a more granular segmentation into smaller business segments. As a result, energy utilities implemented cost accounting systems with enough flexibility to accommodate variations in demands. According to survey respondents, their cost accounting systems embed cost control and techniques capable of supporting strategic decisions that “*go hand in hand with ARERA requirements*” (Firm 15). As noted by four of the respondents:

“We had to constantly adapt our cost accounting systems to regulatory accounting requirements.” (Firm 2)

“We modified our cost accounting systems by setting up changes in accounting attributes and inserting detailed items to comply with the regulation.” (Firms 5, 10)

“ARERA requirements are numerous and spread over the year. They frequently evolve with new requests or changes to the existing ones, affecting our MCS significantly.” (Firm 9)

Another relevant influence was at the organizational level. Energy utilities reported that regulatory requirements have contributed to creating new routines, policies, and procedures within the work environment (Firm 27). Despite the administrative burdens associated with producing information for regulatory purposes, respondents noted that the systematic nature of ARERA requirements has improved efficiency in day-to-day activities. Two respondents commented that:

“It is a fact of internal education. If we did not have to deliver data every year to ARERA, we probably would not have worried about creating structures that know where to put their hands.” (Firm 20)

“Much of the information we produce for ARERA is reused from other departments, so knowledge sharing and coordination are essential here.” (Firm 12)

Companies also argued that regulatory pressure has had a positive impact on their performance by promoting a learning process. This is because ARERA requires them to report a number of indicators and imposes financial penalties in case of poor performance/service quality. As a result, they are stimulated to steadily monitor these indicators and create a feedback loop that helps them improve. Respondents underlined the role of ARERA in driving performance control and improvement through systematic regulatory requirements. Firm 20 provides an example:

“ARERA requires us to report on service continuity indicators such as the number and duration of interruptions during the outage event and imposes financial penalties for electric losses. This incentivizes us to continuously monitor these indicators and creates a feedback loop that help us improve.”

6. Discussion

The paper proceeds analyzing the findings through the theoretical lens of the NIS theory. This theoretical perspective suggests that the use of management accounting information can be viewed as an organizational response to external institutional pressure, indicating evidence of isomorphism and decoupling (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Scott, 2001). This section first identifies the regulatory institution that exerts pressure on the electric and gas industry. Then, it analyses the organizational responses, including convergence and divergence between formal structures and actual internal behaviors.

In the Italian energy sector, ARERA (the regulatory authority) represents the primary source of institutional pressure aimed at evaluating and monitoring the performance (in terms of economic and service quality) of electric and gas utilities through the introduction of a reward/penalty system and by continuously demanding information for regulatory purposes. To comply with the requirements, energy utilities face coercive pressure from ARERA (DiMaggio and Powell, 1983; Dacin *et al.*, 2002), which was influential in the use of management accounting information for decision-

making and control and in shaping the MCS of energy utilities. Coercive pressures from the regulatory environment include detailed segmentation of costs and revenues by activities or smaller business units, as well as the achievement of performance targets aimed at improving firms' efficiency.

Looking at the organizational responses, it emerges that 70% of the surveyed firms fully conformed to ARERA requirements by introducing management accounting information and using it for internal purposes. These firms responded to regulatory pressure by developing corresponding internal accounting structures and using the information for benchmarking analysis, performance monitoring and evaluation. This conformity can be considered institutional isomorphism (DiMaggio and Powell, 1983; Boxenbaum and Jonsson, 2017). As described earlier in the paper, the firms revised their chart of accounts and their cost accounting systems in a similar manner and were motivated by regulatory pressure to monitor their performance against ARERA's targets, identify underperforming areas and prioritize investments accordingly. These firms were proactive actors (Oliver, 1991). The systematic ARERA requirements led to standardized procedures within these organizations, resulting in increased efficiency. The data also suggest that the information generated for ARERA was used by other departments within the energy companies. As noted by Firm 20, "*in this case, having well-organized structures that know where to put their hands and share their knowledge is essential.*" This is an example of how regulatory coercive pressure can indirectly lead to the creation of a shared organizational knowledge (Busco and Scapens, 2011).

However, firms exercise discretion in responding to institutional pressures, as noted by Oliver (1991). Episodes of divergence between formal structures and actual practices have been identified in the Italian energy sector. Accordingly, 30% of respondents produced the necessary information solely for regulatory compliance and did not use it in their day-to-day activities, suggesting a loose coupling phenomenon (Meyer and Rowan, 1977; Oliver, 1991; Scott, 2001; Boxenbaum and Jonsson, 2017). These firms complied with the institutional context and their constituents but left their actual routines largely unchanged (Westphal and Zajack, 2001). Institutional theorists suggest that this dichotomy between the institutional environment and actual behaviors may arise from a divergence between institutional and managerial viewpoints (Meyer and Rowan, 1977; Scott, 2001; Scapens, 2006). This might explain the resistance of energy traders to adopt management accounting information for internal purposes, as revealed by the survey and interviews. As Firm 12 stated "*ARERA has regulatory priorities to ensure efficiency in public utility services protect-*

ing the interests of all operators and users, whereas we are focused on our individual profitability.” Another possible explanation for the resistance could be the scarcity or lack of a managerial culture, particularly among smaller utilities, which may not fully perceive the potential benefits of using management accounting information (Busco *et al.*, 2007; Lavia López and Hiebl, 2015).

From the overall findings it emerges that ARERA requirements played a crucial role in motivating organizations to use regulatory information for internal management purposes. However, the formal requirements alone are not sufficient to ensure the adoption of institutional practices in daily routines (Collier, 2001). It is therefore fundamental to cultivate a managerial culture to facilitate the embracement of institutional practices into day-to-day activities.

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7. Conclusions

This paper has investigated whether Italian electric and gas utilities use for internal management purposes the accounting information that they have to submit as mandatory requirements to the regulatory authority (ARERA). It adopted the theoretical lens of NIS to understand the extent to which the regulatory information imposed by ARERA and used for internal management purposes influenced the MCS of energy utilities.

Based on data from 33 questionnaires and eight follow-up interviews, findings unveil that large-sized utilities and energy distributors comply with regulatory requirements and use the information for decision-making and control. These companies were stimulated by ARERA requirements to use the information for performance control, benchmarking analysis and

prioritization investment strategies. The regulatory (coercive) pressure influenced their cost accounting systems either incrementally or radically, and contributed to the creation of internal routines, policies, and procedures as well as to the development of a loop learning process, encouraging firms to continuously monitor their performance.

Smaller utilities and energy traders produce the information solely for regulatory compliance and do not use it in their day-to-day activities, suggesting a tendency to loosely couple formal structures and internal behaviors. This may be attributed to the lower level of managerial culture that characterize smaller firms, which may not perceive the benefits of using managerial accounting information or may lack the resources and capabilities to implement it effectively (Busco *et al.*, 2007; Lavia López and Hiebl, 2015). Additionally, differing viewpoints between managerial and institutional perspectives may also contribute to the passive compliance approach (Hopper and Powell, 1985).

This paper contributes to the management accounting literature in two ways. First, it extends prior literature on the managerial use of accounting information by public utilities. To the best of my knowledge, this article is the first to explore the internal use of regulatory information in the Italian energy industry. Second, it contributes to the institutional management accounting research by showing that regulatory (coercive) pressure affects the MCS of electric and gas utilities either radically or incrementally.

Future research could enrich the existing literature by examining the use of regulatory information in other regulated context such as water utilities. Additionally, it could be interesting to explore whether and to what extent utility firms influence the regulatory process of ARERA by participating in consultations. Moreover, in addition to firm size and type of operating activity, future studies could focus on other specific firm characteristics, such as ownership. This would allow to examine the behaviour of private utilities, in comparison to their state-owned counterparts, in using regulated information to make decisions.

References

- Abernethy M.A., Brownell P. (1997), Management control systems in research and development organizations: The role of accounting, behavior and personnel controls, *Accounting, Organizations and Society*, 22(3-4), pp. 233-248.
- Abernethy M.A., Chua W.F. (1996), A field study of control system “redesign”: the impact of institutional processes on strategic choice. *Contemporary accounting research*, 13(2), pp. 569-606.

- Ahrens T., Chapman C.S. (2007), Management accounting as practice, *Accounting, Organizations and Society*, 32(1-2), pp. 1-27.
- Andrews F.M. (1984), Construct validity and error components of survey measures: a structural modelling approach, *Public Opinion Quarterly*, 48(2), pp. 409-442.
- Anthony R.N. (1965), *Planning and control systems: a framework for analysis*, Division of Research, Graduate School of Business Administration, Harvard University.
- Avallone F., Ramassa P., Quagli A. (2015), Forward-looking information and results: Evidence on Integration between strategic plans and annual reports, *European Journal of Economics, Finance and Administrative Sciences*, 84, pp. 109-127.
- Barley S.R., Tolbert P.S. (1997), Institutionalization and structuration: Studying the links between action and institution, *Organization studies*, 18(1), pp. 93-117.
- Barone E., Ranamagar N., Solomon J.F. (2013), A Habermasian model of stakeholder (non) engagement and corporate (ir) responsibility reporting, *Accounting Forum*, 37(3), pp. 163-181.
- Barrios Álvarez C., Adhikari P., Gómez Mejía A. (2021), Management accounting practices and efficiency in a Colombian multi-utility conglomerate, *Journal of Accounting in Emerging Economies*, 11(5), pp. 714-734.
- Boxenbaum E., Jonsson S. (2017), Isomorphism, diffusion and decoupling: Concept evolution and theoretical challenges, In *Handbook of organizational institutionalism*, Sage.
- Boyce C., Neale P. (2006), *Conducting in-depth interviews: A guide for designing and conducting in-depth interviews for evaluation input*, Watertown, MA, Pathfinder international.
- Busco C., Riccaboni A., Saviotti A. (2007), *Governance, strategia e misurazione delle performance. Le nuove frontiere della Balanced Scorecard*, Arezzo, Knowità.
- Busco C., Scapens R.W. (2011), Management accounting systems and organisational culture: Interpreting their linkages and processes of change, *Qualitative Research in Accounting & Management*, 8(4), pp. 320-357.
- Cadez S., Guilding C. (2008), An exploratory investigation of an integrated contingency model of strategic management accounting, *Accounting, Organizations and Society*, 33(7-8), pp. 836-863.
- Casas-Arce P., Cheng M.M., Grabner I., Modell S. (2022), Managerial Accounting for Decision-Making and Planning, *Journal of Management Accounting Research*, 34(1), pp. 1-7.
- Chenhall R.H., Langfield-Smith K. (1998), The relationship between strategic priorities, management techniques and management accounting: an empirical investigation using a systems approach, *Accounting, Organizations and Society*, 23(3), pp. 243-264.
- Chenhall R.H., Morris D. (1986), The impact of structure, environment, and interdependence on the perceived usefulness of management accounting systems, *Accounting Review*, pp. 16-35.
- Cinquini L., Collini P., Marelli A., Tenucci A. (2015), Change in the relevance of cost information and costing systems: evidence from two Italian surveys, *Journal of Management & Governance*, 19(3), pp. 557-587.
- Collier M. (2001), The power of accounting: a field study of local financial management in a police force, *Management Accounting Research*, 12, pp. 465-486.
- Conrad L. (2005), A structuration analysis of accounting systems and systems of accountability in the privatised gas industry, *Critical Perspectives on Accounting*, 16(1), pp. 1-26.

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- Culasso F., Broccardo L., Manzi L. M., Truant E. (2016), Management accounting and enterprise risk management. A potential integration as a new change in managerial systems, *Global Business and Economics Review*, 18(3-4), pp. 344-370.
- Dacin T.M., Goodstein J., Scott R.W. (2002), Institutional theory and institutional change: Introduction to the special research forum, *Academy of management journal*, 45(1), pp. 45-56.
- Dillman D.A. (2011), *Mail and Internet surveys: The tailored design method – 2007 Update with new Internet, visual, and mixed-mode guide*, John Wiley & Sons.
- DiMaggio P.J., Powell W.W. (1991), *The new institutionalism in organizational analysis*, University of Chicago press.
- DiMaggio P.J., Powell W.W. (1983), The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American sociological review*, pp. 147-160.
- Ezzamel M., Robson K. (1995), Accounting in time: Organizational time-reckoning and accounting practice, *Critical Perspective on Accounting*, 6, pp. 149-170.
- Farneti F., Guthrie J. (2009), Sustainability reporting by Australian public sector organisations: Why they report, *Accounting Forum*, 33(2), pp. 89-98.
- Ferragina V. (2007), Il benchmarking. Uno strumento per il miglioramento continuo, *Contabilità finanza e controllo*, 8, pp. 713-718.
- Gates S., Langevin P. (2010), Human capital measures, strategy, and performance: HR managers' perceptions, *Accounting, Auditing & Accountability Journal*, 23(1), pp. 112-132.
- Gilardoni A. (2020), *The Italian Utilities Industry*, Springer.
- Gordon L.A., Narayanan V.K. (1984), Management accounting systems, perceived environmental uncertainty and organization structure: an empirical investigation, *Accounting, Organizations and Society*, 9(1), pp. 33-47.
- Goretzki L., Strauss E., Weber J. (2013), An institutional perspective on the changes in management accountants' professional role. *Management Accounting Research*, 24(1), pp. 41-63.
- Granlund M., Lukka K. (1998), Towards increasing business orientation: Finnish management accountants in a changing cultural context, *Management Accounting Research*, 9(2), pp. 185-211.
- Hall M. (2010), Accounting information and managerial work, *Accounting, Organizations and Society*, 35(3), pp. 301-315.
- Hopper T., Powell A. (1985), Making sense of research into the organizational and social aspects of management accounting: a review of its underlying assumptions, *Journal of management Studies*, 22(5), pp. 429-465.
- Kaplan R. S. (1983), Measuring manufacturing performance: a new challenge for managerial accounting research, *Readings in accounting for management control*, pp. 284-306.
- Lavia López O., Hiebl M.R. (2015), Management accounting in small and medium-sized enterprises: current knowledge and avenues for further research, *Journal of management accounting research*, 27(1), pp. 81-119.
- Leotta A., Ruggeri D. (2012), Changes in performance measurement and evaluation systems as institutional processes: the case of an Italian teaching hospital, *Performance Measurement and Management Control: Global Issues*, 25, pp. 427-463.
- Luciani G., Mazzanti M.R. (2006), Italian energy policy: The quest for more competition and supply security, *The International Spectator*, 41(3), pp. 75-89.
- Lukka K. (2007), Management accounting change and stability: loosely coupled rules and routines in action, *Management Accounting Research*, 18(1), pp. 76-101.

- Lukka K., Granlund M. (1996), Cost accounting in Finland: current practice and trends of development, *European Accounting Review*, 5(1), 1-28.
- Macchia S. (2021), Are we ready to change?: a case study of Management Accounting Change (MAC) in an Italian cooperative, *Management Control*, 1, pp. 141-164.
- Malmi T., Brown D.A. (2008), Management control systems as a package – Opportunities, challenges and research directions, *Management Accounting Research*, 19(4), pp. 287-300.
- Mancini D. (2016), Accounting Information Systems in an Open Society. Emerging Trends and Issues, *Management Control*, 1, pp. 5-16.
- Marchi L. (2015), Nuove prospettive di ricerca sulle tematiche di Management Control, *Management Control*, 3, pp. 5-8.
- Marchi L. (2011), L'evoluzione del controllo di gestione nella prospettiva informative e gestionale esterna, *Management Control*, 3, pp. 5-16
- Marchi L. (2003), *I sistemi informativi aziendali*, Milano, Giuffrè.
- Marchi L., Paolini A., Quagli A. (2003), *Strumenti di analisi gestionale*, Giappichelli.
- Merchant K. A., Van der Stede W. A. (2017), *Management Control Systems: Performance Measurement, Evaluation and Incentives*, Pearson.
- Meyer J. W., Rowan B. (1977), Institutionalized organizations: Formal structure as myth and ceremony, *American Journal of Sociology*, 83(2), pp. 340-363.
- Mia L., Chenhall R.H. (1994), The usefulness of management accounting systems, functional differentiation and managerial effectiveness, *Accounting, Organizations and Society*, 19(1), pp. 1-13.
- Migliaccio G., Arena M. (2021), Il benchmarking per il controllo della performance: esiti di una ricerca nei distretti conciarci italiani, *Management Control*, 3, pp. 87-110.
- Nicolò D. (2013), Monitoraggio delle sequenze e risultati aziendali, *Management Control*, 3, pp. 35-50.
- Nor-Aziah A.K., Scapens R.W. (2007), Corporatisation and accounting change: The role of accounting and accountants in a Malaysian public utility, *Management Accounting Research*, 18(2), pp. 209-247.
- Nowotny S., Hirsch B., Nitzl C. (2022), The influence of organizational structure on value-based management sophistication. *Management Accounting Research*, 56, 100797.
- Oliver C. (1997), Sustainable competitive advantage: combining institutional and resource-based views, *Strategic management journal*, 18(9), pp. 697-713.
- Oliver C. (1991), Strategic responses to institutional processes, *Academy of management review*, 16(1), pp. 145-179.
- Orton J.D., Weick K. E. (1990), Loosely coupled systems: A reconceptualization. *Academy of management review*, 15(2), pp. 203-223.
- Otley D. (2001), Extending the boundaries of management accounting research: developing systems for performance management, *The British Accounting Review*, 33(3), pp. 243-261.
- Presti C., Marchi L., Castellano N. (2021), L'utilizzo dei dati contabili per la pianificazione economico-finanziaria: sviluppo della conoscenza e supporto decisionale, *Management Control*, 3, pp. 16-40.
- Quagli A. (2004), *Comunicare il futuro: l'informativa economico-finanziaria di tipo previsionale delle società quotate italiane*, Milano, FrancoAngeli.
- Quagli A., Francioli F. (2021), Management accounting change and the rise of Vespa (1884-1965), *Management Control*, 2, pp. 313-338.
- Robinson J.R., Sikes S.A., Weaver C.D. (2010), Performance measurement of corporate tax departments, *Accounting Review*, 85(3), pp. 1035-1064.

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- Rubin H.J., Rubin I.S. (1995), *Qualitative interviewing: the art of hearing data*, Sage Publications, Thousand Oaks.
- Saukkonen N., Laine T., Suomala P. (2018), Utilizing management accounting information for decision-making: Limitations stemming from the process structure and the actors involved, *Qualitative Research in Accounting & Management*, 15(2), pp. 181-205
- Scapens R.W. (2006), Understanding management accounting practices: A personal journey, *The British Accounting Review*, 38(1), pp. 1-30.
- Scapens R.W. (1994), Never mind the gap: towards an institutional perspective on management accounting practice, *Management Accounting Research*, 5(3-4), pp. 301-321.
- Scott W.R. (2001), *Institutions and organizations*, Sage.
- Scott W.R. (1987), The adolescence of institutional theory, *Administrative science quarterly*, pp. 493-511.
- Scott W.R., Meyer J.W. (1994), *Institutional environments and organizations: Structural complexity and individualism*, Sage.
- Selznick P. (1996), Institutionalism “old” and “new”, *Administrative science quarterly*, pp. 270-277.
- Simon H.A., Guetzkow H., Kosmetsky G., Tyndall G. (1954), *Centralization vs. Decentralization in Organizing the Controller's Department*, Controllershship Foundation. Inc., New York.
- Simons R., (1995), *Levers of Control*, Boston, Harvard University Press.
- Tillema S. (2005), Towards an integrated contingency framework for MAS sophistication: Case studies on the scope of accounting instruments in Dutch power and gas companies, *Management Accounting Research*, 16(1), pp. 101-129.
- Tsamenyi M., Cullen J., González J.M.G. (2006), Changes in accounting and financial information system in a Spanish electricity company: A new institutional theory analysis, *Management Accounting Research*, 17(4), pp. 409-432.
- Van der Veecken H.J., Wouters M.J. (2002), Using accounting information systems by operations managers in a project company, *Management Accounting Research*, 13(3), pp. 345-370.
- Wagenhofer A. (2006), Management accounting research in German-speaking countries, *Journal of Management Accounting Research*, 18(1), pp. 1-19.
- Wanderley C.D.A., Cullen J. (2012), A case of management accounting change: the political and social dynamics, *Revista Contabilidade & Finanças*, 23, pp. 161-172.
- Westphal J.D., Zajac E.J. (2001), Decoupling policy from practice: The case of stock repurchase programs, *Administrative science quarterly*, 46(2), pp. 202-228.
- Zikmund W.G., Babin B.J., Carr J.C., Griffin M. (2013), *Business research methods*, Mason: South Western Cengage Learning.
- Zimmerman J.L., (2005), *Accounting for Decision-Making and Control*, McGraw-Hill, Chicago, USA.

Appendixes

Appendix A. Survey questionnaire⁴

Part 1 - General Information

Company name (optional):

Answer:

Operating activity:

Answer: Production/distribution/transport/sale; electricity/gas

Your role in the company:

Answer:

1. How many employees work in your company's Management Control department?

Answer:

2. What are the primary objectives of your company's Management Control department? (Please select up to three boxes)

Answer 1: Facilitating accurate cost calculations within activities; 2: Controlling cost efficiency; 3: Supporting strategic and policy decision-making; 4: Conducting cost-benefit analysis to guide operational choices; 5: Assessing the profitability of investments before implementation; 6: Informing tariff decisions; 7: Other (please specify)

3. How has your company's management control system evolved in the last ten years?

Answer:

4. Which department is responsible for producing documentation for ARERA?

Answer 1: Financial Reporting; 2: Planning and Control; 3: Finance; 4: Regulatory Affairs; 5: Other (please specify)

5. How many human resources are involved in producing documentation for ARERA?

Answer:

6. How much time does it typically take to produce documentation for ARERA?

Answer:

⁴ The survey was administered in Italian to the management accountants.

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Part 2

7. Does your company's Management Control department use ARERA information requirements for decision-making and control?

Answer 1: Yes; 2: Yes, to some extent; 3: No; 4: Other (please specify)

8. How does your company Management Control department use the information produced for ARERA internally?

Answer 1: To evaluate and make decisions about productivity-enhancing investments; 2: To make strategic pricing decisions; 3: To improve cost-effectiveness; 4: To prevent penalties; 5: Other (please specify)

9. Which type of information prepared for ARERA does your company Management Control department find most useful for decision-making and control?

Answer 1: Accounting Unbundling; 2: Operating costs; 3: Investments; 4: Price data; 5: None of the above; 6: Other (please specify)

10. Describe the main reasons why you repute the selected type of information as the most relevant.

Answer:

11. To what extent has the ARERA information requirements influenced your company's management control system?

Answer 1: Significant influence; 2: Incremental influence; 3: No influence; 4: Other (please specify)

12. What are the most significant changes that have been made to your company's management control system in the last five years as a result of the ARERA information requirements?

Answer:

13. What is your opinion about how the ARERA information requirements have impacted your company's internal accounting systems?

Answer 1: Positive opinion; 2: Negative opinion; 3: Neutral; 4: Other (please specify)

14. If you are interested in discussing the questionnaire topics in more detail through a short interview, please provide your e-mail address below.

Answer:

Appendix B. Interview topic list.

Use of ARERA regulatory requirements: do you use ARERA regulatory requirements for internal purposes? Were they used before becoming mandatory? If yes, how are they used and for what type of analysis? Please provide examples.

Influence of ARERA requirements on MCS: have ARERA requirements influenced your company's MCS? If yes, how have the MCS been impacted? Please provide examples.

Which of the following statements best describe your situation:

- a. We do not use ARERA requirements at all, and only produce the information because we are obliged to.
- b. We did not use regulatory information for internal purposes in the past. ARERA requirements have stimulated us to use them.
- c. We already use regulatory information internally. ARERA requirements increased the level of detail.
- d. We already use regulatory information internally. ARERA requirements have not impacted us at all.

Aligning Integrated Data Management with Corporate Reporting: The role of sustainability reporting

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Abstract

The EU/2014/95 Directive represents a point of discontinuity in corporate reporting which has produced several effects on corporate practices and communication. Corporate control systems also had to be updated to include financial and non-financial issues such as environmental, social and governance (ESG) issues within the control and reporting mechanisms. Integrated data management can represent a crucial tool for managing the changes in progress and improving performance. This study aims to investigate the relationship between integrated data management and corporate reporting by assessing whether the Directive has had an impact on the implementation of integrated systems. The analysis of two virtuous cases in the field of sustainability reporting, as well as a public interest entity, highlights the effects of the Directive on corporate control and data management. The findings suggest different effects on companies with different sustainability reporting experience. The study has theoretical and practical implications contributing to the literature about integrated data systems and sustainability reporting.

Keywords: Integrated data systems, Corporate reporting, Management control, Non-financial information, Directive EU/2014/95

1. Introduction

The increasing attention posed to sustainability issues combined with the growth of the economy, organizations and society recalls the investigation of

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the sustainable development goals (SDGs) (Abhayawansa and Adams, 2021; Bebbington and Unerman, 2020; Marchi, 2020a; Molinari et al., 2021). Aware of the importance and contribution of companies in achieving the goals set by the 2030 Agenda, governments aim to increase corporate accountability in socially responsible behaviour (La Torre et al., 2018; Lakshan et al., 2021). Thus, corporate reporting represents a fundamental tool to give an external account of one's practices to stakeholders and institutions (Lombardi, 2021; Lombardi et al., 2022).

In Europe, Directive 2014/95/EU (NFRD) represented an important step within corporate reporting as it required Public Interest Entities (PIEs) to report non-financial information annually (Leopizzi et al., 2019). Intending to increase the accountability of companies, the European Commission updated NFRD introducing the Corporate Social Responsibility Directive (CSRD) which includes important additions and changes by 2023 (Breijer and Orij, 2022). The new features include the increase in companies required to report non-financial information, the obligation to publish such information in the management report, as well as greater digitization and standardization of information (European Commission, 2021).

Transparent and clear information by companies requires the implementation of measurement and control system (Marchi, 2020b). Within the IT systems, the company is able to manage its data and performance in an integrated manner. Integrated data management is a useful means for creating corporate value as it enables management to be able to reduce information asymmetries (Mazzara et al., 2022). New technologies support management and the processing of ever-increasing amounts of corporate information (Galeotti et al., 2016). Some companies, for example, are using new technologies such as artificial intelligence or data analytics to improve business performance (Paolini, 2022). Few scholars have studied the topic of integrated data management (Mazzara et al., 2022).

This work aims to investigate the relationship between integrated data systems and corporate reporting systems to evaluate whether the NFRD Directive has favored the implementation of integrated data systems. From the analysis of multiple case studies, we explore the general effects of NFRD/CSRD on corporate reporting and company organization and integrated data management. The results show the effects of the legislation on several levels. In terms of changes to the control and responsibility processes, moving on to disclosure and ending with the implementation of information systems to support management control and decisions. The study analyses the best practices of two Italian public interest bodies belonging to the industrial sector.

The motivation behind this research arises from the necessity to gain a deeper understanding of how companies are integrating sustainability into their decision-making procedures. First, the trend towards sustainability reporting and the increasing demand for transparency have made it necessary for companies to integrate data from various sources to provide a more comprehensive view of their environmental, social, and governance performance. Second, integrated data systems can provide greater efficiencies in data collection, management, and reporting, resulting in cost savings and improved accuracy. Finally, there is a growing recognition that sustainable development is not only essential for the long-term survival of companies but is also necessary to address global challenges such as climate change and social inequality. Therefore, the development of effective integrated data systems and corporate reporting can help companies make informed decisions that balance economic, social, and environmental considerations, contributing to a sustainable future.

We choose to employ the qualitative methodology of case studies as it provides a distinctive opportunity to meticulously examine intricate and specific situations. This approach facilitates an in-depth understanding of integrated data systems, encompassing their processes, challenges, and organizational dynamics. As a result, it offers valuable insights and comprehensive knowledge in this field of study.

The next section reviews and discusses the literature. Section 3 describes the method, while the results are presented in Section 4. Section 5 and 6 shows findings, contributions and implications.

2. Literature review

2.1 Changes in corporate reporting system

The corporate reporting system aims to support the decision-making process such as the definition of the actions to be developed (Marchi, 2009). The reporting system takes on a broader meaning incorporating documents and reports intended for communicating dynamics and performance to the stakeholders (Pavan, 2019). There are different types of corporate reporting systems, each of which serves a specific function. They can be classified according to whether they are reports intended for external or internal subjects of the company. This type of reporting typically includes the preparation of financial statements such as balance sheets, income statements, and cash flow statements, which provide a snapshot of the company's financial health. Financial reporting systems are

crucial for investors and creditors to make informed decisions about investing in or lending to a company.

Internal reporting systems involve the communication of information between different departments and levels of management within a company. These reporting systems typically include performance reports, sales reports, and other data that help managers make informed decisions about the company's operations. Internal reporting systems are essential for maintaining efficient operations and ensuring that managers have the information they need to make effective decisions (Marchi and Trucco, 2017).

The connection between company performance and the interests of the external stakeholders is also retrieved in the need to communicate companies' results (Capurro et al., 2020). Sustainability issues must be integrated both internal and external reporting systems (Galeotti et al., 2022). Regarding the first aspect, scholars have begun to investigate the effects of sustainability in control tools. For example, some studies have investigated sustainability budgeting (Roth, 2008) or material and energy flow cost accounting systems (Jasch, 2009). Other studies have focused on new external reporting models. Pressures from stakeholders have led companies to disclose qualitative and quantitative information in addition to the mandatory accounting information included in the annual report. These different reporting models have integrated those that already exist. The architecture of the new models has contributed to increasing information capacity, providing the tools to disclose ESG information.

Dedicated standard setters create frameworks to guide companies in reporting sustainability information and deciding which stakeholders to turn to. Companies can choose whether to use, the SASB standard to primarily address investor groups or, follow the guidelines of the Global Reporting Initiative (GRI) to disseminate more wide-ranging information and involve all categories of stakeholders (Lombardi, 2021). Interest was also shown in the reporting model proposed by the International Integrated Reporting Council (IIRC). This model provides for the integration of typical financial data and ESG matrix data into a single report. Additionally, other frameworks, guidelines and standards exist, such as the Climate Disclosure Standards Board (CDSB), Carbon Disclosure Project (CDP), Gruppo di Studio per il Bilancio Sociale. The EFRAG is also developing the European Sustainability Reporting Standard along the logic of the ESG factors such as ESRS1 "General principles". ESRS2 "General, strategy, governance and materiality assessment disclosure requirements".

In this context, national and European regulators have not remained silent observing the changes taking place in the economic context (Leopizzi et al., 2020). Instead, they tried to grasp the needs of the different actors. The NFRD was created with the intent of the European regulator to increase the accounta-

bility of companies by raising awareness of the issues of sustainability and sustainable development (La Torre et al., 2020). This directive has shown only the minimum content that public interest entities had to report. Starting from 2017, large companies had to publish a non-financial statement containing information about the environment, social issues, employees, the fight against corruption and human rights.

The transition from voluntary disclosure models to mandatory disclosure models has attracted the attention of scholars to evaluate the effects produced by the law. Most studies have focused on reporting by evaluating any changes in quantity or quality. The studies agree on highlighting an increase in the amount of information to be reported (Korca and Costa, 2020; Venturelli et al., 2017). This was also caused by the requests introduced by the Directive which obliged companies to approach issues not previously discussed (Leopizzi et al., 2020). Differently, conflicting opinions were found regarding the quality of the disclosure (Agostini et al., 2022; La Torre et al., 2020). A natural continuation of the NFRD is the CSRD which acts as a tool to overcome the limits of the previous version.

Among the goals set by the CSRD is the attempt to standardize reporting and greater integration between purely financial and ESG information (Breijer and Orij 2022). The new features include the obligation to include the non-financial statement in the management report, a symbol of integration with the financial statements. This approach can be considered in agreement with that adopted by the International Sustainability Standards Board (ISSB) which provides for a deep integration within the same document of financial and non-financial information, following the approach already provided by the Integrated Report of the IIRC. Therefore, the new requests of the CSRD could lead to new changes in the organization and the business processes.

Although several studies have concerned the effects of the Directive, different organizational and management control areas are still unexplored. There is little evidence regarding the control and data management systems that appear to be at a time before the preparation of sustainability reporting.

2.2 Integrated data management

Recent events such as the recent Covid 19 crisis have made companies more aware of changing and updating their management practices (Wang et al., 2023). These events have also emphasized on the need for data integration. This need had already been underlined in previous years by business and management scholars. Scholars argue that only the adaptation of data management systems would allow an adequate representation of company

dynamics and the relationship between management and result measures (Castellano, 2011).

The quality, timeliness, and accuracy of the information provided by integrated data systems are crucial for effective and efficient decision-making. Integrated data systems should be based on multidimensional variables, including financial and non-financial variables, and causal relationships between strategic factors such as objectives, operations, activities, resources, and skills. The systems should also allow for the monitoring of dynamic environments. In addition, there is a need for information integration for social control that incorporates relational control, particularly in cases of external sharing of business objectives.

Integrated data systems can also play a crucial role in integrating environmental, social and governance ESG aspects into different business processes and functions. Regulators and stakeholders pay increasing attention to the practices and communication of ESG aspects. ESG information must be periodically monitored, measured and managed before being reported (Marchi, 2020b). Integrated data systems support the monitoring and evaluation of non-financial results such as sustainability performance. Furthermore, an integrated management system is necessary to achieve a more comprehensive and interactive approach to sustainability management, and to avoid thematic gaps or inefficiencies in operational resources (Nawaz & Koç, 2018). Integrated data systems also provide the management with useful data used for the preparation of strategies and prospective plans as well as annual sustainability reports (Asif & Searcy, 2014). Although scholars have highlighted the strengths of the implementation of such systems, it is noted that integrated systems are associated with increases in costs and management difficulties (Bomheuer et al., 2020). Therefore, these changes are currently the preserve of large companies only.

Due to technological progress and new digital tools, the scientific debate is animated by discussions regarding the use of these new technologies and new techniques for integrated data management functions to performance measurement (Mazzara et al. 2022). Scholars assume the new technological means as fundamental to improving performance as they allow for the extraction and processing of an increasing amount of data. The use of new technologies (e.g. artificial intelligence, blockchain, big data, internet of things) in the management and processing of information allows for better management of data which is transformed into information to support corporate management (Galeotti et al., 2016). The use of IT solutions is directed to increase efficiency, especially at the operational levels and intervening on routine activities. With the growth of managerial skills, information systems acquire different importance. Its application of it has increased the potential of accounting data to support business deci-

sions (Marchi and Mancini, 2009). Some scholars have highlighted the power of Big Data by proposing a framework that could be used by companies to integrate historically and forecast sustainability data together with corporate data, adopting decisions oriented towards the development of responsible and economically successful operations (Hämäläinen & Inkinen, 2019).

However, scholars have also highlighted some critical issues, such as the publication of few studies on the implementation of integrated data management systems requiring revision of the organizational structure and intellectual capital as well as the contribution of top management (Mazzara et al., 2022; Paolini, 2022). Therefore, the research question is as follows:

RQ1: Has the NFRD had an impact on integrated information systems?

3. Methodology

To answer the research questions, an analysis of multiple case studies was conducted (Yin, 2009). The latter is a qualitative method used by accounting and management scholars to analyze complex phenomena, such as integrated data management (Marchi, 2011). A qualitative methodology was used since this method gives importance to aspects that quantitative methodologies do not allow to be enhanced, such as the organization-specific level (Caputo et al., 2017). Several studies have used this method to study the integration of sustainability into business dynamics (Molinari et al., 2021).

Multiple case studies involve the examination of multiple cases, each of which is considered a separate entity, and the identification of patterns across cases (Flynn et al., 1990). This approach is particularly useful when the phenomenon of interest is complex and cannot be adequately explained by a single case. By studying multiple cases, we can identify common points, differences, and underlying causal mechanisms across cases, which helps to develop a more comprehensive understanding of the phenomenon under investigation. Furthermore, this method allows to the mitigation of some risks of generalisability of findings from that single case (Parker & Northcott, 2016).

The two cases analyzed were chosen from the list of companies obliged to report the non-financial statement according to Directive EU/2014/95 according to the Commissione Nazionale per le Società e la Borsa (Consob) list. To address our research question, we analyzed two companies that are significantly different from each other. Company A operates in the industrial sector, while Company B is in the healthcare sector. Furthermore, we deemed it important to evaluate the effects of the Non-Financial Reporting Directive (NFRD) on com-

panies with different approaches to sustainability reporting. On one hand, Company A has extensive experience in sustainability reporting and managing ESG data and information, having voluntarily published reports before 2016, making them one of the few virtuous companies. On the other hand, Company B began communicating ESG information with the introduction of the NFRD, and is therefore gaining experience in this field.

To reduce the risks and objectivity issues we have combined different data ranging from interviews to documents, articles and websites. A semi-structured interview was conducted in Italian language with members of the company's management and here translated by the authors. Moreover, a comprehensive interview questionnaire was formulated through a meticulous brainstorming exercise, where all plausible questions related to the research question were documented. Subsequently, the questions were refined and revised to eliminate any superfluous elements, and the scholarly literature was referred to ensure the question list was exhaustive and pertinent to the study.

To ensure the reliability of the data, the interview involved all the authors and was fully recorded and transcribed. Regarding data analysis, two researchers carried out the coding of the records to minimize elements of subjectivity and ensure the impartiality of the process. A content analysis was therefore carried out in order to identify elements of similarity or dissimilarity regarding the topics investigated. To support the researchers, the NVIVO 12 software was used in the coding and analysis phase. Finally, a Word cloud was performed as a synthesis of the analysis process. It allows you to visually highlight the keywords resulting from the interview. The authors translated the answers from the interviews.

Table 1 – Main data source

Data Source	Type of data	Use in the analysis
Semi-structured interviews	Interview with ESG directors Company A: 60 min Interview with directors of Company B: 50 min	Gaining insights into the concept of integrated data systems in a corporate context; comprehending the organizational implications and the impact on integrated data systems brought forth by the NFRD.
Internal documentation	Internal documents	Mitigating the risks associated with the rhetoric of the observations and enhancing the data gathering process through the collection of additional information.
Public documentation	Companies' websites and documents	Enhancing the credibility of interview-based narratives through support, integration, and cross-referencing

4. Results

Results reflect the growing trend of companies acknowledging the importance of ESG factors and taking steps to integrate them into their decision-making processes. Companies are making progress in incorporating ESG factors into their operations; there is still room for improvement in terms of setting specific targets and measuring progress. It also highlights the challenges that companies may face in developing and implementing ESG metrics and targets, as well as the need for a long-term commitment to sustainability.

The comparison between the two cases shows how the two companies analyzed responded in different ways and at different times. Both companies have decided to adopt IT data collection systems. This aspect symbolizes that there is awareness of the relevance of these systems within corporate management and control. This affirmation is confirmed by what was answered by Company A:

“[...] It is currently unthinkable to be able to understand ESG phenomena without the implementation of systems that support you both in the collection and in the analysis[...].”

Furthermore, it was also pointed out that:

“For the more structured companies it wasn't particularly dramatic. As early as 2016 we had set up an IT data collection system that collected the Group's data, with the same rules for all. We published the data with the financial data (we were the third company to publish the DNF).”

The system implemented has facilitated the data collection process, bringing various advantages also at a strategic and organizational level. The system adopted allows for the standardization of the process along the entire value chain. Such systems were also needed to unify information for all of the company's locations around the globe.

The same cannot be claimed regarding data management and control systems of Company B. It argues that:

“We are implementing year-on-year metrics to measure ESG factors, although we are still having difficulty defining some targets. [...] We started a process 4 years ago and we plan to conclude it in the coming years”

The firm argued that over the years they have achieved the goals they had planned in terms of ESG metrics. The support of qualified personnel (such as the entry into the company of the new Chief Sustainability Officer and other

collaborators with experience on ESG issues) has been instrumental in accelerating this implementation. The Company A has equipped itself with an integrated system to integrate financial and ESG information.

“The applications are different but we have control points where there is data that is collected in two different flows. We have specially created control points.”

It implies that the company has established a system to ensure that the data collected is accurate and reliable, which is crucial for effective decision-making. By having control points, the company can track data flows and identify any discrepancies or errors, enabling them to take corrective actions promptly. Furthermore, this mechanism makes it possible to assign responsibilities to specific subjects and to trace the person responsible in the event of an investigation.

Otherwise Company B:

“The systems do not interface. We have created a separate module that does not interface with other systems.”

From the discussion with company B it emerged that they are aware that the implementation of such systems can represent another important step towards the full integration of sustainability in the business. Although over the years the company has achieved increasingly significant results in the field of measurement and control of ESG phenomena in relation to the reporting obligations of the NFRD, it is not yet ready to bring innovations also in the field of data management.

This made it possible to use this data to integrate ESG information into different assessments and into different internal and external reporting systems. Through an integrated data system for the company A it is possible to complete the analyzes in different areas:

“[...] risks, budgets, impairment, innovation and technology plans. [...] we have also added ESG criteria on evaluations on initiatives to be allocated internally or developed externally. [...] If sustainability is not integrated in all areas, it is not possible to have a forward-looking perspective”

Emphasis is still placed on control systems. IT systems and digitization are important as they facilitate the work of management control. However, in order to govern the changes taking place and so that innovative tools can contribute to the efficiency of processes, the company must increase its intellectual capital.

“More than digitization, it all starts with a control system that the company must equip itself with. You can do it by running Excel files, but if you want to do it well, you can do it using IT applications. However, there must be a reader (natural person) who must have the sensitivity to interpret and evaluate the information.”

Indeed, Company A has envisioned various applications of new technologies, harnessing the computational power of tools such as artificial intelligence (AI). AI is utilized to proactively identify any inefficiencies and mitigate environmental impacts. Furthermore, data intelligence tools and big data analytics have been employed to conduct a supplementary examination of impact themes, thereby enhancing the assessments of material topics resulting from management-stakeholder engagements.

5. Discussion

The case studies highlighted that corporate reporting is based on performance measurement and data management systems. These systems allow on the one hand to carry out an accurate internal control and on the other hand to be able to disclose truthful information in step with the new needs of stakeholders. The centrality of control is confirmed by Figure 1 which shows the Word Cloud created using the answers obtained during the interview. The control is the most relevant keyword (“control”).

Figure 1 – Word Cloud



Control can be more effective if supported by integrated data management systems. Integrated data systems can be key to integrating sustainability into all

business functions and levels (Molinari et al., 2021). Next to the word control, we noticed how “planning”, “indicators” and “internal” are among the most used words. Integrated data systems are necessary to be able to consider ESG aspects also within corporate planning and strategies.

The digitization of processes and new technologies can provide companies with modern tools to manage the challenges that ESG aspects pose. Integrated data management compared to more rudimentary tools has the advantage of being able to measure and control the phenomena along the entire value chain and with standardized information for all company functions. Furthermore, companies that have internally implemented an integrated data management system could receive benefits from the updating of the Directive and the entry into force of the CSRD. By providing for the inclusion of the non-financial statement in the management report, an integrated system would facilitate communication between the two interdependent spheres (financial and non-financial). In particular, it could be a strategic choice for companies to develop Sustainable Enterprise resource planning systems (S-ERP). The S-ERP systems have the function of integrating data relating to sustainability along the entire value chain (Chofreh et al., 2014). As a holistic solution, such systems support businesses to provide and process comprehensive sustainability data (Chofreh et al., 2020).

The information integration supported by the new technological systems, however, requires the development of corporate human capital. It is good to specify how new technologies support decisions but do not replace them. Furthermore, the employees must be equipped with the necessary skills to implement systems of this type and subsequently understand and interpret the information outputs.

However, it should be noted that this is an important step towards which even companies with less consolidated foundations in terms of management, control and communication in the ESG area must strive. The analysis of two companies obliged but with different experiences and maturity has found that the integration of sustainability and systems is a process that needs its time. Therefore, the introduction and updating of the Directive is to be welcomed as it is a factor that is accelerating the changes within companies to welcome ESG values with greater awareness and accuracy.

6. Conclusions, limitation and future research

This study aims to investigate the relationship between integrated data systems and corporate reporting. Specifically, the study evaluated the potential effects of NFRD on data management. The importance placed on the issue of sus-

tainability by the actors of the economic system is to modify the model of value creation (Adams, 2017). Several scholars have stressed the need for an integrated risk and performance management approach to increase opportunities for shared value and to achieve short and long-term objectives consistent with the paradigm of sustainability and sustainable development (Marchi, 2020b). In this perspective, the NFRD and the CSRD want, through reporting, to sensitize an increasing number of companies to adopt sustainable behaviors. Consequently, the companies had to make investments and changes on several levels to equip themselves with a technical and organizational structure suitable for reporting ESG information. Social and environmental sustainability must be managed within the company system before being reported externally.

The companies that have decided to integrate sustainability within their corporate functions have equipped themselves with new tools to manage the amount of information. The results of this work highlight the effects produced by NFRD on two Italian companies. NFRD, in its first version, has accelerated the changes especially in the management and business processes. On the side of integrated data management, the results differ from the state of maturity of the company regarding ESG issues. The company with the most experience in terms of sustainability has long since launched a process of management and integration of ESG data. Companies that have only recently embarked on the process of more accurate measurement and management of ESG facts. It was underlined how necessary an integrated information system is for greater completeness and correctness in the measurement and analysis of corporate performance. The best practice analyzed seems a necessary factor to include ESG issues in the internal and external reports.

The study has theoretical and practical implications. Regarding the first aspect, this work contributes to the literature on integrated data management and sustainability reporting (Paolini, 2022; Wang et al., 2023). This study aims to investigate the relationship between the integration of integrated systems and reporting systems. The results show that integrated data management is also a necessary aspect of collecting and processing qualitative and quantitative information. Moreover, the study provides new evidence on the internal effects of non-financial reporting regulation. The study confirms some implications attributable to the NFRD and provides new evidence about the function of quality control and information transparency. Integrated data management, also supported by new technologies, increases the timeliness and accuracy of information.

The study also has practical implications. The research provides insights into the importance of adopting an integrated approach to data management and reporting and highlights the benefits of doing so. Companies can streamline their

processes, reduce costs, and improve the accuracy and reliability of their sustainability data. Additionally, an integrated approach can help companies to identify and manage risks, improve their decision-making processes, and enhance their reputation and stakeholder trust. However, the comparison of the results referring to the two case studies showed that the implementation of such systems for smaller companies requires more time due to the high financial and organizational costs.

NFRD initially had some positive implications in terms of data management, but these implications have not been entirely satisfactory. Since the Commission has decided to intervene in the digitization of reporting through the CSRD, the regulators can use these results in order to evaluate whether to intervene also to stimulate the integration of data to favour the integration of sustainability.

The present study is not without its limitations. Firstly, the sample consists of companies within a single country limiting the generalizability (Parker & Northcott, 2016). This could limit the generalizability of the findings to companies in other countries or regions with different legal and regulatory frameworks. Different cultural, social, and economic factors may affect the implementation of integrated data management and corporate reporting in other contexts. Furthermore, the sample size of the study was relatively small, which may limit the representativeness of the cases analyzed. It is possible that some other companies or industries have different experiences and challenges related to integrated data management and corporate reporting that were not captured in this study. Also, the study focused mainly on the perspectives of company representatives and did not include the views of other stakeholders such as investors, regulators, or civil society organizations.

There are also opportunities for future research. Future research could expand the sample size and include companies from various countries and regions to better understand the effectiveness of integrated data management and reporting practices. Finally, future research could also explore the potential of emerging technologies, such as blockchain and artificial intelligence, in facilitating integrated data management and reporting practices.

References

- Abhayawansa S., Adams C. (2021), Towards a conceptual framework for non-financial reporting inclusive of pandemic and climate risk reporting, *Meditari Accountancy Research*. Doi: 10.1108/medar-11-2020-1097.

- Adams C.A. (2017), Conceptualising the contemporary corporate value creation process, *Accounting, Auditing and Accountability Journal*, 30(4), pp. 906-931. Doi: 10.1108/AAAJ-04-2016-2529.
- Agostini M., Costa E., Korca B. (2022), Non-Financial Disclosure and Corporate Financial Performance Under Directive 2014/95/EU: Evidence from Italian Listed Companies, *Accounting in Europe*, 19(1), pp. 78-109. Doi: 17449480.2021.1979610.
- Asif M., Searcy C. (2014), Towards a standardised management system for corporate sustainable development, *TQM Journal*, 26(5), 411-430. Doi:10.1108/TQM-08-2012-0057/FULL/PDF.
- Bebbington J., Unerman J. (2020), Advancing research into accounting and the UN Sustainable Development Goals, *Accounting, Auditing and Accountability Journal*, 33(7), pp. 1657-1670. Doi: 10.1108/AAAJ-05-2020-4556.
- Bomheuer M., Mankaa R.N., Traverso M. (2020), Improving data management system from health, Safety and Environmental data external assurance, *Journal of Cleaner Production*, 256, 120240. Doi: 10.1016/j.jclepro.2020.120240.
- Breijer R., Orij R.P. (2022), The Comparability of Non-Financial Information: An Exploration of the Impact of the Non-Financial Reporting Directive (NFRD, 2014/95/EU), *Accounting in Europe*, pp. 1-29. Doi: 10.1080/17449480.2022.2065645.
- Capurro R., Fiorentino R., Garzella S., Morrone C. (2020), La creazione del valore: il necessario completamento del sistema di controllo e di comunicazione aziendale, *Management Control*, 2, pp. 37-55. Doi: 10.3280/MACO2020-002003.
- Caputo F., Veltri S., Venturelli A. (2017), Sustainability strategy and management control systems in family firms. Evidence from a case study, *Sustainability (Switzerland)*, 9(6). Doi: 10.3390/SU9060977.
- Chiuochi M.S., Lombardi R., Mancini D. (2021), *Intellectual Capital, Smart Technologies and Digitalization* (Vol. 1), Springer.
- Chofreh A.G., Goni F.A., Klemeš J.J., Malik M.N., Khan H.H. (2020), Development of guidelines for the implementation of sustainable enterprise resource planning systems, *Journal of Cleaner Production*, 244, 118655. Doi: 10.1016/J.JCLEPRO.2019.118655.
- Chofreh A.G., Goni F.A., Shaharoun A.M., Ismail S., Klemeš J.J. (2014), Sustainable enterprise resource planning: imperatives and research directions, *Journal of Cleaner Production*, 71, pp. 139-147. Doi: 10.1016/J.JCLEPRO.2014.01.010.
- European Commission (2021), *Corporate Social Responsibility Directive Proposal*. -- <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021PC0189&from=EN>.
- Flynn B.B., Sakakibara S., Schroeder R.G., Bates K.A., Flynn E.J. (1990), Empirical research methods in operations management, *Journal of Operations Management*, 9(2), pp. 250-284. Doi: 10.1016/0272-6963(90)90098-X.
- Galeotti M., Lombardi R., Paoloni P., Roberto F. (2022), Big data and sustainability reports: The current approach to non-accounting data management, *Management Control*, Suppl. 2, pp. 95-116. Doi: 10.3280/MACO2022-002-S1005.
- Janasch C. (2009), Environmental and Material Flow Cost Accounting. In *Environmental and Material Flow Cost Accounting*, Springer Netherlands. Doi: 10.1007/978-1-4020-9028-8.
- Korca B., Costa E. (2020), Directive 2014/95/EU: building a research agenda, *Journal of Applied Accounting Research*, 22(3), pp. 401-422. Doi: 10.1108/JAAR-05-2020-0085/FULL/XML.
- La Torre M., Sabelfeld S., Blomkvist M., Dumay J. (2020), Rebuilding trust: sustainability and non-financial reporting and the European Union regulation, *Meditari Accountancy Research*, 28(August), pp. 701-725. Doi: 10.1108/MEDAR-06-2020-0914.

- La Torre M., Sabelfeld S., Blomkvist M., Tarquinio L., Dumay J. (2018), Harmonising non-financial reporting regulation in Europe: Practical forces and projections for future research, *Meditari Accountancy Research*, 26(4), pp. 598-621. Doi:10.1108/MEDAR-02-2018-0290.
- Lakshan A.M.I., Low M., de Villiers C. (2021), Management of risks associated with the disclosure of future-oriented information in integrated reports. *Sustainability Accounting, Management and Policy Journal*, 12(2), pp. 241-266. Doi: 10.1108/SAMPJ-03-2019-0114/FULL/XML.
- Leopizzi R., Iazzi A., Venturelli A., Principale S. (2019), Nonfinancial risk disclosure: The “state of the art” of Italian companies, *Corporate Social Responsibility and Environmental Management*. Doi: 10.1002/csr.1810.
- Leopizzi R., Iazzi A., Venturelli A., Principale S. (2020), Nonfinancial risk disclosure: The “state of the art” of Italian companies, *Corporate Social Responsibility and Environmental Management*, 27(1), pp. 358-368. Doi: 10.1002/csr.1810.
- Lombardi R. (2021), *The Going-Concern-Principle in Non-Financial Disclosure*, pp. 1-100. Doi: 10.1007/978-3-030-81127-3.
- Lombardi R., Cosentino A., Sura A., Galeotti M. (2022), The impact of the EU Directive on non-financial information: Novel features of the Italian case, *Meditari Accountancy Research*, 30(6), pp. 1419-1448. Doi: 10.1108/MEDAR-06-2019-0507/FULL/XML.
- Lombardi R., Trequattrini R., Schimperna F., Cano-Rubio M. (2021), The Impact of Smart Technologies on the Management and Strategic Control: A Structured Literature Review, *Management Control*, Suppl. 1, pp. 11-30. Doi: 10.3280/MACO2021-001-S1002.
- Marchi L. (2011), Integrazione pubblico-privato su metodologie e strumenti di controllo gestionale, *Management Control*, 2, pp. 5-8. Doi: 10.3280/MACO2011-002001.
- Marchi L., Trucco S. (2017), La comunicazione al mercato delle performance economico-finanziarie: il ruolo del controllo di gestione, *Management Control*, 3, pp. 55-78.
- Marchi L. (2020a), Dalla crisi allo sviluppo sostenibile. Il ruolo dei sistemi di misurazione e controllo, *Management Control*, 3, pp. 5-16. Doi: 10.3280/MACO2020-003001.
- Marchi L. (2020b), Dalla crisi allo sviluppo sostenibile. Il ruolo dei sistemi di misurazione e controllo, *Management Control*, 3, pp. 5-16. Doi:10.3280/MACO2020-003001.
- Marchi L., Mancini D. (2009), *Gestione informatica dei dati aziendali*, Milano, FrancoAngeli.
- Mazzara L., Bergamaschi F., Leoni G. (2022), Gestione integrata dei dati e misurazione della performance nei network inter-municipali: un’analisi sistematica della letteratura, *Management Control*, 2, pp. 91-116. Doi: 10.3280/MACO2022-002005.
- Molinari M., Maraghini M.P., Riccaboni A. (2021), Reporting di Sostenibilità e Controllo Manageriale: L’esperienza di Edison S.p.A., *Management Control*, 2, pp. 61-86. Doi: 10.3280/maco2021-002004.
- Nawaz W., Koç M. (2018), Development of a systematic framework for sustainability management of organizations, *Journal of Cleaner Production*, 171, pp. 1255-1274.
- Paolini A. (2022), Gestione integrata dei dati e performance aziendali, *Management Control*, 2, pp. 5-14.
- Parker L.D., Northcott D. (2016), Qualitative generalising in accounting research: concepts and strategies, *Accounting, Auditing and Accountability Journal*, 29(6), pp. 1100-1131. Doi: 10.1108/AAAJ-04-2015-2026/FULL/PDF.
- Pavan A. (2019), Controllo interno e di gestione nella prospettiva del valore. *Management Control*, Suppl. 1, pp. 5-12. Doi: 10.3280/MACO2019-SU1001.
- Parker L.D., Northcott D. (2016), Qualitative generalising in accounting research: concepts and strategies, *Accounting, Auditing & Accountability Journal*, 29(6), pp. 1100-1131.

- Roth H.P. (2008), Using cost management for sustainability efforts. *Journal of Corporate Accounting and Finance*, 19(3), pp. 11-18. Doi: 10.1002/JCAF.20381.
- Venturelli A., Caputo F., Cosma S., Leopizzi R., Pizzi S. (2017), Directive 2014/95/EU: Are Italian Companies Already Compliant?, *Sustainability*, 9(8), 1385. Doi: 10.3390/su9081385.
- Venturelli A., Pizzi S., Caputo F., Principale S. (2020), The revision of nonfinancial reporting directive: A critical lens on the comparability principle, *Business Strategy and the Environment*, 29(8), pp. 3584-3597. Doi: 10.1002/bse.2598.
- Wang L., Shang Y., Li C. (2023), How to improve the initiative and effectiveness of enterprises to implement environmental management system certification?, *Journal of Cleaner Production*, 404, 137013
- Yin R.K. (2009), *Case Study Method: Design and Method* (4th Editio, Vol. 5). Sage. -- <http://coarchitect.files.wordpress.com/2009/12/casestudymethod.pdf>.

The impact of the pandemic crisis on the digital transition process of Italian SMEs

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Abstract

In recent years, the digital revolution has impacted the entrepreneurial system globally, forcing companies to review their business models, products, and services value proposition. Companies must implement digital technologies in production processes to exploit new opportunities. This requires investing in machinery and devices and acquiring new knowledge.

The national and European economic system mainly comprises Small and Medium-Sized Enterprises (SMEs), characterized by low managerial skills and undercapitalization, which may hinder the required investments in information technology.

In Italy, the digital transition is constrained by the structural limits of its conservative entrepreneurial fabric. However, the recent pandemic crisis has accelerated this digital transition process. More and more companies have invested in R&D to increase the production process's automation level and improve their digital capabilities.

Literature has been widely investigating the impact of the pandemic crisis on the innovation process of SMEs adopting different perspectives.

The study aims to answer the following research questions (RQs).

RQ1: Which main foci can be identified in literature facing the impact of COVID-19 on the SMEs' innovation process?

RQ2: Which new needs arose during the pandemic fostering digitalization?

To answer RQ1, a Structured Literature Review (SLR) is adopted (128 studies identified on the SCOPUS database).

To answer RQ2, a qualitative methodology is used based on direct observation of two Italian firms

Keywords: Digital disruption, Small and Medium Enterprises, COVID-19, crisis, innovation

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1. Introduction

The irreversible digital transformation inherent to the entire socio-economic system, representing the current culmination of technical and scientific progress that has been taking place for over two centuries, is identified as ‘Industry 4.0’ (Lombardi *et al.*, 2021). There are two phenomena around which the technological scaffolding of Industry 4.0 is built: digitization and the Internet of Things (IoT) (Marchini *et al.*, 2019; Dicuonzo *et al.*, 2021; Cappelli and Cavallini, 2021; Alhalalmeh, 2022). Digitization consists of converting reality into data through machines, which no longer need human input since the algorithms on which they are based allow them to derive the information to react to specific stimuli. IoT is the machines’ ability to connect to the outside world and each other, communicating, thus transmitting the data generated. Compared to previous ones, the fourth industrial revolution is characterized by the quest for both production and society to be maximally connected (Nielsen and Montemari, 2021). Although Industry 4.0 technologies can improve enterprise performance, several studies point out that the process of transformation and adaptation is arduous for SMEs, underlining the challenges they may face in adopting digital technologies (Caldarelli *et al.*, 2016; Cupertino *et al.*, 2018). The national and European economic system is mainly composed of SMEs, and this concentration affects the speed, efficiency and effectiveness of the digital transaction process. Indeed, they are characterized by structural limitations that make them more vulnerable, like low financial resource availability and lack of specialized knowledge (Dong and Men, 2014; Cesaroni and Sentuti, 2015; Culasso *et al.*, 2022). Insufficient working capital, poor managerial training, and rough strategic use of forecasting planning and control methods affect SMEs’ innovativeness (Ferraris *et al.*, 2017). Innovation is the only way for SMEs not to succumb to the pressure that processes, such as globalization and digitalization, have provoked. Digitalization is essential to survive in a market of increasing unpredictability, fuelled by the shortening of product lifecycles and the demand for extreme product customization (Hofmann and Rüscher, 2017; Kamal *et al.*, 2020). On the other hand, the disadvantaged position to which the new context relegates SMEs endorses this gap between large and small companies and between European and Italian SMEs (Klein and Todesco, 2021). In Italy, the digital transition is held back by the structural limits of its entrepreneurial fabric and by a radical attachment to tradition (Cortesi, 2004). The recent pandemic crisis has accelerated this digitalization, and in Italy, more and more companies have invested in R&D to improve their digital capabilities and increase the automatization of the

production process (Lombardi, 2021; Fissi and Grazzini, 2021). As a result, the basic level of digitalization of Italian SMEs up to 2019 was below the European average (European Commission, 2020), whereas in 2021, the situation was reversed (European Commission, 2021). These results suggest a direct impact of the pandemic crisis on implementing new digital technologies in Italian SMEs.

Literature has been widely investigating the impact of the pandemic crisis on the innovation process of SMEs adopting different perspectives.

In light of this, the study aims to answer the following research questions (RQ).

RQ1: What main foci can be identified in literature facing the impact of COVID on the SMEs' innovation process?

RQ2: What new needs arose during the pandemic fostering digitalization?

The authors carried out a Structured Literature Review (SLR) (Paoloni and Demartini, 2016), a literature classification widely used in business studies to classify them according to four lenses: Article Focus, Research Area, Geographic area, and Research method. The present work considers 128 studies among articles, conference papers, book chapters and books identified on the SCOPUS database by searching “innovation”, “SMEs*”, and “COVID”. In light of the findings, the authors focused on directly observing two Italian firms, representing future broader and deeper research pilot cases.

The analysis confirms the pandemic crisis's positive impact on corporate digitization, noticing a more intense use of the technologies already present and the acquisition of other digital tools in response to new needs. It emerges that the primary needs arising from the deployment of COVID-19' are flexibility, security and connectivity. Notwithstanding these emerging needs, our analysis showed that digital progress in companies is closely related to the business model adopted. The results also reveal that companies active in the same sector may sometimes show opposing development needs depending on the characteristics of their business models. Therefore, the new technologies to be implemented and the digitization processes to be undertaken are also different in responding to opposing needs.

The work is structured as follows. Section 2 contains a context analysis; section 3 defines the research methodology used by the authors; section 4 answers RQ1; section 5 exposes the findings derived from the pilot case studies. Section 6 contains the discussion and concluding remarks, outlining the implications of the work and declaring its limits.

2. Context analysis

The national and European economic system predominantly comprises SMEs. This concentration can incisively mark the speed, efficiency, and effectiveness of the digital transaction process. While the flexible structure of SMEs and the high concurrence of the environment in which they orbit can encourage the small entrepreneur to pursue the search for new knowledge, on the other hand, the low managerial capacity, exacerbated by a chronic undercapitalization of the structure, hinders small entrepreneurs from investing in integrated information systems to support management, or in the absorption of highly skilled human capital (Corbetta and Mazzola, 1989; Centazzo, 2002). However, the recent pandemic has accelerated this digital transition process. Even in Italy, more and more companies have invested in R&D to increase the production process's automation level and improve their digital capabilities (Lombardi, 2021; Fissi and Grazzini, 2021).

To prepare a comprehensive analysis of the context, the authors considered two main indicators' trend: the Digital Economy and Society Index (DESI)¹, and the Digital Intensity Index (DII)².

The analysis compared the above-mentioned reports referring to 2020 and 2022

In the analyses proposed in the 2020 edition, a 2019 updated snapshot of the state of digitalization of Italian companies is depicted, compared to the

¹ Digital Economy and Society Index (DESI) is thus a synthetic index to measure the progress of EU Member States toward a digital economy and society, based on a set of indicators considered relevant for assessing the implementation of the Digital Agenda for Europe. DESI consists of five main dimensions, which together represent over 30 indicators.

The five dimensions are: Connectivity: how widespread, fast and reliable broadband and ultra-broadband is in each EU country. Human capital/Digital skills: the digital skills of the population and the workforce Internet use: the use of the Internet in everyday activities, from reading the news to banking and shopping. Digital technology integration: how companies integrate key digital technologies such as e-invoicing, cloud services, e-commerce, etc. Digital public services: e.g. public administration digital services and digital health.

² Digital Intensity Index (DII) measures the availability at the enterprise level of 12 different digital technologies. The 12 technologies considered are: the use of the Internet for at least 50 percent of people employed; the use of Information and Communication Technology (ICT) specialists; the application of fast broadband (30 Mbps or higher); the implementation of mobile Internet devices for at least 20 percent of people employed; the creation of a Web site or homepage; the equipping of the Web site with sophisticated features; use of social media; sharing electronic supply chain management data; use of Enterprise Resource Planning (ERP) software packages; focus on Customer Relationship Management (CRM); e-commerce sales representing more than 1 percent of total sales; and, finally, business-to-consumer (B2C) web sales constituting more than 10 percent of total web sales.

European situation. This study focused on the SME sector, highlighting a significant under-digitalization of Italian SMEs compared to the European average.

In the DESI 2020 report, Italy ranks 25th out of twenty-eight EU member states, ahead of only Romania, Greece and Bulgaria. Specifically, it is the variable “human capital” that causes a drastic lowering of Italy’s level of digital competitiveness, ranking Italy as last compared to all other European countries, only 42% of people (between 16 and 74 years old) possess basic digital skills against a European average of 58% and a peak in Germany of 70% (DESI, 2020).

The Italian position does not improve if considering the “integration of digital technologies” dimension, registering, even in this case, an average well below the European one that sees the country in 22nd place out of twenty-eight.

Similarly, when analyzing the report proposed by Eurostat in the Digital Intensity Index (DII) 2020, which measures the entrepreneurial availability of twelve different digital technologies, Italy ranks twenty-first, revealing that about 40% of Italian companies would have made modest investments in digital technologies, owning less than three of the twelve technologies monitored (DII, 2020).

Specifically, about 82% of firms with at least ten employees are at a “low” or “very low” level of ICT adoption, not being co-involved in more than six of the activities considered; the remaining 18%, on the other hand, perform at least 7 of the 12 functions, ranking at “high” or “very high” levels of digitalization.

It emerges that firm size and organizational complexity align with the varying firms’ digitalization level, which also differs in the type of technologies implemented. Italian firms with at least one hundred employees base their digitization process predominantly on the use of technologies such as the mid-to-high-level cloud, the workforce’s use of computers and mobile devices, and the presence of ICT specialists. On the contrary, more advanced technologies, such as robotics, Big Data, or 3D printing, are mainly used by companies that have already implemented the aforementioned innovative tools; therefore they can boast of a higher level of digitalization (DII, 2020).

PMI LAB, a national observatory that investigates digital transformation processes in the vast landscape of Italian SMEs, in an analysis conducted in 2019, highlights the areas mainly interested in digitalization in the pre-pandemic period: internal organization and customer service and care.

This situation, however, has changed in the post-pandemic scenario (DESI, 2022; DII, 2022).

At the end of a year that saw the grounding of the first projects and the missions of the PNRR, the most conspicuous recovery and resilience plan among those adopted at the European level, Italy's overall position in the DESI improved, ranking 18th out of the 27 member countries (20th in 2021, and 24th in 2020, when the index was still based on the Europe of 28 including the United Kingdom).

However, the human factor is what mainly penalizes our country: compared to 2019, Italy still ranks third-last in Europe, with more than half of its citizens missing basic digital skills (46% of Italian citizens possess them, against a European average of 54%).

At the same time, only 15% of Italian companies provide ICT training to their employees, 5% below the EU average.

The situation is quite different about connectivity, where Italy climbed the rankings from 23rd to 7th in one year, with a score of 61.2, against a European average of 59.9.

Italy's position also improved with regard to the integration of digital technologies, where our country ranks 8th in Europe, gaining two places compared to 2020.

The performance of our SMEs is good, most of which have at least a basic level of digital intensity (60%, above the EU average of 55%), with significant differences compared to the other Member States (from 86% in Sweden and 82% in Finland to 25% in Bulgaria and 22% in Romania).

Thanks to legislative interventions, 95% of Italian companies use e-invoices. The country also scores well in adopting cloud services, with 52% of enterprises using it (above the EU average of 34%).

The use of ICT technologies for environmental sustainability is also relatively widespread in Italian companies, although lower than the EU average (60% against an EU average of 66%). The use of Big Data is low (used by 9% of Italian firms compared to an EU average of 14%), as is the use of Artificial Intelligence-based technologies (6% of Italian firms compared to an EU average of 8%). E-commerce adoption increased between 2020 and 2021, reaching 13% but remaining below the EU average (18%).

The analysis of the DII 2022 confirms substantial progress in enterprises' digitization, including Italian SMEs, 70% of which register for basic-level digitization.

The composition of the DII changes yearly to update current trends, hence the comparison between 2020 and 2022 can not be homogeneous. Indeed, the 12 targets of the DII 2022 are considerably oriented towards ICT security, to the detriment of some of the targets of the DII 2020 (e.g. use of ERP

systems, CRM systems, sophisticated cloud services), which would be just as crucial for defining the level of digitization of enterprises.

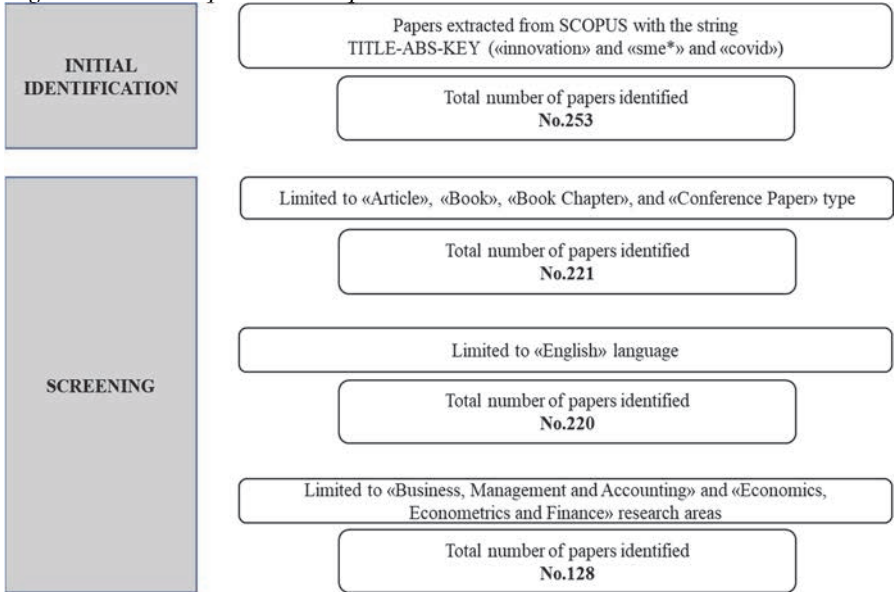
However, Italian SMEs show the most significant progress on the parameter of employee internet access for work purposes (49%). And on the use of remote business systems (73%), at least 3 ICT security measures (74%), and broadband access (83%) also show comforting numbers.

Concerning online sales, the 2022 figures do not show any improvement in the share of companies involved, but only in the values exchanged: 13% of SMEs made online sales for at least 1% of total turnover (down from 12.7% in 2021) against 17.9% of European SMEs. However, among Italian SMEs doing e-commerce, the percentage of turnover achieved online as a percentage of the total rose from 9.4% last year to 13.4%. In general, 18.3% of Italian companies with at least 10 employees made online sales (the European average is 22.8%).

3. Methodology

To answer the RQ1, the authors resorted to an SLR (Serenko, 2021; Paoloni and Demartini, 2016), a more and more popular methodology in business studies (Rocco *et al.*, 2023; Dal Mas *et al.*, 2023), that requires a rigid protocol based on its validity (Petticrew and Roberts, 2008) and reliability (Yin, 2009) and a strict description of how the process happened. The authors extracted the results from the SCOPUS database, considered the most comprehensive database (Del Vecchio *et al.*, 2022; Paoloni and Manzo, 2023). The starting string was TITLE-ABS-KEY (“innovation” AND “SMEs*” AND “COVID”). The research was carried out on 29 March 2023 and 253 studies resulted, but the sample was further reduced by imposing additional filters. As for the type of documents, only articles, books, book chapters, and conference proceedings (Paoloni *et al.*, 2020b) were considered (namely 221 of the original set). In addition, to overcome linguistic problems (Mauro *et al.*, 2017), the authors selected only the papers in English (220). Furthermore, as the SLR wanted to maintain an economic perspective, the authors focused on two research areas: Business, Management and Accounting; and Economics, Econometrics and Finance (128 results). Figure 1 shows the sample selection process (Paoloni and Manzo, 2023; Paoloni *et al.*, 2020a).

Figure 1 - The sample selection process



Source: Authors'elaboration

As previously mentioned, SLR requires the application of a valid framework. The present study uses the one Paoloni and Demartini (2016) introduced and classifies the papers according to four lenses: Article Focus (A), Research Area (B), Geographical Location (C), and Research Method (D). To answer our RQ1, findings will focus only on the article focus analysis. However, the complete review is attached in Appendix (www.sidrea.it/impact-pandemic-crisis).

To reply RQ2, the authors focused on the direct observation of two Italian firms, representing the pilot cases of a future broader and deeper research. The research uses a qualitative methodology particularly suitable when the analysis examines in-depth events of operational reality, attempting to explain “how” and “why” a given phenomenon occurs and explaining the causal links between the variables involved in the course of its manifestation (Yin, 2009). In the present work, the authors begin to move the first steps to comprehend which questions can be useful to ask and how to elaborate on the case study in further research. Therefore, they selected two small businesses and observed specifically to it the new needs that emerged after the pandemic and the implemented digital process. The firms under analysis were selected based on the following criteria. First, they operate in the food

service sector, which is an interesting sector to consider regarding how COVID impacted it. Indeed, on the one hand, distribution and commercial activity were abruptly halted by the pandemic crisis that forced them to re-shape, minimizing physical displacement according to the mobility restrictions imposed. On the other hand, representing necessities, the demand for food has not decreased despite the pandemic. Second, while operating mainly on a regional basis, both companies also distribute their products to neighbouring regions, so a mobility restriction undoubtedly significantly impacts the business model. The first one, located in an upper Lazio province, distributes its products in the regions of Lazio, Tuscany and Umbria; the second one, located in Abruzzo, also serves Marche and Molise. Finally, the company were chosen because of their proximity to the researchers, making obtaining valid and in-depth information easier. Data were collected through an unstructured interview with the company’s CEO. The following elements were sought to shed light on during the interviews. At first, the authors asked for general characteristics of the companies and the entrepreneurs to contextualize the businesses; after that, the interviews aimed to comprehend specific elements inherent in the level of digitalization of the company, comparing the pre-pandemic and post-pandemic phases. The interviews started in January 2022, however the entrepreneurs have been further consulted to preserve the work’s reliability and completeness during the paper’s elaboration.

Figure 2 - Unstructured questionnaire outline

COMPANY DETAILS AND PERSONAL PROFILE OF THE ENTREPRENEUR
Main technological tools used
Needs satisfied through the use of technology
Digitized business areaa
DIGITALIZATION PRE-PANDEMIC PHASE
Main technological tools used
Needs satisfied through the use of technology
Digitized business areaa
DIGITALIZATION POST-PANDEMIC PHASE
New strategic needs emerged during the pandemic
New technological tools implemented after the pandemic
New digitized business areas

Source: Authors’elaboration

3.1 Conceptual Framework

The theoretical framework for conducting the empirical analyses in our research project follows the framework proposed by (Paoloni, 2011; Dewey, 1974).

This envisages a succession of phases: planning, experimentation and rationalization.

In the planning phase, the theoretical framework is defined to clarify the topic's doctrinal and empirical aspects.

This phase includes the development of the theory and general cognitive objectives; the selection of the case study; the design of the data collection; the writing of the individual case; the analysis of the data; and finally, any modifications to the theory and any contradictory reports.

The experimentation phase is the operational phase of the case study in which data collection is carried out by choosing the sources that best fit the chosen methodology.

Finally, in the rationalization phase, the collected data is observed and processed.

4. Findings

4.1 The main Article Foci in the extant literature

To reply RQ1, the authors report the article foci identification; however, in Appendix the full framework and the complete analysis are exposed.

Figure 3 - The article foci

A. Topic
1 - Industry 4.0 and new technologies
2 - Performance
3 - Innovation management
4 - Resilience
5 - Other

Source: Authors' elaboration

4.1.1 Article foci's analysis

The literature investigates how the pandemic crisis impacted the SMEs' innovation process by adopting different perspectives. In light of this, the authors identified the following article foci.

4.1.1.1 Industry 4.0 and New technologies

Literature involved in this class comprehend studies focused on the implementation in SMEs of the new technologies characterizing Industry 4.0. Previous studies have recognized that obstacles to digitalization have different natures: technological, organizational or environmental (Ghobakhloo *et al.*, 2022). The former comprehends the high cost of technologies, such as costs of hardware, software and underlying systems (direct costs), the expenses companies have to bear repeatedly to keep the technology in operation, or consultancy costs (indirect costs). Scholars find that despite becoming more affordable in recent years (Rauch *et al.*, 2019), SMEs still struggle to cover the direct and indirect costs of acquiring Industry 4.0 enabling technologies (Kumar *et al.*, 2020; Masood and Sonntag, 2020).

The literature recognizes that during the pandemic crisis, as a reasonable response to the need to strengthen ties with a distant market in a period of forced social estrangement, SMEs have accelerated their investments in communication technologies such as websites, social media, and e-

commerce or information systems to develop customer relationship management activities (Penco *et al.*, 2022; Culasso *et al.*, 2022), to maintain efficient operations and lower costs (Al-Okaily *et al.*, 2022). For instance, the implementation of cloud-based accounting allowed SMEs to improve their efficiency, financial organization, and flexibility (Al-Okaily *et al.*, 2022); the use of information and communication technology (ICT) made easier the passage to remote work (Jorge *et al.*, 2021); also the access to digital financial products contributed to greater financial inclusion for SMEs in a period when their possibilities were even stricter (Nugraha *et al.*, 2022).

A2. Performance.

This rank counts the studies specifically focusing on the impact of the pandemic on SMEs' performance.

Digitalization constitutes an important source of innovation, generally definable as the modification of specific variables in firms' practices to improve performance (Curristine, 2006) and represents one of the main driving forces of corporate competitiveness (Aramburu and Sáenz, 2011). Hence, these technologies facilitate operational efficiency, increase productivity, improve control processes, optimize inventory and reduce lead times, errors, costs and energy waste (Liao *et al.* 2017).

Some studies focus on the financial performance, confirming the positive impact, during the COVID-19 pandemic, of processes innovation on financial performance (El Chaarani *et al.*, 2022; Gerth *et al.*, 2021).

Further research recognizes that the increased digital innovation capability, like it happened during the pandemic, can lead to better innovative performance (Kó *et al.*, 2022; Anuntarumporn, 2021).

However, in the post-pandemic context, SMEs have been under pressure to make their recovery operations and processes environmentally sustainable and digital tools could help them (Choudhary *et al.*, 2022; Syarief, 2021)

A3. Innovation management.

This class involves studies focused on the organizational change that enterprises have to face to carry out an innovation process. Most of the studies are about open innovation, people management, human and social capital (Crupi *et al.*, 2020; Moro Visconti, 2020; Nielsen and Montemari, 2021, Soni *et al.*, 2022). Embarking on a digitalization process requires not only a monetary investment but a managerial commitment to equip the company with the knowledge and skills to make decisions and develop practical organizational approaches in the new business 4.0 contexts (Garzoni *et al.*, 2020). However, the transformation process does not have to be drastic, it can be implemented gradually and at different levels of changes (Priyono *et al.*, 2020). The digital transition is a profound transformation involving many

aspects of a business organization regarding the business model, much more oriented to the customer engagement, organizational culture, processes, and employees' habits and competencies (Marchini *et al.*, 2019; Alfiero *et al.*, 2018; Matarazzo *et al.*, 2021; Chamocho *et al.*, 2022). These variables have to be changed to fully leverage the opportunities provided by digital technologies and their accelerating impact (Culasso *et al.*, 2022).

A4. Resilience.

This cluster gathers all the studies recognizing the value of an innovation process as a means not only to survey on a disrupting scenario, but to develop a competitive advantage.

These technological upheavals spill over to a broader reality in the guise of 'creative destruction' (Schumpeter, 1976), not only transforming the production process but going so far as to upset the balance of markets through a Darwinian elimination of firms unable to innovate. The pandemic was a disruptive environmental factor (Laato *et al.*, 2020) even for SMEs belonging to traditional sectors with little or no experience in Industry 4.0 (Soto-Acosta, 2020), which were obliged to accelerate the adoption of digital transformation as the only means to avoid short-term economic collapse and boost their resilience (Soto-Acosta, 2020) and reimagine their business model to rebuild new competitive advantages in the new market (Amankwah-Amoah *et al.*, 2021; Wenzel *et al.*, 2020). The crisis caused disruption that brought new opportunities for renewal, triggering a mode of thinking that allowed managers and employees to push the boundaries of what they thought was thinkable and feasible (Wenzel *et al.*, 2020), and especially SMEs to think out of the box and rediscover themselves in unprecedented ways (Zutshi *et al.*, 2021). With reference to the relationship with the external environment, on the other hand, it is clear how digital technologies foster more immediate and effective communication with stakeholders, resulting in the possibility of establishing a closer relationship of trust with them and greater visibility in the market (Agostini and Nosella, 2019; Masood and Sonntag, 2020).

A5. Other

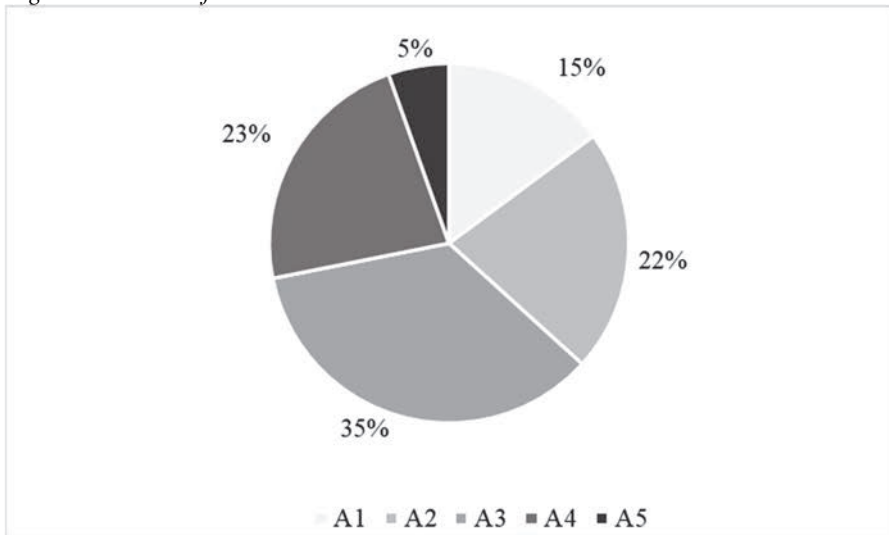
This residual class includes studies that the author does not attribute to the categories mentioned above as dealing with topics that are not treated enough to constitute an independent category or not strictly relevant to the research topic, therefore difficult to contextualize.

4.1.2 Article foci's distribution

As it is shown in Figure 4, the broadest category gathers papers about Innovation management (A3) representing 35% of the sample (45 papers). The second broadest category involves studies focused on the SMEs'

resilience (A4), representing 23% of the sample (29), but it only contains one more work than A2, analyzing how the pandemic affected SMEs' performance and representing 22% of the sample (28). Finally, A1 deepens the new technologies characterizing Industry 4.0 and accounts for 15% of the total (19). As for the "other" cluster, A5, it only represents 5% (7).

Figure 4 – Article foci's distribution



Source: Authors'elaboration

As the literature analysis shows, several studies have focused on the changes in tenors that SMEs must implement to implement the new tenets efficiently. The efforts to adopt Industry 4.0 technology are more likely to fail if SMEs do not have the necessary capabilities to develop and implement a strategy and plan for digitalization. In addition to technological factors, organizational drivers and barriers must be considered, namely the knowledge and skills required for digitalization (Ingaldi and Ulewicz, 2019). An efficient implementation of new technologies also depends on the value chain in which that company is embedded in terms of the willingness of business partners, suppliers and customers to accept Industry 4.0 technologies and the resulting smart products (Ingaldi and Ulewicz, 2019). What the firms need is holistic and cultural change. These changes are not always and not only subsequent and consequential to the implementation of technologies. Indeed, sometimes they are, on the contrary, exigencies and needs that are already present in the organization, leading it to seek new tools to satisfy

them. This happened during the pandemic crisis, which in some cases has emphasized some specific needs already present in some companies, fostering a digitalization process already in progress. In other enterprises, instead, the pandemic has generated some needs that were new or that had never been felt by the organization, leading it to begin an innovation process.

In light of this, we wanted to analyze how this process happened in two different case studies through which we wanted to answer the question *RQ2-What new needs arose during the pandemic fostering digitalization?*

4.2 The pilot case

This section discusses the responses provided by the entrepreneur of the selected company to the unstructured questionnaire submitted.

4.2.1 Company details and personal profile of the entrepreneurs

Two Italian SMEs active in the food services sector were selected. The first (A) is a family business organized in corporate terms as a Limited Liability Company (LLC). It is a commercial enterprise specializing in the supply of fresh, ambient and frozen food products, which stands out in the food service sector, particularly in the hotel-restaurant-cafeteria (HORECA) segment. In addition, the small company is active in the food distribution sector in Lazio, Tuscany and Umbria regions. The operational business model is based on the activity of order collection, which sales agents carry out; subsequently, transporters take care of the delivery of the goods. Danilo, the managing director, is 58 and has been at the company's helm for about 25 years.

The second (B) is an LLC too, which deals with the marketing of fresh, ambient and frozen products in the regions of Abruzzo, Marche and Molise.

Compared to A, the main channel of activity is retail. Similarly to A, B is organized through its internal logistics for delivering goods and a team of agents acting on the market using the order collection method. B has also recently activated the export channel, dealing with the supply of specific food products to wholesalers worldwide. Silvia, the entrepreneur, manages it together with her husband.

The profiles of the two entrepreneurs are similar, as is the company organization. What contrasts are the business lines implemented, since the former is mainly oriented towards the HORECA segment, whereas the latter with a turnover mainly developed in the retail channel. Both SMEs aim to

develop and expand each agent’s customer base, aiming to increase monthly turnover with a sustainable sales margin.

Figure 5 - Descriptions of interviewees

	Nam e	Ag e	Marital Status	Chil dren	In- dustry	Target markets
1	Danilo	58	Married	Yes	Food services	Italy (HO.RE.CA)
2	Silvia	53	Married	Yes	Food services	Italy (Retail) + Export

Source: Authors’elaboration

4.2.2 Digitalization in the pre-pandemic phase

From the interviews, the digital progress of the two pre-pandemic SMEs is rather aligned. Even before the pandemic crisis, both companies state that they went through an initial phase of digital evolution to automate some internal processes and adapt their business to alternative bureaucratic impositions, such as electronic invoicing. Specifically, the main areas digitized pre-pandemic for both companies were internal processes, with the digitization of document flows, communication and marketing. Both companies were already equipped before the pandemic with a basic technological infrastructure: fixed PC workstations, portable laptops, palmtops for agents, company servers, wi-fi connection and a single company software for the integrated management of operational activities. A few months before the pandemic, both SMEs implemented a new business management system, planned and coordinated by an external company, with file access systems and user authentication mechanisms that preserve sensitive information. Moreover, the technology platforms supporting the business processes are characterized by a homogeneous and integrated user experience, regardless of the device, desktop or mobile. On the one hand, this makes it possible to streamline operations by reducing manual steps (and thus errors), however, it ensures greater control and transparency over the execution of each activity. This is a single business management system on which operations are carried out from the moment the order leaves for the supplier, enters the warehouse and is validated on entry through to the invoicing of outgoing goods. It makes it possible to have a fiscal warehouse and thus ensures fiscal and batch control tracking of goods in stock. Both SMEs were also already equipped with a business intelligence (BI) system for performance management, an analysis dashboard accessible by both top management and individual salespeople to self-monitor their business. Both companies analyzed pre-pandemic also had

a digital marketer, under 30, internally responsible for developing the company website and managing social communication on the various Instagram, Facebook and LinkedIn profiles. Danilo stated that his company's internal data before COVID-19 were on internal servers; whereas Silvia stated that she had already implemented a cloud infrastructure years ago with a contract signed with a provider for a hybrid cloud service. Both administrators were thus already aware that an ineffective and inefficient technological infrastructure produced many organizational and functional problems, with high maintenance costs and an enormous dispersion of human resources.

4.2.3 Digitalization in the post-pandemic phase

When the pandemic crisis occurred, both companies underwent a major organisational change: about 40% of the staff, in both cases administrative, bureaucratic, marketing and insurance employees, started working remotely, from home, due to the restrictive measures. For both entrepreneurs, the main objectives therefore became the automation of operational processes to achieve speed and security in the execution of business activities, implementation of tools to ensure remote operation, food traceability and integrated data management.

Based on their different business models, the needs that emerged for the two SMEs during the pandemic were opposite.

The first company (A), in fact, deals mainly with supplies in the HORECA segment, a sector heavily affected by shutdowns and lockouts. This forced the need to implement alternative sales channels to diversify the offer, so an e-commerce platform was designed to allow anyone interested to purchase products from the comfort of their home. Post-pandemic investments were therefore strongly geared toward perfecting the shopping experience for the online user. Danilo, therefore, stated that:

“this was an important strategic change, as the main pre-pandemic sales activity tended to take place through an intermediary, the salesperson; in this case, it was possible to reach the customer directly and thus acquire relevant data on the sales experience”.

To meet the need for flexibility, company (A) also moved all its data from physical servers to a cloud infrastructure through a private cloud contract signed with a major provider. Danilo says that this allowed them to keep all their employees who were forced to work at home operational and benefit from economic and operational advantages:

“Through this innovation, all our workers had access to their desktops remotely and worked on shared files easily. The cloud has enabled my employees to improve their collaboration with access to data, even big data, anytime, anywhere and real-time updates. The introduction of the cloud has proven to be the most cost-effective choice for managing and upgrading the IT infrastructure, in fact, migrating services to the cloud has allowed us to convert capital expenditure into a variable cost; instead of investing massively in server hardware and software, you pay when you consume computing resources and only for the amount you consume”.

These are the main digital advances made by the first company under study.

The second SME (B), on the other hand, developing most of its turnover in the retail channel, a sector less impacted by the closures and blockades imposed during the pandemic months, on the contrary, measured a strong growth in turnover and a strong increase in demand due to the compulsive demands for food supplies. To meet this new demand, Silvia invested part of the funds in the implementation of transport optimization software.

“This tool allowed each hauler, knowing the number of deliveries to be made and the location of each shopkeeper, to quickly identify the route that optimizes in terms of kilometers to be traveled, estimated traffic in the hours ahead and distance from the storage warehouse, the best route to take”.

To speed up and make communication both internally and externally more efficient, company (B) also implemented marketing automation software that allows the automation of certain repetitive marketing activities, which can be included in the demand generation process.

“We have implemented software that makes it possible, for example, to send e-mail marketing with predefined and differentiated deadlines for different target customers, to track those who visit our website, and to submit inquiry forms to anyone who lands on our site”.

Both companies analyzed (A) and (B), as a result of the technological implementations carried out, had to invest in enhancing the skills of individual workers and increasing IT security through the installation of a Virtual Private Network (VPN), i.e. a virtual private network that guarantees

privacy, anonymity and security through a logically confidential communication channel. Danilo reveals that he had access to training courses on the use of the cloud provided by the provider who provided the installation service. It was a course attended by all the teams of workers who operationally use such tools, delivered by engineers and IT specialists who, after a comprehensive introduction and explanation of the cloud and the different types of existing clouds, stimulated employees on the different alternative uses of the tool to maximize its use. Similarly, Silvia states that they needed to introduce a new IT manager in early 2022. This is an IT engineer who oversees the proper functioning of all digital infrastructures, intervenes promptly in the event of malfunctions and is dedicated to the study of innovative software that fits the company's needs. Both respondents state that they maintained and if possible developed the digital implementations activated during the pandemic. Company (A) developed the e-commerce channel, devising online shopping guide videos directly for the end user and personalized shopping experiences via instant messaging chats. To date, about 4% of its turnover is generated through the online channel. Danilo provides quarterly training and refresher courses for his employees and hopes to be able to add an IT competence figure soon, to rationalize consultancy expenses towards external parties. Company (B) also maintained and consolidated the innovations made during the pandemic period, declaring a positive impact of these changes on the general organization and business efficiency.

From an organisational point of view, after the period of closures and restrictions, both companies reinstated work at their offices. In company (A), a flexible mode with 3 days per week in presence and 3 days of remote work was introduced. In company (B) only one day per week of remote working is allowed.

In conclusion, it emerges that the two companies, despite having rather similar distinguishing features and despite operating in the same sector, but in different customer segments, took advantage of the need for organizational change dictated by the pandemic crisis to implement digital development. The main needs that have arisen as a result of the pandemic are flexibility, connectivity, security and diversification.

5. Discussion and conclusion

The digital revolution has globally impacted the balance of the Italian entrepreneurial system, forcing companies to review their business models (Paoloni *et al.*, 2021; Giannetti *et al.*, 2021). Production systems, workflows,

and business organization have thus been transformed by the advent of new technologies that, when integrated into processes, generate numerous benefits such as improved business performance, optimized connectivity, increased productivity and profitability and greater flexibility. The Italian business fabric is predominantly made up of SMEs, so the country's digital evolution assumes that the small business sector mainly embraces the digital transition and is, therefore, willing to invest in this direction. Literature has been widely investigating the impact of the pandemic crisis on the innovation process of SMEs adopting different perspectives. In light of this, the study aims to answer the following research questions (RQs).

RQ1: What main foci can be identified in literature facing the impact of COVID on the SMEs' innovation process?

RQ2: What new needs arose during the pandemic fostering digitalization?

To answer RQ1, an SLR has been conducted, focusing the analysis on the main article foci that emerged from the sample extracted. The SLR brought out four main topics. The most numerous studies analyze the organizational changes necessary within SMEs to support the digitization process resulting from the pandemic or emphasized by it (Moro Visconti, 2020; Nielsen and Montemari, 2021, Soni *et al.*, 2022). In close correlation to this theme, it is not surprising that the second most numerous category involves the studies underlining how the digitization process has represented a resilience tool for SMEs, supporting them in the development of new competitive advantages and in an attempt to reduce the entrepreneurial gap suffered with larger companies (Amankwah-Amoah *et al.*, 2021; Wenzel *et al.*, 2020). Indeed, in third place, there is the cluster containing those studies that analyze the digitization impact on the SMEs' performance levels, underlining both the positive and negative effects (Kö *et al.*, 2022; Anuntarumporn, 2021). Only a few studies strictly concern the technical characteristics of the implementation process of new technologies and the specific tools that companies use (Kumar *et al.*, 2020; Masood and Sonntag, 2020). The SLR, therefore, made it possible to identify a theoretical pattern that the authors wanted to explore more in-depth leading to RQ2.

In order to answer RQ2, the authors focused on the direct observation of two Italian firms, which represent the pilot cases of a future broader and deeper research.

In light of what emerged from the literature analysis and confirmed by the case studies, the pandemic crisis sometimes emphasized particular specific needs already present, favouring a digitization process already

underway. In other cases, it generated new or previously unnoticed needs, leading to begin an innovation's process.

The interviews conducted with the two selected companies revealed some specific opposing needs that arose as a result of the COVID-19 pandemic, depending on their business model but also new common needs: connectivity, flexibility, security and digital training of personnel.

The two selected companies are SMEs active in the food services sector, with two different target customers: HORECA (A) and retail (B). The pandemic destined two opposing fates for the two companies during the months of the health emergency. A suffered a drastic drop in turnover due to the forced closure of restaurants, bars and pastry shops; B experienced a sharp increase in turnover and, therefore, in sales dictated by the compulsive rush to stock up on food at supermarkets and convenience stores which characterized the first few months of the pandemic. In response to this contrasting context, the solutions devised by the companies, and thus the technological innovations made, also diverged. A worked on the implementation of alternative sales channels, such as e-commerce, and the migration of data to a cloud platform, whereas B invested in task optimization and software automation. Both companies invested in the employees' digital training to increase their core competencies.

This paper aims to contribute to enriching the economic literature on the impact that the pandemic has caused in the business world, with specific reference to SMEs and the process of technological innovation they underwent or initiated. The research highlights the limitations, obstacles, but also opportunities that SMEs interface with in implementing a digitization process. Exploring them it is possible to increase small business owner's awareness about the new consumer and business needs, born with Industry 4.0 and exacerbated as a result of the advent of the pandemic. The main critical areas where it may be more cost-effective to invest in order to foster a digital transformation that makes the production process leaner and more competitive; and the collateral structural and organizational changes needed to support efficient change. Among the main limitations of the research there is the small amount of case considered, only two, which does not make the results generalizable for all SMEs operating in agri-food. However, this research is intended to begin a broader analysis that will consider other enterprises to validate the results that emerged.

References

- Agostini L., Nosella A. (2019), The adoption of Industry 4.0 technologies in SMEs: results of an international study, *Management Decision*, 58(4), pp. 625-643.
- Alfiero S., Broccardo L., Esposito A., Cane M. (2018), High Performance Through Innovation Process Management in SMEs: evidence from the Italian wine sector, *Management Control*, 3, pp.87-110. DOI: 10.3280/MACO2018-003005.
- Alhalalmeh M. (2022), The impact of supply chain 4.0 technologies on its strategic outcomes, *Uncertain Supply Chain Management*, 10(4), pp. 1203-1210.
- Al-Okaily M., Alkhwaldi A. F., Abdulmuhsin A.A., Alqudah H., Al-Okaily A. (2022), Cloud-based accounting information systems usage and its impact on Jordanian SMEs' performance: the post-COVID-19 perspective, *Journal of Financial Reporting and Accounting*, (ahead-of-print).
- Amankwah-Amoah J., Khan Z., Wood G. (2021), COVID-19 and business failures: The paradoxes of experience, scale, and scope for theory and practice, *European Management Journal*, 39(2), pp. 179-184.
- Anuntarumporn N. (2021), Exploring the antecedents to innovation performance in thai information communication technology sems, *International Journal of eBusiness and eGovernment Studies*, 13(2), pp. 123-148.
- Aramburu N., Sáenz J. (2011), Structural capital, innovation capability, and size effect: An empirical study, *Journal of Management and Organization*, 17(3), pp. 307-325.
- Caldarelli A., Ferri L., Maffei M. (2016), I rischi derivanti dall'implementazione del cloud computing: un'indagine empirica nelle PMI Italiane, *Management Control*, 3, pp. 27-48.
- Cappelli A., Cavallini I. (2021), The Potential of Big Data Analysis in the Shipbuilding Industry: A Way of Increasing Competitiveness, *Management Control*, 1, pp. 53-74.
- Centazzo R. (2002), Piccola impresa e trasferimento di conoscenza: il caso GAIN club, In AA.VV., *Formazione continua e politiche di sostegno per le micro-imprese, I libri del fondo sociale europeo*, ISFOL, pp. 59 e ss.
- Cesaroni F.M. Sentuti A. (2015), *Imprese Femminili e Crisi Economica. Credito, Competitività e Conciliazione in Una Prospettiva di Genere*, Milano, FrancoAngeli.
- Chamochumbi D., Denisse G., Ciambotti M., Palazzi F., Sgrò F. (2022), The digital transformation process in the agri-food sector: A case study, *The digital transformation process in the agri-food sector: a case study*, pp. 43-70.
- Choudhary P., Jain N.K., Panda A. (2022), Making small and medium enterprises circular economy compliant by reducing the single use plastic consumption, *Journal of Business Research*, 149, pp. 448-462.
- Corbetta G., Mazzola P. (1989), *Strategia delle imprese a rapida crescita: i modelli vincenti, Economia and Management*, 1.
- Cortesi A. (2004), *La crescita delle piccole imprese: fusioni, acquisizioni, accordi*, Torino, Giappichelli.
- Crupi A., Del Sarto N., Di Minin A., Gregori G. L., Lepore D., Marinelli L., Spigarelli F. (2020), The digital transformation of SMEs – a new knowledge broker called the digital innovation hub, *Journal of Knowledge Management*.
- Culasso F., Giacosa E., Giordino D., Crocco E. (2022), Digital transformation: Is COVID-19 a catalyst for micro and small enterprises first steps toward innovation?, *Management Control*, 2, pp. 71-94.
- Cupertino S., Vitale G., Riccaboni A. (2018), L'impatto dei Big Data sulle attività di pianificazione and controllo aziendali: In caso di studio di una PMI agricola Italiana. *Management Control*, 3, pp. 59-86. DOI: 10.3280/MACO2018-003004.

- Curristine T. (2006), Performance information in the budget process: Results of the OECD 2005 questionnaire. *OECD, Journal on Budgeting*, 5(2), pp. 87-131.
- Dal Mas F., Massaro M., Rippa P., Secundo G. (2023), The challenges of digital transformation in healthcare: An interdisciplinary literature review, framework, and future research agenda, *Technovation*, 123, 102716.
- Del Vecchio P., Mele G., Siachou E., Schito G. (2022), A structured literature review on Big Data for customer relationship management (CRM): toward a future agenda in international marketing, *International Marketing Review*, 39(5), pp. 1069-1092
- Dewey J. (1974), *Logica, Teoria dell'indagine*, Einaudi.
- Dicuonzo G., Donofrio F., Fusco A., Dell'Atti V. (2021), Big data and artificial intelligence for health system sustainability: The case of Veneto Region, *Management Control*, 1, pp. 31-52.
- Dong Y., Men C. (2014), SME financing in emerging markets: firm characteristics, banking structure and institutions, *Emerging Markets Finance and Trade*, 50(1), pp. 120-149.
- El Chaarani H., Vrontis P. D., El Nemar S., El Abiad Z. (2022), The impact of strategic competitive innovation on the financial performance of SMEs during COVID-19 pandemic period, *Competitiveness Review: An International Business Journal*, 32(3), pp. 282-301.
- European Commission (2020), Digital Economy and Society Index (DESI) 2020.
- European Commission (2022), Digital Economy and Society Index (DESI) 2022.
- Eurostat (2020), Digital Intensity Index (2020)
- Eurostat (2022), Digital Intensity Index (2022)
- Ferrari A., Broccardo L., Culasso F., Giacosa E. (2017), Management Control in Italian SMEs, *Global Business and Economics Review*, 19(5), p. 1. Doi: 10.1504/gber.2017.10004434.
- Fissi S., Grazzini F. (2021), L'utilizzo dei Social Media durante la pandemia da COVID-19: un nuovo strumento per la gestione del rischio sanitario?, *Management Control*, 2, pp. 265-288. Doi: 10.3280/MACO2021-002-S1012.
- Garzoni A., De Turi I., Secundo G., Del Vecchio P. (2020), Fostering digital transformation of SMEs: a four levels approach, *Management Decision*.
- Gerth F., Ramiah V., Toufaily E., Muschert G. (2021), Assessing the effectiveness of COVID-19 financial product innovations in supporting financially distressed firms and households in the UAE, *Journal of Financial Services Marketing*, 26, pp. 215-225.
- Ghobakhloo M., Iranmanesh M., Vilkas M., Grybauskas A., Amran A. (2022), Drivers and barriers of Industry 4.0 technology adoption among manufacturing SMEs: a systematic review and transformation roadmap, *Journal of Manufacturing Technology Management*, (ahead-of-print).
- Giannetti R., Cinquini L., Rapaccini M. (2021), La valutazione degli investimenti in industria 4.0: oltre l'oldwine in new bottles, *Management Control*, 2, pp. 65-90. Doi: 10.3280/MACO2021-002-S1004.
- Hofmann E., Rüscher M. (2017), Industry 4.0 and the current status as well as future prospects on logistics. *Computers in industry*, 89, pp. 23-34.
- Ingaldi M., Ulewicz R. (2019), Problems with the Implementation of Industry 4.0 in Enterprises from the SME Sector, *Sustainability*, 12(1), p. 217 e ss.
- Jorge L.F., Mosconi E., de Santa-Eulalia L.A., Singh A. (2021), An enterprise social media maturity model for smes, In 30th *International Conference of the International Association for Management of Technology: MOT for the World of the Future, IAMOT 2021*, pp. 769-778.
- Kamal M.M. (2020), The triple-edged sword of COVID-19: understanding the use of digital technologies and the impact of productive, disruptive, and destructive nature of the pandemic, *Information systems management*, 37(4), pp. 310-317.

- Klein V. B., Todesco J. L. (2021), COVID-19 crisis and SMEs responses: The role of digital transformation, *Knowledge and Process Management*, 28(2), pp. 117-133.
- Kő A., Mitev Ariel Z., Kovács T., Fehér P., Szabó Z. (2022), Digital Agility, Digital Competitiveness, and Innovative Performance of SMEs, *Journal of Competitiveness*, 14(4), pp. 78-96.
- Kumar R., Singh R.K., Dwivedi Y.K. (2020), Application of industry 4.0 technologies in SMEs for ethical and sustainable operations: Analysis of challenges, *Journal of cleaner production*, 275, 124063.
- Laato S., Islam A.N., Farooq., Dhir A. (2020), Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach, *Journal of Retailing and Consumer Services*, 57, 102224.
- Liao Y., Deschamps F., Loures E.D.F.R., Ramos L.F.P. (2017), Past, present and future of Industry 4.0-a systematic literature review and research agenda proposal, *International journal of production research*, 55(12), pp. 3609-3629.
- Lombardi R. (2021), Le dimensioni della conoscenza aziendale. Profili di investigazione tra crisi pandemica ed economia digitale, *Management Control*, 3, pp. 5-14. Doi: 10.3280/MACO2021-003001.
- Lombardi R., Cano-Rubio M., Schimperna F., Trequattrini R. (2021), The impact of smart technologies on the management and strategic control: a structured literature review, *Management Control*, pp. 11-30.
- Marchini P. L., Davoli L., Belli L., Medioli A. (2019), Internet of Things e Industria 4.0: un case study di successo di digital manufacturing, *Management Control*, pp. 11-34.
- Masood T., Sonntag P. (2020), Industry 4.0: Adoption challenges and benefits for SMEs. *Computers in Industry*, 121, 103261.
- Matarazzo M., Penco L., Profumo G., Quaglia R. (2021), Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective, *Journal of Business Research*, 123, pp. 642-656.
- Mauro S. G., Cinquini L., Grossi G. (2017), Insights into performance-based budgeting in the public sector: a literature review and a research agenda, *Public Management Review*, 19(7), pp. 911-931.
- Moro Visconti R. (2020), Corporate governance, digital platforms, and network theory: information and risk-return sharing of connected stakeholders, *Management Control*, 2, pp. 179-204, DOI: 10.3280/MACO2020-002009.
- Nielsen C., Montemari M. (2021), Big data for business modeling: Towards the next generation of performance measurement systems?, *Management Control*, pp. 5-10
- Nugraha D. P., Setiawan B., Nathan R. J., Fekete-Farkas M. (2022), Fintech Adoption Drivers for Innovation for SMEs in Indonesia, *Journal of Open Innovation: Technology, Market, and Complexity*, 8(4), p. 208.
- Paoloni P., (2011), *La dimensione relazionale delle imprese femminili*, Milano, FrancoAngeli.
- Paoloni P., Cosentino A., Iannone B. (2021), L'attitudine delle imprese al cambiamento durante le crisi sistemiche. Spunti dal settore agroalimentare, *Management Control*, 2, pp. 241-264. Doi: 10.3280/MACO2021-002-S1011.
- Paoloni N., Manzo M. (2023), Women-led Start-ups: A Literature Analysis, *When the Crisis Becomes an Opportunity: The Role of Women in the Post-COVID Organization*, pp. 89-104.
- Paoloni N., Mattei G., Strologo A. D., Celli M. (2020a), The present and future of intellectual capital in the healthcare sector: A systematic literature review, *Journal of Intellectual Capital*.

- Paoloni P., Demartini, P. (2016), Women in management: Perspectives on a decade of research (2005-2015), *Palgrave Communications*, 2(1), pp. 1-7.
- Paoloni P., Modaffari G., Mattei G. (2020b), Knowledge resources in the university context: an overview of the literature, *Journal of Intellectual Capital*.
- Penco L., Profumo G., Serravalle F., Viassone M. (2022), Has COVID-19 pushed digitalisation in SMEs? The role of entrepreneurial orientation, *Journal of Small Business and Enterprise Development*.
- Petticrew M., Roberts H. (2008), *Systematic reviews in the social sciences: A practical guide*, John Wiley and Sons.
- Priyono A., Moin A., Putri V.N.A.O. (2020), Identifying digital transformation paths in the business model of SMEs during the COVID-19 pandemic, *Journal of Open Innovation: Technology, Market, and Complexity*, 6(4), p. 104.
- Rauch E., Dallasega P., Unterhofer M. (2019), Requirements and barriers for introducing smart manufacturing in small and medium-sized enterprises, *IEEE Engineering Management Review*, 47(3), pp. 87-94.
- Rocco T.S., Plakhotnik M.S., McGill C.M., Huyler D., Collins J.C. (2023), Conducting and Writing a Structured Literature Review in Human Resource Development, *Human Resource Development Review*, 22(1), pp. 104-125.
- Schumpeter J.A. (1976), *II. Capitalism, Socialism, and Democracy*, 1942.
- Serenko A. (2021), A structured literature review of scientometric research of the knowledge management discipline: a 2021 update, *Journal of Knowledge Management*.
- Soni G., Kumar S., Mahto R.V., Mangla S.K., Mittal M.L., Lim W.M. (2022), A decision-making framework for Industry 4.0 technology implementation: The case of FinTech and sustainable supply chain finance for SMEs, *Technological, Forecasting and Social Change*, 180, 121686.
- Soto-Acosta P. (2020), COVID-19 pandemic: Shifting digital transformation to a high-speed gear, *Information Systems Management*, 37(4), pp. 260-266.
- Syarief E. (2021), The role of market uncertainty in fostering innovation and green supply chain management on the performance of tourism SMEs, *Uncertain Supply Chain Management*, 9(3), pp. 617-624.
- Wenzel M., Stanske S., Lieberman M. B. (2020), Strategic responses to crisis. *Strategic Management Journal*, 41(7/18).
- Yin R.K. (2009), *Case study research: Design and methods*, 5, Sage.
- Zutshi A., Mendy J., Sharma G.D., Thomas A., Sarker T. (2021), From challenges to creativity: enhancing SMEs' resilience in the context of COVID-19, *Sustainability*, 13(12), p. 6542.

New digital technologies for social impact assessment: Considerations for Italian social economy organizations

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Abstract

Social Impact Assessment (SIA) holds significant relevance for Social Economy Organizations (SEOs) such as associations, foundations, social enterprises, social cooperatives, and consortiums for accountability and strategic planning purposes. In Italy, the Third Sector Reform passed in 2016 mandates that an SIA should be conducted by third sector entities when they fall under specific circumstances as specified in the guidelines introduced in 2019. Notably, these guidelines do not propose a specific SIA model for Third Sector Entities (TSEs) but consider acceptable models that are internationally recognized in literature and practices. In this paper, we explore the opportunity to consider new digital technologies such as digital platforms, big data, blockchain, and artificial intelligence, to implement SIA for SEOs. We conduct a systematic literature review (SLR) on the intersection of SIA and digitalization in the context of SEOs. The bibliometric analysis aims to show main authors, countries, journals, and keywords associated with the literature on digital technologies and SIA of the SEOs. Finally, various themes and trend topics were identified in this studied literature. We conclude with suggestions for further research.

Keywords: Social impact assessment, Social Economy, Nonprofit, Third sector, digital technologies.

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Introduction

Increasingly, organizations are asked to report on social impact to demonstrate the financial, social, and environmental value they are creating. This is particularly true for third or social economy sector organizations such as associations, nonprofits, foundations, social enterprises, and social cooperatives.

The *Organization for Economic Co-operation and Development* (OECD) and the *European Commission* consider social impact assessment (SIA) fundamental for all European Social Enterprises (2015). Social impact is also a key issue for Italian *Third Sector Entities* (TSEs) ruled by the Third Sector Reform of 2016 (*Law 106/2016, art. 7*). Both the Code of the Third Sector (Decree 117/2017) and the Decree that rules the Social Economy Enterprises (Decree 112/2017) refer to SIA.

In Italy, the first guidelines on SIA were published in the *Decree of the Ministry of Labor and Social Policies, July 23, 2019*, and established that SIA is required only when large projects are commissioned by a public administration or the government (national, regional, local). Therefore, the Italian Third Sector Reform requires that a SIA is conducted if the project or the public interest initiative is long-lasting (at least eighteen months); financially solid (more than 1-million-euros); and not local (developed in an interregional, national, or international context). The consequence is that if a private organization that is under the above conditions does not assess the impact, the government (or the public administration) could not support its project or initiative. Furthermore, the Reform suggests incorporating SIA especially for organizations that promote large-scale initiatives of co-production and planning with public administrations and the Government. In other cases, organizations could freely decide to measure and assess the social impact for accountability reasons.

In this paper, we explore the intersection of SIA and digitalization in the context of social economy organizations such as nonprofits, social cooperatives, and social enterprises. We start by introducing the concept of social economy organizations in the Italian context. After reviewing the content of the Italian Guidelines that discusses SIA and digital technologies, we then conduct a structured literature review on digitalization and SIA with a special focus on models and frameworks for social economy organizations.

Social Economy Organizations

Social Economy Organizations (SEOs) are organizations such as non-profit institutions (NPIs), third sector entities (TSEs), social enterprises and cooperatives (SEs), and benefit corporations “that prioritize social economy objectives over their economic ones” (Mook, Whitman, Quarter, & Armstrong, 2015, p. 3). In Figure 1, the social economy is portrayed as part of a mixed economy, overlapping with the public and private sectors.

Figure 1 – “The Social Economy: An Interactive Approach.”

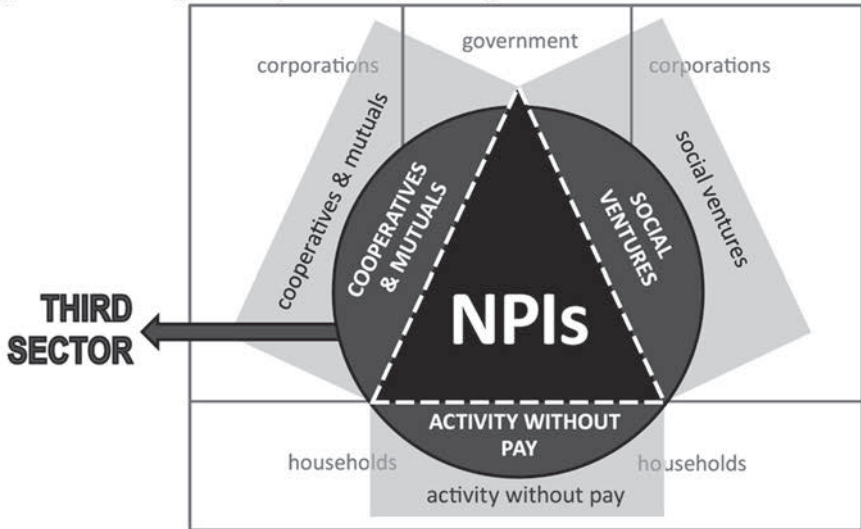


Source: Adapted from Mook et al., 2015, p. 14.

Salamon and Sokolowsky in 2016 provided a re-conceptualization of the Third or Social Economy Sector (TSE) as stated also in the 2018 *United Nations Handbook, Satellite Account on Non-profit and Related Institutions and Volunteer Work* (United Nations, 2018): “In particular, to be considered part of the TSE sector, entities must be *Organizations*, whether formal or informal; *Private*; *Self-governed*; *Non-compulsory*; and *Totally or significantly limited from distributing any surplus they earn* to investors, members, or other stakeholders” (Salamon & Sokolowski, 2016, p. 1533).

This can be illustrated in several ways. In Figure 2, Salamon and Sokolowski (2016) showed how the TSE Sector includes nonprofit institutions (NPIs), social cooperatives, social enterprises, and activity without pay.

Figure 2 – “Conceptualizing the third sector: a first cut.”



Source: Salamon & Sokolowski, 2016, p. 1531.

In the Italian context we refer to the following relevant types of organizations and entities, with specific characteristics and rules:

- *Nonprofit Institutions* (NPIs);
- *Third Sector Entities* (TSEs);
- *Social Enterprises and Cooperatives* (SEs).

Nonprofit Institution (NPI) is the term used by the National Institute of Statistics (ISTAT) to identify associations, foundations, and other organizations that fall in the NPI satellite account working definition. They “define the non-profit sector as consisting of (a) organizations; that (b) are not-for-profit and, by law or custom, do not distribute any surplus they may generate to those who own or control them; (c) are institutionally separate from government; (d) are self-governing; and (e) are non-compulsory (United Nations, 2003, pp. 17-20)”. In practice, some examples of NPIs considered in the System of National Accounts are Nonprofit service providers; non-governmental organizations; Arts and culture organizations; Sports clubs; Advocacy groups; Foundations; Community-based or grass-roots associations;

Political parties; Social clubs; Unions; and Religious congregations (United Nations, 2003, pp. 17-20). Data from the 2020 ISTAT Statistical Register¹ showed a growing sector, with 363,499 entities (336,275 in 2015, 301,191 in 2011, and 235,232 in 2001) with 870,193 employees. This breaks down to associations (85.2%), social cooperatives (4.1%), foundations (2.3%), and others (8.4%).

Social Impact Assessment in the Italian Third Sector Reform

In 2016, the Italian Ministry of Labor and Social Policies began a process of Third Sector Reform. For the first time, it defined *Third Sector Entities* (TSEs). Art. 1 of Law 106/2016, and the derived art. 4 of the new Third Sector Code (D. 117/2017), define Third Sector Entities (TSEs) as voluntary organizations, social promotion associations, philanthropic entities, associative networks, mutual societies, recognized and not recognized associations, foundations, and other private entities, different from the companies or corporations, with nonprofit, civic, charitable, and social objectives that they pursue through activities of collective (general) interest, i.e., volunteering, donations (of money, goods, or services), mutual activities, commercial activities. To obtain the status of a TSE, organizations apply to the *National Register of the Third Sector (Registro Unico Nazionale del Terzo Settore or RUNTS)*. Public entities, political and professional associations or groups, labor unions, etc., are excluded under the definition of a TSE. Religious entities are considered TSEs only if they perform general (or collective) interest activities as defined in Art. 5 of the TS Code and if these activities are formally separated from the religious ones. Social cooperatives, their consortiums, and social enterprises are considered in the boundary of the Third Sector if they perform collective interest activities as listed by the Law (LD 112/2017, art. 2). They are strongly limited (LD 112/2017, art. 3) from distributing any surplus they earn to investors, members, or other stakeholders (Berardi, Mook, & Rea, 2021).

¹ “The permanent census of nonprofit institutions provides a statistical picture of the sector in Italy, by measuring size, organizational framework, human resources, economic and social dimensions of nonprofit institutions”. Retrieved from: <https://www.istat.it/it/archivio/275918> (June 2023).

The strategy for the permanent census of nonprofit institutions is based on two key elements: the use of a Statistical Register, and the sample survey. The last sample survey (2022) was closed on November 23, 2022, and engaged about 110.000 Italian NPIs, new data on the Italian Nonprofit are available from May 2023. Retrieved from: <https://www.istat.it/it/files//2023/05/Censimento-non-profit-primi-risultati.pdf> (June 2023).

The RUNTS was launched on November 23, 2021. About 88,000 voluntary organizations and social promotional associations are transmigrating. Furthermore, about 24,000 social enterprises and mutuals will be also included in the Register. At the end of May 2023, the total number of registered TSEs in the RUNTS is 104,098, of which 39,031² are newly registered TSEs.

Guidelines³ for Social Impact Assessment (SIA) will help drive TSEs towards the challenging process of assessing the social impact of the organizations. Furthermore, the Guidelines on the Social Report refer to the social Impact process and suggest where the information on social impact should be described in the Social Report (part 5: Mission, Objectives, and activities).

For Grieco, Micheli, & Iasevoli (2015, p. 1175), social impact “is described as a combination of resources, inputs, processes, or policies that occur as a result of the real, implied, or imagined presence or actions of individuals in achieving their desired outcomes.” As a result of the externally induced change, social impact includes intended and unintended effects, negative and positive effects, and both long- and short-term consequences (Grieco et. al. 2015). The definition of Social Impact proposed by the Italian legislator (Zamagni, Venturi, & Rago, 2015) incorporates qualitative and quantitative elements of services provided by the organization; the direct, short-term, and medium-long-term effects related to the consequences and the changes induced on the community. The object of the social impact assessment of TSEs is the effects of their activities.

A SIA is not mandatory for all TSEs. The SIA process engages different stakeholders, such as funders, donors, beneficiaries or clients, employees, collaborators, partners, volunteers, citizens, public entities, and other stakeholders (e.g., the local community). The choice of methods and the metrics are free for the TSEs to choose. However, they should be inspired by the following principles: *intentionality, relevance, reliability, measurability, comparability, transparency, and communication*.

In terms of content, the SIA should show the value-added created, the social change activities performed, and the sustainability of the social action. This process should consider the following main elements: *stakeholder engagement to activities; services; input; output; outcome*; and it should develop the following phases: *1) analysis of the context and needs; 2) planning; 3) activities and methods; 4) assessment; 5) communication*. CSVs – i.e.,

² Data provided by the Ministry of labor and social policy in May 2023.

³ Cf. “Decreto 23 luglio 2019, *Linee guida per la realizzazione di sistemi di valutazione dell’impatto sociale delle attività svolte dagli enti del Terzo settore*” (GU Serie Generale n. 214 del 12-09-2019). Retrieved from: <https://www.gazzettaufficiale.it/eli/gu/2019/09/12/214/sg/pdf> (December 2022).

Service Centers for Volunteering and Third Sector (Costa, Ramus & Andreus, 2011; Costa et al., 2014; Costa, Dossi, 2022) could support the TSEs during this complex process. The Guidelines consider acceptable equivalent international systems and models of SIA, especially for TSEs who work in international contexts.

Social Impact Assessment

The definition of *Social Enterprises* (SEs) in Law 106/2016 and Decree 112/2017 is strictly related to the concept of *social impact* as a result of the production and the exchange of goods and services of social benefit (Zamagni et al. 2015), with the possibility to be the beneficiary of social impact investment tools (Social Impact Investment Task Force, 2014).

The *impact* is “the portion of the total outcome that happened as a result of the activity of the venture, above and beyond what would have happened anyway.” (Clark, Rosenzweig, Long, & Olsen, 2004). *Social Impact* is defined by Nicholls as “the measurable outcomes of material changes experienced by target populations as the result of deliberative organizational action. As such, it does not include externalities or accidental consequences that are not material to target stakeholders. Such impact can also be either good/positive or bad/negative.” (Nicholls, Page 150, 2018) Furthermore, he demonstrated that, especially for encouraging and promoting social finance, “within the third sector, generally, there has been a move towards more rigorous social impact measurement and reporting.” (Nicholls, Page 133, 2018).

We refer to the *Impact Value Chain* that identifies Inputs, Operations, Output, Outcome, Impact, and deadweight (Clark et al., 2004). The European Venture Philanthropy Association (EVPA, 2013), and GECES (2014) define these concepts as:

- *Inputs* are all resources, whether capital or human, invested in the activities of the organization – i.e., what resources are used in the delivery of the intervention;
- *Activities* are the concrete actions, tasks, and work carried out by the organization to create its outputs and outcomes and achieve its objectives – i.e., the intervention;
- *Outputs* are the tangible products and services that result from the organization’s activities – i.e., how that activities touch the intended beneficiaries;
- *Outcomes* are the changes, benefits, learnings, or other effects (both long and short term) that result from the organization’s activities – i.e., the change arising in the lives of beneficiaries and others;

- *Social Impact* is the attribution of an organization's activities to broader and longer-term outcomes – i.e., the extent to which that change arises from the intervention;
- *Deadweight* – i.e., what changes would have happened anyway, regardless of the intervention (European Venture Philanthropy Association, 2013; GECES, 2014).

The value created by an organization can be measured by considering *qualitative* and *quantitative* (monetization) techniques and methodologies (European Venture Philanthropy Association, 2013). Zamagni *et al.* (2015) identified about 40 methodologies and tools recognized at the international level with different levels of measurement (*output, outcome, impact*), and different measurements (*monetary, non-monetary*). Most of them (24) measure the value created also at the “*Impact*” level.

Social impact measurement can be described as a process with five stages as proposed by EVPA and GECES (Sub-group on Impact Measurement 2014) with a bottom-up approach: 1) *identify objectives*; 2) *identify stakeholders*; 3) *set relevant measurement*; 4) *measure, validate and value*; and 5) *report, learn and improve*.

Grieco *et al.* (2015) classified 76 Social Impact Models into four clusters, considering 7 main features:

1. *Simple Social Quantitative models* (14%) are based on quantitative indicators. The time frame of the analysis is retrospective. They are easy to apply, generic, or applicable in any sector. They were proposed by several promoters: research centers, universities, nonprofit networks, nonprofit organizations, consulting firms, and institutions (e.g., Cost per Impact method developed by the Center for High Impact Philanthropy, University of Pennsylvania).
2. *Holistic Complex models* (26%) are characterized by both qualitative and quantitative variables. The typology of impact measured by these models is primarily holistic or based on the overall added value. The main purposes are screening to verify the achievement of specific objectives and reporting for reasons of stakeholder accountability. The focus on reporting and communication of results achieved makes these models particularly suited for obtaining funding. These models have a high degree of complexity and apply to any sector. The time frame is ongoing or retrospective, and the models are developed primarily by NP networks (e.g., GRI Sustainability Reporting Framework);
3. *Qualitative Screening models* (41%) employ qualitative variables. The typology of measured impact is mainly holistic. The time frame is retrospective, and due to their qualitative nature, these models have a basic

level of complexity. They can also be applied to specific sectors and have been developed by a variety of organizations (e.g., Charity Analysis Framework produced by NEF);

4. *Management models* (18%) use qualitative or quantitative variables and aim to measure different types of impact (e.g., holistic, employees, environmental, social, and economic). They are characterized mainly by their purpose as they are used for management or certification and are applied during the activities (ongoing time frame). These models are generic and are primarily employed by consulting firms and institutions (e.g., EMAS - European Union Eco-Management and Audit Scheme).

According to Zamagni et al. (2015), the most cited SIA models and tools in the international literature are: BACO ratio (Best Available Charitable Option); Cost-Benefit Analysis (CBA); Social Return On Investment (SROI) (Arvidson, Lyon, Mckay, & Moro, 2013; Bellucci, Nitti, Franchi, & Testi, 2018; Courtney, 2018; Gibbon & Dey, 2011; Maier, Schober, Simsa, & Millner, 2015; Nielsen, Lueg, Van Liempd, 2021; Purwohedi & Gurd, 2019); Balanced Scorecard (Bengo *et al.*, 2015); Social Impact Assessment (SIA); GRI Sustainability Reporting Framework; Randomized Controlled Trials (RCT); Outcomes star; IRIS (Impact Reporting and Investment Standards). Also, Zamagni et al. (2015) developed their own methodological framework for the accounting and the measurement of Social Impact. Other methods are developing in practice – e.g., the “ImpACT” of EURICSE (Depedri, 2016). Authors have also identified performance measurement models for Italian social enterprises (Arena *et al.*, 2015; Bagnoli, Megali, 2011). Other authors studied SIA of SEOs and related projects or initiatives in different fields of activities – i.e., education, art and disability (Mwambela & Mwendia, 2019), local government (Purwohedi & Gurd, 2019), development and humanitarian aid (Seyedsayamdost & Vanderwal, 2020), and cultural ecosystem (Sherren, Parkins, Smit, Holmlund & Chen, 2017).

Digitalization

Digital innovation (or digitalization) could play a fundamental role in the accountability and governance of the social economy, especially Blockchain Technology and Distributed Ledger Technologies (DLTs). Indeed, some preliminary research on this topic can be found in the literature over the last decade (Al-Saqafa & Seidler, 2017; Mangla *et al.* 2021; Seyedsayamdost & Vanderwal, 2020). Also, Big Data (Dicuonzo, 2021), Artificial Intelligence,

and digital platforms could positively affect projects, initiatives, and operations of organizations that pursue social goals, but no relevant studies have already demonstrated this relationship.

Digital innovations such as blockchain technology (Valentinetti, Rea, 2022; Spanò *et al.*, 2023), could be useful for tracking and reporting the social impact produced by SEOs. IBM defines blockchain as “a shared, immutable ledger that facilitates the process of recording transactions and tracking assets in a business network.”⁴ Blockchain Technology could facilitate public-private partnership (PPP) where the government (public administration, i.e., local, regional, national, and European government) delegates some of its responsibility to a private partner through a long-time agreement. The fields of co-production and co-planning between public and private could be potentially unlimited, and Third Sector Entities (TSEs) have a preferred role as established by the law (Decree 117/2017, art. 55; and Sentence 131/2020). They are the only accreditable entities that can co-produce (and co-plan) services with the government from a vertical subsidiarity perspective (Constitution Act, art. 118). The accountability and transparency between the public and private partners could be guaranteed by blockchain technology.

Al-Saqaf and Seidler (2017, p. 2) defined blockchain as “a distributed digital ledger or accounting book” with potentially numerous applications “since they allow disintermediation in ways that can potentially empower people in trade, expression, democratic participation, social interaction, and financial freedom.” The authors described some applications of blockchain technology that positively impact society, due to the characteristics of transparency, accountability, equality, and autonomy, that “could facilitate progress in areas such as online identity, human trafficking, corruption, fraud, democratic participation, and freedom of expression” (Al-Saqaf & Seidler, 2017, p. 12).

Seyedsayamdost and Vanderwal (2020) examined three different use cases of blockchain-based initiatives creating positive social impact. For the authors, “Blockchain is also highly reliable – all transactions are immutably recorded; indeed, its immutability has been considered one of this technology’s most transformative aspects, as it is tampering proof and, as such, ostensibly guarantees transparency and accountability” (Seyedsayamdost & Vanderwal, 2020, p. 944).

These first experiences described in the literature, open the way to a new research agenda that requires multidisciplinary approaches and perspectives.

⁴ Definition of Blockchain retrieved from the IBM website (December 2022): <https://www.ibm.com/topics/what-is-blockchain>.

Several scientific contributions were published on the methods of SIA applied to social economy organizations, but fewer studies focused on the practical tools that translate theoretical methods into practical instruments useful for improving accountability and transparency of social impact organizations. Blockchain or similar distributed ledgers could be one of these innovative tools but should be studied further, taking into account applications in different fields of activities, and the significant environmental concerns due to the large amount of energy required for blockchain mining, the process used to verify transactions.

Systematic Literature Review Methodology

We conducted a systematic literature review to identify possible useful applications of the digital tools and technologies to the SIA of social economy organizations. Our Systematic Literature Review was conducted in Scopus, the largest database of peer-reviewed literature, and used by many scholars to perform a bibliometric analysis. Furthermore, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram as reported in the flow diagram in Figure 3 to manage and describe the process of our analysis (Ianniello *et al.*, 2019).

To assure the quality of our analysis, we considered only articles, book chapters, reviews, and conference papers. All selected documents were written in English. The Scopus first search string was:

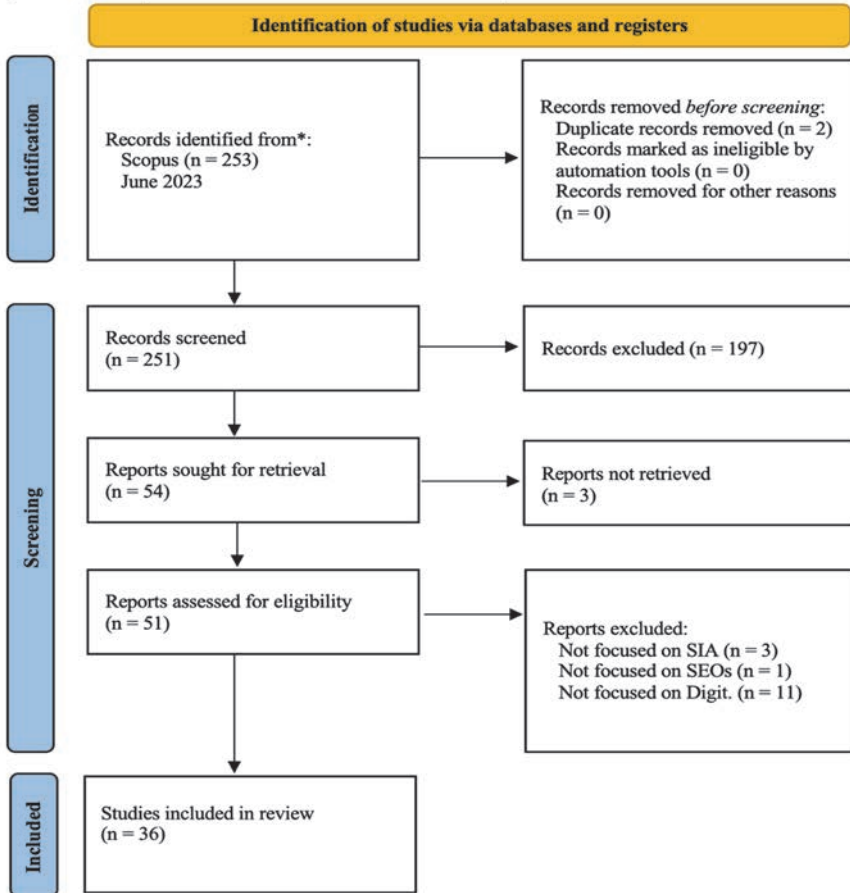
(ALL (“social impact assessment” OR “social impact measurement” OR “social impact indicators” OR “social impact evaluation”) AND ALL (“social economy” OR “nonprofit” OR “third sector” OR “social enterprise” OR “social cooperative” OR “charit” OR “non profit” OR “not for profit”) AND ALL (“Digital*” OR “blockchain” OR “artificial intelligence” OR “cloud” OR “internet of things” OR “machine learning” OR “mobile app” OR “smart tech*”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “ch”) OR LIMIT-TO (DOCTYPE, “re”) OR LIMIT-TO (DOCTYPE, “cp”)) AND (LIMIT-TO (LANGUAGE, “English”)).*

After this first search resulting in 225 documents, we added a new search of 30 documents using this further string:

(TITLE-ABS-KEY (“performance measurement”) AND ALL (“social economy” OR “nonprofit” OR “third sector” OR “social enterprise” OR “social cooperative” OR “charit” OR “non profit” OR “not for profit”) AND TITLE-ABS-KEY (“Digital*” OR “blockchain” OR “artificial intelligence” OR*

“cloud” OR “internet of things” OR “machine learning” OR “mobile app” OR “smart tech”) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “ch”) OR LIMIT-TO (DOCTYPE, “re”) OR LIMIT-TO (DOCTYPE, “cp”)) AND (LIMIT-TO (LANGUAGE, “English”))*

Figura 3 - Flowchart of the systematic literature review based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria



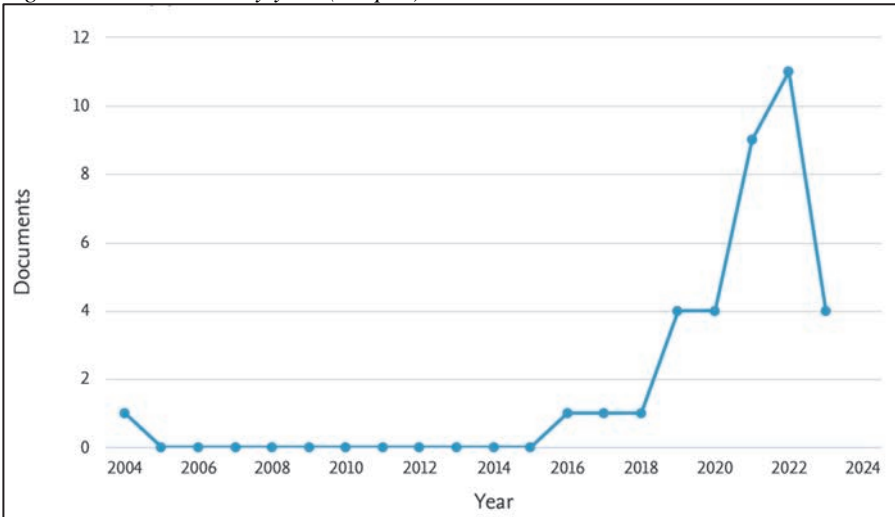
The number of articles returned as result of the search strings was 255. There were 4 duplicates, leaving 251 to analyze. The program rayyan.ai was used for the first screening. The title, abstract and keywords of these articles were reviewed independently by the two authors. Conflicts in rating were discussed until a consensus was reached. After the first screening of title, abstract and keywords, we identified 54 papers for the second screening of

full papers. All but three of the papers were available for download which left us with 51 papers. The collaborative analysis of the full papers' contents was made using Zotero as a repository for the selected 51 documents. An additional 15 papers were eliminated as they did not meet the criteria, leaving 36 papers for the final analysis.

Findings

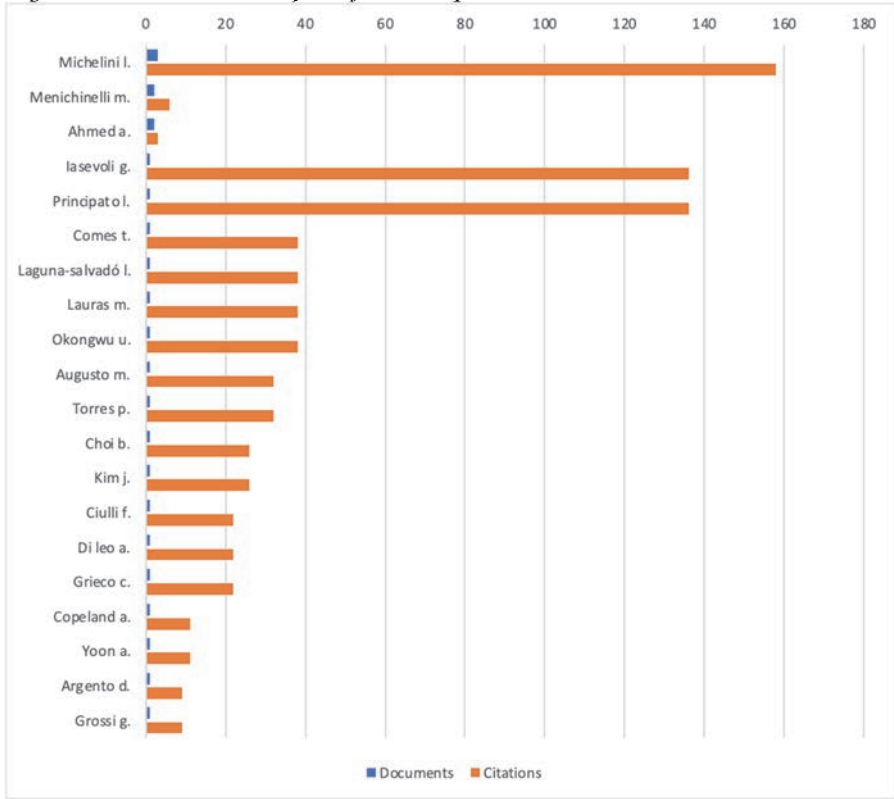
As Figure 4 shows, most of the documents on the intersection of digitalization and SIA for social economy organizations were published during the last decade with a peak in 2022. The first document was published during 2004.

Figure 4 - Documents by year (Scopus)



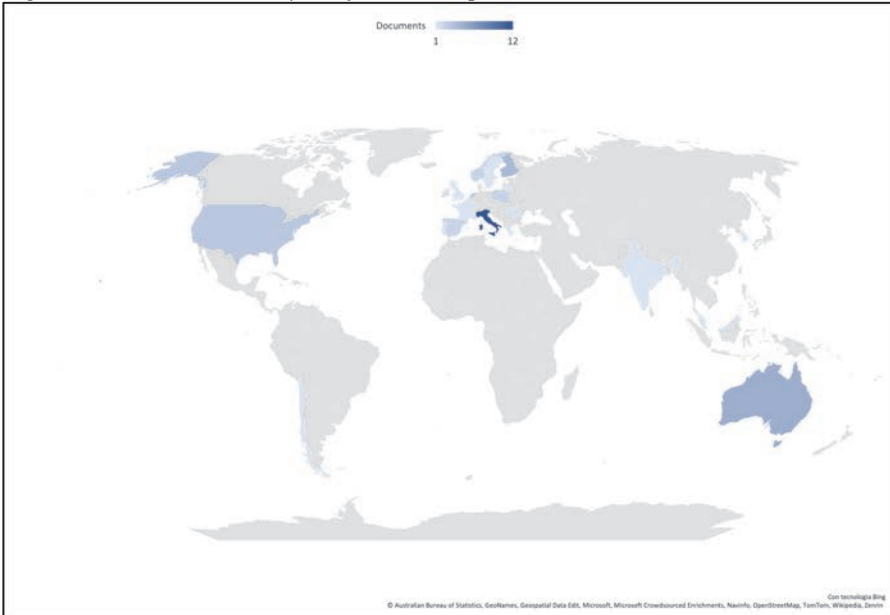
As shown in Figures 5 and 6, the authors with the highest number of documents, and citations in this area are based in Italy, probably due to the impetus provided by the legislator, and the increasing interest demonstrated in accounting practices there during the last few years.

Figure 5 - VOSviewer analysis of authors per documents and citations



Indeed, the top three cited authors are Italians – i.e. Michelini (158 citations), Iasevoli, and Principato (both 136), and the country with the highest number of citations is Italy (179 citations), followed by the Netherlands (61), Norway (47), France (38), and Portugal (32).

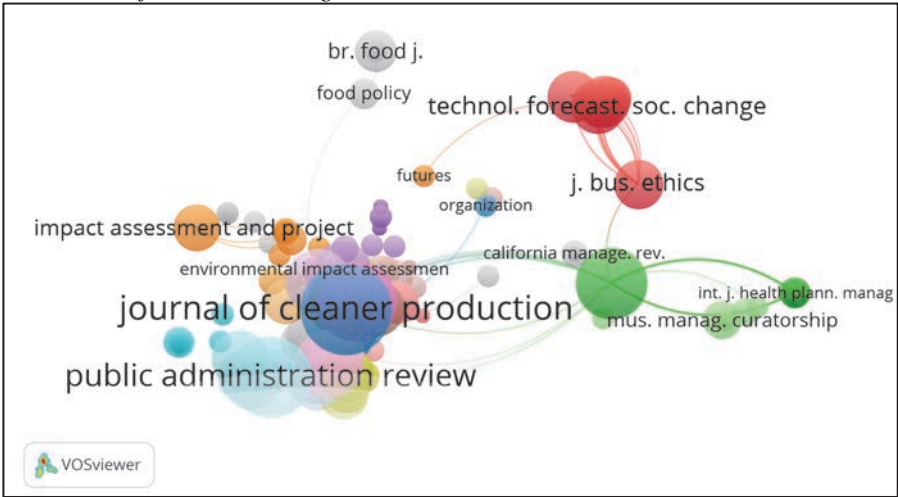
Figure 6 - VOSviewer analysis of countries per documents



The European interest on these topics is also demonstrated by the funding sponsors identified by the Scopus bibliometric analysis, for instance Horizon 2020 and other European funding programs. Fourteen papers did not list a funding source.

The results of the co-citation analysis of the cited sources, made with VOSviewer, identify the most important journals where the debate on the digitalization of SIA in SEOs is developing (Figure 7). Co-cited journals with more than 15 citations are the *Journal of Cleaner Production* (34 citations), *Public Administration Review* (27), *Journal of Social Entrepreneurship* (26), *Sustainability* (21), *International Journal of Productivity and Performance Management* (19), *Journal of Business Ethics* (19), and the *British Food Journal* (17). Our co-citation analysis shows a relatively young research line that, given its multidisciplinary nature, does not have specific journals with relative power of influence in terms of citations.

Figure 7 - VOSviewer network visualization of the co-citation analysis of cited sources with factorial counting



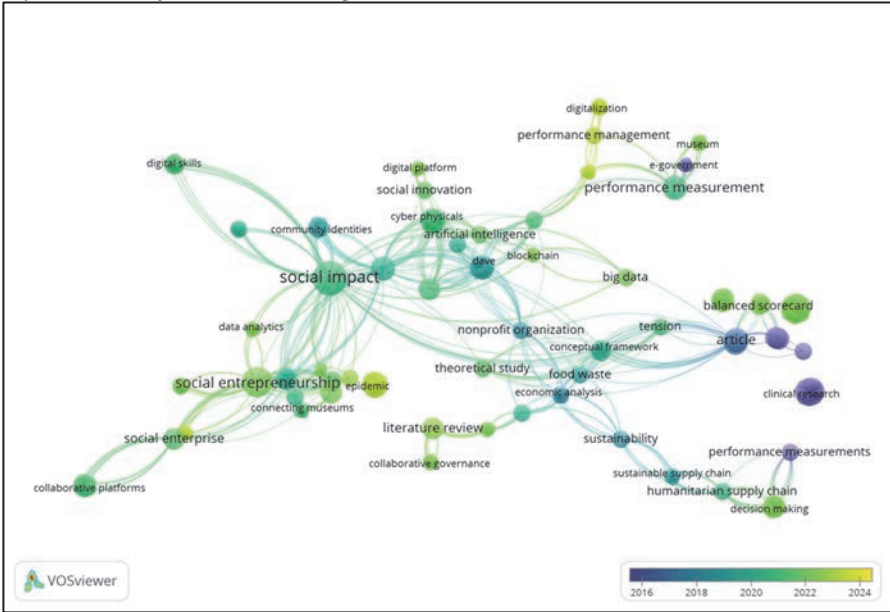
The VOSviewer keywords co-occurrence analysis with a full counting method shows the following result by a network visualization (Figure 8). The keyword colors demonstrate how recently (or not) they have been used in the existing literature. Digitalization (and related keywords of digital platform, AI, blockchain, and big data, data analysis), performance management and measurement (and related keywords of BSC, decision making, collaborative governance), and social entrepreneurship (and related keyword of social enterprise) are the most prevalent emerging topics in the literature considered in our analysis.

The all-keywords analysis done with VOSviewer allows us to identify the trending themes. Three key themes are type of tool, applicability to operations, and fields of application.

Themes several tools that can facilitate the implementation of SIA in SEOs. Most of the 36 selected documents discuss about digital platforms. Digital platforms could be effectively used for social innovation in the volunteering sector (Caridà *et al.*, 2022), and for supporting and assessing the new emerging hybrid communities and their distributed activities in the post-pandemic hybrid spaces (Manzini, Menichinelli, 2021). Furthermore, Collaborative and Sharing Economies (CSE) platforms are also used for mapping the social impact (Sanna, Michelini, 2021). Other digital technologies and tools are considered in some documents, such as blockchain; Internet of

Things; big data, open data, data analytics (van Elten *et al.* 2022; Ingrams, 2016; Yoon, Copeland, 2019; Zulkefly *et al.*, 2022). Some are literature reviews (Berardi, Valentinetti, 2023; De Bernardi *et al.*, 2021).

Figure 8 - VOSviewer overlay visualization of the co-occurrence analysis of all-keywords with factorial counting



Several authors highlight the importance of digitalization for operations. This includes governance performance (Ingrams, 2016; Grossi, Argento 2022), performance measurement and management (Patil *et al.*, 2022; Sardi *et al.*, 2022), dashboard and Balanced Scorecard (BSC) (Vărzaru, 2022), Decision Support Systems (DSS) (Laguna-Salvadó *et al.*, 2019), and value creation (Choi Kim, 2021; Davide, 2021; De Bernardi *et al.*, 2021). This is especially evident in healthcare management (Vărzaru, 2022); humanitarian supply chain management (Laguna-Salvadó *et al.*, 2019; Patil *et al.*, 2022); social services (Itkonen, 2004; Davide, 2021); cultural institutions (Agostino, Costantini, 2021; Choi, Kim, 2021); and in the intersection between public and private nonprofit sector (Ingrams, 2016; Grossi, Argento, 2021; Sardi *et al.*, 2022).

In general the digitalization of SIA in the SEOs context is mostly related to specific fields of activities, such as cultural, heritage, and museums (Ago-

stino, Costantini, 2021; Choi, Kim, 2021; Sakalauskas *et al.*, 2021), education (Ahmed, 2019), health care (Itkonen, 2004; Korhonen *et al.*, 2023; van Elten *et al.*, 2022; Vărzaru, 2022), humanitarian (Laguna-Salvadó *et al.*, 2019), well-being (Torres, Augusto, 2020), social assistance for youth and older people (Pawluczuk *et al.*, 2020; Peterlin *et al.*, 2021), food recovery and distribution (Michelini *et al.*, 2018; 2020), and community development. For instance, the Digital Access Vehicle (as referred as, DAVE) deployed a digital literacy program through a mobile transport platform to initially facilitate digital literacy and education delivery to female students in remote communities of Pakpattan. The project is carried out in collaboration with an Australian university, an Australian not-for-profit organization, and a Pakistan-based community organization.” (Ahmed, 2019).

Limitations and Further Research

As with any systematic literature review, there are limitations to the results as some relevant articles could be missed due to the specific keywords in the search parameters. Furthermore, our analysis has used just one database (Scopus). Future studies could take documents from different databases such as the Web of Science and Google Scholar and compare the results.

Further research could study how digitalization could increase the capability of the social economy organizations to measure and assess the social value created and distributed. Moreover, empirical evidence and practical experience of co-production and partnership between private and public organizations could explore how digitalization could facilitate data transmission, stakeholder engagements, transparency, and accountability.

Further study should consider all possible applications of SIA (not only for SEOs) and explore the existence of good practices both in business and social economy contexts. Furthermore, good practices in specific fields of nonprofit activities (e.g., blockchain applied in the food recovery and distribution charitable initiatives) should be analyzed in different further contexts for verifying the advantage of traceability and transparency of digitalization for accountability and social impact assessment.

Conclusion

The implementation of the Italian (and European) plan of recovery and resilience (PNRR) and the increasing attention to the United Nations 2030 SDGs are stimulating projects and initiatives that involve new technologies

and higher levels of digitalization in social economy organizations. Indeed, those experiences offer the opportunity to investigate how these digital innovations affect the capabilities of different actors (government, nonprofit, and business entities) to achieve social and sustainable goals.

The last ISTAT Census of the Nonprofit Institutions (NPIs) introduced, for the first time, a section of questions focused on the digitalization of NPIs. The results of this survey – presented May 2023, demonstrated that the digital transformation of these types of organizations is at its infancy. The digitization process is appearing in some industries, such as health, culture, education, food chain, humanitarian, and social assistance. Some tools are identified as useful for the SIA (e.g., culturomic tools, machine learning, image digitization, data aggregation and visualization, big data, artificial intelligence, robotics, blockchain), but empirical evidence of their effectiveness is poor at this moment.

Our study is a preliminary analysis of a specific part of the literature that explores the intersection of digitalization of social impact assessment in the context of social economy organizations. As technology continues to advance, a similar analysis in a few years may well show much different results.

References

- Agostino D., Costantini C. (2021), A measurement framework for assessing the digital transformation of cultural institutions: the Italian case, *Meditari Accountancy Research*, 30(4), pp. 1141-1168.
- Ahmed A. (2019), DAVE: A systematic approach to manage a social impact project, Proceedings of the 23rd Pacific Asia Conference on Information Systems: Secure ICT Platform for the 4th Industrial Revolution, PACIS 2019.
- Al-Saqaf W., Seidler N. (2017), Blockchain technology for social impact: opportunities and challenges ahead, *Journal of Cyber Policy*, 2(3), pp. 338-354.
- Arena M., Azzone G., Bengo I. (2015), Performance measurement for social enterprises, *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 26, pp. 649-672.
- Arvidson M., Lyon F. (2014), Social Impact Measurement and Non-profit Organizations: Compliance, Resistance, and Promotion, *Voluntas*, 25(4), pp. 869-886.
- Arvidson M., Lyon F., McKay S., Moro D. (2013), Valuing the social? The nature and controversies of measuring social return on investment (SROI), *Voluntary sector review*, 4(1), pp. 3-18.
- Bagnoli L., Megali C. (2011), Measuring performance in social enterprises. *Nonprofit and Voluntary Sector Quarterly*, 40(1), pp. 149-165.
- Bellucci M., Nitti C., Franchi S., Testi E., Bagnoli L. (2018), Accounting for social return on investment (SROI): The costs and benefits of family-centred care by the Ronald McDonald House Charities, *Social Enterprise Journal*, 15(1), pp. 46-75.
- Bengo I., Arena M., Azzone G. and Calderini M. (2016), Indicators and metrics for social business: a review of current approaches, *Journal of Social Entrepreneurship*, 1(2), pp. 1-24.

- Berardi L., Valentinetti D. (2022), Digitalization of Social Impact for Social Economy Organizations, *Canadian Journal of Nonprofit and Social Economy Research*, 13(2), pp. 116-122.
- Berardi L., Mook L., Rea M. A. (2021), Third sector accounting reform and integrated social accounting for Italian social economy organizations, *Management Control*, (2), pp. 165-188.
- Bloch B. (2012), Everyone's Story Counts: Measuring Social Impact in the Not-for-Profit Sector – an Overview. *Cosmopolitan Civil Societies Journal*, 4(3), pp. 1-18.
- Caridà A., Colurcio M., Melia M. (2022), Digital platform for social innovation: Insights from volunteering, *Creativity and Innovation Management*, 31(4), pp. 755-771.
- Choi B., Kim J. (2021), Changes and challenges in museum management after the COVID-19 pandemic, *Journal of Open Innovation: Technology, Market, and Complexity*, 7(2), Scopus.
- Clark C., Rosenzweig W., Long D., Olsen S. (2004), Double Bottom Line Project Report: Assessing Social Impact In Double Bottom Line Ventures, *Working Paper Series* (No. 13). -- Retrieved from <http://repositories.cdlib.org/crb/wps/13> (December 2022).
- Corvo L., Pastore L. (2021), The Usefulness of Sharing Social Impact Data. Early Findings from an International Benchmarking on SROI Assessments, *The Journal of Entrepreneurial and Organizational Diversity*, 9(2), pp. 45-61.
- Corvo L., Pastore L., Manti A., Iannaci D. (2021), Mapping social impact assessment models: A literature overview for a future research Agenda, *Sustainability*, 13(9), pp. 1-16.
- Costa E., Andreaus M. (2020), Social impact and performance measurement systems in an Italian social enterprise: a participatory action research project, *Journal of Public Budgeting, Accounting and Financial Management*, 33(3), pp. 289-313.
- Costa E., Dossi C. (2022), L'approccio dialogico alla Rendicontazione Integrata Cooperativa: il framework Dial-Coore, *Impresa Progetto*, (2), pp. 1-23.
- Costa E., Pesci C. (2016), Social impact measurement: why do stakeholders matter?, *Sustainability Accounting, Management and Policy Journal*, 7(1), pp. 99-124.
- Costa E., Parker L.D., Andreaus M. (2014), *Accountability and social accounting for social and non-profit organizations*, Emerald Group Publishing.
- Costa E., Ramus T., Andreaus M. (2011), Accountability as a managerial tool in non-profit organizations: Evidence from Italian CSVs, *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, 22(3), pp. 470-493.
- Courtney P. (2018), Conceptualising Social Value for the Third Sector and Developing Methods for Its Assessment. *VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations*, 29(3), pp. 541-557.
- Davide F. (2021), Multi-Stakeholder Digital Collaboration and Social Innovation in Social Services: The Cross Project and the Smart Cities. In F. Davide, A. Gaggioli, G. Misuraca (Eds.), *Emerging Communication: Studies in New Technologies and Practices in Communication*. IOS Press.
- De Bernardi P., Bertello A., Forliano C., Orlandi L.B. (2022), Beyond the "ivory tower". Comparing academic and non-academic knowledge on social entrepreneurship, *International Entrepreneurship and Management Journal*, 18(3), pp. 999-1032.
- Depedri S. (2016), La valutazione dell'impatto sociale nel Terzo Settore. Il posizionamento scientifico di Euricse e il metodo ImpACT. *Euricse. Position paper*. -- Retrieved from <https://euricse.eu/wp-content/uploads/2016/09/Position-Paper.pdf> (December 2022).
- Dicuonzo G., Dell'Atti V., Fusco A., Donofrio F. (2021), Big data and artificial intelligence for health system sustainability: The case of Veneto Region, *Management Control*, pp. 31-52.

- Esteves A. M., Franks D., Vanclay F. (2012), Social impact assessment: The state of the art. *Impact Assessment and Project Appraisal*, 30(1), pp. 34-42.
- EVPA (2013), *A Practical Guide to Measuring and Managing Impact*, European Venture Philanthropy Association, pp. 1-123. -- Retrieved from https://www.oltreventure.com/wp-content/uploads/2015/05/EVPA_A_Practical_Guide_to_Measuring_and_Managing_Impact_final.pdf (December 2022).
- GECES (2014), *Proposed Approaches to Social Impact Measurement in European Commission legislation and in practice relating to EuSEFs and the EaSI*. -- Retrieved <https://op.europa.eu/en/publication-detail/-/publication/0c0b5d38-4ac8-43d1-a7af-32f7b6fcf1cc> (December 2022).
- Gibbon J., Dey C. (2011), Developments in social impact measurement in the third sector: Scaling up or dumbing down?, *Social and Environmental Accountability Journal*, 31(1), pp. 63-72.
- Grieco C., Micheline L., Iasevoli G. (2015), Measuring Value Creation in Social Enterprises: A Cluster Analysis of Social Impact Assessment Models, *Nonprofit and Voluntary Sector Quarterly*, 44(6), pp. 1173-1193.
- Grossi G., Argento D. (2022), The fate of accounting for public governance development. *Accounting, Auditing and Accountability Journal*, 35(9), pp. 272-303.
- Hadad S., Drumea Găucă O. (2014), Social impact measurement in social entrepreneurial organizations, *Management and Marketing*, 9(2), pp. 117-134.
- Hagerty A., Rubinov I. (2019), Global AI ethics: a review of the social impacts and ethical implications of artificial intelligence, *arXiv preprint arXiv, 1907.07892*. -- Retrieved from <https://arxiv.org/pdf/1907.07892.pdf> (December 2022).
- Ianniello M., Iacuzzi S., Fedele P., Brusati L. (2019), Obstacles and solutions on the ladder of citizen participation: A systematic review, *Public Management Review*, 21(1), pp. 21-46. Doi: 10.1080/14719037.2018.1438499.
- Ingrams A. (2016). Assessing Open Government Performance through Three Public Administration Perspectives: Efficiency, Democratic Responsiveness, and Legal-rational Process, *Chinese Public Administration Review*, 7(1), pp. 110-145.
- ISTAT (2021). *Struttura e profili del settore non profit - Censimento Permanente - Anno 2019*. -- Retrieved from https://www.istat.it/it/files//2020/10/REPORT_ISTITUZIONI_NONPROFIT_2018.pdf (December 2022).
- Itkonen P. (2004), *North karelia regional chain of care: Finnish experiences* (Vol. 100).
- Kah S., Akenroye T. (2020), Evaluation of social impact measurement tools and techniques: a systematic review of the literature, *Social Enterprise Journal*, 16(4), pp. 381-402.
- Klarin A., Suseno Y. (2023), An Integrative Literature Review of Social Entrepreneurship Research: Mapping the Literature and Future Research Directions, *Business and Society*, 62(3), pp. 565-611.
- Korhonen T., Sillanpää V., Jääskeläinen A. (2023), Anchor practices that guide horizontal performance measurement: an interventionist case study of the financial aspect of new technology implementation in healthcare, *Journal of Management and Governance*, 27(3), pp. 787-816.
- Laguna-Salvadó L., Luras M., Okongwu U., Comes T. (2019), A multicriteria Master Planning DSS for a sustainable humanitarian supply chain, *Annals of Operations Research*, 283(1-2), pp. 1303-1343.
- Loukopoulos A., & Papadimitriou D. (2022), Organizational growth strategies for Greek social enterprises' social impact during the COVID-19 pandemic, *Social Enterprise Journal*, 18(4), pp. 541-562.
- Lytras M.D., Visvizi A. (2019), Big data and their social impact: Preliminary study. *Sustainability*, 11, 5067, pp. 1-18.

- Maier F., Schober C., Simsa R., Millner R. (2015). SROI as a Method for Evaluation Research: Understanding Merits and Limitations, *Voluntas*, 26(5), pp. 1805-1830.
- Mangla S.K., Kazancoglu Y., Ekinci E., Liu M., Özbiltekin M., Sezer M.D. (2021), Using system dynamics to analyze the societal impacts of blockchain technology in milk supply chains refer, *Transportation Research Part E: Logistics and Transportation Review*, 149, 102289, pp. 1-21.
- Manzini E., Menichinelli M. (2021), Platforms for re-localization. Communities and places in the post-pandemic hybrid spaces, *Strategic Design Research Journal*, 14(1), pp. 351-360.
- Marin D. H., Solorzano-Garcia M. (2021), SIAMES: Social Impact Advisor and Measurement System, *IEEE Technology and Society Magazine*, 40(1), pp. 87-95.
- Menichinelli M. (2020), Exploring the impact of Maker initiatives on cities and regions with a research through design approach, *Strategic Design Research Journal*, 13(1), pp. 92-109.
- Michellini L., Grieco C., Ciulli F., Di Leo A. (2020), Uncovering the impact of food sharing platform business models: a theory of change approach, *British Food Journal*, 122(5), pp. 1437-1462.
- Michellini L., Principato L., Iasevoli G. (2018), Understanding Food Sharing Models to Tackle Sustainability Challenges, *Ecological Economics*, 145, pp. 205-217.
- Mook L., Whitman J.R., Quarter J., Armstrong A. (2015), *Understanding the Social Economy of the United States*, University of Toronto Press.
- Mwambela N. K., Mwendia S. N. (2019), Digitization Impact Assessment Model for Secondary Schools: Case of Nairobi County in Kenya, *Advances in Science, Technology and Engineering Systems Journal*, 4(3), pp. 194-197.
- Nguyen L., Szkudlarek B., Seymour R.G. (2015), Social impact measurement in social enterprises: An interdependence perspective, *Canadian Journal of Administrative Sciences*, 32(4), pp. 224-237.
- Nicholls A. (2018), A General Theory of Social Impact Accounting: Materiality, Uncertainty and Empowerment, *Journal of Social Entrepreneurship*, 9(2), pp. 132-153.
- Nielsen J.G., Lueg R., Van Liempd D. (2021), Challenges and boundaries in implementing social return on investment: An inquiry into its situational appropriateness, *Nonprofit Management and Leadership*, 31(3), pp. 413-435.
- Nigri G., Agulini A., Del Baldo M. (2021), The UN Global Compact SDG Action Manager: How benefit corporations and purpose-driven businesses are driving the change, *Handbook of Sustainability-Driven Business Strategies in Practice* (pp. 173-189).
- Onyx J., Darcy S., Grabowski S., Green J., Maxwell H. (2018), Researching the Social Impact of Arts and Disability: Applying a New Empirical Tool and Method, *Voluntas*, 29(3), pp. 574-589.
- Patil A., Madaan J., Chan F.T.S., Charan P. (2022), Advancement of performance measurement system in the humanitarian supply chain, *Expert Systems with Applications*, 206.
- Pawluczuk A., Hall H., Webster G., Smith C. (2020), Youth digital participation: Measuring social impact, *Journal of Librarianship and Information Science*, 52(1), pp. 3-15.
- Perkiss S., Dean B., & Gibbons B. (2019), Crowdsourcing Corporate Transparency through Social Accounting: Conceptualising the 'Spotlight Account', *Social and Environmental Accountability Journal*, 39(2), pp. 81-99.
- Peterlin J., Dimovski V., Bogataj M. (2021), *Engineering technology-based social innovations accommodating functional decline of older adults*, 54, pp. 762-767.
- Purwohedi U., Gurd B. (2019), Using Social Return on Investment (SROI) to measure project impact in local government. *Public Money and Management*, 39(1), pp. 56-63.
- Rawhouser H., Cummings M., Newbert S.L. (2019). Social Impact Measurement: Current Approaches and Future Directions for Social Entrepreneurship Research, *Entrepreneurship: Theory and Practice*, 43(1), pp. 82-115.

- Ricciuti E., Calo F. (2018), Are foundations assessing their impact? Concepts, methods and barriers to social impact assessment in Italian foundations, *International Review on Public and Nonprofit Marketing*, 15(4), pp. 553-574.
- Sakalauskas L., Dulskis V., Lauzikas R., Miliauskas A., Plikynas D. (2021), A probabilistic model of the impact of cultural participation on social capital, *Journal of Mathematical Sociology*, 45(2), pp. 65-78.
- Salamon L.M., Sokolowski S.W. (2016), Beyond Nonprofits: Re-conceptualizing the Third Sector, *Voluntas*, 27(4), 1515-1545.
- Sanna V. S., Michelini L. (2021), Mapping the impact: Assessment methodologies and policy implications of the collaborative and sharing economy, *Becoming a Platform in Europe: On the Governance of the Collaborative Economy* (pp. 231-259).
- Sardi A., Sorano E., Giovando G., Tradori V. (2023), Performance measurement and management system 4.0: an action research study in investee NPOs by local government, *International Journal of Productivity and Performance Management*, 72(4), pp. 849-872.
- Sargent J., Ahmed A. (2017), What is IT for social impact? A review of literature and practices, *IEEE Technology and Society Magazine*, 36(4), pp. 62-72.
- Seyedsayamdost E., Vanderwal P. (2020), From Good Governance to Governance for Good: Blockchain for Social Impact, *Journal of International Development*, 32(6), pp. 943-960.
- Sherren K., Parkins J.R., Smit M., Holmlund M., Chen Y. (2017), Digital archives, big data and image-based culturomics for social impact assessment: opportunities and challenges, *Environmental Impact Assessment Review*, 67, pp. 23-30.
- Skulimowski A.M.J. (2021), *Social Impact Assessment of Open Knowledge Platforms Based on User Community Features*, pp. 225-235.
- Social Impact Investment Task Force (2014). *La finanza che include: gli investimenti ad impatto sociale per una nuova economia. Rapporto Italiano della Social Impact Investment Task Force istituita in ambito G8*. -- Retrieved from <https://www.humanfoundation.it/wp-content/uploads/2019/07/6-Rapporto-Italiano.pdf> (December 2022).
- Spanò R., Bagnoli C., Caldarelli A., Massaro M. (2023), Blockchain implications for the accounting realm: A critique of extant studies, *Management Control*, 1, pp. 21-42.
- Terzjus (2022), *Dal Non Profit al Terzo Settore una Riforma in Cammino. 2° Rapporto sullo stato e le prospettive del diritto del terzo settore in Italia. Terzjus Report 2022*. -- Retrieved from <https://terzjus.it/articoli/dal-non-profit-al-terzo-settore-una-riforma-in-cammino-terzjus-report-2022/> (December 2022).
- Torres P., Augusto M. (2020), Digitalisation, social entrepreneurship and national well-being, *Technological Forecasting and Social Change*, 161.
- United Nations (2003), Handbook on Non-Profit Institutions in the System of National Accounts. *New York*, p. 327. -- Retrieved from https://unstats.un.org/unsd/publication/seriesf/seriesf_91e.pdf (December 2022).
- United Nations (2018), Satellite Account on Non-profit and Related Institutions and Volunteer Work. *Studies in Methods*, p. 119. -- Retrieved from https://unstats.un.org/unsd/nationalaccount/docs/UN_TSE_HB_FNL_web.pdf (December 2022).
- Valentinetti D., Rea M.A. (2022), Blockchain e bilancio di esercizio: verso una convergenza di interessi “distribuita”?, *Management Control*, 2, pp. 15-40.
- van Elten H. J., Sülz S., van Raaij E.M., Wehrens R. (2022), Big Data Health Care Innovations: Performance Dashboarding as a Process of Collective Sensemaking, *Journal of Medical Internet Research*, 24(2).
- Vărzaru A.A. (2022), An Empirical Framework for Assessing the Balanced Scorecard Impact on Sustainable Development in Healthcare Performance Measurement, *International Journal of Environmental Research and Public Health*, 19(22).
- Yáñez-Valdés C., Guerrero M., Barros-Celume S., & Ibáñez M. J. (2023), Winds of change

- due to global lockdowns: Refreshing digital social entrepreneurship research paradigm, *Technological Forecasting and Social Change*, 190.
- Yoon A., Copeland A. (2019), Understanding social impact of data on local communities, *Aslib Journal of Information Management*, 71(4), pp. 558-567.
- Zamagni S., Venturi S., Rago S. (2015), Valutare l'impatto sociale. La questione della misurazione nelle imprese sociali, *Impresa Sociale*, 6(12), pp. 77-97.
- Zulkefly N.A., Abdul Ghani N., Chin C. P.-Y., Hamid S., Abdullah N.A. (2022), The future of social entrepreneurship: modelling and predicting social impact, *Internet Research*, 32(2), pp. 640-653.

Competencies for Sustainable Development Goals Accounting: Educating public management for disclosure and reporting

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Abstract

Identifying competencies to report SDGs in accountants can enhance corporate disclosure effectiveness and provide more robust information to society. Public managers are called to control through the lens of collective objectives and multiple stakeholders' interests. Based on the knowledge-attitude-skills triad and the political Delphi method, we could identify the antecedent factors to disclose SDGs successfully. The purpose was critical to developing competencies, aligning leaders' mindsets, and suppressing public management barriers to reporting corporate SDGs. By identifying specific competencies, we bring the individual perspectives of accounting sustainability education.

Keywords: Competencies, Sustainable development goals, Sustainable accounting, Sustainability education, Sustainable Reporting, Sustainable accounting compliance,

1. Introduction

Since its conception, sustainable development (SD) has become central in academic and corporate spheres. Protecting future generations and ensuring the same civilizing standards of today (Brundtland, 1987) involves economic, social, and environmental commitments (Elkington, 1994) in a win-win dynamic between organizations and individuals. Institutionally, the United Nations (UN), the World Bank, and the World Trade Organization

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(WTO) were important global front-line actors in the governance and dissemination of actions and undertook SD as their primary political objective (Matsushita & Schoenbaum, 2015).

Until 2015, the debate on SD surrounded the issues of reaching non-specific objectives with relative dispersion. The Sustainable Development Goals (SDGs), more specific and interdisciplinary than their predecessors, the Millennium Goals (MDGs), brought an action plan that must be addressed by organizations and public management (Nilsson *et al.*, 2017). The global warming crisis, globalization, the post-pandemic scenario, and the onset of the digital revolution are trends already foreseen by academia in the ontology of events that expose how the physical, biological, economic, and social systems are interrelated. Moreover, above all, how thinly balanced these forces are when under an impact of extreme magnitude (Atik *et al.*, 2023; Murali *et al.*, 2023).

For that, organizations have an apparent intention to compel SDGs Agenda. The “best” organizations seek greener through integrated reports, certifications, partnerships, and new, cleaner products and processes (Lans *et al.*, 2014). On the other hand, terrible disasters occur within these organizations, reflecting severe failures in their managers’ and accountants’ responsibility, such as the rupture of the Mariana and Brumadinho dams that killed more than 300 people in Brazil. The company responsible for these tragedies had fancy and complete sustainability reporting raising some failures or, at least, some clues of greenwashing in their disclosing reports.

Thus, despite their well-intentioned efforts, not often do managers and accountants fail to legitimate sustainable practices by SDGs disclosing reporting (Elalfy *et al.*, 2020). While recognizing the progress that SDGs have brought to the way public and private policies are formulated, the consistent difficulties in complying with and reporting robust indicators (Avrampou *et al.*, 2019; Dickens *et al.*, 2019; Erin *et al.*, 2022; Hansson *et al.*, 2019). Simply enforcing the 2030 Agenda is a challenging task. It requires qualification and motivation (Martins *et al.*, 2022). The main challenges in the transition to sustainability in organizational reporting rely in the individual level, of human competencies’ shortcomings (Dalton, 2020; Kjellgren & Richter, 2021).

Among the many difficulties for accountants and managers, we can identify a) the complexity of 169 goals dealing with different subjects (Joshi *et al.*, 2015), b) a basic knowledge of data analytics (Sierra García *et al.*, 2022), c) the myriad of SDGs frameworks (Erin *et al.*, 2022; Sætra, 2021; Tsalis *et al.*, 2020), c) the addressing of marketing purposes with the reporting, and,

d) employees' sensibility and motivation to comply with the Agenda (Flores *et al.*, 2022).

Organizational transition to sustainability is directly linked to the capacity to promote individual competencies among employees, shaping a new corporate culture (Bask *et al.*, 2020; Dyllick & Hockerts, 2002). In this sense, an emergency light goes on when discussing public accounting managers' capability to comply with sustainability through reporting (Leal Filho *et al.*, 2022), especially with the SDGs Agenda. Aside from technical skills and the bureaucratic process of public management connected to knowledge, competencies related to individual morals, values and abilities are inflection points for changing attitudes in favor of the DS (Florea *et al.*, 2013; Molderez & Ceulemans, 2018; Shrivastava, 2010).

The competencies for sustainability (Lambrechts *et al.*, 2013; Wiek *et al.*, 2011) involve the purposes beneath the limits of public management techniques (van Marrewijk & Werre, n.d.). On the other hand, the pedagogical development of competencies is structured on discussions involving competence scales, teaching methods, and expected results (Agirreazkuenaga, 2020; Aleixo *et al.*, 2018; Grant & Lips-Wiersma, 2017). Investigations discussing how organizations, especially public organizations, can develop human competencies are increasingly needed, while there is an open debate on properly incorporating a broad agenda in sustainability reporting (Martins *et al.*, 2019).

The human development of managers and accountants is one of the critical factors for developing more robust and accurate reporting. (Demssie *et al.*, 2019; Grant & Lips-Wiersma, n.d.; Molderez & Ceulemans, 2018). Nevertheless, there is a long road ahead for research efforts to break through the barrier to implementing education for sustainable development (ESD) based on non-cognitive competencies (Brandt *et al.*, 2019; Sabbir & Taufique, 2022; Zhou, 2017). What we are sure of is that disclosing sustainability is critical to share and stakeholders' interests (Milne & Gray, 2013), and a higher-level of quality in this process is directly linked to the individual development of accountants (Boiral *et al.*, 2019).

Often, public management is considered the primarily agent of change in society for sustainable development (Martins *et al.*, 2022). However, state owned companies fight against institutional pressures in disclosing non-financial information to society (Ligorio *et al.*, 2022). State ownership significantly affects this process, leading them to disclose less sustainability information than partially state-owned or private companies (Argento *et al.*, 2019). Political pressures on public accountability intensify tensions around

public managers' behaviour and the debate on how public managers can overcome institutional logic (Capalbo *et al.*, 2021).

In addition, the literature on sustainable accountability in public management is scarce (Haigh and Hoffman, 2014). Sustainability reporting on public management focuses on identifying different methods (Williams, 2015), addressing environmental indicators (Qian *et al.*, 2011) and stakeholder engagement (Kaur & Lodhia, 2019). Preliminary insights are on the antecedents of sustainability reporting (Lodhia & Jacobs, 2013), mainly found in the organizational level of analysis. Although public management exists in many different contexts worldwide, previous research has focused on single regions without extensive knowledge of standardized systems (Papenfuß *et al.*, 2018) or narrowed to qualitative approaches (Argento *et al.*, 2019).

Sustainability accounting, accountability and reporting in the public sector disclosure still need to be explored for not presenting consistent evidence of the role of public accountants, taken as economic and social agents, in disclosing sustainability. Human competencies can be a prominent path to investigate the phenomena, using a quantitative approach to fulfil open spaces in the individual level analysis, highlining the role of the accountant in this process.

For instance, human competencies for sustainability are more often described in the literature to the knowledge of private organizations, whereas no literature shows a specific approach individual-level on public management, especially about the reality of emerging economies (De Carvalho *et al.*, 2015; Heiskanen *et al.*, 2016; Wolf *et al.*, 2022).

To this end, we question “How to develop competencies in accountants for report SDGs in their organizational disclosing process? We identify the antecedents of human competencies to sustainability in organizations within public management using a sample of accounting managers from municipalities in Brazil.

Governments in its three spheres (municipal, state, and federal), non-governmental organizations (NGOs), industry associations, companies or for-profit organizations, universities, regulating agencies or autarchies, different institutional arrangements for group representation, and, finally, individuals are involved in the problem and co-responsible for the solution. Nevertheless, a more widespread assembling and activity coordination fall under the public administration's responsibility, considering its relevance to the social and economic context.

The first step for implementing the Agenda is, no doubt, qualifying professionals to make decisions favoring SD. However, unfortunately, little is known about the public accountant's level of understanding regarding SDGs,

let alone how the public servants place themselves as agents of change and even less about how capable that servant would be of managing large-scale data to subsidize new policies. The predecessor of the SDG good reporting is the development of human competencies for this procedure. Developing competencies in public servants can stimulate sustainable development in organizations by activating personal motivations (Patro, 2020).

The paper is structured in sequential sections from the theoretical foundation, going forward to the methodological explanations describing the procedures in this research to reach the final discussion and conclusions on the subject.

2. Literature review

Management accounting and control in the public sector emphasizes that the public sector operates differently from private companies and non-profits due to its role in executing public policy. This specific practice is portrayed as intricately tied to politics, leading to unique forms of budgeting, cost accounting, and performance management (Pollanen, 2011). Accountants primarily deal with internal financial information and support managerial decision-making through cost analysis, budgeting, performance evaluation, and financial forecasting. In contrast, public accounting deals with external financial reporting for various clients, offering services like auditing, tax preparation, financial consulting, and forensic accounting. Nevertheless, distinct focuses, work environments, and competencies sets are required for these two accounting branches.

Sustainability accounting meets public management accounting for pursuing the same common future and collective interests. In this sense, accountants, when certified or working in public management, tend to picture themselves as more ethically oriented than their peers (Ward, 1993), while no differences between public and private organizations were found when it comes to hiring and promoting employees based on their technical skills (Ragland, 2014). Also, public commitments and welfare promotion are essential objectives that guide their professional duties.

While public management offers a strongly regulated environment for new management and accounting methods, public accountants are pressured to disclose SDG information in public reporting adequately.

Their capacity to acquire new competencies individually is vital to successfully reporting, embracing this complexity and reaching broader com-

munication and legitimacy objectives. Enabling conditions (accounting capabilities, profession and digitalisation) is one rich lens to understand, from a plurality of perspectives, the antecedent factors that can stimulate accountants' competencies and their complicated responsibility to report SDGs information under public management context.

2.1 Competencies in sustainability reporting

The term competencies repeatedly appear in the daily life of individuals and companies. However, the concepts that make understanding the terms possible are relatively fragmented, making it difficult to standardize the audience's understanding. McClelland (1990) and Boyatzis (1982) initially related the term to an individual's performance, while French authors like Zarifian (1999) and Le Boterf (1995) describe the word "competence" based on the relationships and environmental variability.

Prévot *et al.* (2010) analysed the definitions of competence and highlighted three aspects concerning the purposes "Competency is a complex organizational tangle arising from interactions between knowledge, practices, and attitudes". Competencies consist of knowledge, skills, and attitudes that enable the successful performance of the task (Fleury & Fleury, 2001; Mulder, 2014). In Brazil, the idea of KSA (competence as a set of knowledge, skills, and attitudes) was initially disseminated by Fleury and Fleury (2001) based on studies by Parry (1996).

In general terms, Parry (1996) and Brophy & Kiely (2002) present the basic competencies model: knowledge-skill-attitude, the most cited models in management and accounting sciences. With this approach, Parry (1996, p.50) summarizes the concept of competencies as "a cluster of related knowledge, skills, and attitudes that affect most of a function (a role or responsibility), that correlate to the performance that can be measured against parameters.

This model can be more detailed as K = Knowledge (knowledge acquired throughout life, in schools, universities, courses, etc. ex: Knowledge of the competition and negotiation technique); S = skills, how to do (the ability to perform a specific physical or mental task, ex: Competition analysis and negotiation); A = attitudes, intention to do (behaviours we have in the face of everyday situations and the tasks we carry out in our day-to-day activities, ex: Participating in competition and negotiating) (Brophy & Kiely, 2002; Parry, 1996).

In general, competencies for sustainability stimulate participatory processes, empowering governance structures and encouraging and promoting feedback cycles that institutionalize changes (Barth *et al.*, 2007). However, attention is drawn to the need for change in how individuals work. Changing in favour of sustainability is breaking a paradigm of the pure practical concept and seeking maximum efficiency (De Carvalho *et al.*, 2015).

In the same way, the World Council for Sustainable Development (WBCSD, 2008) understands that competencies for sustainability are comprised of individual preparation for the inclusion of needs and the aspirations of different interest groups and the promotion of balance and recognition of rights. According to the agency's report, critical competencies for sustainability follow the knowledge-skill-attitude scheme by Parry (1996) and Brophy & Kiely (2002). In this same sense, Fleury & Fleury (2001) define societal competence as responsible and recognized knowledge, which implies mobilizing, integrating, and transferring knowledge, resources, and abilities that add economic value to the organization and social value to the individual.

Competencies focused on sustainability should add value to the organization, the individual, society, and the environment (De Carvalho *et al.*, 2015). The authors state that the need to expand the consequences of decisions made by employees for social purposes, aside from the organization, can make them more autonomous and ready for changes. The most critical competencies involve understanding the interdependence between companies and society, knowing how to deal with diversity, and being open to joint discussions and solutions built through dialogue (Hind *et al.*, 2009).

Sustainability change will contest the basis of organizational values and, as a result, power and cultural structures. When seeking to reach the Triple Bottom Line (Elkington, 1994) in its strategic matrix, organizations begin to accept new rules that pertain to meeting social and ecological needs more than their growth and profit-generating interests.

In this context, education is the only way to promote a revolution in habits and processes. Education can guide people to reflect and act according to a critical and emancipatory perspective, rupturing the traditional system of business as usual (Springett, 2005).

For the company to achieve full development, managers and accountants should have specific competencies and deliveries to conduct other individuals towards the same organizational goals (De Carvalho *et al.*, 2015; Hind *et al.*, 2009). In specific contexts such as emerging economies (Goulart *et al.*, 2021a; Goulart *et al.*, 2021b) or public administration, changes have more institutional barriers to overcome.

In short, the generalist competencies for the sustainability field (Wiek *et al.*, 2011) can be summarized in two changes: one aimed at the individual who should rationalize systemically, understanding the complex systems of economic, environmental and social; the second based on the organizational level itself, meaning that, for the individual to be able to act effectively, the organization should have internalized sustainability values or, at least have the intention of having them to make the necessary process changes feasible. However, some changes after the SDGs occurred accelerating the pace of this change (Quiroz-Niño & Murga-Menoyo, 2017).

Nevertheless, the contributions that tackle factors that compose the competencies for reporting sustainability point to the identification of the main themes that deserve emphasis, such as the excellent use of data resources, collaborative work, formal training, qualification of the professional, communication, positive relationships, support articulation, team collaboration, decision-making, and management process (Maas *et al.*, 2016; Munzarova *et al.*, 2022). In this sense, the non-cognitive competencies appear fundamental for the sustainability disclosure and reporting (Caniglia *et al.*, 2016). Rimanoczy (2020) developed a competency-based model that goes beyond technical competencies, incorporating emotional aspects and other non-cognitive paradigms corroborating with Shrivastava (2010) and the need of a passion for sustainability. This passion can only be developed through a holistic pedagogy integrating physical and emotional learning with traditional cognitive knowledge about sustainable management.

Literature contributions demonstrate a wide range of focuses and methods, and theoretical repertoires to approach the issue that is the object of this research. As such, despite important themes regarding SDGs competencies, it was defined that the work will follow the premises imposed by the theoretical reference, remaining with the most traditional and cited construct of Parry (1996) and Brophy & Kiely (2002). This view is justified to fill the literature gap, considering the greater theoretical, empirical, and social importance since it meets the needs of organizations in understanding how to comply with the Agenda of its managers and employees. In addition, it was found that international literature presented the theme in a way that is more aligned to the education context than studies that report experiences or propose competence development models for the 2030 Agenda and SDGs in organizations.

Educational models for developing SDG competencies in managers and accountants need to demonstrate skills and the difficulties of individual qualification. As a definition, we adopted the general and classical concept of Parry (1996) (Table 1).

Table 1 - The triad model explained

Factors	Metrics	Description	Sources
Knowledge	Data Management	Statistical perspicuity, critical analysis of data, communication and synthesis mastery, and proficiency in proposing new solutions	Munzarova S., Kostalova J., & Fialova E. (2022).
	Formal training	schooling, study level, dimensions of training, hours of corporate training	Maas K., Schaltegger S., & Crutzen N. (2016) Perego P., & Kolk A. (2012)
	Qualification	background in sustainability management, specialization, and domain in accounting reports	Zanellato G., & Tiron-Tudor A. (2021); Farooq M. B., Ahmed A., & Nadeem M. (2018)
Skills	Communication	Transmitting a message and eventually receiving another message in response.	Probst <i>et al.</i> (2019); Urban & Naidoo (2012); Girella L., Zambon S., & Rossi P. (2021)
	Positive relationships	Being responsible in relationships, positive thinking styles, attentive listening, expressing gratitude, and dealing with difficulties	Anshari M., & Hamdan M. (2022), Boiral <i>et al.</i> (2020)
	Support articulation	Influencing people to achieve a goal and convincing them to follow a particular line of work	
	Team collaboration	Share responsibilities and efforts to solve problems.	
Attitudes	Decision-making	choice or intention to obtain some result under specific resources and information	Subramanian K. R. (2017)
	Management Process	discipline in which people use various methods to discover, model, analyze, measure, improve, optimize, and automate business processes	EIHaffar G., Durif F., & Dubé L. (2020); Boiral <i>et al.</i> (2020)

Source: authors

Figure 1 presents the literature’s identified constructs and metrics presented in recent studies, derived from the KSA model of Brophy & Kiely (2002) and Parry (1996) to report SDGs organizational performance.

2.2 Sustainability Accounting

Sustainability, seen as a concept that seeks to establish the relationship between the continuity of human activities on Earth and the resulting reduc-

tion of the impacts inherent to these processes, has, in accountability, an essential ally for the dissemination of organizational information that enables its communication with society (Brown, 2009; Cho *et al.*, 2020). Organizations, in turn, have increased interest in disclosing information related to sustainability and seeking to establish criteria that ensure greater credibility and transparency in this information (Schaltegger & Zvezdov, 2015). Establishing this communication, however, is imbricated in a series of characteristics linked to Sustainability accounting, that is, an accounting practice that seeks to ensure means for organizations to effectively communicate to stakeholders the disclosure resulting from their environmental and social practices with the issues related to sustainability (Boiral *et al.*, 2019).

Within sustainability reports, organizations have a way of expanding communication with stakeholders to ensure legitimated information that demonstrates its environmental disclosure (Monteiro *et al.*, 2021). Initiatives such as the Global Initiative (GRI) and the International Integrated Reporting Framework (IIRF) has been adopted as incremental innovation that contributes to a new perspective on reporting and disclosure of accounting data (Hsiao *et al.*, 2022).

However, O'Dwyer and Owen (2005) bring a critical perspective of analysis of the efficiency of these reports when they understand that the organizational intention of valuing its image in the market often subdues the potential contribution of accountability as a form of ensuring the credibility of the data made available to stakeholders. Furthermore, from a more dialogic perspective, sustainability accounting and reporting hold a solid potential to minimize the substantial and merely managerial perspective that pursues social responsibility initiatives and socially responsible investment (Diouf & Boiral, 2017) communications to the market (Rankin *et al.*, 2011). Instead, this argument opens space for a deeper discussion about how accountability, more specifically, sustainability accounting, may create ways of disclosing data and accounting information of organizations to increase their credibility in the market and society (Maroun, 2017). Based on the growing demand for organizational reports, there is a concern regarding the training and development of professionals and future professionals who dialogue with society, demonstrating from credible data how organizations have played their role in line with sustainable perspectives.

Considering accountants' education and the possibilities that sustainability accounting brings to the disclosure of accounting information, we emphasise the critical understanding of this accounting instrument from the perspective of communication quality with stakeholders (Diouf & Boiral, 2017; Maroun, 2017; Bellucci, 2019). Sustainable disclosure and its correlation

with the company performance (Clarkson *et al.*, 2008; Schaltegger & Zvezdov, 2015; Moteiro *et al.*, 2021), the need to index and follow the guidance of international entities such as GRI (Stefanescu, 2022) and IIRF (Hsiao *et al.*, 2021) led to greater credibility and legitimacy regarding the information disclosed to the market and society (Rankin *et al.*, 2011; Diouf & Boiral, 2017).

Thus, the specificity but interdisciplinary characteristic that education for sustainability accounting must have needs to be clarified. We need robust methods to achieve impactful results to develop ethical leaders who seek to establish an explicit and legitimate dialogue with society (Cho *et al.*, 2020). Conclusively, this work seeks to establish a discussion from this theoretical contribution that encompasses Sustainability accounting and individual education to address new perspectives in accountants' performance.

3. Research method

Considering the triad definition of competence (Parry, 1996; Brophy & Kiely, 2002) as our theoretical archetype, we proceed with the Delphi Method to find empirical information.

3.1 Data Collection and Method Procedures

The Delphi method is a qualitative research technique that seeks a consensus regarding a specific definition or concept. It is used when there is a lack of clarity regarding a particular phenomenon, and experts' opinions are sought to analyze the subject. The technique is designed through questionnaires (structured or not) in which several rounds were held to reach a consensus of answers (Kayo, Securato, 1997; Landeta, 1999). The difference between Delphi and interviews or surveys is that the answers from the experts are compared, and the results are presented in sequential rounds until a subject is clarified. Commonly, this method is employed for technological forecasting or something that has not yet materialized in the present (Facione, 1990; Linstone & Turoff, 2002).

Our experts' samples were chosen based on criteria that considered two main characteristics: a) being a senior accountant of a municipality in Brazil for at least five years; b) taking part in a project related to the SDGs on public management. Thus, the National SDGs Commission (CNODS) members were connected by their registration data on the Partnerships and Means of Implementation (SDG 17) discussion group. Of the 25 experts, 11 answered

the first round, and 10 answered the second round. The sample is considered semi-convenient, meaning that the members from CNODS were accessed by the intervention of an officially requested database from the National School of Public Administration (Enap) in Brazil.

We conducted two instances of attendance at the National Conference of the National School of Public Administration (ENAP), during which we procured data directly from participants via a physical survey instrument. These data collection activities transpired on two discrete occasions: the initial occurrence transpired in January 2019, followed by a subsequent iteration in December 2019. These events were in Brasília, Brazil. The data acquisition endeavors were facilitated by the support of ENAP, which granted permission to distribute and administer the research questionnaire during designated sessions, each lasting approximately 30 minutes, optimizing the official presence of the municipal accountants in Brasilia at the Enap headquarters.

Initially, the first step was devoted to clarifying the main study questions of the model KSA (knowledge, skills, attitude) (Parry, 1996; Brophy & Kiely, 2002). Initial data analysis focused on whether participants agreed with or disagreed with the traditional triadic model of competencies. We develop a semi-structured instrument based on scales available and validated in the literature for sustainability management (Brandão & Guimarães, 2001; Brandão & Bahry, 2005; Cella-De-Oliveira & Takahashi, 2014). In the first round three open questions were asked:

- (KNOWLEDGE) Do you believe that public accountants know how to report SDGs? Why?
- (SKILLS) Are the accountants skilled to communicate, have positive relationships, support articulation and work efficiently in team collaboration?
- (ATTITUDE) Is reporting for SDGs something you would like to do in your municipality?

The second phase was then characterized by an effort to find agreement among the responses using a group evaluative strategy. In the second round of analysis, the audience was introduced to the main results of the first phase and based on them. They had to propose feasible alternatives to develop the barriers found in the first round. The research protocol of the second round was a formulaire to measure the level of agreement of the experts about the barriers to developing competencies and a open question inquiring them about feasible solutions they would suggest to the topic: “Today, there is much discussion around how to implement SDG training programs in public administration. In your expert opinion, what would be the best way to do it? Why?”.

The two-round method is compatible with the Delphi method principle. It allows the researcher to deepen the investigation based on the results of the first inquiry. The second round is a propositive phase when experts can freely argue about the topic, and this rich information is summarized for developing new insights in the field.

4. Results

The first round validated the model with the experts, following the sequence of variables KSA (knowledge, attitude, skills) (Parry, 1996; Brophy & Kiely, 2002). Experts expressed their opinions by answering their level of agreement or disagreement with the antecedent factors of competency.

4.1 First round

When asked their opinion about the level of **Knowledge** they have about SDGs, out of eleven, only two consider the accountants to know the SDGs meaning, arguing in general that the topic is new and that they received no training. In turn, they consider themselves qualified to the task regarding technical skills. Table 1 summarises the result of question 1 (Knowledge).

The second factor of the model is **Skills**. Skills in competence literature comprise communication abilities, positive relationships, support articulation and team collaboration. Experts express important concerns about the work environment of public municipalities, affecting their skill capacities directly. Most of them (8 of 11) consider themselves able to perform those skills. Nevertheless, they emphasise that for requiring high levels of interaction among their co-workers, leaders and operational staff, that dimension is not a single effort. They are unanimous in affirming that they consider it especially difficult because of the nuances of cultural aspects of the municipalities. Also, no different element was identified from their traditional control tasks to the SDGs reporting (table 2).

Table 1 - Results of the first round - knowledge (E - Expert)

Measured Variable	Excerpts examples	Identified organizational context antecedents
knowledge	<p>“Public accountants get approved through high standards thresholds to be a public employee. They are very well qualified. Typically graduated from the best accounting courses in Brazil” E (1).</p> <p>E1 states that “information about SDGs in this sense is very recent”, and E4 indicates that “they might know, but they do not feel sufficiently responsible for any related objective” (E2)</p> <p>“Even if there is some knowledge of the subject from employees and their role connected to SDGs, the accountants would not know how to disclose practices or data about SDGs, especially without any orientation, policy or training.” (E3).</p> <p>“More resistance comes from older public accountants since the matter is new” (E6).</p> <p>“We are pressured to change every time a new law is approved. I do not see any difficulties about how to do a report” (E8)</p> <p>“SDGs are a new theme, we are not prepared to report, we need to understand the topic better” (E11).</p>	<p>New theme</p> <p>Absent of training</p> <p>Adequate technical qualification</p>

*E (1 to 11): Expert 1, 2; N. *Source:* authors

Table 2 - Results of the first round - Skills (E - Expert)

Measured Variable	Excerpt	Identified organizational context
skills	<p>“We practice every day, but it is a very informal thing among the processes we have to fulfil”</p> <p>“I do not see any connection with these skills when producing a special report, this is required to work in any circumstances”</p> <p>“sometimes the control process can intimidate social interactions, so I think that this would be the most difficult part in any municipality”</p> <p>“All accountants have to have these skills, for sure, for any task”</p> <p>“This is not about the role of the accountant, it is something that the management deals”</p> <p>“It depends, there are municipalities that are very dynamic and efficient, but the majority of them does not have any special program for this kind of skill”</p> <p>“In my opinion it is something beyond the role of the accountant if the municipality wants us to develop social skills, they need to offer support or training”.</p>	<p>Leadership</p> <p>Management support for the development of social skills</p>

*E (1 to 11): Expert 1, 2; N.

Source: authors

The last factor of the model KSA is attitude. Attitudes are conceived as the decision-making process and by the Management Process. In other words, a choice or intention to obtain some result under specific resources and information combined with a discipline in which people use various methods to discover, model, analyze, measure, improve, optimize, and automate business processes. (ElHaffar, Durif & Dubé, 2020; Boiral *et al.*, 2020).

Table 3 - Results of the first round - Attitude (E - Expert)

Measured Variable	Excerpts	Identified organizational context antecedents
attitude	<p>“Brazilian municipalities have been through cloudy and uncertain periods (E1).”</p> <p>“Brazilian municipalities are broken. (E6)”.</p> <p>“I find it challenging to disclose sustainability projects within the context of the scarce resources of Brazilian municipalities.” (E2)</p> <p>“Most senior accountants are still embedded in legal compliance and cannot innovate and use what they know. This a tough situation in all Brazilian municipalities” (5).</p> <p>“We are already overloaded, it is hard to change the mind of people to become attractive to new challenges, the daily routine is already overwhelming” (E6)</p> <p>“Accountants to do only what is asked by law, only basics compliance” (E1)</p> <p>“It should be very commendable, but there is an eminent risk of political influence on this task. The reports are often used to promote political actions” (E4).</p> <p>Experts 2 and 9 (E2 and E9) mention that “politics” may compromise the reliability of the disclosing process.</p>	<p>lack of resources</p> <p>overwhelming workload</p> <p>politics</p>

*E (1 to 11): Expert 1, 2; N.

Source: authors

None of them, as expected, clearly declared a negative attitude against the SDGs reporting. However, they indicate some contextual problems of public management as barriers to performing it effectively.

The first one is the financial problem. The second one is politics and, hence, the third is overwhelming routine to be complied with law.

Experts also emphasise the issue of involving the Agenda in partisan disputes. As such, there is still confusion that the Agenda might be a political project within the offices, which will fatally influence the motivation of public accountants to contribute to its development. Experts reinforced that the

public accountant is usually overloaded and tends to resist change, especially with senior accountants.

4.1 Second round

On the second round of the Delphi Method, experts were called to propose alternatives to develop competencies to report SDGs in public management based on the identified factors of the first round. The only point that was considered positive in their perception was accountants' technical qualification. As the the only positive driver, technical qualification was excluded from the barriers factors to develop such competencies.

Table 4 - Second round results - validation of barriers factors

Barriers Factors	Indicate the level of agreement with the presented barrier of your municipality to develop human competencies in reporting SDGs (1 - totally disagree to 5 - totally agree)*
New theme	24
Absent of training	50
Quality of Leadership	35
Management support for the development of social skills	22
Financial resources of the municipality	46
Overwhelming workloads	50
Politics	29

* simple average, 10 experts

Source: authors

It is possible to analyze that “Management support for the development of social skills” and the “New theme” were barriers that received less than 25 points, the others were validated by the accountant's sample. This means that the dimension of Attitude was completely validated whereas the other two, skills and knowledge show differences from the original model we based our research, the KSA.

As already mentioned in the method section, during the second round we

provided an open space for the experts to express possible alternatives of how to suppress the specific barriers of the public management to develop the accountants to report SDGs.

Many suggestions emerged. Experts generally reveal that attractiveness is an essential factor. They point out that engagement is critical for success, entering the activities accountants perform daily, not just on a technical level.

Also, the teaching method appear as an essential factor of the training program. They propose employing of more dynamic methodologies such as gaming and awards and taking advantage of the accountant's high level of schooling. One of the experts also calls attention to awareness or "demystification of the theme," bringing information to hinder initial resistance.

"Public accountants can become more motivated and aware by removing them from their comfort zone. They need to understand the purpose of knowing the subject" (E2), "leaders need to promote more motivated and conscious employees, arguing for the reason for doing anything" (E5). If this is attractive to the employee, "those well-intentioned will inevitably adhere to it." Finally, for expert E7, the SDGs reporting is "an easy matter to discuss, but difficult to do" The possibility would be an alignment to topics closer to those already addressed by accountants daily. This idea is corroborated by expert 2 (E2), who understands that "the best way to training, because SDGs are typically unattached from the accountants' life, having a practical and unique template could be interesting"

Most respondents reaffirmed the importance of a more attractive, unconventional format that differs from the traditional lecture scheme. E1 reminds us: "We need fast format and hands-on teaching," a perception corroborated by E3, who understands that "training should bring awareness that the SDGs is already part of our routine, breaking the ice." In this sense, Expert E2 suggested new methods, mainly in a new environment that is not a classroom. Expert 4 also supported that the method must be different, consistent with "student-centered methodologies" and that "doing it in a new format could be interesting."

"I believe that most people are unknowledgeable (...) there should be a mechanism to foster the and facilitate the report" (E10)

Aside from these perceptions, other experts suggest active participation methods with accountants, and only E11 considers that, although the technique is essential, the theme should attract only interested accountants. Finally, E10 agrees that training should be consistent with the work hours, non-mandatory, and, if possible, should be included as the workload for career progression.

E7 provides some insights about the training method and how to engage accountants: “These courses end up leading to something boring... One more thing for us to do. It does not work. They need to understand the purpose of knowing the subject.”

In addition, the expert 4 emphasizes that accountants think this is a misunderstanding in their role in disclosing SDGs.

“Other countries and private companies should undertake the lead, setting aside the responsibility of public management for sustainable development.” E(4).

In sum, experts do not propose any articulation with third parties or any possible solution for the lack of resources and work overload, they centred their proposals on training methods, offering new ideas on how to link SDGs with their daily activities and stimulating accountants with active teaching approaches.

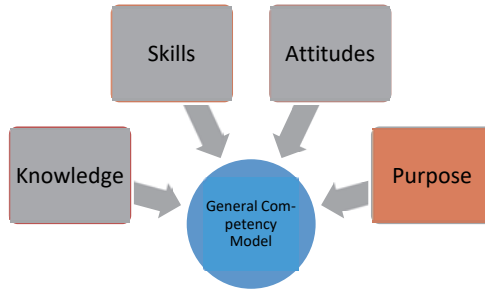
5. Discussion

Some discussions can be raised considering the hypothetical conditions provided by this sample data. Therefore, conceptual models for optimizing relationships between the elements are sought in deep discussions on the theme.

By the aggregated answers, we summarized that one more factor should be included beyond the triad of Parry (1996) and Brophy & Kiely (2002): knowledge-skills-attitude. The fourth variable of the construct is defined as purpose (figure 2). This means that even if they can execute the task, their tenacity can moderate for better performance (Parry, 1996; Brophy & Kiely, 2002). The characteristics of a training program are to optimize their qualification and reduce their demotivation, weakening up their willingness to social good, by individual purpose.

We add a variable as a construct proposition to the traditional models of Parry (1996) and Brophy & Kiely (2002) (figure 2). Purpose emerges as a new antecedent of competencies to report SDGs in accountants by the combination of literature insights (Dlouhá; Pospíšilová, 2018; D’Souza *et al.*, 2019; Fuertes-Camacho *et al.*, 2019; Corriveau, 2020) and the public management specialist statements.

Figure 2 – Purpose as a new variable in Parry (1996) and Brophy & Kiely (2002)



Source: authors

Literature on competencies presents recent evidence since 2016 that points to an emotional matter as being conducive to an attitude of “wanting to do.” Thus, this work explores a new theoretical idea to contribute to the model by Parry (1996) and Brophy & Kiely (2002), as demonstrated in the diagram in Figure 2. In this sense, the fourth construct was incorporated into the classic model as an stimulus because they value the SDGs as something aggregating to themselves and for society, not just as professionals or for corporate means.

There is an overall high qualification for the accountants. Accountants have a strong basis of technical knowledge and have no difficulties in writing, text interpretation, logical reasoning, or mathematics. That kind of gap would require more profound and technical training. Some respondents asked for a template that can be efficiently utilized by those provided by government agencies with guidelines for disclosing SDGs in public management. However, they state that difficulties are in dealing with specific software to produce the report. This is an important question to discuss, asking if layout and writing are exactly inside the expected competencies of accountants for SDGs reporting. A simple combination between Excel and a design (free) platform can be enough for this objective.

The identified gap in the attitude dimension of our model is much more aligned with the difficulty of coordinating, leading, controlling and disclosing any process or information than specific technical deficits. Instead, personal values positively relate to the agenda’s objectives, reinforcing individual engagement and motivation to report SDGs. Accountants are demoti-

vated by the workload, resource scarcity and organizational climate problems more than exerting effort to report the SDGs accordingly.

Some subjective behaviors will deserve a more specific approach, for example, the problem of being unable to negotiate and deal with political disputes. Sometimes, many excellent projects are overturned by a lack of adhesion to the idea of dominant groups in power. Therefore, it is also on the table the role of accountants in the responsibility to fight against this trend in their workplace. For this, options of training that consider political aspects, including themes such as negotiation, communication techniques, speech, counterarguing, and dramatic persuasion are welcome.

Regarding identifying the SDGs in daily professional activities, active learning methodologies and group development should be developed to break this resistance, as training is they consider it “boring”. This method is ideal for developing deficits presented in the sample, such as communication skills, teamwork, and collaborative focus. For example, we can invite the accountant to relate daily activities to SDGs Agenda fulfillment. From there, it could allow collaboration among the parties to elaborate the report.

Instead, the purpose dimension is one of the most challenging tasks. There is no evidence that training can change the personal values that an individual brings with him or her until that moment. All that is known is that, for an individual to be sensitized to a topic, they need to have information on the subject to, from there, conceive their own opinion on that subject. However, this opinion and the degree of orientation that this person may come to develop concerning sustainability will be intrinsically connected to their empathy and relationship with the subject in prior experiences, mindset, culture, and even religious and political orientation. Thus, respecting these limitations, active training can improve sensibilization success by using accountants' local reality, daily activities, and organizational peculiarities.

6. Recommendations for sustainability accounting practices

To meet the goals of developing competencies on all the information raised, we recommend four modules to a training program to public accountants.

1. Diagnosis of technical knowledge: the moderator applies a simple questionnaire of up to 30 multiple-choice questions in this step. The accountant reaches a score regarding the contents: i) Writing, ii) Text interpretation, iii) Logical reasoning, and iv) Mathematics.

2. Lectures on negotiation techniques: referring to negotiation techniques involving the content connected to communication, leadership, dialog, persuasion, and persistence to support the effectiveness of the political articulation.
3. Conversational experiences: The third module proposed a dialog experience that should count on previously prepared material to work on a sustainable development case (e.g., poverty, lack of education, and health services) specific to the organization or its geographic region. In the case of municipalities, the most important problems of public accountants should be prioritized, shortening the distances between their work and the Agenda.
4. Benchmarking to best practices: Companies that received awards that are part of GRI, Global Gap, Rainforest, and ISO 14.001 used to have complete reporting that is open access on their website. That material can be the basis of initial development and provide mature insights into other companies that have already published reports aligning operations with SDGs.

We comprehend that organizational culture will be a filtering characteristic concerning the difference in desirable and viable routine actions, considering that the more intense the orientation for sustainability and the flexibility in the organization's management, the closer these two directions will be.

This proposal understands the need for contextualization and supporting the public accountant through political articulation. It also approaches the characteristics involving individual emotion and purpose that public accountants should deal with to systemically develop the subject, incorporating the SDGs in their planning. This initial framework can be implemented at strategic, tactical, or operational levels helping accountants to disclose efficiently and connecting the sustainable development outcomes of various organization departments.

The active teaching methodology is relevant to analyzing stakeholder engagement's role in sustainability reporting. For instance, developing the professionals' competencies to fulfil the Agenda is a matter of optimizing their qualifications and encouraging the adhesion to new values and purposes.

Still, in this context, public employees enjoy job stability, naturally making them more resistant to change. Thus, the difficulties in public administration will be equal to or more significant when developing new competencies aligned to a plan that, in Brazil, is often entailed by a political-partisan stereotype and lack of financial resources.

Nevertheless, SDGs competencies for reporting in public management are relevant when considering the severity of social, environmental, and economic problems. Furthermore, Brazil also receives even greater worldwide pressure for being the largest geographic area in the Amazon Forest region, with the most extraordinary biodiversity globally. The need for Brazilian accountants to acquire those competencies is vital to fair communication to society, especially regarding public budget expenses.

7. Conclusion

Developing competencies for SDGs reporting is still obscure and lacks prepositive frameworks (Brandão & Guimarães, 2001; Cella-De-Oliveira & Takahashi, 2014). The challenge of exploring how to deal with the subject within the context of an emergent economy and in public accountability makes it even more intriguing. For example, municipalities depend on federal budgets shaped by the pluriannual planning – a highly counterproductive method to allow management changes (Constanza *et al.*, 2016). Moreover, due to public agents' low awareness and motivations (Ragland, 2014), SDGs reporting is still considered useless (Allen *et al.*, 2016). On the other hand, the world, and the different public administration stakeholders, especially the Brazilian population, urge immediate solutions to the country's profound social, economic, and environmental wicked problems.

This work identified antecedent factors of accountants' competence for SDGs disclosure. The theoretical narrative showed that emotions and personal values should be embedded, refining traditional methods with a new dimension (purpose). Accountants' technical qualifications must be optimized for the social good by purpose.

In practice, we contribute by proposing an educational model to public accountants. The model can contribute to suppressing political barriers in public management, improving the socio-emotional competencies of the accountants, and aligning with the personal purpose of seeking sustainable management performance.

The limitations pertain primarily to the sample size employed in this study. While the Delphi method is renowned for its capacity to yield insights with relatively modest sample sizes, we undertook proactive measures to mitigate this constraint. Specifically, we adopted a strategy to enhance the sample's representativeness. This involved including participants from a diverse array of geographical locations across Brazil, encompassing experts hailing from all regions of the country.

With this work, we expose public management problems that are barriers to a better reporting and disclosure process from accountants. Also, we close the gap by offering a framework to suppress the barriers and support public management to educate accountants on this new and challenging task. In addition, a secondary contribution also improves public management's paths to mobilize their staff so that more significant, long-term, and less tangible objectives can be pursued with motivation, effectiveness, and efficiency.

Implementing the SDGs as the best way to disclose sustainability in corporate reporting is expected to be made feasible, making SDGs more tangible and adapting to organizational reality.

References

- Agirreazkuenaga L. (2020), Education for Agenda 2030: What Direction do We Want to Take Going Forward?, *Sustainability*, 12(5), 2035. Doi: 10.3390/su12052035.
- Aleixo A.M., Azeiteiro U., Leal S. (2018), The implementation of sustainability practices in Portuguese higher education institutions, *International Journal of Sustainability in Higher Education*, 19(1), pp. 146-178. Doi: 10.1108/IJSHE-02-2017-0016.
- Allen C., Metternicht G., Wiedmann T. (2016), National pathways to the Sustainable Development Goals (SDGs): A comparative review of scenario modelling tools, *Environmental Science & Policy*, 66, pp. 199-207.
- Argento D., Grossi G., Persson K., Vingren T. (2019), Sustainability disclosures of hybrid organizations: Swedish state-owned enterprises, *Meditari Accountancy Research*, 27(4), pp. 505-533.
- Atik D., Dholakia N., Ozgun A. (2023), Post-Pandemic Futures: Balancing Technological Optimism with Sociocultural Fairness, *Global Business Review*. Doi: 10.1177/09721509221142110.
- Avrampou A., Skouloudis A., Iliopoulos G., Khan N. (2019), Advancing the Sustainable Development Goals: Evidence from leading European banks, *Sustainable Development*, 27(4), pp. 743-757. Doi: 10.1002/sd.1938.
- Barth M., Godemann J., Rieckmann M., Stoltenberg U. (2007), Developing key competencies for sustainable development in higher education, *International Journal of Sustainability in Higher Education*, 8(4), pp. 416-430. Doi: 10.1108/14676370710823582.
- Bask A., Halme M., Kallio M., Kuula M. (2020), Business students' value priorities and attitudes towards sustainable development, *Journal of Cleaner Production*, 264, 121711. Doi: 10.1016/j.jclepro.2020.121711.
- Bellucci M., Simoni L., Acuti D., Manetti G. (2019), Stakeholder engagement and dialogic accounting: Empirical evidence in sustainability reporting, *Accounting, Auditing & Accountability Journal*, 32(5), pp. 1467-1499.
- Boiral O., Heras-Saizarbitoria I., & Brotherton M.-C. (2019), Assessing and Improving the Quality of Sustainability Reports: The Auditors' Perspective, *Journal of Business Ethics*, 155(3), pp. 703-721. Doi: 10.1007/s10551-017-3516-4.
- Boterf G. L. (n.d.), *Évaluer les compétences Quels jugements? Quels critères? Quelles instances ?*.

- Boyatzis R., & Sala F. (2004), *Assessing Emotional Intelligence Competencies* (Nova Science Publishers).
- Brandão H. P., & Bahry C. P. (2005), Gestão por competências: métodos e técnicas para mapeamento de competências, *Revista do Serviço Público*, 56(2), pp. 179-194.
- Brandão H. P., & Guimarães T. D. A. (2001), Gestão de competências e gestão de desempenho: tecnologias distintas ou instrumentos de um mesmo construto?, *Revista de Administração de empresas*, 41, pp. 8-15.
- Brandt J.-O., Bürgener L., Barth M., & Redman A. (2019), Becoming a competent teacher in education for sustainable development: Learning outcomes and processes in teacher education, *International Journal of Sustainability in Higher Education*, 20(4), pp. 630-653. Doi: 10.1108/IJSHE-10-2018-0183.
- Brophy M., & Kiely T. (2002), Competencies: A new sector, *Journal of European Industrial Training*, 26(2/3/4), pp. 165-176. Doi: 10.1108/03090590210422049.
- Brown J. (2009), Democracy, sustainability and dialogic accounting technologies: Taking pluralism seriously, *Critical Perspectives on Accounting*, 20(3), pp. 313-342. Doi: 10.1016/j.cpa.2008.08.002.
- Brundtland G. H. (1987), Our Common Future – Call for Action, *Environmental Conservation*, 14(4), pp. 291-294. Doi: 10.1017/S0376892900016805.
- Caniglia G., John B., Kohler M., Bellina L., Wiek A., Rojas C., Laubichler M. D., & Lang D. (2016), An experience-based learning framework: Activities for the initial development of sustainability competencies, *International Journal of Sustainability in Higher Education*, 17(6), pp. 827-852. Doi: 10.1108/IJSHE-04-2015-0065.
- Cella-de-Oliveira F. A., & Takahashi A. R. W. (2014), Desenvolvimento Da Competência Sustentabilidade E Aprendizagem Organizacional À Luz Da Teoria Da Racionalidade/Racing Development And Sustainability Organizational Learning In The Light Of The Theory Rationality, *Revista de Gestão Social e Ambiental*, 8(3), 118.
- Clarkson P. M., Li Y., Richardson G. D., & Vasvari F. P. (2008), Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis, *Accounting, organizations and society*, 33(4-5), pp. 303-327.
- Cho C. H., Kim A., Rodrigue M., & Schneider T. (2020), Towards a better understanding of sustainability accounting and management research and teaching in North America: A look at the community, *Sustainability Accounting, Management and Policy Journal*, 11(6), pp. 985-1007. Doi: 10.1108/SAMPJ-08-2019-0311.
- Costanza R., Daly L., Fioramonti L., Giovannini E., Kubiszewski I., Mortensen L. F., ... & Wilkinson R. (2016), Modelling and measuring sustainable wellbeing in connection with the UN Sustainable Development Goals, *Ecological economics*, 130, pp. 350-355.
- Dalton V. (2020), The challenge of engaging with and reporting against the SDGs for SMEs such as Sydney Theatre Company, *Journal of Management and Organization*, 26(6), pp. 975-994. Doi: 10.1017/jmo.2020.23.
- De Carvalho A. C. V., Stefano S. R., & Munck L. (2015), Competências voltadas à sustentabilidade organizacional: um estudo de caso em uma indústria exportadora, *Gestão & Regionalidade*, 31(91). Doi: 10.13037/gr.vol31n91.2278.
- Demssie Y. N., Wesselink R., Biemans H. J. A., & Mulder M. (2019). Think outside the European box: Identifying sustainability competencies for a base of the pyramid context. *Journal of Cleaner Production*, 221, pp. 828-838. Doi: 10.1016/j.jclepro.2019.02.255.
- Dickens C., Smakhtin V., McCartney M., O'Brien G., & Dahir L. (2019), Defining and quantifying national-level targets, indicators and benchmarks for management of natural resources to achieve the sustainable development goals, *Sustainability (Switzerland)*, 11(2). Doi: 10.3390/sul1020462.

- Diouf D., & Boiral O. (2017), The quality of sustainability reports and impression management: A stakeholder perspective, *Accounting, Auditing & Accountability Journal*, 30(3), pp. 643-667.
- Dyllick T., & Hockerts K. (2002), Beyond the business case for corporate sustainability, *Business Strategy and the Environment*, 11(2), pp. 130-141. Doi: 10.1002/bse.323.
- Eisenhardt K. M. (1989), Building Theories from Case Study Research, *Academy of Management Review*, 14(4), pp. 532-550. Doi: 10.2307/258557.
- Eisenhardt K. M., & Graebner M. E. (2007), Theory Building From Cases: Opportunities And Challenges, *Academy of Management Journal*, 50(1), pp. 25-32. Doi: 10.5465/AMJ.2007.24160888.
- Elalfy A., Weber O., & Geobey S. (2020), The Sustainable Development Goals (SDGs): A rising tide lifts all boats? Global reporting implications in a post SDGs world, *Journal of Applied Accounting Research*, 22(3), pp. 557-575. Doi: 10.1108/JAAR-06-2020-0116.
- ElHaffar G., Durif F., & Dubé L. (2020), Towards closing the attitude-intention-behavior gap in green consumption: A narrative review of the literature and an overview of future research directions, *Journal of cleaner production*, 275, 122556.
- Elkington J. (1994), Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development, *California Management Review*, 36(2), pp. 90-100. Doi: 10.2307/41165746.
- Erevelles S., Fukawa N., & Swayne L. (2016), Big Data consumer analytics and the transformation of marketing, *Journal of Business Research*, 69(2), pp. 897-904. Doi: 10.1016/J.JBUSRES.2015.07.001.
- Erin O. A., Bamigboye O. A., & Oyewo B. (2022), Sustainable development goals (SDG) reporting: An analysis of disclosure, *Journal of Accounting in Emerging Economies*, 12(5), pp. 761-789. Doi: 10.1108/JAEE-02-2020-0037.
- Facione P. (1990), *Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction* (The Delphi Report).
- Fleury M. T. L., & Fleury A. (2001), Construindo o conceito de competência, *Revista de Administração Contemporânea*, 5(spe), pp. 183-196. Doi: 10.1590/S1415-65552001000500010.
- Florea L., Cheung Y. H., & Herndon N. C. (2013), For All Good Reasons: Role of Values in Organizational Sustainability, *Journal of Business Ethics*, 114(3), pp. 393-408. Doi: 10.1007/s10551-012-1355-x.
- Flores G., Ahmed R., & Wagstaff M. F. (2022), Humanistic leadership and support for the sustainable development goals, *Management Research: Journal of the Iberoamerican Academy of Management*. Doi: 10.1108/MRJIAM-01-2022-1264.
- Hsiao P. C. K., de Villiers C., & Scott T. (2022), Is voluntary International Integrated Reporting Framework adoption a step on the sustainability road and does adoption matter to capital markets?, *Meditari Accountancy Research*, 30(3), pp. 786-818.
- Goulart A. R., Liboni L. B., & Cezarino L. O. (2021), Qualification as a societal challenge and the role of higher education from a system approach, *Higher Education, Skills and Work-Based Learning*, 11(5), pp. 1002-1019. Doi: 10.1108/heswbl-06-2020-0118.
- Goulart V. G., Liboni L. B., & Cezarino L. O. (2021), Balancing skills in the digital transformation era: The future of jobs and the role of higher education, *Industry and Higher Education*, 36(2), pp. 118-127. Doi: 10.1177/09504222211029796.
- Grant P., & Lips-Wiersma M. (n.d.), Developing Essential Competencies of Sustainability Educators: Teaching and Modelling Systems Thinking Through Partnership Learning, *Journal of Business Ethics Education*.

- Hansson S., Arfvidsson H., & Simon D. (2019), Governance for sustainable urban development: The double function of SDG indicators, *Area Development and Policy*, 4(3), pp. 217-235. Doi: 10.1080/23792949.2019.1585192.
- Heiskanen E., Thidell Å., & Rodhe H. (2016), Educating sustainability change agents: The importance of practical skills and experience, *Journal of Cleaner Production*, 123, pp. 218-226. Doi: 10.1016/j.jclepro.2015.11.063.
- Hind P., Wilson A., & Lenssen G. (2009), Developing leaders for sustainable business, *Corporate Governance: The International Journal of Business in Society*, 9(1), pp. 7-20. Doi: 10.1108/14720700910936029.
- Hsiao P.-C. K., de Villiers C., & Scott T. (2022), Is voluntary International Integrated Reporting Framework adoption a step on the sustainability road and does adoption matter to capital markets?, *Meditari Accountancy Research*, 30(3), pp. 786-818. Doi: 10.1108/MEDAR-08-2020-0978.
- Joshi D. K., Hughes B. B., & Sisk T. D. (2015), Improving Governance for the Post-2015 Sustainable Development Goals: Scenario Forecasting the Next 50years, *World Development*, 70, pp. 286-302. Doi: 10.1016/j.worlddev.2015.01.013.
- Kayo E. K., & Securato J. R. (1997), Método Delphi: fundamentos, críticas e vieses, *Caderno de Pesquisas em Administração*, 1(4), pp. 51-61.
- Kjellgren B., & Richter T. (2021), Education for a sustainable future: Strategies for holistic global competence development at engineering institutions, *Sustainability (Switzerland)*, 13(20). Doi: 10.3390/su132011184.
- Lambrechts W., Mulà I., Ceulemans K., Molderez I., & Gaeremynck V. (2013), The integration of competences for sustainable development in higher education: An analysis of bachelor programs in management, *Journal of Cleaner Production*, 48, pp. 65-73. Doi: 10.1016/j.jclepro.2011.12.034.
- Landeta J. (1999), *El método Delphi: una técnica de previsión para la incertidumbre* (pp. 836-2), Barcelona, Ariel.
- Lans T., Blok V., & Wesselink R. (2014), Learning apart and together: Towards an integrated competence framework for sustainable entrepreneurship in higher education, *Journal of Cleaner Production*, 62, pp. 37-47. Doi: 10.1016/j.jclepro.2013.03.036.
- Leal Filho W., Coronado-Marín A., Salvia A. L., Silva F. F., Wolf F., LeVasseur T., Kirrane M. J., Doni F., Paço A., Blicharska M., Schmitz M., Grahl A. T., & Moggi S. (2022), International Trends and Practices on Sustainability Reporting in Higher Education Institutions, *Sustainability*, 14(19), 12238. Doi: 10.3390/su141912238.
- Le Boterf G. (1998), Évaluer les compétences. Quels jugements? Quels critères? Quelles instances, *Education permanente*, 135(2), pp. 143-151.
- Ligorio L., Caputo F., & Venturelli A. (2022). Sustainability disclosure and reporting by municipally owned water utilities. *Utilities Policy*, 77, 101382.
- Maas K., Schaltegger S., & Crutzen N. (2016), Integrating corporate sustainability assessment, management accounting, control, and reporting, *Journal of Cleaner Production*, 136, pp. 237-248. Doi: 10.1016/j.jclepro.2016.05.008.
- Maroun W. (2017), Assuring the integrated report: Insights and recommendations from auditors and preparers, *The British Accounting Review*, 49(3), pp. 329-346.
- Martins V. W. B., Rampasso I. S., Anholon R., Quelhas O. L. G., & Leal Filho W. (2019), Knowledge management in the context of sustainability: Literature review and opportunities for future research, *Journal of Cleaner Production*, 229, pp. 489-500. Doi: 10.1016/j.jclepro.2019.04.354.
- Matsushita M., & Schoenbaum T. J. (n.d.), *The World Trade Organization*.

- McClelland K. (1990), Cumulative Disadvantage Among the Highly Ambitious, *Sociology of Education*, 63(2), pp. 102-121. JSTOR. Doi: 10.2307/2112857.
- Milne M. J., & Gray R. (2013), W(h)ither Ecology? The Triple Bottom Line, the Global Reporting Initiative, and Corporate Sustainability Reporting, *Journal of Business Ethics*, 118(1), pp. 13-29. Doi: 10.1007/s10551-012-1543-8.
- Molderez I., & Ceulemans K. (2018), The power of art to foster systems thinking, one of the key competencies of education for sustainable development, *Journal of Cleaner Production*, 186, pp. 758-770. Doi: 10.1016/j.jclepro.2018.03.120.
- Monteiro A. P., Pereira C., & Barbosa F. M. (2021), Environmental disclosure on mandatory and voluntary reporting of Portuguese listed firms: The role of environmental certification, lucratively and corporate governance, *Meditari Accountancy Research*. Doi: 10.1108/MEDAR-09-2020-1001.
- Mulder M. (2014), Conceptions of Professional Competence, In S. Billett, C. Harteis, & H. Gruber (Eds.), *International Handbook of Research in Professional and Practice-based Learning* (pp. 107-137). Springer Netherlands. Doi: 10.1007/978-94-017-8902-8_5.
- Munzarova S., Kostalova J., & Fialova E. (2022), Non-Financial Reporting of Chemical Companies in the Czech Republic, *Business: Theory and Practice*, 23(1), pp. 88-98. Doi: 10.3846/btp.2022.11972.
- Murali G., Iwamura T., Meiri S., & Roll U. (2023), Future temperature extremes threaten land vertebrates, *Nature*. Doi: 10.1038/s41586-022-05606-z.
- Nilsson M., Griggs D., Visbeck M., Ringle C., McCollum D. (2017), *A guide to SDG interactions: From science to implementation*, International Council for Science (ICSU). Doi: 10.24948/2017.01.
- Parry S. (1996), The quest for competencies, *Training*, 33(7), 48.
- Patro C. S. (2020), An Evaluation of Employees' Competence Towards the Development of a Learning Organization, *International Journal of Knowledge Management*, 16(4), pp. 26-41. Doi: 10.4018/IJKM.2020100102.
- Pollanen R. (2011), Management Accounting and Control Research in Public Organizations, In Abdel-Kader M.G. (eds.), *Review of Management Accounting Research*. Doi: 10.1057/9780230353275_15.
- Prévo F., Brulhart F., & Guieu G. (2010), Perspectives fondées sur les ressources. Proposition de synthèse, *Revue française de gestion*, 204(5), pp. 87-103. Cairn.info.
- Qu S. Q., & Dumay J. (2011), The qualitative research interview, *Qualitative Research in Accounting & Management*, 8(3), pp. 238-264. Doi: 10.1108/11766091111162070.
- Quiroz-Niño C., & Murga-Menoyo M. (2017), Social and Solidarity Economy, Sustainable Development Goals, and Community Development: The Mission of Adult Education & Training, *Sustainability*, 9(12), 2164. Doi: 10.3390/su9122164.
- Ragland L., & Ramachandran U. (2014), Towards an understanding of excel functional skills needed for a career in public accounting: Perceptions from public accountants and accounting students, *Journal of Accounting Education*, 32(2), pp. 113-129.
- Rankin M., Windsor C., & Wahyuni D. (2011), An investigation of voluntary corporate greenhouse gas emissions reporting in a market governance system: Australian evidence, *Accounting, Auditing & Accountability Journal*, 24(8), pp. 1037-1070.
- Rimanoczy I. (2020), *The Sustainability Mindset Principles: A Guide to Develop a Mindset for a Better World* (1st ed.). Doi: 10.4324/9781003095637.
- Sabbir Md. M., & Taufique K. M. R. (2022), Sustainable employee green behavior in the workplace: Integrating cognitive and non-cognitive factors in corporate environmental policy, *Business Strategy and the Environment*, 31(1), pp. 110-128. Doi: 10.1002/bse.2877.

- Sætra H. S. (2021), A framework for evaluating and disclosing the esg related impacts of ai with the SDGS, *Sustainability (Switzerland)*, 13(15). Doi: 10.3390/su13158503.
- Scapens R. W. (2004), Doing Case Study Research, In C. Humphrey & B. Lee (Eds.), *The real life guide to accounting research. A Behind-the-Scenes View of Using Qualitative Research Methods* (pp. 257-279). Elsevier.
- Schaltegger S., & Zvezdov D. (2015), Gatekeepers of sustainability information: Exploring the roles of accountants, *Journal of Accounting & Organizational Change*, 11(3), pp. 333-361. Doi: 10.1108/JAOC-10-2013-0083.
- Shrivastava P. (2010), *Pedagogy of Passion for Sustainability*.
- Sierra García L., Bollas-Araya H. M., & García Benau M. A. (2022), Sustainable development goals and assurance of non-financial information reporting in Spain, *Sustainability Accounting, Management and Policy Journal*, 13(4), pp. 878-898. Doi: 10.1108/SAMPJ-04-2021-0131.
- Springett D. (2005), 'Education for sustainability' in the business studies curriculum: A call for a critical agenda, *Business Strategy and the Environment*, 14(3), pp. 146-159. Doi: 10.1002/bse.447.
- Stake R.E. (2006), *Multiple case study analysis*, The Guilford Press.
- Stefanescu C.A. (2022), Linking sustainability reporting frameworks and sustainable development goals, *Accounting Research Journal*, 35(4), pp. 508-525.
- Tsalis T.A., Malamateniou K.E., Koulouriotis D., Nikolaou I.E. (2020), New challenges for corporate sustainability reporting: United Nations' 2030 Agenda for sustainable development and the sustainable development goals, *Corporate Social Responsibility and Environmental Management*, 27(4), pp. 1617-1629. Doi: 10.1002/csr.1910.
- Turoff M., Linstone H.A. (2002), *The Delphi method-techniques and applications*.
- van Marrewijk M., Were M. (n.d.), *Multiple Levels of Corporate Sustainability*.
- Ward S.P., Ward D.R., Deck A.B. (1993), Certified public accountants: Ethical perception skills and attitudes on ethics education, *Journal of Business Ethics*, 12, pp. 601-610.
- Wiek A., Withycombe L., Redman C.L. (2011), Key competencies in sustainability: A reference framework for academic program development, *Sustainability Science*, 6(2), pp. 203-218. Doi: 10.1007/s11625-011-0132-6.
- Wolf M., Ketenci A., Weyand A., Weigold M., Ramsauer C. (2022), Learning Factories and Sustainable Engineering – Competencies for Students and Industrial Workforce. *IEEE Engineering Management Review*, 50(3), pp. 115-122. Doi: 10.1109/EMR.2022.3195452.
- Zarifian P. (1999), *Objectif Compétence. Pour une nouvelle logique*, Editions Liaisons.
- Zhou K. (2017), Non-cognitive skills: Potential candidates for global measurement, *European Journal of Education*, 52(4), pp. 487-497. Doi: 10.1111/ejed.12241.

Can we trust ESG Ratings?

Some insights based on a bibliometric analysis of ESG data quality and rating reliability

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Abstract

The aim of this research is to investigate the quality and reliability of ESG data provided by companies, as well as the accuracy and objectivity of ESG ratings produced by sustainability rating agencies (SRAs). Since SRAs use companies' non-financial information as input data when formulating their ESG ratings, these two topics appear to be strictly interconnected.

Drawing on the Shanon and Weaver (1949) model of communication, we have addressed these issues by means of a systematic literature review combined with a bibliometric analysis. In our investigation we run: *i*) the co-citation analysis to detect the seminal papers; *ii*) a keyword co-occurrence analysis to explore how the main features of the academic debate have unfolded in the last five years; *iii*) a keyword co-occurrence analysis to obtain a network visualisation map to explore how the research broad scope was articulated in different clusters (i.e., themes of research). Among the clusters that emerged from the mapping, we have decided to delve into the streams of research we consider most relevant and deal with: the relationships between ESG and Artificial Intelligence (AI). Namely, we deem that AI may allow us to process massive amounts of data that contain crucial information for ESG investing. However, even if computer algorithms are able to analyse all information available efficiently, and in a timely manner, managers and investors should be aware of their opportunities and criticisms, while scholars should list propositions for advancing the research on these topics.

Keywords: ESG ratings, Data quality, Theory of communication, Artificial Intelligence, Bibliometric analysis

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1. Introduction

Since most investors have integrated Environmental, Social and Governance (ESG) information into their investment decisions, larger pools of capital are available to the companies that pay greater attention to Environmental, Social and Governance (ESG) issues (Ioannou and Serafeim, 2015; Kotsantonis *et al.*, 2016; Eccles and Klimenko, 2019). The growing awareness that ‘sustainable’ investments may produce better financial performance (Friede *et al.*, 2015; Alshehhi, 2018), and lower cost of capital (Dhaliwal *et al.* 2011), has indeed prompted numerous companies to voluntarily publish sustainability reports with the aim of guiding, at least in part, investment decisions (Willis, 2003; Magness, 2010; Berthelot *et al.*, 2012; Lourenco *et al.*, 2012; De Villiers, 2017).

With the aim of providing guidance for investors seeking further insight into sustainability performance, many sustainability indices have been designed by rating agencies to measure the performance of the firms that set industry-wide best practices with regard to sustainability (Robinson *et al.*, 2011; Escrig-Olmedo *et al.*, 2019).

Sustainability indices provide meaningful signals of social legitimacy in an attempt “to verify that a firm’s goals and actions align with societal values such as environmental sustainability, labour and human rights, anti-corruption practices, and community engagement” (Hawn *et al.*, 2011, p. 3). It has indeed been argued that they serve as informational intermediaries between companies and their stakeholders (such as analysts, brokers and financial institutions but not only) by evaluating the information on ESG issues released by companies through different media and channels (Robinson *et al.*, 2011; Clarkson *et al.*, 2019; Galeotti *et al.*, 2022). Within the realm of sustainability indices, the most widely recognised are the DJSI Family. Established in 1999 and maintained collaboratively by RobecoSAM and S&P Dow Jones Indices, the DJSI family tracks the performance of the world’s largest companies leading the field in terms of corporate sustainability (López *et al.*, 2007; Searcy and Elkhawas, 2012; Hawn *et al.*, 2018; Bernardi and Demartini, 2019).

However, the quality of ESG performance provided by the company and how they are translated by rating agencies in sustainability indices does not lack criticism (Durand *et al.*, 2019; Arribas *et al.*, 2021; Avramov *et al.*, 2022; Tsang *et al.* 2023) as explained in the following. For investors, having measurable and trustworthy ESG indices allows them to track companies’ performance over time and check, at a future time, if they have been able to achieve the objectives set out in the past. For the management of the company, setting and disclosing information regarding ESG performance is appreciated by the ESG investors, making it easier to define appropriate strategies and policies to reach them. Last but not

least, all stakeholders should be able to objectively evaluate and compare different companies' sustainability performance: this is possible only when using suitable, complete and standardised metrics.

In the past, the assessment for the inclusion in a main index, such as the Dow Jones Sustainability launched in 1999, was mainly based on information provided by the companies through questionnaires and interviews complemented with non-financial data acquired through the manual screening of official corporate sources (e.g. websites, corporate reporting, press releases, etc.), as well as through surveys and market analysis. Nowadays a large amount of information on ESG corporate performance is available, can be gathered from several sources inside and outside the company and media channels (i.e., websites, social media, newspapers, etc.), and is also elaborated using Artificial Intelligence (AI).

This brings with it several problems and criticism about the quality and reliability of the information gathered by info-providers and the algorithm applied by rating agencies (Berg *et al.*, 2020; Billio *et al.*, 2021; Sahin *et al.*, 2023).

Companies' ESG data are scattered throughout different sections of different public documents (depending on the specific firm) and can have the form of quantitative or qualitative information (Saad and Strauss, 2020). In both cases, sometimes it is not even clear how companies translate sustainability principles into strategic and operational objectives, and then measure their ESG performance (Wang *et al.*, 2023). Furthermore, there are no guidelines explaining how investors should interpret these results (In *et al.*, 2019; Serafeim and Yoon, 2022). Even though many institutional actors and NGOs are working towards a joint vision, the goal of shaping a comprehensive global framework has not yet been reached (Cruz and Matos, 2023).

Hence, it is necessary to find out how to guarantee and verify the reliability of ESG performance by analysing the quality of the information flow from its origin to the end users.

For this purpose, in our study, we will draw on the communication model elaborated by Shannon and Weaver (1949), who study the process of processing and transmitting information from an issuer to a recipient and focus precisely on the process of coding and decoding information, as a fundamental aspect to guarantee the effectiveness of communication, which we have seen to be the central theme in the above rationale for our research.

Namely, the aim of this paper is to investigate the quality and reliability of ESG data provided by the companies, as well as the accuracy and objectivity of ESG ratings produced by sustainability rating agencies (SRAs). Since SRAs use companies' non-financial information as input data when formulating their ESG ratings, these two topics appear to be strictly interconnected. At the same time,

the implementation of new data processing to collect and process information is emerging as a central theme for assessing the quality of ESG information flow.

Previous studies analyse some of the elements that comprise the quality of ESG information. Yet, they consider these issues in an isolated way, related to specific purposes (i.e., the quality of ESG information for sustainable investing), rather than focusing on the whole communication flow. On the contrary, we deem a holistic analysis of all the involved elements is key to properly understanding the ESG communication process, therefore with the aim to offer a broad picture of the problem outlined up to now, we have addressed these issues by means of a systematic literature review (Transfield *et al.*, 2003) combined with a bibliometric analysis (Donthu *et al.*, 2021), based on the following research questions:

- How has the topic of ESG data quality developed over the last 5 years?
- What is the current state-of-the-art?
- What are the main literature gaps that might guide future research avenues?

The use of VOSviewer software (Van Eck and Waltman, 2010) enabled us to run a bibliometric analysis to investigate the conceptual structure of the field under examination (Ji *et al.*, 2018) and to address possible future research avenues regarding:

- i. the quality and reliability of ESG data and ratings,
- ii. the implementation of new data processing technologies – such as Distributed Ledger Technologies (DLTs) and Artificial Intelligence (AI) – in the mechanisms of ESG disclosure and rating formulation.

Namely, we deem that AI may allow us to process massive amounts of data that contain crucial information for ESG investing. However, even if computer algorithms are able to analyse all information available efficiently and in a timely manner, managers and investors should be aware of their opportunities and criticisms, while scholars should list propositions for advancing the research on these topics.

This paper is structured as follows. Section 2 illustrates the theoretical background and the purpose of the research, while Section 3 focuses on the methodology applied. An overview of the bibliometric results is presented in Section 4. Section 5 draws on the findings and provides an interpretation of the state-of-the-art on ESG data quality research, while 6 highlights some implications for future research directions. Conclusions follow in section 7.

2. Theoretical background and purpose of study

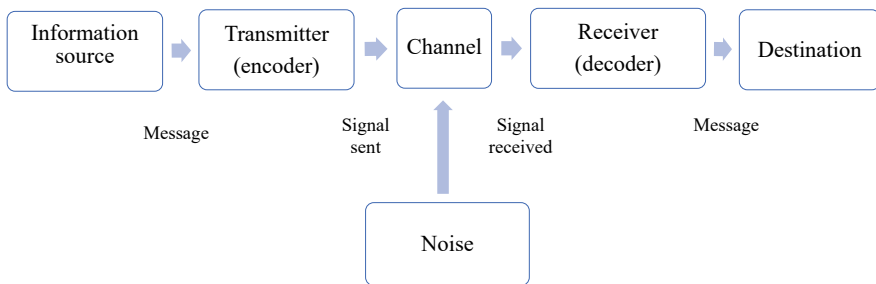
To thoroughly examine our research topic, we refer to the well-known theoretical framework of information theory that takes its starting point from the

mathematical theory of communication by Shannon and Weaver (1949), who have been very influential in various fields (Krippendorff, 2009), including information theory (Cornelius, 2002), communication theory (Fiske, 2011), even CSR communication (Garcia-Torea *et al.*, 2020).

Information theory focuses on the study of data transmission and its processing and measurement of information and consists of a series of elements and processes arranged, in fact, in a linear order, (see Figure 1):

- an information source (Issuer) that encodes a message, which passes through
- a channel or medium of transmission of the signal that is received by
- a recipient (decoder) who decrypts it,
- the factors that can distort or prevent a message from effectively reaching the recipient.

Figure 1 - Shannon and Weaver's model of communication



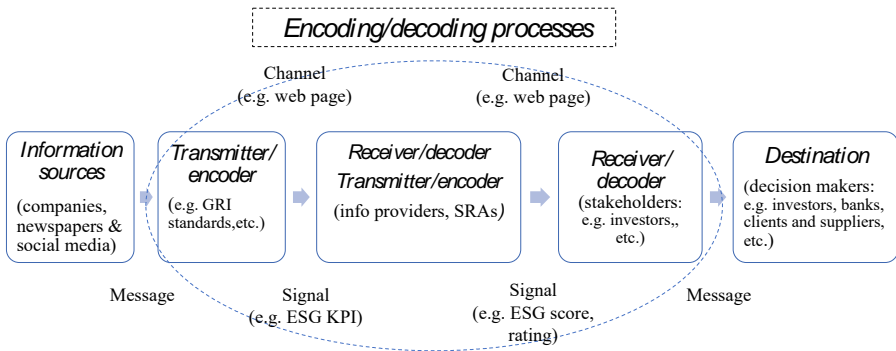
The model elaborated by Shannon-Weaver is also known as the code model, as it maintains that a necessary condition for communicating effectively is to have a shared code to encode and decode signals (Al-Fedaghi, 2012).

Many subsequent theorists built their own models on its insights (Hollnagel and Woods, 2005; Krippendorff, 2009; Fiske, 2011). However, it is often criticised based on the claim that it oversimplifies communication especially to analyse social processes and human communication (Chandler, 1994). One common objection is that communication should not be understood as a one-way process but as a dynamic interaction of messages going back and forth between both participants (Schram, 1954). This approach highlights the dynamic nature of the communication process that unfolds as a multi-directional exchange of messages.

Another criticism argues instead that the message does not exist as a form of preexisting information; this means that coding and encoding processes are creative processes that create the content (Richards, 1955).

Despite criticism and reinterpretation in various disciplinary fields, the model is still recognised as influential today. As accounting scholars, we are very interested in investigating the coding and decoding processes of ESG information, which represent a starting point for assessing the quality of the information system. Hence, we have built on Shannon and Weaver’s model to draw a framework for the ESG information as a communication system (see Figure 2)

Figure 2- ESG communication system



As source of information, we consider not only the firms but also other external sources of ESG information (i.e., social media and newspapers). The firm and other external sources decide on which messages will be communicated.

Companies select the message they want to communicate depending on their motivation for disclosing ESG information (e.g., accountability, green-washing, legitimisation and mandatory requirements) (Krueger *et al.* 2021). Companies can collect information internally and externally, for example, by interacting with supply chain suppliers and stakeholders. The use of AI by companies is increasingly frequent, especially large ones, to collect and process information (Galeotti *et al.*, 2022). ESG information will be collected, processed and encoded on the basis of specific reporting models and standards (i.e., GRI guidelines; TFCF guidance, etc.), which in our model represent the transmitter or encoder element. The outcome is that ESG data is scattered, generally voluntarily, throughout different sections of official reporting (i.e., sustainability or integrated, etc.) and other forms of disclosure (i.e., price-sensitive information, press releases) (Saad and Strauss, 2020). Afterward, firms distribute their reports to their stakeholders

through a channel (i.e., physical reports, document format files, or interactive webpage) (Arvidsson and Dumay, 2022).

Information on companies' ESG available on social media and in newspapers is even more important as they complement, confirm or contradict the ESG data provided by companies. The content of the message comes from journalists, interest groups, activists, researchers, etc., increasingly interested in environmental and social issues. This information is usually presented in written form and conveyed via the internet (Aouadi and Marsat, 2018; She and Michelon, 2019).

In this communication process, the first receivers of the signal are the so-called ESG info provider and/or the SRAs that collect different data points to assess a firm's ESG performance and thus provide an ESG score/rating. In this decoding and coding process, several criticisms arise about the transparency and reliability of algorithms applied by info providers/SRAs (Berg *et al.*, 2020; Billio *et al.*, 2021; Sahin *et al.*, 2023).

The final recipients of the message are the different categories of stakeholders (i.e., investors, asset management companies, banks, clients and suppliers, the public administration and civil society) using ESG scores and ratings in their decision-making. They decode the message and interpret the information. Each firm's stakeholders may consider different impacts as relevant, hence, decoding the signal on the basis of their priorities and ESG framework (Amel-Zadeh and Serafeim, 2018; In *et al.*, 2019; Serafeim and Yoon, 2022).

What emerges from this picture of the ESG information system is the lack, to date, of a shared code among the various players, throughout the process of production, processing and interpretation of ESG information. Previous studies have analysed some of the elements that comprise the quality and reliability of ESG information. Yet, they consider these issues in an isolated way, related to specific phases (i.e., the drawing of the sustainability reporting) or purposes (i.e., the quality of ESG information for sustainable investing), rather than the whole communication flow. A holistic analysis of all the involved elements is key to properly understanding the ESG communication process.

To draw a complete picture of the ESG information flow, and to detect the scholarly knowledge in this field and the research gaps, the methodology to follow is a systematic literature review (Dumay *et al.*, 2016; Massaro *et al.*, 2016). The latter is a literature review, that attempts to identify, select, synthesise and appraise academic contributions that, in our case, are relevant to answer the above-mentioned RQs.

While since 2020 the number of literature reviews on ESG matters in Accounting, Finance and Management research has dramatically increased, which

means that the topic is gaining momentum and is core to address emerging issues in many fields, from our preliminary scrutiny and search on bibliographic citation databases, we found that none of them is oriented to address our RQs, as can be seen in the summary provided in Appendix (see www.sidrea.it/trust-esg-ratings).

3. Research methodology: a systematic review and a bibliometric analysis

3.1. A systematic review procedure

According to Pickering and Byrne (2014, p. 539), a systematic review method “works well for emerging areas”, which is perfectly suited to the topic we want to address, i.e., the quality of ESG data, given its increasing relevance and the possibility of analysing it from different perspectives. The aim is to offer a framework to explore, discover and develop knowledge processes related to an emerging, complex and articulated topic. In so doing, we adopt organised, transparent and replicable procedures (Petticrew and Roberts, 2008). Namely, we have followed the three stages outlined by Tranfield *et al.* (2003): planning, conducting and reporting the review.

The first step, planning, requires the involvement of a review panel, in our case composed of the two authors, to define the key steps to conduct the review and ensure the methodological rigour through a cross-checking process. Planning the review allows us to define the criteria for the search strategy and to outline the research boundaries (Tranfield *et al.*, 2003, p. 215).

The second step consists in conducting the review. Academic contributions have been drawn from Thomson Reuters’ Web of Science (WoS), which is one of the most important global bibliographic citation databases of peer-reviewed literature. WoS was chosen because its database consists of over 33,000 sources and focuses on hard science and social science areas, which fit perfectly with the purpose of our research, aiming to contaminate our field of research with insights from authors not only from the social sciences (e.g., accounting, finance, management) but also from other disciplines (e.g., information science).

Based on the main topics we decided to investigate, in November 2022, a search was conducted with the following keywords (included in the title, abstract, author keywords and Keywords Plus): “ESG” or “non-financial information” or “sustainability reporting” AND “rating” or “KPI” or “quality of data” or “artificial intelligence” or “machine learning” or “big data”. We have carefully selected all these keywords, through an iterative process of adding new keywords, in order to include many contributions in our dataset and not risk losing some themes that we were not able to identify a priori.

We restricted the examination to English-language texts only from 2013 to 2022 regarding Business Finance, Management, Business and Economics fields.

The result is a set of 125 documents, cited 1,552 times (without self-citations) in the considered timeframe, with 13.17 average citations per item and a Hirsch index¹ of 20.

Subsequently, we built a bibliographic database with all the details of the articles included in the literature review (title, authors, journal and other publication details), and each article was downloaded, collected and stored.

For each documentary source, the content of the abstract was examined individually by each author and the same authors unanimously considered this document to be coherent for the purposes of the research.

The third and last step concerns the reporting of the review. According to Tranfield *et al.* (2003, p. 218), a two-stage report should be developed: the descriptive and the thematic analyses. The first one allows researchers to provide a description of how research has developed and to understand which authors are contributing the most and how. The second stage allows them to identify key emerging themes. In this stage, linking the themes across the main contributions and identifying research gaps for future investigation are crucial in the reporting process.

In terms of methodology, the novelty of our study is the combination of a systematic literature review with a bibliometric analysis, which allows us, through specific software and techniques, to uncover clusters of interconnected themes characterising the structure of the research field.

A systematic literature review uses systematic procedures, which are typically carried out manually by scholars. It requires a narrow scope of study and thus tends to include a lesser number of papers for review (e.g., between tens and low hundreds) (Snyder, 2019). In that sense, systematic literature reviews are better suited for niche research areas. In our case, the number of papers extracted, 125, is quite high, but above all, the use of bibliometric analysis is justified because the research scope is broad and has no limited boundaries. Therefore, as we will explain below, we adopted a bibliometric analysis to map the main topics and how they are interrelated.

¹ It is a distribution-based indicator reflecting the number of papers (N) in a given dataset having N or more citations. In our case, a Hirsch index of 20 indicates that 20 papers in the given set were cited at least 20 times each. This measure attempts to reflect both productivity (number of papers) and impact (number of citations) in one number.

3.2. A bibliometric analysis procedure

Unlike systematic literature reviews that tend to rely on qualitative techniques, bibliometric analysis relies upon quantitative techniques. The bibliometric analysis is a scientific method that can be useful for scholars who wish to pursue a retrospective of broad and rich areas in business research (Donthu *et al.*, 2021). Bibliometric methodology has gained immense popularity recently due to the usefulness of bibliometric software (such as VOSviewer) and databases (i.e., WoS or Scopus) that ease the acquisition and assessment of large volumes of scientific data.

The aims of a bibliometric study are to unveil the so-called ‘performance’ and ‘intellectual capital’ of a research field. In terms of performance, bibliometric analysis may help to gather information on the research constituents (which may include authors, institutions, countries and journals).

In terms of intellectual capital, bibliometric analyses “*reveal the bibliometric structure that encapsulates the networks between research constituents contributing to the intellectual structure that is founded upon clusters of interconnected themes in the research field*” (Donthu *et al.*, 2021, p. 287).

To this aim, we made use of VOSviewer software (Van Eck and Waltman, 2010), which maps and clusters bibliometric networks based on citation, co-citation, co-authorship, co-occurrence and bibliographic coupling links².

Each link has a *strength* which is represented by a positive numerical value: the higher this value, the stronger the link. For example, in the case of co-occurrence links, the strength indicates the number of documents in which two keywords occur together.

Each item of a network has a different size, depending on its prominence within the system. For example, in the case of the co-occurrence network, each keyword has a different size, depending on how many times it occurs throughout the selected documents.

The items of a network may be grouped into clusters that are labelled using numbers and different colours. An advantage of VOSviewer is that it pays special attention to the graphical representation of bibliometric maps in an easy-to-interpret way. Scholars should use bibliometric visualisation to curate analytical over descriptive discussions.

² Links are defined as follows:

- citation links: links between pairs of items, one citing the other;
- co-citation links: links between pairs of items, both cited by the same document;
- co-occurrence links: links between pairs of keywords, both occurring together in a considered pair of documents (more specifically, in their titles, abstracts or lists of authors’ keywords);
- bibliographic coupling links: links between pairs of items, both citing the same document.

In our investigation, we have run:

- the co-citation analysis in order to detect the main studies the topic we are investigating is based on (i.e., seminal papers);
- a keyword co-occurrence analysis was performed using VOSviewer to explore how the main features of the academic debate have unfolded in the last five years (i.e., 2018-2022 chronological development of the topic);
- a keyword co-occurrence analysis was also performed to obtain a network visualisation map to explore how the research's broad scope was articulated in different clusters (i.e., themes of research).

In interpreting the findings from bibliometric analysis, it is important to understand the content of each thematic cluster and the meaning entailed in the topics of publications in that cluster. In order to grasp a good understanding of the content, it is also important to examine their contextual meaning. For example, scholars can rely on the words that manifest prominently in the cluster to understand its content (e.g., words that are more connected than others); however, they must also review how the words are connected to each other in order to decipher the context of each cluster (e.g., studies in which those words appear).

Finally, among the clusters emerging from the mapping, we decided to delve into the streams of research we considered most relevant and dealing with:

- the issues of ESG data and ratings quality, objectivity, reliability and rigorousness;
- the relationships between ESG and Artificial Intelligence.

Moreover, in line with the systematic review, we proceeded to read through all contributions to highlight gaps in the literature and outline future research avenues.

4. Results

4.1. The data set overview

Our data set was made of 125 documents. The topic under examination has experienced rapid growth in recent years, with the greatest number of publications (28) recorded in 2021 (figure 3). Also, the number of citations of the selected publications have seen an exponential growth over time, reaching a peak of 569 in 2021. Such evidence further confirms that the topic we are investigating represents a new research frontier.

Figure 3 - Times cited and publications over time

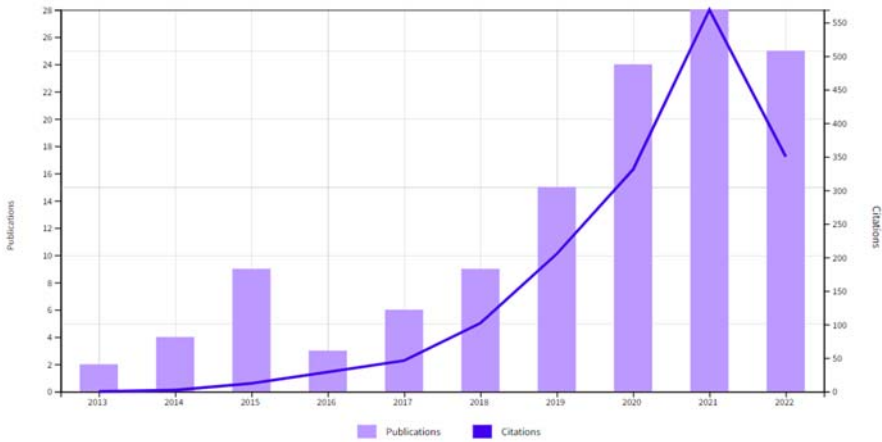


Table 1 shows the sources where at least two items of our sample have been published. The ones with a higher number of publications with respect to the documents selected are: the Journal of Sustainable Finance and Investment (13), Business Strategy and the Environment (8), the Journal of Business Ethics (6), Corporate Social Responsibility and Environmental Management (6), and the Journal of Asset Management (6). They are also the sources that have been cited the most, on average. This shows, as we would have expected, that the main contributions to the topic we are exploring come from documents that have been published in Finance, Business and Management journals. In particular, great attention has to be paid to the sources dealing with sustainability and environmental and social issues.

Table 1 – Sources with a minimum of two items

Source	Documents	Citations
<i>Journal of Sustainable Finance & Investment</i>	13	64
<i>Business Strategy and the Environment</i>	8	205
<i>Journal of Business Ethics</i>	6	430
<i>Corporate Social Responsibility and Environmental Management</i>	6	190
<i>Journal of Asset Management</i>	6	177
<i>Journal of Portfolio Management</i>	5	28
<i>Social Responsibility Journal</i>	4	58
<i>Meditary Accountancy Research</i>	3	26
<i>Finance Research Letters</i>	3	2

<i>Journal of Banking & Finance</i>	2	89
<i>Management Decision</i>	2	76
<i>Financial Analysts Journal</i>	2	18
<i>International Journal of Strategic Property Management</i>	2	15
<i>Journal of the Operational Research Society</i>	2	13
<i>Accounting Auditing & Accountability Journal</i>	2	12
<i>Journal of Applied Corporate Finance</i>	2	7

Source: Web of Science

The selected 125 documents were written by 332 authors. Only 16 of them have published at least two of the items considered, while four of them have been cited more than 50 times.

In particular, the four authors that contributed the most (both in terms of number of papers and quotations) to the development of the topic we are analyzing are: Dorfleintner G., (main research interests: sustainable finance, FinTech, and risk measures); Klein C. (behavioural finance, sustainable and responsible investing); Zwergel B. (behavioural finance, sustainable and responsible investing), and Halbritter G. (sustainable investments and corporate performance evaluation). This bibliometric evidence shows that the debate has developed mainly within the academic community dealing with sustainable finance and responsible investing. The latter involves taking ESG impacts into account when making investment decisions, leading to more long-term investments in sustainable businesses and projects. In this area of research, the quality of information is functional for the smooth functioning of the capital market according to the *efficient-market hypothesis* (Demartini, 2004).

4.2. Development of the research field

A valuable analysis that researchers may conduct using VOSviewer is the co-citation analysis in order to detect the main seminal papers the topic we are investigating is based on.

Then, a complementary keyword co-occurrence analysis was performed to explore how the main features of the academic debate have unfolded in the last years (2018-2022).

The results are discussed in the appendix (www.sidrea.it/trust-esg-ratings).

5. The state-of-the-art on ESG quality of data and rating reliability

An analysis of the development of the research over time shows that, despite the existence of a “fil rouge” between topics, it is evident that our dataset includes academic contributions from multidisciplinary fields of study, mainly: finance, accounting and information systems. Thus, a keyword co-occurrence analysis was performed using VOSviewer to highlight the main themes representing the intellectual structure of our research topic. In our case, the map shows eight main clusters that have been mapped in the light of our interpretative framework (see the results in appendix, www.sidrea.it/trust-esg-ratings).

Among the clusters that have emerged from the mapping, we have decided to delve into the research streams that we consider to be closest to the encoding and decoding processes of ESG information. These relate to:

- the quality, objectivity, reliability, and rigorousness of ESG data and ratings (clusters 1 and 2);
- the connections between ESG information and Artificial Intelligence (cluster 3).

Moreover, in line with the systematic review, we proceeded to read through all contributions to highlight gaps in the literature and outline future research avenues.

5.1. ESG data and ratings’ quality, objectivity, reliability, and rigorousness

In order to make informed decisions, stakeholders must be able to objectively evaluate and compare different companies and investment opportunities using clear, appropriate, complete and standardised metrics. Nevertheless, ESG measurement is somehow problematic given the lack of common definitions, reporting standards and shared characteristics among each ESG component and across different rating providers (Billio *et al.*, 2021). The concerns of investors for an effective integration of ESG factors in their investment decisions are manifold and endanger reaching urgent societal goals. The paper by Friede (2019) uses meta-analysis to develop a comprehensive understanding of these impediments from a diverse set of papers. Supported by textual analysis, it identifies about 160 different topics, which are divided into different groups and aggregated along a four-pillar framework of market, firm, regulatory and individual-based impediments. As we would have expected, the most prominent impediments are found in the areas of (i) the quality of data, (ii) the absence of clear standards and definitions, and (iii) various behavioural biases.

Due to the complexity related to the analysis of ESG data – which are

themselves the result of complicated and unclear measurement and disclosure processes – interpretations are increasingly being provided by specialised organisations (sustainability rating agencies-SRAs) that facilitate the use of this information and the comparison of companies’ sustainability performance (Boiral *et al.*, 2020).

By providing evaluations on corporate sustainability, SRAs act as intermediaries between companies who provide information in the field of ESG and stakeholders who use this information (Windolph, 2011; Escrig-Olmedo *et al.*, 2014). This aspect may constitute an additional problem when addressing the issue of the quality of ESG scores. In fact, even in an ideal case in which we are dealing with perfectly reliable non-financial information, it could be possible that they fail to reach investors because they are “lost in translation” when issued through third-party ESG information providers (Cho *et al.*, 2020).

Even though SRAs address a real need, their role and activities have been widely criticised in the literature. Several studies have highlighted the opacity and fuzziness of their methods of analysis (Stubbs *et al.*, 2013; SustainAbility, 2018). This lack of clarity could be explained by the fact that the ratings providers’ sector is highly competitive, thus leading SRAs to keep their methods of analysis private in order to perform better than their peers (Boiral *et al.*, 2020). However, this aspect raises questions about the reliability of the scores produced, undermining the credibility of sustainable responsible investment products based on ESG information. Furthermore, having more accurate information on SRAs’ measurement methods would be a plus for ESG data users. Similarly, it would be an advantage also for SRAs themselves because guaranteeing a higher level of transparency would make them more reliable. They should also benefit from a greater level of collaboration among themselves in order to save time and costs related to more in-depth ESG evaluations.

5.2 Possible ways to overcome the critical issues related to ESG data and ratings’ quality, objectivity, reliability and rigorousness

It is worth noting that, among contributions belonging to cluster no. 2, we have found papers focusing on possible solutions to overcome the problem of the quality of data. Namely:

- i. the external assurance of the non-financial information included in the corporate reports and
- ii. the implementation of Distributed Ledger Technologies (DLTs) to create efficient, transparent and automated data collection processes.

5.2.1. Assurance of non-financial information

Currently, in most countries, companies are not obliged to have their sustainability reports audited by an external assurance provider because there are neither obligations concerning the standards to be applied in the preparation of these documents nor uniform assurance auditing standards (Schüler *et al.*, 2018; Quick and Inwinkl, P., 2020). However, over the last few years, many firms have started to submit voluntary external audits to provide credibility to their sustainability reports, strengthen their stakeholders' confidence in the information provided and avoid being accused of greenwashing (Owen *et al.*, 2008). Additionally, external audit support could also help companies to integrate the sustainability principle into their core business more consistently and to make it part of their strategic decisions. The audit may offer reasonable assurance or limited assurance, depending on the extent and depth of the assurance work undertaken by the assurance provider in relation to the company's sustainability report. The paper by Schüler *et al.* (2018) shows that 78.9% of the assurance reporting analysed has performed a limited/moderate assurance of companies' sustainability reports. Alongside the external assurance of sustainability reports through professional services, there are also other possible ways they can try to overcome the issue of ESG data reliability. Other studies have shown that other tools employed for obtaining ESG sustainability report certifications are internal assurance and the production of these reports in line with specific standard government regulatory requirements (Al-Shaer and Zamaal., 2018; Velte, 2020; García-Sánchez *et al.*, 2022; Pozzoli *et al.*, 2022).

5.2.2 Distributed Ledgers Technologies (DLTs)

The lack of standardisation and the absence of a globally accepted framework for non-financial reporting has negative repercussions on collecting, processing and disclosing clear, objective and comparable data. Regarding ESG reporting and data sharing, instead, there is still a lack of comprehensive technological applications, resulting in manual management processes of inaccurate information, without proper data communication channels between participants. The paper by Cerchiaro *et al.* (2021) suggests that many of the obstacles related to non-financial reporting could be addressed by exploiting recent technological advances. For this reason, the above-mentioned authors suggested the implementation of Distributed Ledgers Technologies (DLTs) in order to make ESG reporting more efficient. DLTs are decentralised peer-to-peer transactional database enabling validated and consistent transactions between many participants in a network that consists of tamper-resistant nodes (Glaser, 2017; Beck *et al.*, 2018). In this framework, all participants

are equally privileged and interconnected, and there is no need for a centralised administrative authority because control is distributed among all nodes on a continuous basis. Potential benefits are manifold. DLTs could:

- simplify and automate processes, making complex and time-consuming activities easier to handle for all stakeholders. This is also beneficial for auditing and tracing processes because, once a transaction is executed in the network, it cannot be reversed;
- bring a higher level of transparency to the reporting process, as every record committed to the ledger can be accessed by all permitted participants. This reduces the risk of human error and greenwashing;
- reduce costs and the time allocation connected with the reporting activity, due to the fact that data can be quickly processed and stored;
- allow for improved data sharing and verifiability for all parties. All participants can work in a collaborative way, inputting raw ESG data into the ledger without the need of a central authority that coordinates and controls the whole process. This enhances communication among participants, reducing frictions from coordination-based tasks. Privacy is guaranteed thanks to the fact that all information is shared with permitted participants on a need-to-know basis — meaning that information is available only for those who need it for legitimate purposes, performance of duties or discharge of legal obligations. The access to the network could be extended to any third party in charge to review ESG information and revoked at any time.

The introduction of DLTs in the ESG reporting process brings with it some criticisms, too. For instance, implementing this kind of platform in an enterprise environment requires the existence of some specific technological infrastructures and capabilities. In addition, companies should have a good understanding of DLTs' mechanisms in order to implement them successfully (Centorrino *et al.*, 2022). This could be a critical aspect because there is an overall knowledge deficit in this field due to its recentness (Post *et al.*, 2018). However, limitations are not only related to technical aspects: questions and doubts around the ESG reporting process itself still remain.

5.3 ESG data and artificial intelligence

Traditionally, ESG ratings were exclusively produced by human research analysts on the basis of companies' disclosures, released articles and industry research.

However, innovations in financial technology are disrupting the environment of ESG ratings. Many questions have arisen about the extent to which AI

could affect businesses and the role it could play in helping investors and stakeholders to take optimal investment decisions. Within the last few years, the development of AI and machine learning have led to the creation of a new type of ESG ratings provider – called “*alternative*” (rather than “*traditional*”). In particular, it analyses companies’ ESG risks and opportunities by collecting and processing unstructured data from internet sources using AI.

In fact, while in the past the assessment for inclusion in a sustainability index was based on information gathered from companies’ online questionnaires built on a range of financially relevant sustainability criteria covering the economic, environmental and social dimensions (Bernardi and Demartini, 2019), nowadays information on ESG performance is collected from various sources and media and elaborated using AI.

The most relevant contribution to our study in the latter field is the Special Issue by Musleh Al-Sartawi *et al.* (2022). It is a collection of various papers examining the role of AI in helping creditors, investors and business managers to take optimal decisions. It encourages the readers to (i) reflect on the challenges and opportunities presented by AI in providing solutions to sustainability issues and (ii) to understand its value beyond a problem-solving tool. Alternative ESG rating providers use natural language processing (NLP) to extract the public sentiment on a company through the automatic synthetization of a large amount of unstructured data collected from online sources. Bala *et al.* (2021) have shown how AI is able to give structure to unstructured data by assigning quantitative values to qualitative information based on cognitive computing processes. In this way, the discussion on relevant ESG issues is no longer fed by corporations themselves only but involves many more stakeholders: there is a collection of third parties’ public information on companies coming from NGOs, national and international media sources, academic journals and so on. For this reason, ESG knowledge production of alternative ESG rating providers is potentially more democratic and less subjective with respect to the traditional ones.

6. The quality of ESG data, ratings and artificial intelligence: current gaps and possible future research developments

In trying to understand the state-of-the-art of research on the ESG ratings and the quality of information gathered and provided to the market and the stakeholders, our findings reveal that authors interested in different fields of research (e.g., CSR, sustainability reporting, responsible investing, finance, economics of information) underline the lack of common standards in reporting and evaluating the ESG performance of individual companies.

Currently, there is a general bias in ESG data. Some themes/categories tend to be under-represented and some others over-represented – depending, for example, on the amount and quality of non-financial data that has been disclosed. Another critical aspect lies in the fact that there is no homogeneity in the way companies disclose their non-financial information.

However, as a result of constant pressure coming from markets, institutions and society with the aim of improving the quality of sustainability information, on 28 November 2022, the European Union Council gave its final approval to the corporate sustainability reporting directive (CSRD), offering the possibility of increasing the homogeneity of ESG data. Standards are being developed by the European Financial Reporting Advisory Group (EFRAG) and they will be shaped to EU policies, but also feed into and incorporate global initiatives.

Hence, the European Union will have its own sustainability reporting standards on ESG issues, marked by a multi-stakeholder perspective that (i) will be consistent with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and (ii) will reflect the disclosure requirements issued by the EU Green Taxonomy and the proposed Corporate Sustainability Due Diligence Directive (CSDDD). At the same time, the European standards are expected to contribute to the process of the global convergence of sustainability reporting standards, supporting the work already carried out by the International Sustainability Standards Board (ISSB).

In order to increase the dissemination and comparability of information, the CSRD also places an obligation to make the information contained in sustainability reports digital, using XHTML and XBRL markup language, already mandatory in Europe for all listed companies. This implies that a taxonomy of sustainability information with related “tags” (digital labels) should be prepared, and all digitised sustainability information should (i) be published according to a European Single Electronic Format (ESEF) and (ii) flow into the European Single Access Point (ESAP).

Hence, the adoption of the new CSRD and the European Single Electronic Format XHTML – as required by the Directive itself – call on especially accounting scholars to investigate if a new regulation design and adoption would greatly simplify the collection process and, consequently, the analysis of non-financial data.

Furthermore, the lack of transparency on the framework used by rating agencies in developing sustainability indices is a problem for both companies and investors. In this sense, further questions arise about the extent to which AI affects businesses and the role it must play in helping investors and stakeholders to take optimal decisions. This seems like one of the most promising fields for future research avenues.

AI allows sustainable investors to process massive amounts of data that hold crucial information for ESG investing. However, even if computer algorithms are able to analyse all the information available about a company efficiently and in a timely manner, managers and investors should be aware of their opportunities and shortcomings, while scholars should address propositions for advancing the research on these topics.

In fact, in a context where multiple sources and big data are available, it is necessary to consider the challenges presented by AI in providing solutions to sustainability issues.

We deem that AI's peculiar features generate some managerial, ethical and regulatory concerns over the following dimensions:

- AI governance: there is still inadequate management of and governance over AI applications, insufficient data protection mechanisms, lack of experienced AI talent and lack of training for managers and other responsible parties (Demartini and De Mauro, 2020; Demartini, 2021);
- Algorithms quality: apart from the problems related to input data, algorithms themselves are often biased. Since they are initially designed by individuals, subjectivity is inevitably involved in their formulation procedure, which is also usually not clear. Reasoned use of AI allows companies to create new market opportunities and become more competitive in an increasingly concentrated environment. That is why there is no incentive for market operators to disclose how algorithms are designed, what they do and how they make decisions. Furthermore, very little ESG data have been produced by the companies until now. This means that, since we do not have the historical information to be fed into these algorithms, the latter are not able to learn from the past and cannot be considered very efficient yet. In the future, much more non-financial information will be provided by the firms and fed into these algorithms, thus leading to an increase in the historical depth of ESG data and consequently to a greater predictive ability of these intelligent systems.

As accounting scholars, we need to analyse the strengths and limits of AI systems in order to make them useful for solving accounting and business problems and to determine the appropriate training and skills needed to allow accountants to control intelligent systems more easily. Hence, future research could examine the need for AI regulations and AI governance systems in corporations from a holistic perspective, because AI will be increasingly widespread in the processes that regulate information flows inside and outside the company.

7. Conclusions

The academic contributions that we have examined in this literature review adopt a partial perspective and address individual issues concerning the quality of ESG information, highlighting the limits that currently characterise ESG information by focusing on the role/behavior of the individual actors involved in the information process (i.e., issuers or intermediaries or final recipients), and/or on the different methods of coding, transmission, collection and decoding of ESG information.

In this complex and articulated picture, we believe that our research, contributes to previous studies by offering a broader perspective. Drawing on the theoretical framework of information theory, we deem that the quality of ESG information can only be guaranteed by clear coding rules and decoding of information, throughout the information process that goes from the source to the final recipient of the message. As suggested by the Shannon-Weaver model, sharing a code is a necessary condition for communicating. This implies not only a process of harmonisation and standardisation of the information produced by companies, as has been the case since the 1990s for financial information, but also a governed and transparent use of AI in the collection, processing and distribution of information by the actors involved in the information process.

Our bibliometric analysis shows that the debate on ESG information has so far mainly developed within the scientific community dealing with sustainable finance and responsible investing. Hence, a further contribution of our study is the call for future research on ESG information quality for accounting and management scholars, due to the relevance of this issue on the company's internal and external information flows, as well as on the company's control system. In addition to research implications, our study is of interest to legislators and practitioners alike for our insights into the potential but also the risks of applying AI to the processes of collecting, processing and transmitting ESG information.

There are some limitations of our study that should be considered, too.

First, the bibliographic database used to conduct the systematic review is largely comprehensive but not exhaustive. Further reviews could cover additional bibliographic sources, and unpublished papers could be included by looking at the main conferences or platforms that can provide work-in-progress papers.

Second, the search strategy and procedure attempted to encompass all the relevant studies. However, it is likely that some articles were not included because of the use of different keywords or the different categorisation by subject area in the bibliographic databases.

Third, within the thematic analysis, key themes have been identified and categorised through bibliometrics tools and our subjective interpretation and

understanding of the emerging categories. It is important to understand that though bibliometric analysis is an effective method of summarising and synthesising literature, it is not without limitations. The techniques chosen and the decisions associated with each step to perform bibliometric analysis are critical because they influence the results obtained and the interpretations that can be drawn from the analysis.

Notwithstanding these limitations, the bibliometric methodology can empower scholars to pursue ambitious retrospectives of business research. Indeed, even in business research as in other research fields, the use of bibliometric analysis can facilitate knowledge creation. Finally, bibliometric analysis is quantitative in nature, wherein the relationship between quantitative and qualitative results is based on the researcher's interpretation (Wallin, 2005). In this regard, scholars should take care when making qualitative assertions about bibliometric observations and supplement them with content analysis, where appropriate, as we did.

References

- Al-Fedaghi S. (2012), A conceptual foundation for the Shannon-Weaver model of communication, *International Journal of Soft Computing*, 7(1), pp. 12-19. Doi: 10.3923/ijscmp.2012.12.19.
- Al-Shaer H., Zaman M. (2018), Credibility of sustainability reports: the contribution of Audit Committees, *Business Strategy and the Environment*, 27, pp. 73-986. Doi: 10.1002/bse.2046.
- Alshehhi A., Nobanee H., Khare N. (2018), The impact of sustainability practices on corporate financial performance: Literature trends and future research potential, *Sustainability*, 10(2), 494. Doi: 10.3390/su10020494.
- Amel-Zadeh A., Serafeim G. (2018), Why and how investors use ESG information: Evidence from a global survey, *Financial Analysts Journal*, 74(3), pp. 87-103. Doi: 10.2469/faj.v74.n3.2.
- Aouadi A., Marsat S. (2018), Do ESG controversies matter for firm value? Evidence from international data, *Journal of Business Ethics*, 151, pp. 1027-1047. Doi: 10.1007/s10551-016-3213-8.
- Arribas I., Espinós-Vañó M. D., Garcia, F., Riley, N. (2021), Do irresponsible corporate activities prevent membership in sustainable stock indices? The case of the Dow Jones Sustainability Index world, *Journal of Cleaner Production*, 298, 126711. Doi: 1016/j.jclepro.2021.126711.
- Arvidsson S., Dumay J. (2022), Corporate ESG reporting quantity, quality and performance: Where to now for environmental policy and practice?, *Business Strategy and the Environment*, 31(3), pp. 1091-1110. Doi: 10.1002/bse.2937.
- Avramov D., Cheng S., Lioui A., Tarelli A. (2022), Sustainable investing with ESG rating uncertainty, *Journal of Financial Economics*, 145(2), pp. 642-664. Doi: jfineco.2021.09.009.

- Bala G., Bartel H., Hawley J. P., Lee Y.J. (2015), Tracking real-time corporate sustainability signals using cognitive computing, *Journal of Applied Corporate Finance*, pp. 27-95. Doi: 10.1111/jacf.12122.
- Barman E. (2018), Doing Well by doing Good: A comparative Analysis of ESG Standards for Responsible Investment, *Sustainability, Stakeholder Governance, and Corporate Social Responsibility*, 38, pp. 289-311. Doi: 10.1108/S0742-332220180000038016.
- Beck R., Müller-Bloch C., King J.L. (2018), Governance in the Blockchain Economy: A Framework and Research Agenda, *Journal of the Association for Information Systems*, 19, pp. 1020-1034. Doi: 10.17705/1jais.00518.
- Berg F., Fabisik K., Sautner Z. (2020), Rewriting history II: The (un) predictable past of ESG ratings, *European Corporate Governance Institute – Finance Working Paper*, 708, 10-2139.
- Bernardi C., Demartini P. (2019), Building Sustainable Intellectual Capital: insight from a company included in the Dow Jones Sustainability Index, In Chiucchi S. and Demartini P. (Eds), *Qualitative research in Intangibles, Intellectual Capital and Integrated Reporting practices*, Series Corporate governance e scenari di settore delle imprese, Roma Tre Press p. 97. Doi: 10.13134/978-88-32136-21-0/10.
- Berthelot S., Coulmont M., Serret V. (2012), Do investors value sustainability reports? A Canadian study, *Corporate Social Responsibility and Environmental Management*, 19(6), pp. 355-363. Doi: 10.1002/csr.285.
- Billio M., Costola M., Hristova I., Latino C., Pelizzon L. (2021), Inside the ESG Ratings:(Dis) agreement and performance, *Corporate Social Responsibility and Environmental Management*, 28(5), pp. 1426-1445. Doi: 10.1002/csr.2177.
- Boiral O., Talbot D., Brotherton M. C., Heras-Saizarbitoria I. (2021). Sustainability rating and moral fictionalism: opening the black box of nonfinancial agencies, *Accounting Auditing & Accountability Journal*, 34, pp.1740-1768. Doi: 10.1108/AAAJ-12-2019-4356.
- Centorrino G., Naciti V., Rupo D. (2022), From double-entry bookkeeping and ledger to blockchain technology: New frontiers for accounting information systems, *Management Control*, special issue 2, pp. 15-41. Doi: 10.3280/MACO2022-002-S1002.
- Cerchiaro D., Leo S., Landriault E., De Vega P. (2021), DLT to boost Efficiency for Financial Intermediaries. An Application in ESG Reporting Activities, *Technology Analysis & Strategic Management*, pp. 1-14. Doi: 10.1080/09537325.2021.1999921.
- Chandler D. (1994), The transmission model of communication. -- URL: <http://www.aber.ac.uk/media/Documents/short/trans.Htm>.
- Chatterji A.K., Durand R., Levine D., Touboul S. (2016), Do Ratings of Firms converge? Implications for Managers, Investors, and Strategy Researchers, *Strategic Management Journal*, 37, pp. 1597-1614. Doi: 10.1002/smj.2407.
- Cho C.H., Bohr K., Choi T.J., Partridge K., Shah J.M., Swierszcz A. (2020), Advancing Sustainability Reporting in Canada: 2019 Report on Progress, *Accounting Perspectives*, 19, pp. 181-204. Doi: 10.1111/1911-3838.12232.
- Clarkson P., Li Y., Richardson G., Tsang A. (2019), Causes and consequences of voluntary assurance of CSR reports: International evidence involving Dow Jones Sustainability Index Inclusion and firm valuation, *Accounting, Auditing & Accountability Journal*, 32(8), pp. 2451-2474. Doi:10.1108/AAAJ-03-2018-3424.
- Cornelius I. (2002), Theorizing information for information science, *Annual review of information science and technology*, 36(1), pp. 392-425. Doi: 10.1002/aris.1440360110.
- Cruz C.A., Matos F. (2023), ESG maturity: A software framework for the challenges of ESG data in investment. *Sustainability*, 15(3), 2610. Doi: 10.3390/su15032610.

- Cucari N., Esposito de Falco S., Orlando B. (2018), Diversity of board of directors and environmental social governance: Evidence from Italian listed companies, *Corporate Social Responsibility and Environmental Management*, 25(3), pp. 250-266. Doi: 10.1002/csr.1452.
- De Villiers C. (2017), Stakeholder requirements for sustainability reporting, In *Sustainability accounting and integrated reporting*, pp. 57-63, Routledge. Doi: 10.4324/9781315108032-6.
- Demartini P. (2021), Sul contributo dei Big Data al processo decisionale del Board, In Mancini D., D'Onza G., Caserio C., *Scritti in onore di Luciano Marchi*, vol. 2, Torino, Giapichelli.
- Demartini P. (ed.) (2004), *Informazione, imprese e mercati finanziari efficienti: spunti di riflessione in una prospettiva multidisciplinare*, Milano, FrancoAngeli.
- Demartini P., De Mauro A (2020), The impact of Big Data on board level decision making, *Proceedings of the IFKAD 2020: Knowledge in Digital Age*, pp. 1712-1722.
- Dhaliwal D.S., Li O.Z., Tsang A., Yang Y.G. (2011), Voluntary nonfinancial disclosure and the cost of equity capital: The initiation of corporate social responsibility reporting, *The accounting review*, 86(1), pp. 59-100. Doi: 10.2308/accr.00000005.
- Dimson E., Marsh P., Staunton M. (2020), Divergent ESG ratings, *The Journal of Portfolio Management*, 47(1), pp.75-87. Doi: 10.3905/jpm.2020.1.175.
- Donthu N., Kumar S., Mukherjee D., Pandey N., Lim W. M. (2021), How to conduct a bibliometric analysis: An overview and guidelines, *Journal of Business Research*, 133, pp. 285-296. Doi: 10.1016/j.jbusres.2021.04.070.
- Dorfleitner G., Kreuzer C., Sparrer C. (2020), ESG Controversies and Controversial ESG: About silent Saints and small Sinners, *Journal of Asset Management*, 21, pp. 393-412. Doi: 10.1057/s41260-020-00178-x.
- Dorfleitner G., Utz S., Wimmer M. (2018), Patience pays off - Corporate Social Responsibility and long-term Stock Returns, *Journal of Sustainable Finance & Investment*, 8, pp. 132-157. Doi: 10.1080/20430795.2017.1403272.
- Dumay J., Bernardi C., Guthrie J., Demartini P. (2016), Integrated reporting: A structured literature review, *Accounting forum*, 40(3), pp.166-185). Doi: 10.1016/j.accfor.2016.06.001.
- Durand R., Paugam L., Stolowy H. (2019), Do investors actually value sustainability indices? Replication, development, and new evidence on CSR visibility, *Strategic Management Journal*, 40(9), pp. 1471-1490. Doi: 10.1002/smj.3035.
- Eccles R.G., Klimenko S. (2019), The investor revolution, *Harvard Business Review*, 97(3), pp. 106-116.
- El Ghoul S., Guedhami O., Kwok C.C.Y., Mishra D. (2011), Does Corporate Social Responsibility affect the cost of capital?, *Journal of Banking & Finance*, 35, pp. 2388-2406. Doi: 10.1016/j.jbankfin.2011.02.007.
- Escrig-Olmedo E., Fernández-Izquierdo M.Á., Ferrero-Ferrero I., Rivera-Lirio J.M., Muñoz-Torres M.J. (2019), Rating the raters: Evaluating how ESG rating agencies integrate sustainability principles, *Sustainability*, 11(3), 915. Doi: 10.3390/su11030915.
- Escrig-Olmedo E., Muñoz-Torres M.J., Fernández-Izquierdo M.A., Rivera-Lirio J. M. (2014), Lights and shadows on sustainability rating scoring, *Review of Managerial Science*, 8, pp. 559-574. Doi: 10.1007/s11846-013-0118-0.
- Fiske J. (2011), *Introduction to Communication Studies*, Routledge, 3rd Edition. Doi: 10.4324/9780203837382.
- Friede G. (2019), Why don't we see more Action? A Metasynthesis of the investor impediments to integrate environmental, social, and governance factors, *Business Strategy and the Environment*, 28, pp. 1260-82. Doi: 10.1002/bse.2346.
- Friede G., Busch T., Bassen A. (2015), ESG and financial performance: aggregated evidence

- from more than 2000 empirical studies, *Journal of Sustainable Finance & Investment*, 5(4), pp. 210-233. Doi: 10.1080/20430795.2015.1118917.
- Galeotti M., Lombardi R., Paoloni P., Roberto F. (2022), Big data and sustainability reports: The current approach to non-accounting data management, *Management Control*, special issue 2, pp. 95-116. Doi: 10.3280/MACO2022-002-S1005.
- García-Sánchez I.M., Hussain N., Khan S.A., Martínez-Ferrero J. (2022), Assurance of corporate social responsibility reports: Examining the role of internal and external corporate governance mechanisms, *Corporate Social Responsibility and Environmental Management*, 29(1), pp. 89-106. Doi: 10.1002/csr.2186.
- Glaser F. (2017), Pervasive decentralisation of digital infrastructures: A framework for blockchain enabled system and use case analysis, *Paper Presented at the 50th Hawaii International Conference on System Sciences, Waikoloa, Hawaii, USA*. Doi: 10.24251/HICSS.2017.186.
- Haller A., Van Staden C.J., Landis C. (2018), Value added as part of sustainability reporting: Reporting on distributional fairness or obfuscation?, *Journal of Business Ethics*, 152, pp. 763-781. Doi: 10.1007/s10551-016-3338-9.
- Hawn O., Chatterji A.K., Mitchell W. (2018), Do investors actually value sustainability? New evidence from investor reactions to the Dow Jones Sustainability Index (DJSI), *Strategic Management Journal*, 39(4), pp. 949-976. Doi:10.1002/smj.2752
- Hawn O., Chatterji A., Mitchell W. (2011), *Two coins in one purse? How market legitimacy affects the financial impact of changes in social legitimacy: Addition and deletion by the Dow Jones Sustainability Index*. Duke University.
- Hollnagel E., Woods D.D. (2005), *Joint cognitive systems: Foundations of cognitive systems engineering*, CRC press. Doi: 10.1201/9781420038194.
- Hughes A., Urban M.A., Wójcik D. (2021), Alternative ESG ratings: How technological innovation is reshaping sustainable investment, *Sustainability*, 13. Doi: 10.3390/su13063551.
- In S.Y., Rook D., Monk A. (2019), Integrating alternative data (also known as ESG data) in investment decision making, *Global Economic Review*, 48(3), pp. 237-260. Doi: 10.1080/1226508X.2019.1643059.
- Ioannou I., Serafeim G. (2015), The impact of corporate social responsibility on investment recommendations: Analysts' perceptions and shifting institutional logics, *Strategic Management Journal*, 36(7), pp. 1053-1081. Doi: 10.1002/smj.2268.
- Ji L., Liu C., Huang L., Huang G. (2018), The evolution of resources conservation and recycling over the past 30 years: A bibliometric overview, *Resources, Conservation and Recycling*, 134, pp. 34-43. Doi: 10.1016/j.resconrec.2018.03.005.
- Kotsantonis S., Pinney C., Serafeim G. (2016), ESG integration in investment management: Myths and realities, *Journal of Applied Corporate Finance*, 28(2), pp. 10-16.
- Krasodomska J., Zarzycka E. (2019), The new Regulatory Framework and Non-Financial Kpis Disclosure: Is there any Room for Improvement in the Corporate Practice?, *Vision 2025: Education Excellence and Management of Innovations through Sustainable Economic Competitive Advantage*, pp. 9330-37.
- Krippendorff K. (2009). Mathematical theory of communication. *Departmental Papers (ASC)*, 169.
- Krueger P., Sautner Z., Tang D.Y., Zhong R. (2021), The effects of mandatory ESG disclosure around the world, *European Corporate Governance Institute – Finance Working Paper*, (754), pp. 21-44. Doi: 10.2139/ssrn.3832745.
- Landi G., Sciarelli M. (2019), Towards a more ethical Market: The Impact of ESG Rating on Corporate Financial Performance, *Social Responsibility Journal*, 15, pp. 11-27. Doi: 10.1108/SRJ-11-2017-0254.

- Lin J.L., Hou T.C.T., Hsiao Y.L. (2019), Introduction to the special issue of Big Data analytics: Using financial and non-financial information, *Asia Pacific Management Review*, 24. Doi: 10.1016/j.apmr.2019.02.001.
- López M. V., Garcia A., Rodriguez L. (2007), Sustainable development and corporate performance: A study based on the Dow Jones sustainability index, *Journal of business ethics*, 75, pp. 285-300. Doi: 10.1007/s10551-006-9253-8.
- Macmahon S. (2020), The challenge of rating ESG performance, *Harvard Business Review*, 98, pp. 52-54.
- Magness V. (2010), Environmental disclosure in the mining industry: A signaling paradox?, *Advances in Environmental Accounting and Management*, 4, pp. 55-81. Doi: 10.1108/S1479-3598(2010)0000004006.
- Massaro M., Dumay J., Guthrie J. (2016), On the shoulders of giants: undertaking a structured literature review in accounting, *Accounting, Auditing & Accountability Journal*, 29(5), pp. 767-801. Doi: 10.1108/AAAJ-01-2015-1939.
- Munoz-Torres M.J., Fernandez-Izquierdo M.A., Rivera-Lirio J.M., Escrig-Olmedo E. (2019), Can Environmental, Social, and Governance Rating Agencies favor Business Models that promote a more Sustainable Development?, *Corporate Social Responsibility and Environmental Management*, 26, pp. 439-452. Doi: 10.1002/csr.1695.
- Musleh Al-Sartawi M.A.M., Hussainey K., Razzaque A. (2022), The Role of Artificial Intelligence in Sustainable Finance, *Journal of Sustainable Finance & Investment*, pp. 1-6. Doi: 10.1080/20430795.2022.2057405.
- Petticrew M., Roberts H. (2008), *Systematic reviews in the Social Sciences: A practical guide*, John Wiley & Sons. Doi: 10.1002/9780470754887.
- Pickering C., Byrne J. (2014), The benefits of publishing systematic quantitative literature reviews for PhD candidates and other early-career researchers, *Higher Education Research and Development*, 33(3), pp. 534-548. Doi: 10.1080/07294360.2013.841651.
- Popelkova V. (2018), Non-Financial Information according to the Act on Accounting in Czech Republic. *European Financial Systems: Proceedings of the 15th International Scientific Conference*, pp. 543-549.
- Post R., Smit K., Zoet M. (2018), Identifying factors affecting blockchain technology diffusion, *Twenty-Fourth Americas Conference on Information Systems*, pp. 1-10.
- Pozzoli M., Pagani A., Paolone F. (2022), The impact of audit committee characteristics on ESG performance in the European Union member states: Empirical evidence before and during the COVID-19 pandemic, *Journal of Cleaner Production*, 371, 133411. Doi: 10.1016/j.jclepro.2022.133411.
- Quick R., Inwinkl P. (2020), Assurance on CSR reports: impact on the credibility perceptions of non-financial information by bank directors, *Meditari Accountancy Research*, 28(5), pp. 833-862. Doi: 10.1108/MEDAR-10-2019-0597.
- Rezaee Z., Tuo L. (2019), Are the quantity and quality of sustainability disclosures associated with the innate and discretionary earnings quality?, *Journal of Business Ethics*, 155, pp. 763-786. Doi:10.1007/s10551-017-3546-y.
- Richards I.A. (1955), *Speculative Instruments*, University of Chicago Press.
- Robinson M., Kleffner A., Bertels S. (2011), Signaling sustainability leadership: Empirical evidence of the value of DJSI membership. *Journal of business ethics*, 101(3), pp. 493-505. Doi: 10.1007/s10551-011-0735-y.
- Saad A. I., Strauss D. (2020), A new “Reasonable Investor” and changing frontiers of materiality: Increasing investor reliance on ESG disclosures and implications for securities litigation, *Berkeley Bus. LJ*, 17, 391.

- Sahin Ö., Bax K., Paterlini S., Czado C. (2023), The pitfalls of (non-definitive) Environmental, Social, and Governance scoring methodology, *Global Finance Journal*, 56, 100780. Doi: 10.1016/j.gfj.2022.100780.
- Schram W. (ed.) (1954), *The process and effects of mass communication*, University of Illinois Press.
- Schüler T., Arp A.K., Kirschner C., Please D.A. (2018), External assurance and decision usefulness of sustainability reports, *2018 BASIQ International Conference: New Trends in Sustainable Business and Consumption*, pp. 131-139.
- Searcy C., Elkhawas D. (2012), Corporate sustainability ratings: an investigation into how corporations use the Dow Jones Sustainability Index, *Journal of Cleaner Production*, 35, pp. 79-92. Doi: 10.1016/j.jclepro.2012.05.022.
- Serafeim G., Yoon A. (2022), Stock Price Reactions to ESG News: The Role of ESG Ratings and Disagreement, *Review of Accounting Studies*, pp. 1-31. Doi: 10.1007/s11142-022-09675-3.
- Sharma U., Gupta A., Gupta S.K. (2022), The Pertinence of incorporating ESG ratings to make investment decisions: A quantitative analysis using machine learning, *Journal of Sustainable Finance & Investment*, pp. 1-15. Doi: 10.1080/20430795.2021.2013151.
- She C., Michelon G. (2019), Managing stakeholder perceptions: Organized hypocrisy in CSR disclosures on Facebook, *Critical Perspectives on Accounting*, 61, pp. 54-76. Doi: 10.1016/j.cpa.2018.09.004.
- Skapa S., Bockova N., Doubravsky K., Dohnal M. (2022), Fuzzy confrontations of models of ESG investing versus non-ESG investing based on Artificial Intelligence Algorithms, *Journal of Sustainable Finance & Investment*, 13(1), pp. 763-775. Doi: 10.1080/20430795.2022.2030666.
- Snyder H. (2019), Literature review as a research methodology: An overview and guidelines, *Journal of Business Research*, 104, pp. 333-39. Doi: 10.1016/j.jbusres.2019.07.039.
- Stubbs W., Rogers P. (2013), Lifting the veil on Environment-Social-Governance rating methods, *Social Responsibility Journal*, 9, pp. 622-640. Doi: 10.1108/SRJ-03-2012-0035.
- Tranfield D., Denyer D., Smart P. (2003), Towards a methodology for developing evidence-informed management knowledge by means of systematic review, *British Journal of Management*, 14(3), pp. 207-222. Doi: 10.1111/1467-8551.00375.
- Tsang A., Frost T., Cao H. (2023), Environmental, Social, and Governance (ESG) disclosure: A literature review, *The British Accounting Review*, 55(1), 101149. Doi: 10.1016/j.bar.2022.101149.
- Utz S. (2019), Corporate scandals and the reliability of ESG assessments: Evidence from an international sample, *Review of Managerial Science*, 13, pp. 483-511. Doi: 10.1007/s11846-017-0256-x.
- Van Eck N.J., Waltman L. (2010), Software survey: VOSviewer, a computer program for bibliometric mapping, *Scientometrics*, 84, pp. 523-538. Doi: 10.1007/s11192-009-0146-3.
- Velte P. (2020), Determinants and consequences of corporate social responsibility assurance: A systematic review of archival research, *Society and Business Review*. Doi: 10.1108/SBR-05-2020-0077.
- Wallin J.A. (2005), Bibliometric methods: pitfalls and possibilities, *Basic & clinical pharmacology & toxicology*, 97(5), pp. 261-275. Doi:10.1111/j.1742-7843.2005.pto_139.x.
- Wang N., Pan H., Feng Y., Du S. (2023), How do ESG practices create value for businesses? Research review and prospects, *Sustainability Accounting, Management and Policy Journal*. Doi: 10.1108/SAMPJ-12-2021-0515.
- Willis A. (2003), The role of the global reporting initiative's sustainability reporting guidelines in the social screening of investments, *Journal of Business Ethics*, 43(3), pp. 233-237. Doi: 10.1023/A:1022958618391.
- Windolph S.E. (2011), Assessing Corporate Sustainability through ratings: Challenges and their causes, *Journal of Environmental Sustainability*, 1, pp. 37-57. Doi: 10.14448/jes.01.0005.

Management accounting implementation in SMEs: A Structured Literature Review

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Abstract

This paper aims to provide a state of the art of the current scientific literature on management accounting implementation phase in SMEs, whose economic impact in terms of GDP production and employment is recognized at worldwide level. Performing a structured literature review on the top journals' publications related to four different scientific fields covering the period 2005-2021, we found 88 papers focusing on the topic. Findings reveal that the theoretical contribution on management accounting implementation in SMEs has registered a decreasing trend of publications and presents a very fragmented picture of approaches and scientific perspectives. In such conditions, over the last fifteen years the structural gap between theory and practice in the implementation of management accounting in SMEs appears to be widened rather than narrowed, leaving the smaller companies without effective academic support and propositions to face the new evolutionary challenges for the management control.

Keywords: Management accounting, SMEs, implementation, structured literature review

1. Introduction

Small and medium-sized enterprises (SMEs) play a vital role for the modern economies worldwide (Eggers, 2020; Moeuf et al., 2020; Javalgi and Todd, 2011) supporting a relevant percentage of GDP production and workforce employment at global level (OECD, 2017). Consequently, assuming

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the fundamental function of management accounting techniques for the strategic effectiveness and operational efficiency (Bourne et al., 2003), the challenge of their implementation in SMEs should be considered a primary challenge for theory and practice. However, as highlighted by Lavia Lòpez and Hiebl (2015), management accounting (MA) research on SMEs has never been “fashionable” (Mitchell and Reid, 2000, p. 386) and its real implementation in SMEs is poorly diffused as denounced by literature several years ago (Garengo et al., 2005). MA systems are usually implemented in large companies while they are rarely used and/or scarcely known by smaller firms (Lombardi Stocchetti, 1996). In the last twenty years, research in SMEs has increased (Heinicke, 2018) but it remains still limited (Lavia Lòpez and Hiebl, 2015).

According to Neely et al. (2000), MA life cycle is composed of four phases: design, implementation, use, and maintaining. Since the beginning of the new millennium scholars highlight that the implementation is the most critical stage (Neely et al. 2000; Bourne et al., 2003), especially in the context of SMEs (Heinicke, 2018). Additionally, as demonstrated in Ciambotti et al. (2020), most of the studies greatly focus on design and use phases of MA lyfe-cycle, failing to understand the characteristics in terms of diffusion, antecedents and effect of the implementation stage. From a theoretical perspective this stage continues to remain scarcely investigated (Ahmad, 2017) and it is anecdotally to observe a limited implementation of MA tools in SMEs (Cerved, 2019; Dlamini and Schutte, 2021). Lòpez and Hiebl (2015) see the main reason for this in the dispersal of research findings among various research fields, such as accounting, small business and entrepreneurship, general management, or operations and production management. A comprehensive understanding of the MA research in such areas could contribute to the development of this research stream, useful for theory and practice.

To fill this gap, the paper focuses on MA implementation phase in the SMEs context with the aim to provide a state of the art of the current scientific literature on the topic. The paper adopts a structured literature review (SLR) methodology as developed by Massaro *et al.* (2016), reviewing the top journals in different research fields.

Our research contributes to management accounting theory for SMEs. We expect that our results will also be useful for practitioners, highlighting a possible convergence of methods, approaches and contributions practically consistent for the implementation stage in the context of SMEs. To this extent the literature review could reveal whether some models and frameworks suggested by theory over the last fifteen years have experienced a practical consensus and affirmation. Thus, the paper is organized as follows. After the

introduction section, paragraph 2 proposes existing literature and research gap. Section 3 presents the research methodology and section 4 shows our results. The last section proposed discussion and conclusions.

2. Literature analysis and research gap

MA is understood as the practice of identifying, measuring, analyzing, interpreting, and communicating financial information to managers for the pursuit of an organizations' goals (Tuovila, 2021). This definition is wide enough to cover several perspectives of the traditional MA, which can work for different functions and enables the inclusion of MA research in its various configurations. Along the evolution of MA, the most comprehensive concept of Performance Measurement System (PMS) has incorporated the need to integrate non-financial information (Garengo *et al.*, 2005) for the company strategic challenges. Consistently with Dlamini and Schutte (2021; p. 137) definition we intend MA as "a practical science that processes financial and non-financial information for the purposes of decision-making and policy formulation as well as value creation".

Consequently, for the aim of this paper the reference to MA tools includes all the instruments implemented for guiding the managers for the pursuit of the organizations' goal using structured information, both financial and/or non-financial, and the managers' ability to integrate these instruments in their decision-making process. The implementation issue will then be implicitly referred to MA and/or PMS tools.

In terms of implementation, the size has always played a significant determinant in theory and practice (Lavia López and Hiebl, 2015). SMEs are characterized by their own peculiarities which make them different to larger firms. For example, several authors (King *et al.*, 2010; Sandalgaard and Nielsen, 2018; Hiebl *et al.*, Speckbacher *et al.*, 2003) underline how smaller firms rely on informal tools, differently from larger firms. Similarly, Chenhall (2007) debates the needed information when a firm grows up. Other authors (Filbeck and Lee, 2000; Speckbacher and Wentges, 2012; Hiebl *et al.*, 2013) show the importance of contextual factors such as ownership structure or external environment (Hudson *et al.*, 2001; Garengo *et al.*, 2005) which lead them towards greater innovation and continuous improvement. In general, SMEs operate in more limited markets characterized by few customers (Hudson *et al.*, 2001) and can rely on lesser physical and financial resources (Cardoni, 2018; Jaradat *et al.*, 2021). Finally, smaller firms have a flat structure, high flexibility, and innovative potential, which allow them to react quickly

to changes in market demands (Heinicke, 2018). Hence, SMEs possess different features which limit the adoption of MA tools (Jaradat, 2021). However, in order to compete in the current business environment, it is crucial for SMEs to manage their scarce resources using proper information and control systems (Lavia Lòpez and Hiebl, 2015). Most scholars address the crucial question of the adoption of an innovative MA system for SMEs as well, especially in hyper-competitive environments such as the actual scenario (Havliček *et al.*, 2013). Even in SMEs, MA is an important corporate function that supports the main business operations by providing information that are valuable for management planning and control (Lavia Lòpez and Hiebl, 2015).

The existing research reveals that only few literature reviews try to map existing knowledge of MA implementation in SMEs covering the different research fields and the most recent literature. Bourne *et al.* (2003) focus on the specific stage of implementation without contextualizing for SMEs. On the contrary, Garengo *et al.* (2005), refer to SMEs treating the PMS in general, covering all the stages. Lòpez and Hiebl, (2015) develop a systematic literature review considering the SMEs context with a comprehensive view of the different research fields but limiting the analysis up to the year 2012. Heinicke (2018) devotes specific attention to family firms without including in the analysis the research stream of technology and engineering and not considering the citation metrics. Sulaiman *et al.* (2014) perform traditional literature reviews, whose objective results can be threatened by a lack of rigor (Massaro *et al.*, 2016).

In such theoretical background, for the aim of this paper we found particularly relevant the work of Neely *et al.* (2000) that conceptualizes the separation of the four MA steps, and the literature review of Garengo *et al.* (2005), specifically focused on the SMEs characteristics. These two papers have been published in two top-tier journals and produced a significant impact on academic community (to date, in Google Scholar they respectively register 1.552 citations and 1.232). Moreover, in our view these researches have the merit to follow a holistic approach, theoretically grounded but also practically oriented, with a clear specification of the real challenges, limits and conditions the SMEs have to face when implementing any MA tool. Summarizing, these two papers picture an effective state of the art at the beginning of the new millennium, highlighting the following central points:

- the paradox of an increasing relevance of MA in SMEs in the current business environment coexisting with a very scarce implementation, accompanied by a consistent gap between theory and practice (Garengo *et al.*, 2005);

- the scientific and practical relevance of long-term research investigation in collaboration with the SMEs (Neely *et al.*, 2000), often reluctant to be involved in such initiatives (Garengo *et al.*, 2005);
- the clear identification of influencing factors that can promote or hinder the MA implementation (Neely *et al.* 2000; Garengo *et al.* 2005);
- the importance of frameworks specifically tailored for the SMEs characteristics (Garengo *et al.*, 2005);
- the call for further research aimed to investigate in deeper details how to deal with such characteristics and manage the influencing factors in order to reduce the theory-practice gap (Neely *et al.*, 2000; Garengo *et al.*, 2005);

In order to study the evolution of literature over the last fifteen years and considering the research issues highlighted above, the inspiring research question of the paper is the follows:

RQ: How has the literature of MA implementation in SMEs evolved over the last fifteen years? Has this literature found a convergence and proposed solutions on the most critical influencing factors highlighted at the beginning of the new millennium?

3. Methodology

For the purposes of this research, we used a structured literature review (SLR) methodology, a precise and rigorous approach (Massaro *et al.* 2016), able to overcome some limits of the traditional literature reviews related to subjectivity and narrative style (Tranfield *et al.*, 2003; Denyer and Tranfield, 2006; Petticrew and Roberts, 2008)

Following the methodology provided by Massaro *et al.* (2016), we built the research protocol (Petticrew and Roberts, 2008), which includes: research question; type of search; article impact; analytical framework; reliability and validity; coding; contribution to theory and practice through analyzing the dataset; develop future research paths and questions. Table 1 summarizes each step of this literature review protocol.

Table 1 – Research protocol for the structured literature review (SLR)

Question	<i>How has the literature of MA implementation in SMEs evolved over the last fifteen years? Has this literature found a convergence and proposed solutions on the most critical influencing factors highlighted at the beginning of the new millennium?</i>	
Search	<u>Journals:</u> -high rank in ABS-list (2, 3, 4 grade) -four research fields (Lavia Lopez and Hiebl, 2015): accounting, small business and entrepreneurship, general management, operations and production management	<u>Articles:</u> -2005-2021 -Keywords: “SME” and similar ⁽¹⁾ ; “management account” and similar ⁽²⁾ ; “implementation and similar” ⁽³⁾ .
Article impact	Citation per article	
Frameworks	Framework integrating Neely et al. (2000) on MA cycle and Garengo et al. (2005) on SMEs characteristics (Table 3)	
Reliability	Cross checking and Cronbach’s α	
Validity	<u>Internal:</u> Pattern matching and theory explanation	<u>External:</u> 67 top-tier management journals are chosen with highest ranks
Code	<u>Formal:</u> - Title & Authors - Year - Location - Citations	<u>Scientific contents:</u> - Research method - Research MA focus - Theories and/or frameworks - Key issues
Expected insights	Permanence of criticalities in the implementation of management accounting in SMEs,	
Contribution	<u>Theoretical</u> Understanding the development of literature over the last 15 years in terms of trend, location, theoretical perspectives and key issues to orient future research	<u>Practical:</u> Investigating the gap between theory and practice, providing some suggestions for increasing the diffusion and implementation of MA in SMEs.
Future research	- Empirical research on SMEs MA implementation	

- (1) = small business, small and medium-sized enterprise, medium-sized enterprise, small enterprise, small enterprise, medium enterprise, small firm, medium-sized firm, small company, medium-sized company, startup/start-up;
- (2) = management account, managerial account, management control, budget, performance measure, performance manage, performance evaluation, cost account, cost manage, activity based manage, activity-based cost, balanced scorecard;
- (3) = presence, practices, adoption, use, develop, development, introduction, introduce, diffusion.

This work was restricted to papers published in academic top-tier journals for the following reasons.

Firstly, the research question has been inspired by high-impact academic contributions (Neely *et al.*, 2000; Garengo *et al.*, 2005) published in top-tier journals, as demonstrated by their impact factor score (to date, respectively 9.36 for IJOPM and 8.95 for IJMR). This testifies that the topic has attracted significant attention at the higher segments of academic literature.

Secondly, even considering the abundant literature on the topic at all levels of scientific production, including the so-called “grey literature”, the prestigious of the top journals tend to exercise a major impact on scientific and public debate, focusing the attention of academics, policy makers, managers and practitioners on specific topics. Moreover, in the top accounting journals has been observed a phenomenon of convergence and polarization on the geographical area (Jones and Robert, 2005), research topics and publications outlets (Eleftheriou *et al.*, 2023), that can create reinforcing or weakening cycle of investigation on some specific issues.

Thirdly, the top journals tend to attract the worldwide interest of scholars aspiring to be published in such outlets for personal career and/or institutional ranking (Bonner *et al.*, 2006; Meyer *et al.*, 2018). This process can direct a massive development of intellectual resources to investigate issues, activate collaboration and propose solutions, able to produce a dramatic impact on the professional environment. Focusing on the top journals may certainly create difficulties to appreciate the more operational contributions on the managerial side, though allowing to capture a long-term tendency with strong practical implications, also through the influence on educational programs.

Similar to Heinicke (2018), the journal selection was grounded on the Academic Journal Quality Guide 2018 (ABS Guide), with a rating two, three or four in the following research fields (Lavia Lòpez and Hiebl, 2015): “Accounting”, “Entrepreneurship and small business management”, “General management”, and “Operations and technology management”. At the same time, the journals should be ranked as “A” level in the “Anvur” ranking valid for Italian criteria. The combination of these criteria created a selection of 67 top-tier journals (Table 2).

Table 2 – Journals included in the SLR according to the selection criteria

Section: Accounting	Section: Entrepreneurship and small business management
<p><i>Abacus (Abacus)</i> <i>Accounting and Business Research (ABR)</i> <i>Accounting Forum (AF)</i> <i>Accounting Horizons (AH)</i> <i>Accounting Review (AR)</i> <i>Accounting, Auditing and Accountability Journal (AAAJ)</i> <i>Accounting, Organizations and Society (AOS)</i> <i>Auditing: A Journal of Practice and Theory (AJPT)</i> <i>Behavioral Research in Accounting (BRIA)</i> <i>British Accounting Review (BAR)</i> <i>British Tax Review (BTR)</i> <i>Contemporary Accounting Research (CAR)</i> <i>Critical Perspectives on Accounting (CPA)</i> <i>European Accounting Review (EAR)</i> <i>Financial Accountability and Management (FAM)</i> <i>Foundations and Trends in Accounting (FTA)</i> <i>International Journal of Accounting (IJA)</i> <i>Journal of Accounting and Economics (JAE)</i> <i>Journal of Accounting and Public Policy (JAPP)</i> <i>Journal of Accounting Literature (JAL)</i> <i>Journal of Accounting Research (JAR)</i> <i>Journal of Accounting, Auditing and Finance (JAAF)</i> <i>Journal of Business Finance and Accounting (JBFA)</i> <i>Journal of International Accounting, Auditing and Taxation (JIAAT)</i> <i>Journal of the American Taxation Association (JATA)</i> <i>Management Accounting Research (MAR)</i> <i>Review of Accounting Studies (RAS)</i></p>	<p><i>Entrepreneurship and Regional Development (ERD)</i> <i>Entrepreneurship, Theory and Practice (ETP)</i> <i>Family Business Review (FBR)</i> <i>International Small Business Journal (ISBJ)</i> <i>Journal of Business Venturing (JBV)</i> <i>Journal of Small Business Management (JSBM)</i> <i>Small Business Economics (SBE)</i> <i>Strategic Entrepreneurship Journal (SEJ)</i></p>
Section: General management	Section: Operations and technology management
<p><i>Academy of Management Annals (AMA)</i> <i>Academy of Management Journal (AMJ)</i> <i>Academy of Management Perspectives (AMP)</i> <i>Academy of Management Review (AMR)</i></p>	<p><i>Computers in Industry (CI)</i> <i>IEEE Transactions on Engineering Management (IEEE)</i> <i>International Journal of Operations and Production Management (IJOPM)</i></p>

<p><i>Administrative Science Quarterly (ASQ)</i> <i>British Journal of Management (BJM)</i> <i>Business and Society (BS)</i> <i>Business Ethics Quarterly (BEQ)</i> <i>California Management Review (CMR)</i> <i>European Management Review (EMR)</i> <i>Gender and Society (GS)</i> <i>Gender, Work and Organization (GWO)</i> <i>Harvard Business Review (HBR)</i> <i>International Journal of Management Reviews (IJMR)</i> <i>Journal of Business Ethics (JBE)</i> <i>Journal of Business Research (JBR)</i> <i>Journal of Management (JM)</i> <i>Journal of Management Inquiry (JMI)</i> <i>Journal of Management Studies (JMS)</i> <i>MIT Sloan Management Review (MIT)</i></p>	<p><i>International Journal of Production Economics (IJPE)</i> <i>International Journal of Production Research (IJPR)</i> <i>Journal of Operations Management (JOM)</i> <i>Journal of Scheduling (JS)</i> <i>Journal of Supply Chain Management (JSCM)</i> <i>Manufacturing and Service Operations Management (MSOM)</i> <i>Production and Operations Management (POM)</i> <i>Production Planning and Control (PPC)</i> <i>Supply Chain Management: An International Journal (SCMIJ)</i></p>
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The selection involved the period from 2005 to 2021, covering more than fifteen years of management accounting research on SMEs (Mitchell and Reid, 2000; Chenhall, 2003).

The searching strategy was implemented considering a set of keywords combining “SME”, “management account” and “implementation” or similar terms as explicitly indicated in the bottom part of the Table 1. The search string was used to find the article’s titles, keywords and abstracts of the papers in the selected journals. The elaboration was performed using the software “Harzing’s Publish or Perish” applied to Google Scholar database, recognized as valuable data source for assessing impact when conducting an SLR especially in accounting field (Massaro *et al.* 2016). The software adopted also measures the total citations and citations per year (CPY) allowing an estimation of the articles’ scientific relevance and impact (Li *et al.*, 2013).

The analytical framework is based on the four stages defined by Neely *et al.* (2000) cycle of MA integrated with the arguments provided by Garengo *et al.* (2005) about the characteristics and influencing factors of MA implementation in SMEs (Table 3).

Table 3 – Reference framework for paper analysis

Relevant elements for MA implementation (Neely <i>et al.</i> , 2000)	Relevant characteristics and influencing factors of MA implementation in the specific context of SMEs (Garengo <i>et al.</i> , 2005)
People	- Lack of human resources and managerial capacity
Processes	- Rare implementation of holistic approach - Informal, not planned and not based on a predefined model - Limited use of data analysis
Infrastructure	- Limited capital resources
Culture	- Difficulty in involving SMES in projects - Reactive approach - Tacit knowledge

The reliability of our research was supported by selective cross-checking (Larsson, 1993) and Cronbach’s alpha (Cronbach, 1970; Taber, 2018), while the validity has been assured through the usage of high-ranking journals and strong theoretical support of our expected results.

For the coding process (Hart, 1998; Stanley, 2001) we opted for a manual procedure (Guthrie *et al.*, 2012; Linderman, 2001; Abraham and Michie, 2008; Saldaña, 2021). We performed a content analysis of the abstract and/or the text of the paper selected (Guthrie *et al.*, 2012), using a spreadsheet to record the articles codification and developing tables and/or graphs of their results (Massaro *et al.*, 2016). The information gathered according to the coding scheme are referred to formal aspects (title, authors, year of publication, location, and number of citations) as well as to scientific characteristics, such as scientific fields, theories and/or frameworks (Malmi and Granlund, 2009), research method (Dumay, 2014; Snyder, 2019; Tranfield *et al.*, 2003), MA focus (Massaro *et al.*, 2016) and key issues (Francis and Holloway, 2007; Heinicke, 2018).

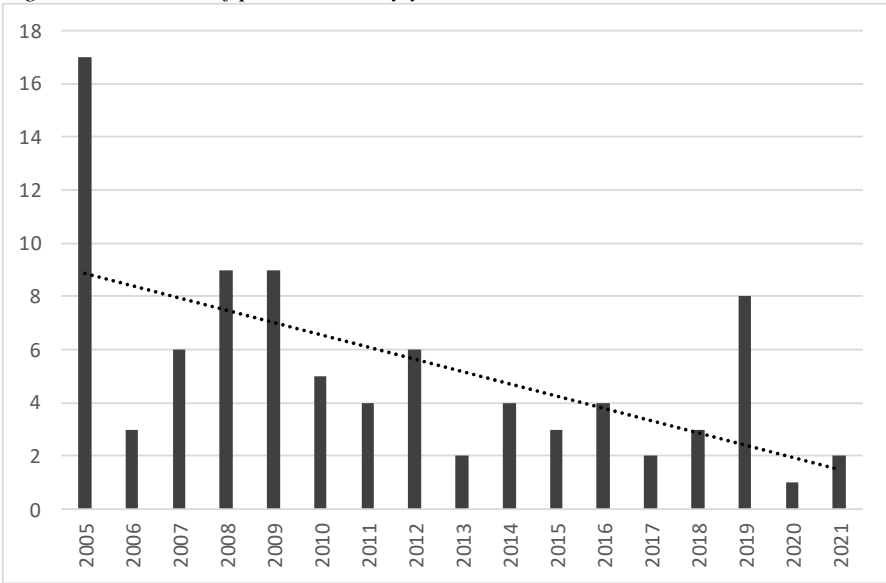
Our work is aimed at contributing at theoretical level providing a state of the art of the literature on the topic in terms of trend, location, theoretical perspectives and key issues to orient future research. Our review may also be useful for practitioners, in the attempt to investigate the gap between theory and practice, providing some suggestions for increasing the diffusion and implementation of management accounting in SMEs.

4. Results

The final dataset compliant with the searching criteria includes 88 articles published in 24 journals.

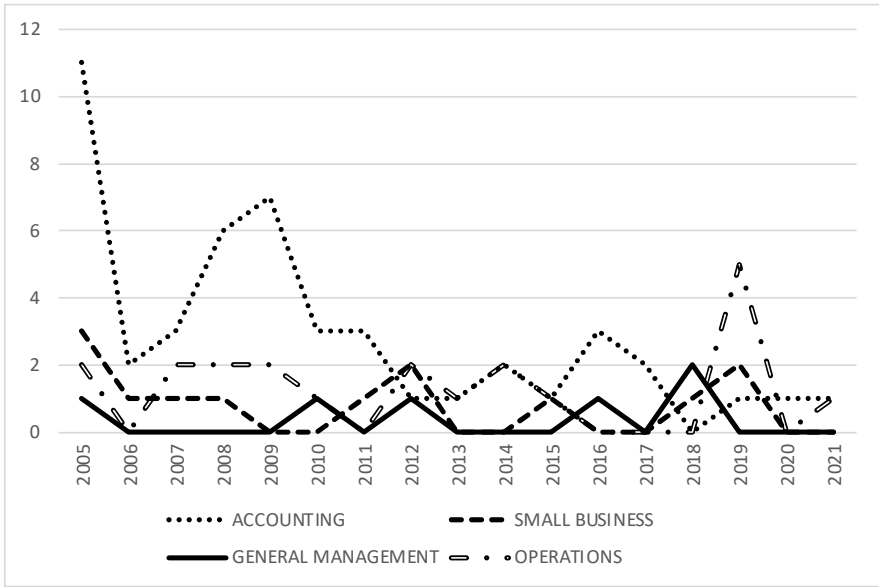
The evolution over time of the articles is represented in Figure 1. The results show a quite irregular dynamic, registering the peak on 2005 (17 articles) and a minimum of appearance on 2020 (only 1 article). During the observed period the analysis highlights a decreasing trend, especially referred to the last decade, with the only exception of the year 2019 (8 papers).

Figure 1 – Number of publications by year



Elaborating a breakdown for the different research streams (Figure 2) it is observed a visible fall affecting the publications in accounting journals, while publications in the operations area have a more constant trend, contributing significantly to revitalize the topic at the end of the period considered.

Figure 2 –Trend of publications differentiated for research streams



Looking at the location (Table 4), it can be observed that Europe is the most represented area (53.4%), followed with a certain distance by North America (15.9%) and Oceania (9.1%). Inside the continental Europe, Italy accounts for 7 papers, the 7.9% on the total, while UK context and Scandinavian countries are more represented with respectively 11 and 15 papers (12.5% and 17.0% on the total).

Table 4 - Number of publications by the area involved in the analysis

Area	Results (#)	%
Europe	47	53.4%
North America	14	15.9%
Oceania	8	9.1%
Asia	7	8.0%
Other/not specified	12	13.6%
Total	88	100.0%

In terms of scientific contexts and impact, results are showed in the following table (Table 5).

Table 5 – Scientific fields and academic impact

Journal title	No. of articles	Average Year	Average citations for article	Average citation per Year (CPY)
Accounting				
<i>MAR</i>	14	2010	208	22
<i>AR</i>	6	2008	300	28
<i>EAR</i>	6	2010	147	15
<i>BAR</i>	5	2011	204	29
<i>AAAJ</i>	5	2013	164	25
<i>AOS</i>	4	2008	600	22
<i>CAR</i>	3	2010	288	14
<i>FAM</i>	2	2010	59	25
<i>Abacus</i>	1	2005	227	6
<i>IJA</i>	1	2005	44	5
<i>CPA</i>	1	2020	68	23
	48			
Entrepreneurship and Small Business Management				
<i>JSBM</i>	6	2015	84	8
<i>FBR</i>	2	2008	205	17
<i>ISBJ</i>	2	2006	196	27
<i>SBE</i>	2	2012	96	10
<i>ETP</i>	1	2007	86	7
	13			
General Management				
<i>JBR</i>	2	2017	100	24
<i>IJMR</i>	2	2012	529	38
<i>CMR</i>	1	2010	137	8
<i>JBE</i>	1	2018	37	6
	6			
Operations Management				
<i>PPC</i>	8	2015	96	8
<i>IJPR</i>	6	2014	87	12
<i>IJPE</i>	4	2008	112	9
<i>IJOPM</i>	3	2008	143	10
	21			
Total	88			

As expected, most of the articles are published in Accounting field (n.48), with a predominant role played by *MAR* with a number of 14 articles and a good performance in terms of citations. Even the articles published in *AR*, *EAR*, *BAR*, *AAAJ* and *AOS* are characterized by very high frequency of cita-

tions, indicating a valuable feed-back from the academic community. Looking at the average year of publications, such journals tend to mostly concentrate the scientific production at the end of the last decade.

Considering the Entrepreneurship and Small Business Management perspective, the section includes 13 articles. *JSBM* is the journal with the highest number of papers quite poor in terms of citation per year. Viceversa, the two articles from *ISBJ* are highly cited, even if referring to an average period of 2006.

The six articles of General Management journals present the most heterogeneous situation. Some of them are very recent, especially the papers in *JBR* and *JBE* journals, and the two published in *IJMR* show the highest average level of citation, almost reaching the performance of the best accounting outlets.

After the accounting section, Operations management perspective presents the highest frequency of research focusing on MA implementation for smaller firms. The 21 papers are concentrated in only four journals whose attention to the topic is relevant but not so recent, with the exception of *PPC*, and also the scientific feed-back in terms of citations is not particularly pronounced.

As for the theoretical perspectives, the table reported below (table 6) indicates the different theories and/or frameworks adopted and the methodological approaches used in the paper.

Table 6 - Theoretical perspectives and methodological approaches

a) Theories and/or frameworks	Results (#)	%
Contingency theory	20	22.7%
Organizational life-cycle theory	7	8.0%
Balanced scorecard theory	6	6.8%
Multiple theories	5	5.7%
Resource based view	5	5.7%
Actor-network theory	4	4.5%
Agency cost theory	2	2.3%
Evolutionary theory	2	2.3%
Simons' framework	2	2.3%
Knowledge based view/knowledge management	2	2.3%
Upper Echelon theory	2	2.3%
Absorptive capacity theory	1	1.1%
Behavioral theory	1	1.1%
Management control theory	1	1.1%
Organizational culture theory	1	1.1%
Teleological theory	1	1.1%
Configuration theory	1	1.1%
Legitimacy theory	1	1.1%

Dynamic capabilities theory	1	1.1%
Grounded theory	1	1.1%
Innovation theory	1	1.1%
Other not specified	21	23.9%
Total	88	100.0%
b) Methodological approach	Results (#)	%
Quantitative cross-sectional	33	37.5%
Mixed methods	14	15.9%
Case study/ies	11	12.5%
Literature review	7	8.0%
Viewpoint	6	6.8%
Other qualitative	5	5.7%
Action/Interventionist research	3	3.4%
Other quantitative	3	3.4%
Triangulation method	2	2.3%
Quantitative longitudinal	2	2.3%
Experimental	1	1.1%
Multivariate methods	1	1.1%
Total	88	100.0%

Looking at the theory used (Table 6, part a), the contingency theory plays a predominant role in MA implementation (22.7%), remaining the leading benchmark in the field (Otley, 2016). This well matches the Table 6, part b), since the quantitative cross-sectional analysis often use this theory to build the independent variables (Baird *et al.*, 2004; Schoute, 2011). Surprisingly, the results show a significant number of articles (23.9%) which do not have a specific reference theory. Finally, even organizational life-cycle and balanced scorecard framework have a good incidence (8.0% and 6.8% respectively).

Analyzing the research method (Table 6, part b), there is a dispersion of the methodological approaches similar to theoretical perspectives (Hopper and Bui, 2016). What stands out immediately is the leading role played by quantitative approaches, with particular reference to cross-sectional analysis (37.5%). In the sample, there is also a good presence of mixed methods and case study/ies and (15.9% and 12.5%). The more practical design such as action/interventionist research is very scarcely implemented (3.4%).

With regards to the MA focus and the investigated issues, the next table (table 7) represent the results obtained from the analysis.

Table 7 – MA focus and investigated issues

a) Focus	Results (#)	%
MASs	26	29.5%
Performance measurement systems	16	18.2%
Balanced scorecard	11	12.5%
Activity based costing	8	9.1%
Cost control systems	3	3.4%
Budgeting practices	3	3.4%
Planning and control/Financial planning	2	2.3%
Cost management	2	2.3%
Human resource management systems	2	2.3%
Target costing	2	2.3%
Other	13	14.8%
Total	88	100.0%
a)		
a) Investigated issues	Results (#)	%
Influencing factors on MA adoption	36	40.9%
Effects of MA adoption	15	17.0%
Antecedents and effects of MA adoption	11	12.5%
Reasons/importance for MA presence	6	6.8%
MA implementation way/success	4	4.5%
Critical issues in MA implementation	3	3.4%
Research opportunities in MA implementation	3	3.4%
MA adoption rates	1	1.1%
Other	9	10.2%
Total	88	100.0%

The primary focus is related to MA tools in general (29.5%) and the attention devoted to PMS, Balanced scorecard and Activity based costing is relevant (respectively 18.2%, 12.5% and 9.1%). The references to more advanced decision support system or strategic management accounting are substantially missing.

As for the investigated issues, the table shows that the research about influencing factors on MA adoption is largely predominant (40.9%), followed by the analysis of effects (17.0%) and the study of the correlation between antecedents and effects (12.5%). The authors appear to be highly interested on investigating the possible antecedents for the MA tools implementation or, alternatively, their consequences (Ciambotti *et al.*, 2020), following quantitative approaches (Abdel-Kader and Luther, 2008).

The next table (Table 8) focused on the papers devoted to investigate the influencing factors on MA adoption, highlighting the wide range of variables emerged in the key findings.

Table 8 – Variables studied as influencing factors

<i>Author/s</i>	<i>Influencing factors</i>
Abernethy and Bouwens (2005)	Decentralization choices, information asymmetries, intrafirm interdependencies
Cassia et al. (2005)	Organisational configurations
Davila (2005)	Size, age, founder as CEO, outside investors
Drury and Tayles (2005)	Cost structure, Competitive environment, Product diversity
Granlund and Taipaleenmäki (2005)	Time pressure and pressures to meet expectations placed by certain external parties (venture capitalists and market)
McKeiver and Gadenne (2005)	Age, customers, employees, education, legislation
Wouters and Sportel (2005)	Existing “informal” performance measures
Coad and Cullen (2006)	Instituted capabilities, high level of inter-organizational relationships
Ghobadian and O’Regan (2006)	Ownership, strategy making process, transformational leadership style
Davila and Foster (2007)	Number of employees, outside investors, time to revenue and CEO turnover, size
Garengo and Bititci (2007)	Corporate governance, management information system, strategy, organizational culture and management style, external environment, size
Abdel-Kader and Luther (2008)	Customer power, decentralization, size, advanced manufacturing technology, total quality management and just in time
Ax et al. (2008)	Competition and uncertainty
Chanegrih (2008)	Top management support, levels of complexity/ simplification and degree of resistance to change
Desai (2008)	Prevention, appraisal, internal failure and external failure
Kallunki and Silvola (2008)	Size, age, strategy, education, external investors, listed status, industry
Sandelin (2008)	Internal consistency between design and use of control elements, management response to functional demands
Cassar (2009)	Outside funding, level of competition, venture scale, intangible investments
Dowlatshahi and Taham (2009)	Barriers (lack of supplier cooperation, difficulty to manage demand fluctuation, lack of capital to acquire advanced technologies, quality control problems, inadequate employee training and development). Enablers (empower employees, overcome employee resistance to change, governmental support)
Gil and Hartmann (2009)	CFOs' characteristics, strategy and historical performance
Abernethy and Bouwens, Van Lent (2010)	Leadership style, subunit interdependencies, knowledge asymmetries
Qu and Cooper (2011)	Management consultants and clients features
Schoute (2011)	Product diversity

Pedersen and Sudzina (2012)	Organisational capabilities and perceived environmental uncertainties
Taylor and Taylor (2013)	Organisational size
Taipaleenmaki (2014)	Change resistance, cultural, political, technical and functional factors
Taylor and Taylor (2014)	Strategy, information system, management style, learning orientation, culture.
Bititci et al. (2015)	Maturity level and organizational characteristics
Al-Sayed and Dugdale (2016)	Perceived innovation attributes, organisational factors and the perceived environmental uncertainty
Ax and Greve (2016)	Firm's valued and beliefs, potential gains perceived
Lin et al. (2016)	Dynamic capabilities (relational capability - sensing capability - absorptive capacity - integrative capability)
Samagaio et al. (2018)	Type of investor, environmental heterogeneity, business strategy, structure decentralization
Lansiluoto A. et al. (2019)	Market orientation, organizational size
Zor et al. (2019)	CEO characteristics, age, education, openness to experience
Bordeleau et al. (2019)	Organizational learning, Organizational culture
Laosirihongthong et al. (2019)	Economic dimension, sustainable design

The mostly reported variables refer to how external, organizational, and economic factors determine the MA implementation (Table 8). For instance, items such as size, external investors, level of competition, age, customers, employees, external pressures, corporate governance, and perceived environmental uncertainty are pivotal influencing factors inside the current debate. Even key staff characteristics and organizational culture seem to play a key role in promoting MA tools' adoption and implementation.

5. Discussion and conclusions

The aim of this SLR was to picture a state of the art related to the current scientific literature focused on the MA implementation in SMEs, a still limited research topic affected by the dispersal of research findings among various research fields (Lavia López and Hiebl, 2015).

At the beginning of the period considered the topic received much attention from the scientific community, experiencing a visible decrease since the year 2009 that has still continued for the last decade highlighting an issue of relevance lost (Pelz, 2019), with the only exception of year 2019. In terms of location, the Italian context is scarcely represented in the sample selected, less than the UK and Scandinavian contexts. This contrasts with the relevance of SMEs in Italy (Cerved, 2019) and may also depend on the lack of a

top leading journal for the country. The Anglo-Saxon countries are more familiar with these themes since there are several top-level journals in the current sample contemplated. Scandinavian researchers, from their side, are able to produce high quality papers contextualizing the research for their countries. As for the research fields and their relative impacts, findings demonstrate that Management Accounting Research journal represents the major source of leading-edge research in the field of management accounting (Scapens and Bromwich, 2010). With reference to theories/framework adopted the results show a very high fragmentation and the predominant role played by the contingency theory. Even considering the high reputation and diffusion of this theory, the focus on the contingent variables (Garengo and Bititci, 2007) may underestimate the impact of knowledge factors during the implementation stage. It is possible to notice that smaller firms often ground their competition on the knowledge, experience and skills of the business's owner and companies' staff become especially relevant to their survival (Hiebl, 2014; Cardoni *et al.*, 2018). This is partially confirmed by the list of variables studied as influencing factors (Table 8), including several items related to individual characteristics (for example age or education of the CEO/founder or employees) or organizational cognitive factors (for example organizational learning, culture and absorptive capacity). However, we found that these factors are treated in an occasional and unstructured way, while they would deserve a major focus and development through a more consistent research stream based on knowledge management.

The limited presence of scientific perspective based on knowledge characteristics at individual and/or organizational level can be considered a point of weakness of the literature evolution, especially considering the critical factors highlighted in the analytical framework (Table 3) that include "lack of human resources and managerial capacity", "reactive approach" and "tacit knowledge". As stated by Cardoni (2018), successful implementation of management accounting innovation requires a compatibility between the organizational culture of the adopter and the system of values and principles incorporated in administrative innovation (Love and Cebon, 2008). In similar vein, Hartmann (2005, p. 333) require to extend the analysis "as to why companies adapt their MAS to the environmental context, and in what pace, or why not. As this involves the study of dynamic processes, it is hard to see how this can be achieved within the cross-sectional methodology that is typical for MAS research". Indeed, top management, staff characteristics and organizational culture seem to play a key role in promoting MA tools' implementation (Ciambotti *et al.*, 2020; Lavia Lopez and Hiebl, 2015; Pelz, 2019).

In methodological terms, the SLR demonstrates the predominant role played by quantitative cross-sectional approach, even though an increasing number of MA scholars are devoting to qualitative research (Parker, 2012; Nørreklit, 2014; Alsharari and Al-Shboul, 2019), especially with the use of case studies (Scapens, 1990; Alsharari and Al-Shboul, 2019). One possible reason is that studies related to implementation phase are devoted mainly to investigate what are the antecedents that affect MA implementation into smaller firms or the consequences of the tools adopted (e.g., financial/economic performance). The almost total absence of practical methods (i.e. action/interventionist research) seems a contradictory evidence when related to a practical field such as MA (Chiucchi, 2014; Vaivio, 2008; Dumay, 2010; Palazzi *et al.*, 2019), especially in the light of the critical factors highlighted in the analytical framework (Table 3) explicitly mentioning the “rare implementation of holistic approach”, the “difficulty in involving SMEs in projects” and their “reactive approach”. To investigate these factors and propose some significant contributions a major involvement of researchers in action/interventionist research would have needed, following the clear statement expressed by Neely *et al.* (2000) who consider actions research as “extremely successful method of developing a robust and exploitable performance measurement system” (p. 1142). The authors highlighted, that implementing such kind of research made evident that “much of the writing about performance measurement to date has been too superficial, in that it ignores the complexity involved in the actual design of measurement systems” (p. 1142). As stated by Vaivio (2008), field research might be needed in order to assist the theory through a set of practical principles which support qualitative efforts. So, qualitative approaches are welcome since they allow researchers to “capture various nuances, patterns, and more latent elements that other research approaches might overlook” (Berg, 2007, p. 318). Even quantitative methods such as quantitative longitudinal studies are welcome especially if combined with organizational life-cycle theories. In this view, it could be interesting to understand the adoption times of managerial tools along a broad range of SMEs life-cycle stages.

Summarizing with a holistic view, findings show that the last 15 years the issue of MA implementation in SMEs has gradually declined at a scientific standpoint and lost relevance in practice. In the top journals the topic has been decreasingly treated with very fragmented theoretical perspectives often concentrated on specific tools and approaches, unable to provide a comprehensive picture and practical inspirations for the firms. The analysis of business cases is very limited and the projects of action/interventionist research in collaboration with the companies are almost entirely absent. These

results, partly motivated by a tendency of the editorial choices of the top journals to favor quantitative studies, can be also attributable to a SMEs decreasing motivations in the MA implementation. In the light of the issues reported by Neely *et al.*, 2000 and Garengo *et al.*, 2005 (Table 3), the SLR demonstrates that the top-journals' contribution has not found a convergence on the most critical influencing factors highlighted at the beginning of the new millennium, limiting the possibility to inspire practical solutions and models. This particularly contrasts with the need to overcome the SMEs weaknesses related to "informal, not planned and not based on a predefined model" MA and the "limited use of data analysis", as highlighted in the framework (table 3), threatening the contributions relevance.

The issue of MA relevance is not new (Chondhury, 1986; Argyris, 1990) and can be considered a structural problem very far to be solved. Especially with reference to SMEs, this issue has created over time a very strong gap between theory and practice, well denounced by the academic community (Chiucchi, 2014; Vaivio, 2008).

Supported by the SLR findings, it is possible to deduce that a series of strategic conditions (globalization, innovation, technological advancement, competitiveness) prompted the SMEs, at the beginning of the new millennium, to experiment new evolutions in their control models. This phenomenon was supported by the greater attention from the scientific community in different research fields. The MA models in the SMEs, however, have remained very traditional, unable to support innovation and strategy elaboration (Ahmad, 2017). With the advent of the profound discontinuities that the business environment experimented since the financial crisis of 2008, the traditional MA approaches lost their relevance, and SMEs had to mostly rely on entrepreneurial orientation to achieve resilience (Eggers, 2020), interrupting a process of investment of resources and skills on more advanced MA tools. In such context, the demand for empirical research has presumably decreased and the scientific proposals, highly linked to a logic of publication in top journals, has gradually moved away from themes and approaches with more operational value. The only three cases of action/interventionist research are testifying a difficulty to match SMEs' needs with academic research.

Concluding, the results of the literature review demonstrates that over the last fifteen years the gap between theory and practice in the implementation of MA in SMEs has widened rather than narrowed. From the empirical evidences obtained, it is observable that the business-academy-consulting cycle (Bergamin Barbato, 2003) still has not been activated, thus representing a point of weakness for the future challenges attaining the SMEs' productive

system, due to the following reasons. Firstly, the role that academia should play for enhancing the management control culture and innovate the accounting tools (Havlicek, 2013) is dramatically important (Palazzi *et al.*, 2019). Theoretical and practical literature demonstrates that SMEs consultants struggle to shift from a traditional approach based on compliance to a more evolute perspective able to stimulate a necessary change (Del Baldo *et al.*, 2019). Many SMEs are still managed and governed according to an elementary logic, with a minimum of adequate tools for the strategic governance of the current business environment. The risk that academia will remain far from the practical perspective avoiding to focus and investigate the most critical factors in the SMEs context can produce negative effects for the economic system, aggravating the relevance lost of scientific research in the topic. Secondly, in the actual scenario there are important challenges for SMEs that require an evolution of MA, such as strategic discontinuities (Arcari, 2018) and sustainability (Manzaneque-Lizano *et al.*, 2019; Torugsa *et al.*, 2013). With such a turbulent business environment, the control system must be integrated with a risk management logic (Arcari, 2018). At the same time, looking at the strategic relevance of sustainability the accounting tools have to gradually embed the environmental perspective (Maraghini *et al.*, 2018). As demonstrated by the evolutionary stage approaches, these advancements require a gradual process of evolution on the capacity to elaborate and manage financial and non-financial information, which is scarcely implemented in SMEs.

In this scenario, the role of future research can be fundamental, especially to reduce the gap between theory and practice and bring the academia closer to the SMEs' production system. Future contributions should increase the operational approaches (action/interventionist), focusing more on the characteristics of the owner/management/staff of the SMEs and investigating the conditions, both organizational (Castellano and Leto, 2021) and individual (Cardoni and Paradisi, 2020), affecting the MA implementation, with particular attention to cognitive factors to be developed in a more consistent knowledge management perspective (Cardoni, 2018; Cardoni and Paradisi, 2020).

To avoid excessive fragmentation of analysis and subjectivity in the interpretation, future research should try to make the actual state of knowledge organic and define a minimum standard of MA tools and processes to implement in a SME (Dlamini and Schutte, 2021), at least as a basis for supporting the integration with the logic of risk management and sustainability.

This work suffers some limitations to be considered. Firstly, the review is grounded on articles that were found in electronic databases. Hence, other

kinds of sources (e.g., books or books chapters) were not contemplated and could provide important contribution for the research field. Second, only very top-level journals were considered. Thus, some relevant articles included in other important journals may not be captured. Finally, the keyword search used was deemed to be exhaustive.

References

- Abdel-Kader M., Luther R. (2008), The impact of firm characteristics on management accounting practices: A UK-based empirical analysis, *The British Accounting Review*, 40, pp. 2-27. Doi: 10.1016/j.bar.2007.11.003.
- Abraham C., Michie S. (2008), A taxonomy of behavior change techniques used in interventions, *Health Psychology*, 27, pp. 379-387. Doi: 10.1037/0278-6133.27.3.379.
- Ahmad K. (2017), The Implementation of Management Accounting Practices and its Relationship with Performance in Small and Medium Enterprises, *International Review of Management and Marketing*, 7, pp. 342-353.
- Alsharari N.M., Al-Shboul M. (2019), Evaluating qualitative research in management accounting using the criteria of “convincingness”, *Pacific Accounting Review*, 31, pp. 43-62. Doi: 10.1108/PAR-03-2016-0031.
- Arcari A.M. (2018), Preventing crises and managing turnaround processes in SMEs. The role of economic measurement tools, *Management Control*, 3, pp. 131-155. Doi: 10.3280/MACO2018-003007.
- Argyris C. (1990). The dilemma of implementing controls: the case of managerial accounting, In Emmanuel C., Otley D., Merchant K. (eds), *Readings in Accounting for Management Control*. Boston, MA, Springer. Doi: 10.1007/978-1-4899-7138-8_30.
- Baird K.M., Harrison G.L., Reeve R.C. (2004), Adoption of activity management practices: a note on the extent of adoption and the influence of organizational and cultural factors, *Management Accounting Research*, 15, pp. 383-399. Doi: 10.1016/j.mar.2004.07.002.
- Berg B.L. (2007), *Qualitative Research Methods for the Social Sciences*, Boston, Pearson Education.
- Bergamin Barbato M. (2003), Genesi e sviluppo del controllo di gestione nella cultura aziendale e professionale, *Contabilità e Cultura Aziendale*, III(2).
- Bonner S.E., Hesford J.W., Van der Stede W.A., Young, S.M., (2006), The most influential journals in academic accounting, *Accounting, Organizations and Society*, 31, pp. 663-685, Doi: 10.1016/j.aos.2005.06.003.
- Bourne M., Neely A., Mills J., Platts K. (2003), Implementing performance measurement systems: a literature review, *International Journal of Performance Management*, 5(1), pp. 1-24.
- Cardoni A. (2018), Le sfide evolutive del Management Control tra relazioni strategiche, innovazione e discontinuità: a knowledge transfer matter?, *Management Control*, 1, pp. 5-15. Doi: 10.3280/MACO2018-001001.
- Cardoni A., Paradisi A. (2020), The implementation of management accounting in small-medium enterprises (SMEs). A knowledge transfer perspective, *Management Control*, Suppl. 1, pp. 39-61. Doi: 10.3280/MACO2020-001-S1004.
- Cardoni A., Dumay J., Palmaccio M., Celenza D. (2018), KT in a start-up craft brewery, *Business Process Mgmt Journal*, 25, pp. 219-243. Doi: 10.1108/BPMJ-07-2017-0205.

- Cassar G., Gibson B. (2008), Budgets, Internal Reports, and Manager Forecast Accuracy, *Contemporary Accounting Research*, 25, pp. 707-738. Doi: 10.1506/car.25.3.3.
- Castellano N., Leto L. (2021), Implementazione di Sistemi di Misurazione delle Performance nelle PMI: elementi di analisi nella prospettiva del cambiamento organizzativo, *Management Control*, 1, pp. 129-150. Doi: 10.3280/MACO2021-001007.
- Cerved (2019), *Rapporto Cerved PMI 2019*, Roma, Cerved.
- Chenhall R.H. (2003), Management control systems design within its organizational context: findings from contingency-based research and directions for the future, *Accounting, Organizations and Society*, 28, pp. 127-168. Doi: 10.1016/S0361-3682(01)00027-7.
- Chenhall R.H. (2007), Theorizing Contingencies in Management Control Systems Research, In Chapman C. S., Hopwood A. G. and Shields M. D. (Eds.), *Handbook of MA Research*, pp. 163-205, Oxford, Elsevier, UK.
- Chicchini M.S. (2014), Il gap tra teoria e prassi nel Management Accounting: il contributo della field-based research, *Management Control*, 3, pp. 5-9. Doi: 10.3280/MACO2014-003001.
- Chondury N., In Search of Relevance in Management Accounting Research, *Accounting and Business Research*, 17(65), pp. 21-32.
- Ciambotti M., Palazzi M., Sgrò F., Gelsomini L. (2020), Factors promoting and hindering the adoption of management accounting tools: evidence from Italian manufacturing SMEs, *Management Control*, Special Issue 1, pp. 19-38.
- Cronbach L.J. (1970), *Essentials of Psychological Testing*, 3rd ed., New York, NY, USA, Harper & Row.
- Del Baldo M., Arcari A.M., Ruisi M. (2019), Controllo di gestione nelle PMI e consulenti esterni, *Management Control*, 1, pp. 69-94.
- Denyer D., Tranfield D. (2006), Using qualitative research synthesis to build an actionable knowledge base, *Management Decision*, 44, pp. 213-227. Doi: 10.1108/00251740610650201.
- Dlamini B. and Schutte D. (2021), The development of a management accounting framework for small and medium enterprises operating in emerging economies, *Journal of Accounting, Finance and Auditing Studies*, 7(3), pp. 136-157.
- Dumay J.C. (2010), A critical reflective discourse of an interventionist research project, *Qualitative Res Acc & Man*, 7, pp. 46-70. Doi: 10.1108/11766091011034271.
- Dumay J.C. (2014), Reflections on interdisciplinary accounting research: the state of the art of intellectual capital, *Accounting, Auditing & Accountability Journal*, 27, pp. 1257-1264. Doi: 10.1108/AAAJ-05-2014-1714.
- Eggers F. (2020), Masters of disasters? Challenges and opportunities for SMEs in times of crisis, *Journal of Business Research*, 116, pp. 199-208. Doi: 10.1016/j.jbusres.2020.05.025.
- Eleftheriou K., Patsoulis P., Polemis M. (2023), Convergence among academic journals in accounting: a note, *Scientometrics*, 128, pp. 1055-1069. Doi: 10.1007/s11192-022-04588-z.
- Filbeck G., Lee S. (2000), Financial Management Techniques in Family Businesses, *Family Business Review*, 13, pp. 201-216. Doi: 10.1111/j.1741-6248.2000.00201.x.
- Francis G., Holloway J. (2007), What have we learned? Themes from the literature on best-practice benchmarking, *International Journal of Management Reviews*, 9, pp. 171-189. Doi: 10.1111/j.1468-2370.2007.00204.
- Garengo P., Bititci U. (2007), Towards a contingency approach to performance measurement: an empirical study in Scottish SMEs, *International Journal of Operations & Production Management*, 27, pp. 802-825. Doi: 10.1108/01443570710763787.

- Garengo P., Biazzo S., Bititci U.S. (2005), Performance measurement systems in SMEs: A review for a research agenda, *International Journal of Management Reviews*, 7, pp. 25-47. Doi: 10.1111/j.1468-2370.2005.00105.x.
- Garfield E. (1989), Citation classics and citation behavior revisited, *Current Contents*, 12, pp. 3-8.
- Guthrie J., Ricceri F., Dumay J. (2012), Reflections and projections: a decade of intellectual capital accounting research, *The British Accounting Review*, 44, pp. 68-82. Doi: 10.1016/j.bar.2012.03.004.
- Hart C. (1998), *Doing Literature Review: Releasing the Social Science Research Imagination*, London, Sage Publications.
- Hartmann F.G.H. (2005), The impact of departmental interdependencies and management accounting system use on subunit performance: A comment, *European Accounting Review*, 14, pp. 329-334. Doi: 10.1080/09638180500043527.
- Havlicek K., Thalassinou E., Berezkinova L. (2013), Innovation management and controlling in SMEs, *European Research Studies Journal*, 16, pp. 57-70.
- Heinicke A., (2018), Performance measurement systems in small and medium-sized enterprises and family firms: a systematic literature review, *Journal of Management Control*, 28, pp. 457-502. Doi: 10.1007/s00187-017-0254-9.
- Hiebl M.R.W. (2014), Upper echelons theory in management accounting and control research, *Journal of Management Control*, 24, pp. 223-240. Doi: 10.1007/s00187-013-0183-1.
- Hiebl M.R.W., Feldbauer-Durstmüller B., Duller C. (2013), The changing role of MA in the transition from a family business to a non-family business, *Journal of Accounting & Organizational Change*, 9, pp. 119-154. Doi: 10.1108/18325911311325933.
- Hopper T., Bui B. (2016), Has Management Accounting Research been critical?, *Management Accounting Research*, 31, pp. 10-30. Doi: 10.1016/j.mar.2015.08.001.
- Hudson M., Smart A., Bourne M. (2001), Theory and practice in SME performance measurement system, *International Journal of Operations & Production Management*, 21, pp. 1096-1115. Doi: 10.1108/EUM0000000005587.
- Jaradat Z., Roshaiza R., Mat Zin R., Wan Zakaria W.Z. and Abdul Aziz R. (2021), The use and implications of management accounting practices in small and medium-sized enterprises, *Asia-Pacific Management Accounting Journal*, 16(1), pp. 250-295.
- Javalgi R. (R.) G., Todd P. R. (2011), Entrepreneurial orientation, management commitment, and human capital: The internationalization of SMEs in India, *Journal of Business Research*, 64, pp. 1004-1010. Doi: 10.1016/j.jbusres.2010.11.024.
- Jones M.J., Robert R., (2005), International Publishing Patterns: An Investigation of Leading UK and US Accounting and Finance Journals, *Journal of Business Finance & Accounting*, 32(5) & (6), June/July.
- King R., Clarkson P.M., Wallace S., (2010), Budgeting practices and performance in small healthcare businesses, *Management Accounting Research*, 21, pp. 40-55. Doi: 10.1016/j.mar.2009.11.002.
- Larsson R. (1993), Case survey methodology: quantitative analysis of patterns across case studies, *Academy of Management Journal*, 36, pp. 1515-1546. Doi: 10.5465/256820.
- Lavia López O., Hiebl M.R. (2015), Management accounting in small and medium sized enterprises: current knowledge and avenues for further research, *Journal of Management Accounting Research*, 27, pp. 81-119. Doi: 10.2308/jmar-50915.
- Li E.Y., Liao C.H., Yen H.R. (2013), Co-authorship networks and research impact: A social capital perspective, *Research Policy*, 42, pp. 1515-1530. Doi: 10.1016/j.respol.2013.06.012.

- Linderman A. (2001), Computer content analysis and manual coding techniques: A comparative analysis, In West M. D. (eds), *Theory, Method, and Practice in Computer Content Analysis*, London, Westport, Connecticut, Ablex Publishing.
- Lombardi Stocchetti G. (1996), *Il controllo di gestione nella piccola impresa*, Cuneo, EGEA.
- Love E.G., Cebon P. (2008), Meanings on Multiple Levels: The Influence of Field-Level and Organizational-Level Meaning Systems on Diffusion, *Journal of Management Studies*, 45, pp. 239-267. Doi: 10.1111/j.1467-6486.2007.00739.x.
- Malmi T., Granlund M. (2009), In Search of Management Accounting Theory, *European Accounting Review*, 18, pp. 597-620. Doi: 10.1080/09638180902863779.
- Manzanaque-Lizano M., Alfaro-Cortés E., Priego la Cruz A.M. (2019), Stakeholders and Long-Term Sustainability of SMEs. Who Really Matters in Crisis Contexts, and When, *Sustainability*, 11, 6551. Doi: 10.3390/su11236551.
- Maraghini M.P., Vitale G. (2018), Sistemi di controllo a supporto dello sviluppo sostenibile delle PMI del settore vitivinicolo: il caso D'Ambra vini s.r.l., *Management Control*, 3, pp. 111-130. Doi: 10.3280/MACO2018-003006.
- Massaro M., Dumay J., Guthrie J. (2016), On the shoulders of giants: undertaking a structured literature review in accounting, *Accounting, Auditing & Accountability Journal*, 29, pp. 767-801. Doi: 10.1108/AAAJ-01-2015-1939.
- Meyer M., Waldkirch R.W., Duscher I., Just A. (2018), Drivers of citations: An analysis of publications in "top" accounting journals, *Critical Perspectives on Accounting*, 51, pp. 24-46, Doi: 10.1016/j.cpa.2017.07.001.
- Mitchell F.F., Reid G. (2000), Editorial problems, challenges and opportunities: the small business as a setting for Management accounting research, *Management Accounting Research*, 11, pp. 385-390. Doi: 10.1006/mare.2000.0152.
- Moeuf A., Lamouri S., Pellerin R., Tamayo-Giraldo S., Tobon-Valencia E., Eburdy R. (2020), Identification of critical success factors, risks and opportunities of Industry 4.0 in SMEs, *International Journal of Production Research*, 58, pp. 1384-1400. Doi: 10.1080/00207543.2019.1636323.
- Neely A., Mills J., Platts K., Richards H., Gregory M., Bourne M., Kennerley M. (2000), Performance measurement system design: developing and testing a process-based approach, *International Journal of Operations & Production Management*, 20, pp. 1119-1145. Doi: 10.1108/01443570010343708.
- Nørreklit H. (2014), Quality in qualitative management accounting research, *Qualitative Research in Accounting & Management*, 11, pp. 29-39. Doi: 10.1108/QRAM-02-2014-0014.
- OECD (2017), *Small, Medium, Strong. Trends in SME Performance and Business Conditions*, Paris, OECD Publishing.
- Otley D. (2016), The contingency theory of management accounting and control: 1980-2014, *Management Accounting Research*, 31, pp. 45-62. Doi: 10.1016/j.mar.2016.02.001.
- Palazzi F., Ciambotti M., Gelsomini L. (2019), L'adozione dell'Activity-Based Costing nelle PMI: analisi di un caso, *Management Control*, 1, pp. 97-122.
- Parker L.D. (2012), Qualitative management accounting research: Assessing deliverables and relevance, *Critical Perspectives on Accounting*, 23, pp. 54-70. Doi: 10.1016/j.cpa.2011.06.002.
- Pelz M. (2019), Can Management Accounting Be Helpful for Young and Small Companies? Systematic Review of a Paradox, *International Journal of Management Reviews*, 21, pp. 256-274. Doi: 10.1111/ijmr.12197.
- Petticrew M., Roberts H. (2008), *Systematic Reviews in the Social Sciences: A Practical Guide*, Kindle ed., , Oxford, Wiley-Blackwell.
- Saldaña J. (2021), *The Coding Manual for Qualitative Researchers*, London, SAGE publications.

On the role of cost-effectiveness in accounting

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Abstract

Cost-effectiveness refers to the achievement of optimal allocation of limited resources and its ultimate purpose is to support rational decision-making. Cost-effectiveness principles govern financial reporting and managerial accounting frameworks, yet in practice these might not have been formally characterised and identified within the accounting literature due to semantic issues and norms. This article explores the nexus between cost-effectiveness and accounting by conducting a scoping review of the published literature. Findings from this study suggest that use of the cost-effectiveness criterion has increased over time and been more frequently employed by authors affiliated to U.S. academic institutions. Cost-effectiveness principles have been invoked both in published financial and managerial accounting research. However, only a handful of mostly empirical studies have quantified cost-effectiveness evidence and formally applied and discussed its analytical methods. This article highlights a research gap pertaining to the development of interdisciplinary frameworks and analytical methods able to formally integrate the concept of cost-effectiveness and cost-benefit analyses into accounting research.

Keywords: cost-effectiveness, cost-benefit, accounting, decision-making.

1. Introduction

Cost-effectiveness refers to the achievement of optimal allocation of limited resources, expressed as the maximisation of output (e.g., societal value), given a resource constraint and consequent opportunity cost attached to the decision (Fattore G., 2009). Over the last decades, cost-effectiveness has increasingly provided a formal decision-making criterion (Borgonovi E., 1979; Borgonovi E. *et al.*, 1983), and its general analytical framework – economic evaluation – has been adopted to inform public and business administration

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decisions as pertaining to public spending and its incremental benefits (Farneti G. *et al.*, 1996; Mussari R., 2001, Monteduro F., 2010; Mihaiu D., 2010).

Economic evaluation is the process of systematic identification, measurement and valuation of the inputs and outcomes of (at least) two mutually exclusive alternative courses of action, and subsequent formal comparative analysis (Briggs *et al.*, 2006). The ultimate purpose of cost-effectiveness analysis is to guide and support rational, evidence-based resource allocation decision-making, maintenance of institutional accountability and stewardship (Longo *et al.*, 2012). Further, in practice, accounting data and conventions are routinely applied for and essential to the derivation and implementation of public policy (Hutton *et al.*, 2021, Florio *et al.*, 2018; Andersson, 2018). Computational issues pertaining, for example, to the depreciation and amortisation of assets and attribution of overhead costs – to name a few – are intrinsic to cost-effectiveness analysis and permeate its applied literature, across its multiple sectors of application (Roberts, 2006).

One of the principles governing financial reporting is that the cost of providing a certain piece of information, disclosure or preparing a statement should not outweigh its benefits, typically associated with increased transparency and informational value for investors and other users of financial statements (IFRS Foundation, 2018). This is exemplified, for instance, by the application of cost-benefit analysis for the purpose of financial regulation and informed Security Exchange Commission rulemaking (White, 2016; Coates, 2015; Posner *et al.*, 2014) and changes in financial reporting standards (Schipper, 2011). On the other end of the accounting spectrum, and very much in line with its stated mission functional claims (CIMA, 1996), management accounting is aimed to support decision making in public and private organisations by providing managers with relevant information and analysis on the performance, costs, and benefits of any given business operation (Sargiacomo M., 2013; Sardar, 2016; Tappura *et al.*, 2015;). It would therefore appear that the cost-effectiveness criterion and principles are embedded in accounting conceptual frameworks. Yet, in practice such concepts and conventions might not have been characterised due to semantic issues and norms.

The aim of this paper was therefore to shed some light on this proposition by conducting a scoping review of the published accounting literature. The remaining of this manuscript is organised as follows: section 2 outlines the review methods used to identify the relevant literature, section 3 provides a

descriptive analysis of the identified records, followed by a narrative synthesis. Section 4 focuses on discussing the study findings and implications for future research.

2. Methods

A search strategy was developed based on a title and abstract-based extraction mode. The search was conducted in Scopus using a query based on the Boolean operator “or,” and a combination of keywords as follows: “cost-effective”, “cost-effectiveness”, “economic evaluation”, “cost-benefit”. In line with the approach used in a previously published review (Becciu *et al.*, 2022), twelve accounting journals were selected manually based on their relevance and position in the *Academic Journal Guide 2018* (Journal Ranking Portal, 2023). *Accounting Organizations and Society*, *Accounting and Business Research*, *Accounting and Finance*, *Accounting Review*, *Contemporary Accounting Research*, *European Accounting Review*, *Journal of Accounting and Economics*, *Journal of Accounting and Public Policy*, *Journal of Accounting Research*, *Journal of Business Finance and Accounting*, *Review of Quantitative Finance and Accounting*. Original research articles only were considered. The full texts of the identified records were retrieved and reviewed for content. A descriptive analysis was conducted to illustrate publication trends and article characteristics. A narrative synthesis then focused on the topic covered by the articles and evaluated how the concepts and methods of cost-effectiveness were therein considered.

3. Results

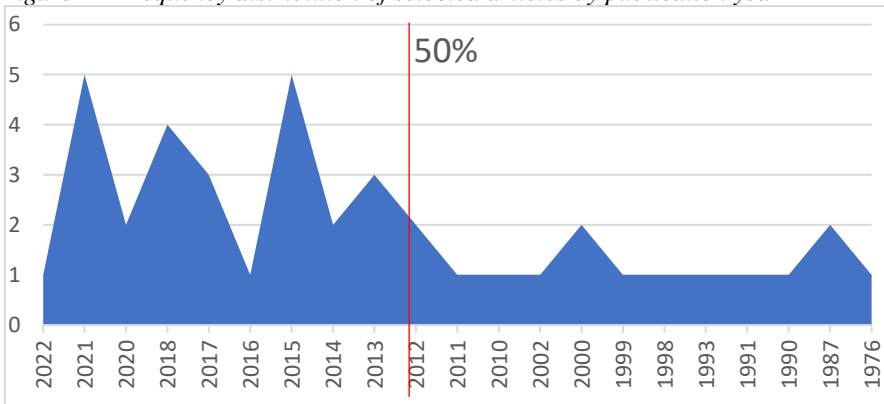
Forty-one articles were identified across the selected journals, for 37 of which full texts were available. Publications covered an almost fifty-year time span, with the oldest record being published in 1976 (**Appendix I – www.sidrea.it/cost-effectiveness-accounting**). **Figure 1** shows how the published articles are distributed over time and that most of them are concentrated within the last decade.

Table 1 shows the distribution of the identified articles by publication journal, author affiliation country and research design. At the top of the rank with 20% of all publication, the *Journal of Accounting and Public Policy* stood, followed by *Accounting Organizations and Society* and

Contemporary Accounting Research, both at 15%, for a total of 50% between these three journals. As for geographical location, publications were spread across four continents, with America holding two thirds of all records and the United States totalling over 60%. In terms of research design, a quarter of the 37 papers employed experimental or quasi-experimental approaches, around one third were theoretical or conceptual paper, as many used correlational approaches, whereas only 11% had a descriptive research design either in the form of direct observations or documental analyses.

Sixteen (43%) articles focused on research questions related to managerial accounting and decision-making, whereas the remaining papers investigated topics related to financial accounting and statements. Among the former group, issues pertaining to contractual obligations and options (Ma *et al.*, 2022; Bens *et al.*, 2020), risk predictions and asset investment decisions (Bodin *et al.*, 2018; Chen *et al.*, 2015; Huang *et al.*, 2015), management decision making (Hemmer, 1998; Chenhall *et al.*, 1991) and internal control such as misconduct (Stikeleather, 2016) and budget slack (Webb, 2002) were addressed.

Figure 1 - Frequency distribution of selected articles by publication year



Regarding financial accounting, three articles focused their research on accounting standards (Li *et al.*, 2021; Geoffroy *et al.*, 2021; Chen *et al.*, 2018), while the remaining addressed questions related to reporting issues such reporting frequency (Gigler *et al.*, 2014), disclosure of non-financial ratios (Crawford *et al.*, 2021) and auditing (Vanstraelen *et al.*, 2017; Grenier *et al.*, 2015, Trompeter *et al.*, 2010; Caplan *et al.*, 2000; Canning *et al.*, 1999). At the intersection between the two accounting areas, three articles investigated the relationship between financial reporting and management

decision-making (Nikolaev *et al.*, 2017; DeZoort *et al.*, 2017; Li, 2013) while accounting practice and methods were the focus of other three articles (Boedker *et al.*, 2013; Espahbodi *et al.*, 1987; Stark, 1987).

Most selected articles either merely invoked the principle of cost-effectiveness or used it as a compass for guiding the interpretation of study findings. Two articles focused on cost-effectiveness-related behaviours, in respect to increases in rationing decisions (Barniv *et al.*, 2000) and considerations of opportunity costs in resource allocation (Chenhall *et al.*, 1991). Two articles discussed the cost-benefit implications of using different models for accounting for inflation (Espahbodi *et al.*, 1987; Stark, 1987), while three studies evaluated the effects of changes in reporting standards (Chen *et al.*, 2021; Li *et al.*, 2021; Khan *et al.*, 2018), though without explicitly attaching any economic value to such effects. The largest category of articles addressed issues relating either to management decision-making such as the use of debt covenants (Ma *et al.*, 2022; Nikolaev, 2017), cybersecurity insurance (Bodin *et al.*, 2018), artificial intelligence (Grüning, 2021) and rewards and disincentives against misconduct (Stikeleather, 2016; Webb, 2002), or choice of disclosure/reporting methods (Crawford *et al.*, 2021; Skinner, 1990; DeZoort *et al.*, 2017; Gigler *et al.*, 2014; Li, 2013), and auditing services (Vanstraelen *et al.*, 2017; Grenier *et al.*, 2015; Canning *et al.*, 1999; Caplan *et al.*, 2000). For these papers – which were essentially quantitative in nature – the cost of the proposed options were compared with their respective benefits, (e.g., in terms of better-quality information or improved behaviour), though no formal cost-effectiveness framework was employed nor any attempt to quantifying the economic efficiency of such propositions was undertaken.

Two among the earliest articles citing the concept of cost-effectiveness formally addressed research questions pertaining to the choice of performance measurement systems (Hemmer, 1998) and measures of human resource development (Mirvis *et al.*, 1976). An article by Hemmer (1999) focused on the choice of performance measures and responsibility assignment in a two-stage sequential production setting. In the studied setting, two responsibility assignments competed for optimality – a “push approach”, whereby the agent of the final stage is made responsible for finishing whatever the agent at the initial stage produces, while the agent at the initial stage is responsible for the overall output level. The other assignment was a “pull approach”, that is the reverse. The choice of optimal assignment design was quantitatively evaluated in cost-effectiveness terms, based on whether the

benefits related to an increase in informativeness of available performance measures resulted by changing the responsibility assignment outweighed the costs of the undesirable incentive that is responsible for its availability.

Table 1 - Characteristics of the selected articles

Journal	<i>Accounting Organizations and Society</i>	15%
	<i>Accounting and Business Research</i>	10%
	<i>Accounting and Finance</i>	2%
	<i>Accounting Review</i>	12%
	<i>Contemporary Accounting Research</i>	15%
	<i>European Accounting Review</i>	5%
	<i>Journal of Accounting and Economics</i>	10%
	<i>Journal of Accounting and Public Policy</i>	20%
	<i>Journal of Accounting Research</i>	5%
	<i>Journal of Business Finance and Accounting</i>	5%
	<i>Review of Quantitative Finance and Accounting</i>	2%
Country of author affiliation	Australia	8%
	Belgium	5%
	Canada	4%
	China	3%
	Denmark	1%
	France	1%
	Germany	1%
	Hong Kong	4%
	Ireland	1%
	Netherlands	1%
	Singapore	3%
	Spain	1%
	Taiwan	3%
	United Kingdom	3%
	United States	62%
Research design	correlational	32%
	descriptive	11%
	experiment	14%
	quasi-experiment	11%
	theoretical / conceptual	32%

* 37 full-text available

The earliest article from 1976 by Mirvis and Macy presented an interdisciplinary approach to measuring the costs and social and financial benefits of human resource development in an organisational setting. Interestingly, the authors described and applied what in fact are the most commonly used approaches to economic evaluation, that is cost-effectiveness and cost-benefit analysis. Mirvis and Macy (1976) neatly illustrated both these techniques by employing a “synthesizing model”, arguing that the latter paradigm (cost-benefit) would be more suited than the former – in that it gives full reign to the productive capacities of human resource development. They highlighted the importance of considering the present (expected) value of future benefits against the programme costs when judging the relative merits of mutually exclusive options and recognised the key role that an interdisciplinary assessment (combining accounting and cost-effectiveness) can have in informing managerial decision making. In sharing their experience, the authors concluded by identifying the refinement of interdisciplinary assessment methods as a key area of future research with cost-benefit comparisons carrying an “enormous potential”.

4. Discussion and conclusions

Cost-effectiveness principles have been invoked both in published financial and managerial accounting research. Most articles used them as guiding compass, and only a handful of studies quantified cost-effectiveness evidence and applied its methods. Interdisciplinary approaches have been called upon since the mid-1970s’, with a lack of methodological research able to integrate the accounting and cost-effectiveness methods being highlighted.

To the best of knowledge, this is the first scoping review exploring the nexus between accounting and cost-effectiveness. The search focused on key accounting journals and applied a systematic search strategy which improved reproducibility and reliability of findings. However, the search was limited in scope – being exploratory in essence – with only part of the published accounting literature being potentially reviewed. Nevertheless, the adopted journal selection provided a representative sample for an analysis focused on highly respected outlets in the accounting field and beyond. Heterogeneity of the literature made it particularly challenging to further dissecting and categorising the extracted information, hence a narrative synthesis approach was employed. This paper provides insight into the historical trend and distribution of the relevant articles, as well as a summary of their contents as

pertaining to the use and application of cost-effectiveness principles and methods.

While cost-effectiveness criteria are referred to in the accounting literature and used in practice, to date, the formal application of cost-effectiveness frameworks in applied research and method development remain at an early stage. Future interdisciplinary research should be conducted to advance such methods and ultimately support rational and informed resource allocation and regulatory decisions.

References

- Andersson H. (2018), Application of BCA in Europe - Experiences and Challenges, *Journal of Benefit-Cost Analysis*, 9(1), pp. 84-96.
- Barniv R. et al. (2000), The impact of medicare capital prospective payment regulation on hospital capital expenditures, *Journal of Accounting and Public Policy*, 19(1), pp. 9-40.
- Becciu A., Calota C.A., Gonnella C., Russo S. (2022), Human Resources Management, Knowledge Sharing and Innovative Behavior: which nexus? A Systematic Literature Review, *Management Control*, 3, pp 14-39. Doi: 10.3280/MACO2022-003002.
- Bens D. et al. (2020), Contracting and Reporting Conservatism around a Change in Fiduciary Duties*, *Contemporary Accounting Research*, 37(4), pp. 2472-2500.
- Bodin L.D. et al. (2018). Cybersecurity insurance and risk-sharing, *Journal of Accounting and Public Policy*, 37(6), pp. 527-544.
- Boedker C., Chua W.F. (2013), Accounting as an affective technology: A study of circulation, agency and entrenchment, *Accounting, Organizations and Society*, 38(4), pp. 245-267.
- Borgonovi E. (1979). *L'impresa pubblica*, Milano, Giuffrè.
- Borgonovi E., Dellamano R. (a cura di) (1983), *Uno strumento operativo per la decisione in sanità :l'analisi costi-benefici*, Milano, FrancoAngeli.
- Briggs A, Sculpher M., Claxton K. (2006), *Decision Modelling for Health Economic Evaluation*, Oxford, Oxford University Press.
- Bushee B.J. (2012), Discussion of "Financial reporting opacity and informed trading by international institutional investors", *Journal of Accounting and Economics*, 54(2-3), pp. 221-228.
- Canning M., Gwilliam D. (1999), Non-audit services and auditor independence: some evidence from Ireland, *European Accounting Review* 8(3), pp. 401-419.
- Caplan D.H., Kirschenheiter M. (2000), Outsourcing and Audit Risk for Internal Audit Services, *Contemporary Accounting Research*, 17(3), pp. 387-428.
- Chartered Institute of Management Accountants – CIMA (1996), *Management accounting official terminology*, Oxford, CIMA Publishing.
- Chen J.Z. et al. (2021), Information processing costs and corporate tax avoidance: Evidence from the SEC's XBRL mandate, *Journal of Accounting and Public Policy*, 40(2).
- Chen N.X. et al. (2018), Do Analysts Matter for Corporate Tax Planning? Evidence from a Natural Experiment, *Contemporary Accounting Research*, 35(2), pp. 794-829.
- Chen Z. et al. (2015), A model of emulation funds, *Accounting and Finance*, 55(3), pp. 717-748.

- Chenhall R., Morris D. (1991), The effect of cognitive style and sponsorship bias on the treatment of opportunity costs in resource allocation decisions, *Accounting, Organizations and Society*, 16(1), pp. 27-46.
- Coates John C. IV (2015), Cost-Benefit Analysis of Financial Regulation: Case Studies and Implications. [Available at SSRN: -- <https://www.yalelawjournal.org/article/cost-benefit-analysis-of-financial-regulation>, accessed: 27.03.2023].
- Crawford S.S. et al. (2021), Mind the gap: CEO-employee pay ratios and shareholder say-on-pay votes, *Journal of Business Finance and Accounting*, 48(1-2), pp. 308-337.
- DeZoort F.T. et al. (2017), The effect of SME reporting framework and credit risk on lenders' judgments and decisions, *Journal of Accounting and Public Policy*, 36(4), pp. 302-315.
- Espahbodi R., Hendrikson H. (1987), A discussion of cost-benefit analysis methodology, *Journal of Accounting and Public Policy*, 6(3), pp. 219-228.
- Farneti G., Mazzara L., Savioli G. (1996), *Il sistema degli indicatori negli enti locali*, Torino, Giappichelli Editore.
- Fattore G. (2009), Proposta di linee guida per la valutazione economica degli interventi sanitari in Italia, *Pharmacoeconomics-Ital-Res-Articles* 11, pp. 83-93. Doi: 10.1007/BF03320660.
- Florio M., Morretta V., Willak W. (2018), Cost-Benefit Analysis and European Union Cohesion Policy: Economic Versus Financial Returns in Investment Project Appraisal, *Journal of Benefit-Cost Analysis*, 9(1), pp. 147-180. Doi: 10.1017/bca.2018.4.
- Geoffroy R., Lee H. (2021), The Role of Academic Research in SEC Rulemaking: Evidence from Business Roundtable v. SEC, *Journal of Accounting Research*, 59(2), pp. 375-435.
- Gigler F. et al. (2014), How Frequent Financial Reporting Can Cause Managerial Short-Termism: An Analysis of the Costs and Benefits of Increasing Reporting Frequency, *Journal of Accounting Research*, 52(2), pp. 357-387.
- Grenier J.H. et al. (2015), The effects of accounting standard precision, auditor task expertise, and judgment frameworks on audit firm litigation exposure, *Contemporary Accounting Research*, 32(1), pp. 336-357.
- Grüning M. (2011), Artificial Intelligence Measurement of Disclosure (AIMD), *European Accounting Review*, 20(3), pp. 485-519.
- Harp N.L., Barnes B.G. (2018), Internal control weaknesses and acquisition performance, *Accounting Review*, 93(1), pp. 235-258.
- Hemmer T. (1998), Performance measurement systems, incentives, and the optimal allocation of responsibilities, *Journal of Accounting and Economics*, 25(3), pp. 321-347.
- Huang M., Wu C.C. (2015), Economic benefits and determinants of extreme dependences between REIT and stock returns, *Review of Quantitative Finance and Accounting*, 44(2), pp. 299-327.
- Hutton G., Baltussen R. (2021), Valuation of goods in cost-effectiveness analysis: notions of opportunity costs and transferability across time and countries. [Available at: -- <https://www.who.int/publications/m/item/valuation-of-goods-in-cost-effectiveness-analysis-notions-of-opportunity-costs-and-transferability-across-time-and-countries>, accessed: 27.03.2023].
- IFRS Foundation (2018). Conceptual Framework for Financial Reporting. [Available at: -- <https://www.ifrs.org/issued-standards/list-of-standards/conceptual-framework/>, accessed: 27.03.2023].
- Jalal Sardar (2022). The Role of Management Accounting in the Decision-Making Process. [Available at SSRN: -- <https://ssrn.com/abstract=4116922> or -- <http://dx.doi.org/10.2139/ssrn.4116922>, accessed: 27.03.2023].
- Journal Ranking Portal (2023), *Abs journal Ranking 2018*. [Available at: -- <https://journalranking.org/wp-content/uploads/2020/11/ABS-LIST-2018.pdf>, accessed: 27.03.2023].

- Khan U. et al. (2018), Do the FASB's standards add shareholder value?, *Accounting Review*, 93(2), pp. 209-247.
- Konchitchki Y., Patatoukas P.N. (2014), Taking the pulse of the real economy using financial statement analysis: Implications for macro forecasting and stock valuation, *Accounting Review*, 89(2), pp. 669-694.
- Kuhlmann A., Treskova M., Braun S. et al. (2015). The Role of decision-analytic modelling in German health technology assessments, *Health Econ Rev.*, Doi: 10.1186/s13561-014-0039-x.
- Li B. et al. (2021), Economic Consequences of IFRS Adoption: The Role of Changes in Disclosure Quality*, *Contemporary Accounting Research*, 38(1), pp. 129-179.
- Li E.X. (2013), Revealing future prospects without forecasts: The case of accelerating material contract filings, *Accounting Review*, 88(5), pp. 1769-1804.
- Longo F. et al. (2012), *Governo dei servizi territoriali: budget e valutazione dell'integrazione. Modelli teorici ed evidenze empiriche*. EGEA.
- Ma Z. et al. (2022), What's my style? Supply-side determinants of debt covenant inclusion, *Journal of Business Finance and Accounting*, 49(3-4), pp. 461-490.
- Mihaiu D. (2010), *Public Expenditure Efficiency Analysis Based On Cost Benefit Analysis, Studies in Business and Economics*, Lucian Blaga University of Sibiu, Faculty of Economic Sciences, vol. 5(1), pages 113-125, april.
- Mirvis P.H., Macy B.A. (1976), Accounting for the costs and benefits of human resource development programs: An interdisciplinary approach, *Accounting, Organizations and Society*, 1(2-3), pp. 179-193.
- Monteduro F. (2010), Il ciclo di gestione delle performance, In Hinna L. e Valotti G. (a cura di), *Gestire e valutare le performance nella PA, Guida per una lettura manageriale del D.Lgs. 150/2009*, Maggioli, pp. 323-435.
- Mussari R. (2001), Misurazione e valutazione delle performance: un'analisi critica", In Lombro A. (a cura di), *Il controllo di gestione negli enti locali*, Maggioli Editore, pp. 41-98.
- National Institute for Health and Care Excellence (2022). *Developing NICE guidelines: the manual* [Available at: -- <https://www.nice.org.uk/process/pmg20/chapter/incorporating-economic-evaluation>, accessed: 27.03.2023].
- Nikolaev V.V. (2017), Discussion of Borrower private information covenants and loan contract monitoring, *Journal of Accounting and Economics*, 64(2-3), pp. 340-345.
- Office for Health Improvement and Disparities (2020). Cost effectiveness analysis: health economic studies. [Available at: -- <https://www.gov.uk/guidance/cost-effectiveness-analysis-health-economic-studies>, accessed: 27.03.2023].
- Posner E.A., Weyl E.G. (2014), Benefit-Cost Paradigms in Financial Regulation, *The Journal of Legal Studies*, 43(S2), S1-S34. Doi: 10.1086/676985.
- Roberts J. (2006), *What Happens when Public Expenditure is Scaled Up? An Enquiry into the Costs and Cost-effectiveness of Expenditure in Phases of Expansion*. [Available at: -- <https://cdn.odi.org/media/documents/2511.pdf>, accessed: 27.03.2023].
- Samiolo R. (2012), Commensuration and styles of reasoning: Venice, cost-benefit, and the defence of place, *Accounting, Organizations and Society*, 37(6), pp. 382-402.
- Sargiacomo M. (2013), *Public Sector Management in Italy (UK Higher Education Humanities & Social Sciences Politics)*. McGraw-Hill Higher Education.
- Schipper K. (2010), How can we measure the costs and benefits of changes in financial reporting standards?, *Accounting and Business Research*, 40(3), pp. 309-327. Doi: 10.1080/00014788.2010.9663406.
- Skinner D.J. (1990), Options markets and the information content of accounting earnings releases, *Journal of Accounting and Economics*, 13(3), pp. 191-211.

- Skinner D.J. (1990), Options markets and the information content of accounting earnings releases, *Journal of Accounting and Economics*, 13(3), pp. 191-211.
- Stark A.W. (1987), Some thoughts on “A cost-benefit analysis of accounting for inflation”, *Journal of Accounting and Public Policy*, 6(3), pp. 209-217.
- Stikeleather B.R. (2016), When do employers benefit from offering workers a financial reward for reporting internal misconduct?, *Accounting, Organizations and Society*, 52, pp. 1-14.
- Tappura S., Sievänen M., Heikkilä J., Jussila A., Nenonen N. (2015), A management accounting perspective on safety, *Safety Science*, Doi: 10.1016/j.ssci.2014.01.011.
- Trompeter G., Wright A. (2010), The world has changed - Have analytical procedure practices?, *Contemporary Accounting Research*, 27(2), pp. 669-700.
- Vanstraelen A., Schelleman C. (2017), Auditing private companies: what do we know?, *Accounting and Business Research*, 47(5), pp. 565-584.
- Webb R.A. (2002), The impact of reputation and variance investigations on the creation of budget slack, *Accounting, Organizations and Society*, 27(4-5), pp. 361-378.
- White J. T. (2016), *Quantified Cost-Benefit Analysis at the SEC*. *Administrative Law Review Accord*. Forthcoming, [Available at SSRN: -- <https://ssrn.com/abstract=2820891>, accessed: 27.03.2023].

MANAGEMENT CONTROL

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Lombardi R. (2021), Le dimensioni della conoscenza aziendale. Profili di investigazione tra crisi pandemica ed economia digitale, *Management Control*, 3, pp. 5-14. Doi: 10.3280/MACO2021-003001.

Tessier S., Otley D. (2012), A conceptual development of Simons' Levers of Control framework, *Management accounting research*, 23(3), pp.171-185. Doi: 10.1016/j.mar.2012.04.003.

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