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ORIGINAL PAPER

Orchestrating the flow of information for decision making: new dynamics between management accountants and operational managers leveraging business intelligence & analytics systems

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Abstract

This paper investigates whether and how the use of business intelligence & analytics (BI&A) systems influences the way management accountants (MAs) support the decision-making processes of operational managers within organisations. Drawing on a cross-sectional field study of five Italian companies and using the concepts of technological properties, affordances and constraints, findings show that MAs' degree of involvement in decision-making processes depends on how MAs and operational managers leverage BI&A properties to perform tasks during the production, transmission and reception of information. Although BI&A systems have reduced MAs' traditional tasks and responsibilities during the informational flow, by leveraging specific BI&A properties, MAs can recognise themselves as orchestrators of information flows because they establish the entire information framework available to managers for decision making. In intra-functional decision making, MAs' orchestration is largely invisible within the BI&A infrastructure because operational managers gain greater autonomy in managing information. However, this autonomy is enabled by the tailored information perimeter previously configured by MAs, making their diminished presence more apparent than real. Conversely, in inter-functional decision making, MAs' orchestration becomes overt as operational managers actively seek their involvement. Moreover, MAs leverage their enterprise-wide access to BI&A information and business knowledge to safeguard local decisions that reflect their broader organisational implications.

Keywords Management accountants · Controllers · Decision making · Business intelligence · Business analytics · BI&A

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1 Introduction

This paper examines the role of management accountants (MAs) in supporting operational managers' decision making (Byrne & Pierce, 2018; Pierce & O'Dea, 2003) in the context of business intelligence and analytics (BI&A) use. BI&A systems integrate diverse data sources, automate data cleansing and provide advanced tools for data visualisation and information analysis (Davenport, 2006; Davenport et al., 2010). Recent studies suggest they may redistribute roles and responsibilities regarding the management of information flows and influence how decision-making autonomy is allocated (Arkhipova et al., 2024; Cavélius et al., 2020; Labro et al., 2023; Szukits, 2022; Rikhardsson & Yigitbasioglu, 2018).

Indeed, the integration of BI&A systems into decision-making processes can reshape the relationship between MAs and operational managers, either by fostering synergies that enhance their collaboration (e.g. Becker & Heinzelmann, 2017; Fehrenbacher et al., 2022) or by creating tensions that push these professional groups further apart (e.g. Arnaboldi et al., 2021; Becker & Heinzelmann, 2017). In particular, BI&A systems can alter the balance of decision-making authority by enhancing operational managers' autonomy, diminishing the 'local responsibility' traditionally assumed by MAs (Maas & Matějka, 2009) or centralising decision-making processes in headquarters (Labro et al., 2023). However, our knowledge about whether and how the use of BI&A systems influences the relationship between MAs and operational managers is still limited and research is needed on how such systems interfere with MAs' local support for decision making (Boerner, 2025; Knudsen, 2020; Wolf et al., 2020). Specifically, some studies call for additional qualitative research on the evolving role of MAs as their decision-support responsibilities are expected to shift due to digitalisation (Cavélius et al., 2020; Szukits, 2022). Thus, this paper investigates the following research question: *whether and how might the use of BI&A systems influence the way MAs support the decision-making processes of operational managers within organisations*?

This work applies the concepts of properties, affordances and constraints of technological artefacts (Leonardi, 2011; Leonardi & Barley, 2008; Orlikowski, 2000). It also draws on the empirical material collected through a cross-sectional field study involving five large Italian companies. This study illustrates that the inherent properties of BI&A systems afford and/or constrain the fulfilment of activities by MAs and operational managers throughout the flow of information, that is its production, transmission and reception (Catasús & Gröjer, 2006; Catasús et al., 2007).

The findings reveal a nuanced view of MAs' involvement in decision making, which varies according to how MAs and operational managers leverage BI&A properties to perform their organisational roles. More particularly, in BI&A systems, MAs perceive themselves as 'orchestrators of information flows' because they can establish the entire information infrastructure available to managers and deliver to each manager a tailored pool of information to support decision-making processes. However, this orchestrator role unfolds differently depending on the decision-making context. In decision-making processes confined within a single organisational function, the adoption of BI&A systems enables operational managers to act with greater autonomy, reducing their dependence on MAs. However, this independence rests on

informational frameworks configured by MAs, whose role remains largely hidden behind the BI&A infrastructure. Correspondingly, while MAs appear less present in local decision making, their influence persists through the structures they have designed. In contrast, when decisions carry cross-functional implications and their consequences affect a company, operational managers actively turn to MAs for support. In these contexts, MAs' orchestrator role becomes explicit as they exploit their enterprise-wide access to BI&A information and their business acumen to ensure that managerial choices account for broader organisational consequences.

This paper is structured as follows. The next section provides the theoretical background for analysing if and how BI&A influences MAs' local decision support to operational managers. The third section describes the research method. The fourth section illustrates the empirical analysis. Finally, the fifth section concludes the paper by discussing its main findings and contributions, and by offering potential avenues for future research.

2 Theoretical background

2.1 BI&A systems' advent and evolving relation between management accountants and operational managers

BI&A systems are technologies and methodologies that collect, organise and analyse data to provide actionable information that can support managerial decision-making processes (Davenport, 2006; Davenport et al., 2010). BI&A systems can streamline data collection, analyse data, produce and organise information through reports and dashboards for making results available to decision makers (Appelbaum et al., 2017; Bhimani & Willcocks, 2014; Lönnqvist & Pirttimäki, 2006; Quattrone, 2016). This ability has raised an academic debate about the implications of its use for MAs' role (e.g. Cavélius et al., 2020; Järvenpää et al., 2023; Knudsen, 2020). In particular, this recent strand of literature suggests that BI&A systems might alter the relationship between MAs and operational managers when such systems are integrated to support local decision-making processes, either fostering synergies that strengthen their collaboration (e.g. Becker & Heinzelmann, 2017; Fehrenbacher et al., 2022; Fähndrich, 2023; Fähndrich & Pedell, 2025) or generating tensions that distance these professional groups (Arnaboldi et al., 2021; Becker & Heinzelmann, 2017; Labro et al., 2023).

Disentangling BI&A systems' influence on MAs' and operational managers' interactions might offer new insights into the evolving boundaries of this relationship, which is marked by conflicting dynamics (Byrne & Pierce, 2018; Maas & Matějka, 2009; Sikka & Willmott, 1995). On the one hand, a bulk of research illustrates that operational managers are often hesitant and express scepticism towards involving MAs in supporting decision making, driven by concerns that MAs may primarily monitor local performance or unduly interfere with operational choices (Mouritsen, 1996; Lambert & Sponem, 2012; Pierce & O'Dea, 2003; ten Rouwelaar et al., 2018). On the other hand, a strand of studies acknowledges that MAs' proximity to business issues allows them to more effectively prepare and deliver information for

decisions, enabling operational managers to better perform work (Wolf et al., 2015; Järvenpää, 2007; ten Rouwelaar et al., 2018). This ultimately allows MAs to be recognised as 'business partners' (Granlund & Lukka, 1998; Järvenpää, 2007; Pierce & O'Dea, 2003). Therefore, illuminating whether and how BI&A systems offer MAs a consultative position, leveraging their business acumen and their analytic approach and expertise in finance and planning (Quinn, 2014; Richins et al., 2017), or undermine their relevance in assisting decision-making processes (Becker & Heinzelmann, 2017; Arnaboldi et al., 2021) has recently drawn the attention of researchers (Boerner, 2025; Knudsen, 2020; Szukits, 2022; Wolf et al., 2020).

2.2 Technological properties, affordances and constraints

The information systems literature has explored the adoption and utilisation of BI&A systems, focusing on the properties that may enhance decision quality (Aina et al., 2015; Elbashir et al., 2008; Peters et al., 2016; Wieder et al., 2012). Orlikowski (2000) defines the properties of technological artefacts as the 'bundle of material and symbolic properties packaged in some socially recognisable form, e.g. hardware, software, techniques' (p. 408). *Properties*, then, are objectively and unequivocally defined features of a technology that exist independently of individuals who use it (Leonardi, 2011). Properties offer them the possibility of accomplishing traditional tasks in innovative ways (Leonardi & Barley, 2008). By definition, the properties of a technology are the same for everyone who interacts with it. However, the action possibilities they afford or constrain are not. These depend on the contexts where the technology is used and on the user who interacts with it (Leonardi, 2013; Volkoff & Strong, 2013). Therefore, the influence of BI&A systems on the role that MAs can play in supporting managerial decision-making processes depends on BI&A properties and, more notably, on the action possibilities – the affordances or constraints – that users (MAs and operational managers, in our case) perceive to enable or limit their roles within organisations.

Specifically, *affordances* are the potential actions that a technological property enables users to perform, namely, what users might accomplish using the technology (Markus & Silver, 2008; Gibson, 1979). Affordances, thus, represent a relational concept. They emerge not only from the interaction between the user and the properties of a technology, but also from the user's interpretation of the technology according to his or her goals for action (Leonardi, 2011). Conversely, *constraints* reflect users' understandings that a technology lacks affordances for action, thereby limiting their capability to achieve their objectives (Orlikowski & Barley, 2001). Then, considering that users' perceptions of affordances and constraints enable or limit the possibility of action by using the technology, this perception changes tasks and, consequently, the roles of the actors involved (Leonardi & Barley, 2008).

Below, we discuss that BI&A systems' influence on the role that MAs play in supporting managerial decision-making processes depends on BI&A properties and, to a greater extent, the action possibilities – the affordances or constraints – that MAs and operational managers perceive to facilitate or constrain their roles. The primary purpose of BI&A is to support decision-making processes by providing managers with timely, relevant and easy-to-use information (Elbashir et al., 2008). This means

that BI&A properties and their potential affordances and constraints for MAs and operational managers can be analysed from a management accounting perspective. In this regard, management accounting scholars widely acknowledge that, to support decision-making processes, information must be produced by designers (production of information), transmitted to users (transmission of information) and received by them to activate future actions (reception of information) (Catasús & Gröjer, 2006; Catasús et al., 2007).

2.3 BI&A properties, affordances and constraints in the production of information

The *production* of information regards the choices about what and how information should be generated to support decision making (Catasús & Gröjer, 2006; Catasús et al., 2007). This represents a crucial stage. Behind this activity, there should be 'an active idea of what ought to be important to the organization' (Catasús et al., 2007, p. 508). At this stage, key decisions regard the definition of what and how to measure, how to structure information and how to collect and prepare data. The properties that BI&A systems can offer to users to produce information regard the extraction, transformation, and loading (ETL) tools and the data storage into the data warehouses (Baars & Kemper, 2008). More specifically, these properties permit the integration of large volumes of data from different sources, as well as data cleansing, standardising and loading (Davenport et al., 2010; Chaudhuri et al., 2011). Hence, the BI&A data management and storage architecture facilitate the automation of numerous repetitive, low-value and time-consuming activities, such as data collection, traditionally pertained to MAs, reducing their involvement (Davenport, 2014; Gärtner & Hiebl, 2018; Guthrie & Parker, 2016; Rikhardsson & Yigitbasioglu, 2018; Ippolito et al., 2024). Consequently, *BI&A properties can diminish the role of MAs in the production of information* (a)[1].

However, concerns remain that BI&A systems do not necessarily free up time for MAs to focus on value-added activities. The automation of traditional, non-value-added tasks is often offset by the emergence of new ones, such as data cleaning (Cavélius et al., 2020; Oesterreich et al., 2019). In addition, the integration of a large volume of data from different sources in a unique data warehouse represents a crucial element of the production of information through BI&A systems. Leveraging this property, MAs can position themselves as leaders in introducing new information and acting as trainers for managers, helping them better understand management accounting practices (Cobb et al., 1995). Additionally, initiatives related to the introduction of new information can also come from operational managers who seek diversified indicators that are useful for better addressing their business needs (Kasurinen, 2002). Such engagement in the production of information potentially fosters closer interactions between these two groups, thus expanding the role of MAs into

[1] Corroborating the qualitative nature of this study, the lettered statements (a–g) introduced in this section are used as interpretive propositions that synthesize prior theoretical arguments. The letters are introduced to facilitate the traceability of these propositions across the theoretical background, Fig. 1, the findings and the discussion, where the results are analysed relative to these interpretive propositions.

operational domains (Cobb et al., 1995). Building on this, we suggest that the way MAs and operational managers leverage the properties of BI&A related to information production can foster discussions on how information should be structured to support decision making. Thus, *BI&A properties can enable closer interactions between MAs and operational managers*, *promoting the diffusion of management accounting logics throughout the organisation* (b).

2.4 BI&A properties, affordances and constraints in the transmission of information

Once information has been produced, *transmission* refers to the process of selecting what to present to managers and deciding how it should be delivered in terms of timing and communication channels (Catasús & Gröjer, 2006; Catasús et al., 2007). These choices are pivotal because, to be effectively considered for managerial decision making, information must be presented in a way that is understandable to its recipients and aligned with their perspectives, enabling them to recognise its relevance for decision-making purposes (Chiucchi & Montemari, 2016). At this step, the availability of a wide range of data visualisation techniques, the opportunity to customise the information to be included in the dashboards and the easy and rapid accessibility to the information represent the properties of the BI&A systems that enable the transmission of information to managers (Chen et al., 2012). Therefore, we argue that leveraging these BI&A properties may support MAs in deciding "'what" should be reported, "how" it should be reported and "when" it should be reported' (Goretzki et al., 2018, p. 8) to each manager to successfully support different information flows. This could allow MAs to act as 'orchestrators' of informational flows within organisations by identifying managers' needs, prioritising relevant content and ensuring the monitoring of key performance indicators (Ippolito et al., 2024). In doing so, MAs centralise control over informational flow, which might limit operational managers' autonomy in decision-making processes (Labro et al., 2023). This role is performed in the back region, within the management accounting function, where MAs interact with peers and the CFO through 'backstage interactions' before engaging with operational managers (Goretzki & Messner, 2019). Moreover, advanced use of the features of BI&A systems, including query construction tools (Mudau et al., 2024), could permit MAs to perform a role more oriented towards a consultative nature when it comes to transmitting information (Andreassen, 2020). Therefore, *BI&A properties can enable MAs to act as orchestrators of the informational flow in the backstage* (c).

Conversely, the easy access to information and data visualisation techniques provided by BI&A systems can enhance operational managers' autonomy by enabling them to engage more independently with information (Ippolito et al., 2024). Operational managers thus can independently access and organise information in formats suited to their needs without involving MAs (Becker & Heinzelmann, 2017; Arnaboldi et al., 2021). Consequently, *BI&A properties can decrease MAs' involvement in providing information* (d). On the one hand, we propose that the abovementioned BI&A properties can afford for MAs to act as orchestrators of the informational flow, potentially 'surveilling' the autonomy of operational managers in decision-making processes. On the other hand, by leveraging BI&A properties related to the access

and customisation of information, operational managers can gain autonomy in managing information without asking for MA support. Accordingly, *BI&A properties can limit or enhance operational managers' autonomy in decision-making processes* (e).

2.5 BI&A properties, affordances and constraints in the reception of information

The *reception* of information pertains to what happens to information once transmitted to managers. Managers may choose to use information to guide their decisions, allowing it to shape their actions, or they may decide to disregard it (Catasús & Gröjer, 2006; Catasús et al., 2007). The properties of BI&A systems that play a role in this step concern the interactive exploration and navigation of data, including filtering, pivoting, slicing, dicing, roll-up and drill-down, which facilitate a more information-based decision-making process (Chaudhuri et al., 2011). At this stage, the MAs' 'feel for the numbers' can play a relevant role in translating information provided by the BI&A systems into decision-relevant business information (Al-Htaybat & von Alberti-Alhtaybat, 2017; Becker & Heinzelmann, 2017). This ability can lead to a sense-giving role for MAs (Järvenpää et al., 2023). At this stage, MAs can leverage what Mack and Goretzki (2017) term *panoramic knowledge*: a broad understanding of practices and initiatives across organisational units. This enables them to support operational managers in improving decision making. In this context, MAs can get involved in 'front-stage interactions' with operational managers. Within the informational journey, this represents the 'ultimate' stage (Goretzki & Messner, 2019, p. 10) where their contribution to support the decision-making process becomes visible. Then, *BI&A properties can allow MAs to show their ability to interpret information during front-stage interactions with operational managers* (f).

However, BI&A systems allow for the interactive exploration and autonomous navigation of information by operational managers (Arnaboldi et al., 2021; Arkhipova et al., 2024). Such autonomy can foster greater speed in decision making. Nonetheless, it threatens to diminish the role of MAs as intermediaries in the decision-making process and sense-makers of information (Dunne et al., 2013; Mertins & White, 2014). Hence, *BI&A properties can enable operational managers to interpret information independently*, *thereby diminishing the need to seek support from MAs* (g).

Overall, we propose that by transforming how information is produced, conveyed, accessed and used in decision making, BI&A systems can reshape responsibilities across the entire informational flow and reallocate decision-making autonomy. It is true that BI&A systems possess properties that influence the production, transmission and reception of information. However, we suggest that it is largely how MAs and operational managers effectively and purposefully leverage these properties to pursue their goals that might influence the way MAs support managerial decision-making processes within organisations. Outcomes can vary significantly from the perspective of MAs, as discussed above (Fig. 1).

In the following sections, we explore how BI&A systems' properties afford or constrain MAs and operational managers' actions in the production, transmission and reception of information. This will offer an empirical illustration of whether and

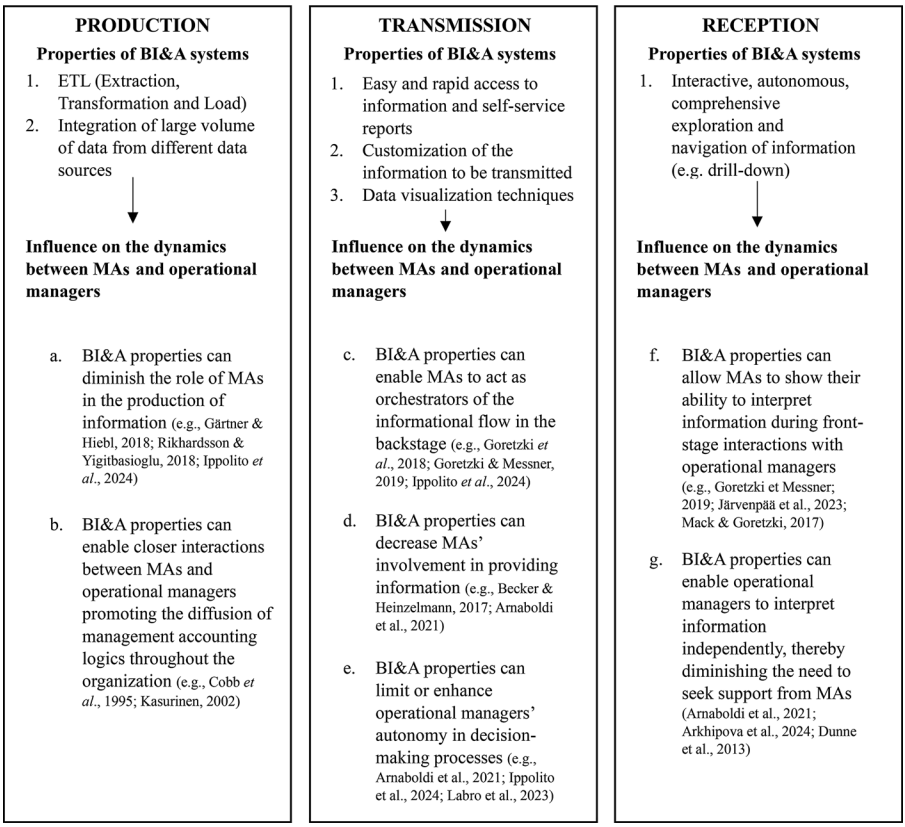

Fig. 1 The influence of BI&A systems' properties on whether and how MAs support decision-making processes of operational managers

how this influences the role of MAs in supporting local decision-making processes within companies.

3 Methodology

3.1 Research design

To answer the research question, we conducted a cross-sectional field study involving five Italian companies. This research methodology, 'lying somewhere between in-depth cases and broad-based surveys' (Lillis & Mundy, 2005, p. 120), includes relatively few organisations through a less rigid and structured data collection than a survey and with less depth than a case study (Roslender & Hart, 2003). By intentionally limiting the study's depth, a broad overview of the phenomenon can be gained while examining certain aspects in detail (Granlund & Malmi, 2002). In particular, the cross-sectional field study allows researchers to investigate topics that are not suf-

ficiently explored and to enrich their understanding by focusing on social contextual elements (Lillis & Mundy, 2005).

Hence, the choice to conduct a cross-sectional field study to reach our research aim was determined for the following reasons. First, the current knowledge on how the use of BI&A systems can influence the supporting role of MAs in decision making is limited. This method, then, provides the opportunity to identify emerging issues from different perspectives and in different contexts (cf. Granlund & Malmi, 2002; Scapens & Jazayeri, 2003, about ERP systems). Correspondingly, the cross-sectional field study also allows us to explore how a phenomenon unfolds within its specific social context. Thus, it appears suitable to investigate whether and how BI&A properties afford or constrain the actions of users in different organisational contexts. Similarly, the characteristics of MAs' role regarding tasks, relationships with other organisational functions and support for managerial decision-making processes strongly depend on the organisational context in which MAs operate (Mouritsen, 1996; Lambert & Sponem, 2012). Hence, using this method appears appropriate to reach the aim of the study. The rationale for selecting the sample of this study follows the logic of purposeful sampling (Patton, 1990). Specifically, the underpinning of this selection lies in choosing information-rich cases that enable the detection of crucial elements for the purpose of the study.

Following this line of reasoning, the sampling process involved identifying companies that use BI&A systems for management accounting purposes. In greater detail, the logic behind the sampling process was to include companies that can show the potential influence of BI&A systems on the role of MAs in supporting decision making. Accordingly, the authors identified five Italian companies that introduced BI&A systems for management accounting purposes where MAs and operational managers had been using these systems to perform their tasks (see the Appendix for an overview of the case companies).

3.2 Data collection

The main source of data collection comprised 28 semi-structured interviews conducted with MAs and operational managers. The use of the semi-structured interview, thanks to its high degree of flexibility and adaptability, allowed us to reach a detailed understanding of the phenomenon and to compare different business contexts (Kreiner & Mouritsen, 2005; Qu & Dumay, 2011). Data collection occurred in three main steps. First, in 2022, the authors conducted five interviews with MAs to investigate how the use of BI&A systems affects the role of MAs within organisations. From these interviews, it clearly emerged that the use of BI&A systems influenced the way MAs support operational managers' decision-making processes. Therefore, the authors decided to delve more into this topic and during December 2023 and February 2024 conducted 12 semi-structured interviews with MAs and operational managers. On the one hand, the authors conducted interviews with MAs to gain in-depth knowledge about how the use of BI&A systems changed their role in supporting managerial decision making. On the other hand, the authors interviewed managers to gain knowledge about their perceptions of the role of MAs in supporting decision-making processes.

According to the research aim, the authors asked MAs about their use of BI&A systems, the way they gather and elaborate data, filter and present information, focusing on whether and how BI&A properties allow or hinder them from performing specific tasks compared to the past. Questions were also asked about MAs' perceptions about if and how BI&A systems influenced their role in supporting decision making. Regarding operational managers, the authors asked about their use of BI&A systems and whether it changed the way they obtained information compared to the past. The questions also focused on how they used information through the BI&A systems and how this influenced the support provided by MAs and their relationships with them. Finally, during October and November 2024, 11 follow-up interviews were conducted to deepen the specific themes that emerged in the previous interviews. To enrich the understanding of the phenomenon under investigation and corroborate our findings, the authors conducted a document analysis (Bowen, 2009). This included company websites, financial statements and internal reports used before the introduction of BI&A systems and BI&A dashboards.

According to the maximum variation sampling strategy (Patton, 1990) and as in previous studies on the dyadic relationships between MAs and operational managers (e.g. Byrne & Pierce, 2018; Bruesch & Quinn, 2024), the operational managers interviewed belong to different business functions. This helped to capture a variety of perspectives and to gain a broader and more nuanced comprehension of the interactions between MAs and operational managers. While these managers' informational needs differ depending on their functional areas, the study highlights overarching tendencies across these diverse functions rather than examining each category in depth. The interviews conducted with MAs and managers lasted an average of 60 min and 30 min each, respectively. Each interview was recorded and subsequently transcribed (see the Appendix for detailed information about the interviews).

3.3 Data analysis

All the authors participated in the data collection and took detailed notes during interviews. After each interview, the authors organised a short meeting to share notes and perceptions about the interview. During the data collection period, the authors examined the transcriptions of the interviews independently and met regularly to discuss emerging themes. One of the authors wrote a detailed summary of each company, which represented the background for the following steps of the analysis. These summaries described the reasons for the introduction of BI&A systems, their daily use by MAs and operational managers, and how such introduction changed their tasks compared to the past. The authors then analysed the interview transcriptions, drawing on the concept of properties (Orlikowski, 2000) and, in particular, on BI&A properties identified by extant literature on BI&A (Baars & Kemper, 2008; Chaudhuri et al., 2011; Chen et al., 2012). The authors identified the BI&A properties reported by MAs and operational managers for each stage of production, transmission and reception. Subsequently, the specific technological properties of the BI&A systems (e.g. 'ETL tools' for production, 'data visualisation techniques' for transmission and 'dynamic data exploration' for reception) were identified from the interview data.

As the data analysis progressed, the authors noticed that the way MAs and operational managers used these properties to produce, transmit and receive information influenced the role of MAs in supporting decision-making processes. The authors returned to the theory and identified the concepts of affordances and constraints (Leonardi, 2011; Leonardi & Barley, 2008; Orlikowski & Barley, 2001) as a useful framing device to disentangle how action possibilities (BI&A system affordances) or limitations (BI&A system constraints) leveraged by MAs and operational managers influence MAs' role in supporting managerial decision-making processes. The authors independently analysed and coded the material for each organisation using the concepts of affordances and constraints and later discussed the results collectively. The coding procedure aimed at detecting how these properties enabled or constrained actions through the identification of constructs that describe affordances and constraints as perceived by MAs and operational managers in the production, transmission and reception of information. The authors constantly cross-examined these constructs to find similarities and differences among companies. For example, in the production phase, when MAs highlighted that BI&A allowed the '*production of new indicators*', this was coded as an affordance for them. Conversely, in the transmission step, when MAs described limitations regarding '*fewer requests of data from managers*', these were coded as constraints. Likewise, in the reception stage, when operational managers mentioned limitations, such as '*limited interpretability of interfunctional effects*', these were identified as constraints.

The next section illustrates our empirical results and is organised into three main parts, according to the BI&A properties that play a role in the production (4.1), transmission (4.2) and reception (4.3) of information. For each subsection, the affordances and constraints provided by BI&A properties for both MAs and operational managers are analysed, as well as how they influence the role of MAs in supporting managerial decision-making processes.

4 Findings

4.1 Information production

The production of information involves decisions about what data to generate and how it should be collected, structured and prepared to support decision making (Catasús & Gröjer, 2006; Catasús et al., 2007). This step includes identifying the phenomena to be measured, defining the appropriate methods for their measurement and the structure of the resulting information. Consequently, the production of information encompasses collecting raw data from various sources, validating and cleansing those data and transforming them into information. All these tasks are completed before information is ready for transmission to users. Before the adoption of BI&A systems, within most companies, the tasks related to the production of information were performed by MAs. Often supported by IT staff, MAs extracted data from different sources and manually elaborated it to create reports in Excel spreadsheets.

Once BI&A systems have been introduced, interviewees agree that the system has certain inherent properties. Including data ETL, these properties permit the produc-

tion of information by extracting data from various sources, transforming it to ensure consistency and quality and loading it into a data warehouse for analysis. With BI&A systems' capabilities to extract, clean and standardise data, MAs are constrained in their ability to execute these tasks. Because these processes are now embedded in the systems and performed automatically, their opportunity to engage them directly is significantly reduced, limiting their involvement in the collection, structuring and preparation of data. Nonetheless, this limitation contributes to a significant improvement in the accuracy of the information provided to operational managers. The MA of Company D reported the following:

> We can now deliver information that is more accurate, consistent and reliable. Previously, the same request would yield different data in meetings, generating debates over data accuracy and discussions about how the data were generated. Now, since the production of the data was defined during the implementation of BI, the adoption of the BI system has effectively certified the information we provide, making it unquestionable. (Management Accountant – Company D)

The transition of data extraction, transformation and loading activities from manual tasks performed by MAs in Excel spreadsheets to the functionalities provided by the BI&A system has significantly reduced frequent errors associated with customisation and complex pivot tables produced through Excel spreadsheets. The ETL capabilities of BI&A systems ensure the information is error free and certified, enhancing its reliability. The MA of Company B explained the following:

> There was a customisation in Excel files that led to a significant margin for error. With a pivot table containing hundreds of parameters, it was easy to make a mistake, such as misapplying a flag, which inevitably resulted in incorrect data. In the past, this caused disagreements over data accuracy, and the data were not always validated. With BI, we have "locked down" the data. Now, we know it is certified, accurate and that everyone can access and rely on the same data. (Management Accountant – Company B)

The adoption of BI&A systems improved the accuracy of information, allowing its homogeneity across managers. The information reliability granted by BI&A properties mitigated discrepancies arising from divergent information sources, reducing conflicts between MAs and operational managers. Moreover, in most companies under study, the ability of BI&A systems to integrate data from diverse sources has enabled MAs to generate new and more complex indicators that were previously impossible to produce. According to the MA of Company E:

> In the production area, we initially analysed product volume alone; with the implementation of BI, we were able to conduct an in-depth analysis of productivity, examining product volume in correlation with man hours dedicated to specific production phases. Consequently, we developed productivity indicators tailored to specific phases and departments within the production area, such as quality control, reproduction and packaging stages. […] It would have

> been impossible to achieve through data extraction and subsequent processing in Excel. (Management Accountant – Company E)

Thus, the opportunity to produce new indicators allows MAs to gain deeper insights into their businesses. By leveraging the possibility of creating tailored indicators, MAs are now equipped to monitor performance across highly specific dimensions down to micro-areas and individual activities. This depth of analysis provides a more detailed, layered understanding of various business areas—insights previously unreachable with traditional systems. As a result, the enhanced granularity of analysis allows MAs '*to uncover phenomena that were previously hidden*' (Management Accountant – Company E), given that certain operational functions were previously subjected to less thorough examination, relying more on intuitive judgment. The MA of Company D reported:

> There are now more indicators available. […]. Adopting this tool has enabled the addition of certain informational details and analyses that were previously overlooked. It has also allowed us to measure the performance of areas that were previously more approximate. Using the BI system, we were able to develop specific indicators and performance reports for those areas as well. (Management Accountant – Company D)

Additionally, Company B's MA highlighted that this transformation catalysed the extension of management accounting logics to other business functions:

> They (operational managers) can view the macro-level indicator, but now they can also access other detailed indicators by item, category and product. […]. Sharing this information has greatly helped to raise awareness. It has been instrumental in fostering a management accounting culture within the sales function and across other functions. (Management Accountant – Company B)

BI&A properties not only influence the work of MAs but also significantly affect operational managers. The capabilities of these systems to gather and integrate data from various sources empower operational managers to advocate for the introduction of new types of analyses and indicators. This has led managers to request additional analysis of MAs. Such requests affect the production of information. They imply the collection of new data from diverse sources and their elaboration and incorporation into the existing information architecture. Hence, operational managers actively participate in the production of information. This enables them to obtain the deeper insights necessary for their decision making. In the words of the MA of Company E:

> For example, we provided the purchasing department with a dashboard that would allow not only the simple view of monthly revenue or the purchase volume of a single item, but also a comparison of the average cost compared between this year and last year or between different suppliers. Thus, this kind of reporting and analysis fostered a sense of curiosity among the operational managers, prompting requests like: 'Okay, this configuration of the purchasing

> database is not sufficient for my needs. […] Can you also add this feature for me? Can you also add that to help me analyse this specific aspect? (Management Accountant – Company E)

The request for new indicators relevant to specific domains reflects the increasing engagement of operational managers with MAs in the production of information through BI&A systems. Their ongoing use of these systems and the consequent increasing proficiency afford operational managers the opportunity to seek indicators closely aligned with their requirements. By leveraging the properties of BI&A systems, operational managers are no longer passive recipients of information, but active participants in shaping it within their function. As stated by the IT manager of Company B:

> The more you have, the more you want. Thus, gaining familiarity with the BI&A system and beginning to use it prompted the identification of additional KPIs relevant to my area. […]. By using it [the BI system], people realise that they might also need to verify or track things differently. (IT Manager – Company B)

Hence, the properties of BI&A systems create affordances and constraints regarding the MA's choices regarding what data to generate and how they should be collected and prepared to support decision making. In particular, the elimination of data cleansing, standardisation and loading tasks by the MAs improves the reliability of the information. The inherent integration of a large volume of data from different sources affords MAs the ability to generate new indicators. This extends management accounting logics across business functions that were previously monitored less comprehensively. Regarding operational managers, leveraging the integration capabilities of BI&A systems has enabled them to become more actively involved in producing accurate and relevant information tailored to their needs. Unlike in the past, they now request additional indicators specific to their functional areas, reflecting a more engaged role in shaping the information they require. Thus, regardless of who effectively proposes the new indicators, at this step, the BI&A intensifies the engagement between MAs and operational managers (Fig. 2).

4.2 Information transmission

The transmission phase begins once information has been created and made available to users. The transmission of information refers to the process of selecting information to present to each manager (Catasús & Gröjer, 2006; Catasús et al., 2007). In this phase, attention shifts from determining what data should be generated and how they should be processed to identifying which information should be communicated, with whom and in what format. This involves structuring and presenting previously produced information in ways that align with the needs and roles of recipients. Making decisions about what information should be conveyed and how the information should be presented influences how operational managers will later use it in decision-making processes. Before the implementation of the BI&A systems, operational

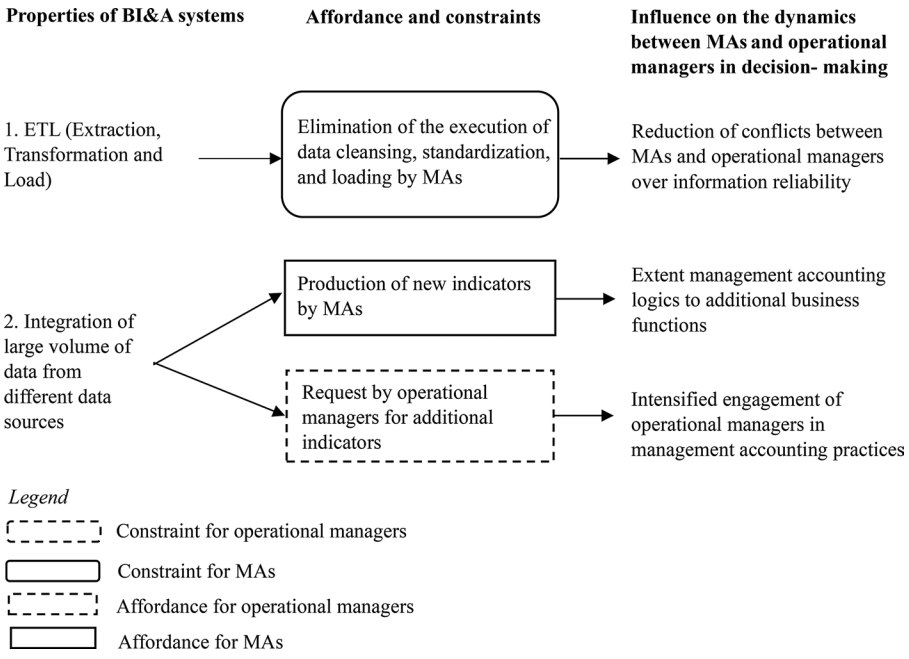

Fig. 2 Affordances and constraints for MAs and operational managers in information production through BI&A systems

managers traditionally relied on MAs to obtain information directly. However, the use of Excel spreadsheets made it challenging to customise reports for individual managers. Correspondingly, MAs often produced standardised reports that lacked the flexibility to address specific managerial needs. The use of BI&A systems, instead, plays a key role in structuring the transmission of information to operational managers since, in designing the BI&A, the system already is permitted to customise the information to be presented. Subsequently, MAs are enabled to select, filter and tailor the information available to each operational manager. Tailoring the information means customising the already-produced information according to the needs of the managers who will use it for decision making. The IT manager of Company B reported the following:

> The MA is the one setting the rules for how we create reports in the BI&A systems. […]. There are different roles within the company, and people need to access specific data useful to them. So, it is clear that the MA made a specific choice. I believe it was done to communicate more effectively with each function. (IT Manager – Company B)

Leveraging the possibility of customising information enables MAs to decide how to organise information according to what they think can be important for managers and what they want managers to focus on. The MAs, then, tailor the information to

specific operational managers and align it with what the MA perceives to be their actual needs. As highlighted by the MA of Company E:

> The technical aspect is managed by the IT manager, while the information content, especially concerning operational managers, is handled by MAs. MAs define both which information to present and how to present it. […]. We identified the need to understand how to present information based on the end user who will utilise it. Above all, it is essential to use data visualisation techniques that are suitable and aligned with the information being provided. (Management Accountant – Company E)

Next, in most companies under study, the MAs select, filter and structure the information to ensure its alignment with the needs of the whole company, acting as an architect or designer of all the information flow (Management Accountant – Company A). This view of the MA as a 'director of information' is also shared by the sustainability manager of Company D, who observed this:

> An individual operational manager might develop a KPI tailored to specific needs, yet this metric could potentially be misaligned with the organisation's overarching structure. […]. The MA acts as a director of information, guaranteeing uniformity and consistency in the information structure. While the democratisation of data facilitates broader access and availability of information across various levels, effective coordination remains essential; otherwise, there would be anarchy. (Sustainability Manager – Company D)

Likewise, the MA of Company C highlighted this:

> MAs played a key role in shaping the BI system, taking on a leading position. The MAs identified the necessary data, decided which information to integrate, how to present it and the order of priority. The selection of data was guided by the company's operational needs. For instance, the primary requirement at the outset was to have precise insights into what the company was selling, where it was selling it and similar critical metrics. (Management Accountant – Company C)

Accordingly, the interviews illustrated that through the coordination of the information flow across business functions, MAs orchestrate a coherent information structure, delineating the informational framework of each operational manager. This process shapes the extent of the decision-making autonomy of operational managers. Although the sustainability manager of Company D recognises MAs' pivotal role in coordinating information flows, he also offers a nuanced understanding of this phenomenon. In particular, in Company D, the process of selecting and filtering the information provided to each manager through BI&A involved the active participation of operational managers alongside MAs:

> I have been involved in defining the data required to produce reports. BI&A generates reports as output, but it is not self-referential. We could produce an infinite number of reports, but which ones truly add value? The goal is to generate reports that support managers in making well-informed decisions. For this reason, business process managers were involved to determine which reports were useful to provide support in decision making within their respective areas. (Sustainability Manager – Company D)

As the quote illustrates, in this case, the selection of the information to be transmitted was jointly defined by the operational manager and the MA, allowing consideration of their informational needs in terms of both data availability and presentation. This collaborative approach ensured that the information presented effectively met the operational managers' requirements.

During the transmission step, another key property of BI&A systems—the ability to present information through a wide range of visualisation techniques – comes into play. The IT manager of Company B clarified the following:

> Viewing raw data in Excel, such as "28 million" is one thing; interpreting a bar chart that shows increases or decreases compared to the previous year is another. This approach has significantly benefited those less skilled or experienced in data analysis. It has enabled the company – not just me – to communicate key insights better. For instance, the implications of rising or falling margins or fluctuating costs were not always clear from Excel spreadsheets alone. Visual representations have made these aspects much more intuitive and accessible. (IT Manager – Company B)

Hence, the data visualisation techniques provided by BI&A systems significantly enhance data comprehensibility for operational managers. By translating numeric data into visual formats – such as bar charts or trend lines within intuitive dashboards – BI&A properties make information immediately visible and understandable. This enables operational managers to readily understand information and reduce their reliance on MAs for support. The MA of Company A illustrates this point from his perspective:

> Another critical factor is determining how to convey this response to operational managers concisely, whether through data, graphs or visualisations. […]. You must be able to close your eyes and already envision the report. Otherwise, in these data cubes, you risk getting lost because you are managing millions and millions of data. (Management Accountant – Company A)

Moreover, the potential of BI&A systems to provide easy access to a broad range of data, indicators and reports allows operational managers to have more autonomous and rapid access to information that they can directly use in their decision-making processes. The MA of Company B claimed the following:

> Within our BI&A system, I have included all possible buttons for filtering what people want – categories, items, products, areas and so on. Before the BI&A, there was almost a sort of fear of sharing everything. Today, there is significant openness. Before, access was limited to me and another person. Today, everyone has access to information. (Management Accountant – Company B)

This view is shared by the HR manager of Company C, who explained:

> What has changed, however, is the autonomy with which I access specific data to make decisions. […]. For instance, in the new system, there is a highly specialised data analytics module. This choice was made precisely to enhance my independence and further strengthen my ability to autonomously manage specific data, particularly those highly specific to my function. (HR Manager – Company C)

Consequently, once MAs delineate the informational framework of operational managers, accessibility to information is ensured by the BI&A. The system readily provides these data directly to all users. This property of BI&A systems to provide direct data accessibility, on the one hand, enables operational managers to have greater autonomy in accessing information and, on the other hand, reduces the involvement of MAs in providing such information. This is perceived as a constraint for MAs, because the ease of operational managers' access to data through BI&A prevents MAs from being actively engaged through information requests and delivery. Hence, the MA of Company D had a disclaimer:

> Before the BI&A, in any case, to have the data, managers had to necessarily interface with us and ask for it. Now, information is available. So, if the analysis has been done and defined and the assumptions are clear to everyone, the number is that one presented by the BI&A. Thus, there is no longer a need to interface with the MA. (Management Accountant – Company D)

The functionalities of BI&A systems create affordances and constraints regarding both how the MAs define the information to be presented to operational managers and how the latter access and interpret that information. Accordingly, the findings reveal a nuanced dynamic between the '*democratisation of information*' and the guided structure of the information flow within organisations. While BI&A systems empower operational managers with autonomous access to information and an easier interpretation of the information, itself, this autonomy is underpinned by the pivotal orchestration role played by MAs during the design of the information framework. MAs do indeed define the informational framework, select relevant data and tailor their presentation to ensure coherence with the managerial information needs. Although operational managers enjoy greater independence in accessing and interpreting information, this independence is rooted in meticulously defined informational frameworks previously established by MAs (Fig. 3).

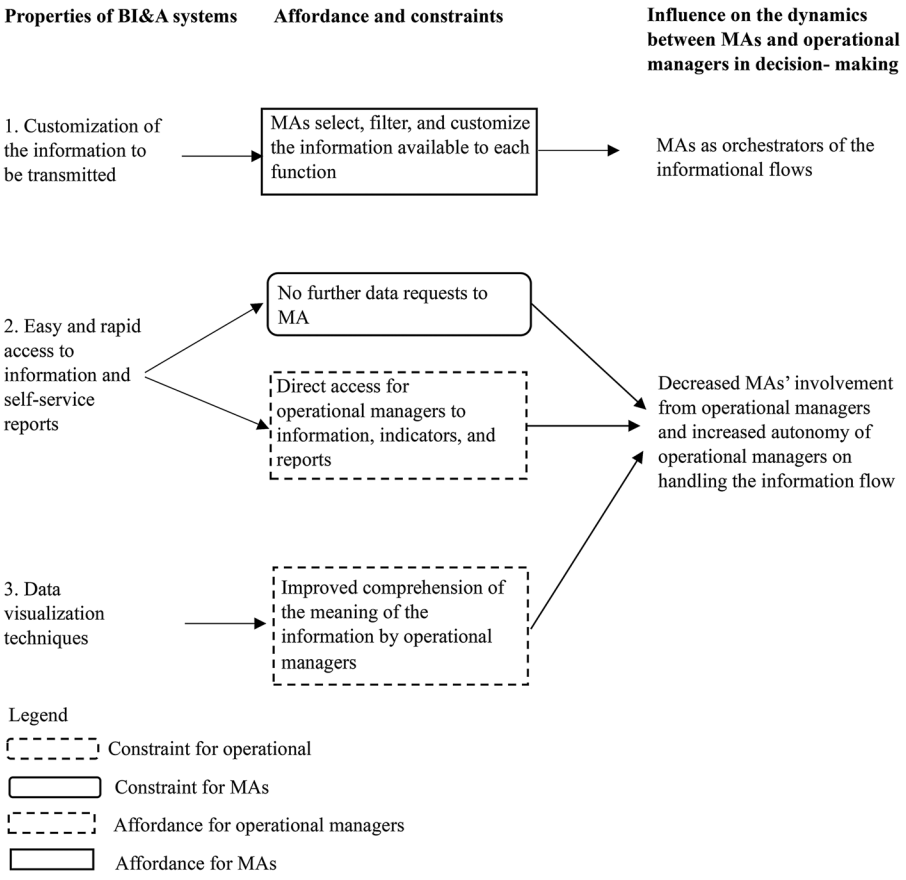

Fig. 3 Affordances and constraints for MAs and operational managers in information transmission through BI&A systems

4.3 Information reception

The reception of information refers to what occurs to information once it reaches managers, that is if and how the information transmitted is used for managerial decision making (Catasús & Gröjer, 2006; Catasús et al., 2007). Before implementing BI&A systems, operational managers were often used to involving MAs in interpreting the information to make decisions. Regarding BI&A systems, the interactive exploration and navigation of information (e.g. through drill-down functionalities) influences how operational managers use and incorporate information into decision-making processes. The analysis of the interviews permitted distinguishing how BI&A properties afford or constrain certain actions to both MAs and operational managers in two decision-making processes, that is 'intra-functional' and 'inter-functional'. The former concerns decisions confined to a single organisational function, tied to the activities and responsibilities of that area, which do not generate significant impacts

on other functions. The latter, instead, refers to decisions that involve multiple functions within the organisation, thus impacting aspects beyond a single function.

Regarding intra-functional decision-making processes, the interactive exploration and navigation of data from BI&A systems empowers operational managers to independently utilise the relevant information, enabling them to make informed decisions within their specific areas of responsibility. As a result, operational managers gain greater autonomy compared to the pre-BI&A era. Now, they can explore information more easily and integrate insights more effectively into decision-making processes specific to their own areas, with less reliance on MAs. The IT manager of Company B explained in this way:

> With simpler data navigation, managers can more readily interpret situations, such as identifying potential errors or areas needing attention – like a revenue decrease occurring at a specific time or in a particular pattern. At that point, the manager has greater ability in identifying potential solutions to address these issues. (IT Manager – Company B)

For example, the drill-down functionality of BI&A systems allows operational managers to move from aggregated information to more detailed and granular data. This capability enables them to explore data and gain a clearer understanding of the causes behind the information. By facilitating a deeper analysis, this BI&A property enhances operational managers' autonomy to make decisions. The sustainability manager of Company D explained the following:

> I use BI functionalities for analysis. For instance, when analysing price deltas, I started with aggregated data in the BI system. If the total delta shows a +3% change, I break it down by product categories and identify the main contributor, which might account for 80% of the change. I then drilled down further into specific suppliers or item codes to uncover the root cause. This approach allows me to identify the issue and propose corrective actions. (Sustainability Manager – Company D)

Similarly, the sales manager of Company A reported this:

> In the commercial domain, our decisions are always made based on the potential impact of a promotional activity targeting the customer, particularly in terms of product and customer margins. For us, BI&A plays a significant role in measuring customer profitability. Through the breakdown of the unit cost of each product, we can track the cost impact across all stages – from production to distribution – allowing us to understand the cost contribution at every phase'. (Sales Manager – Company A)

This increased independence and self-sufficiency of operational managers has, in turn, limited the role of MAs in supporting these decision-making processes. In other words, what emerges from most interviews is that when operational managers face decisions without cross-functional implications, they no longer engage MAs for sup-

port. Consequently, MAs appear less involved in intra-functional decision-making processes. Operational managers rely on their autonomous navigation of data for insights, limiting the possibility for MAs to provide support in these kinds of decision-making processes. The HR manager of Company E reported the following:

> Data extraction from BI&A has consistently enabled us to make decisions, as we can easily extract data and intervene with actions. […]. We consult less or almost never the MA, when we are within the human resources domain. (HR Manager – Company E)

The managers' view is confirmed by MAs, who observed their reduced role in supporting intra-functional decision-making processes. In this regard, the MA of Company B claimed this:

> There is an empowerment of the various functions within the organisation. So, having the possibility to access data in an autonomous way often leads to a situation that we, as MAs, appreciate – that they make decisions independently of us. (Management Accountant – Company B)

The disempowerment of MAs can be linked to MAs' orchestrator role in the transmission of information. Hence, MAs effectively grant managers increased autonomy in intra-functional decision-making processes and managers feel more independent in making decisions within their area. However, this independence is confined to informational frameworks created by MAs.

The increased autonomy of operational managers, enabled by the interactive, autonomous exploration and navigation of information, remains anchored to a scope of action without cross-organisational effects. Regarding inter-functional decision-making processes, MAs' support has become increasingly significant to operational managers. This is because the dynamic exploration of data has significantly expanded the informational landscape accessible to MAs. This gives MAs the possibility to navigate and analyse a comprehensive set of information integrated within the BI&A spanning various organisational functions. Enterprise-wide access to BI&A dashboards enhances MAs' decision-making support role, since it provides a holistic view of data that can aid inter-functional decision-making processes. As explained by the sustainability manager of Company D:

> For operational-level decisions, the involvement of the MA is generally no longer necessary. For example, in a procurement process, I operate within the operational scope without affecting upstream or downstream processes. When decisions could influence other areas, I recognise the need for MAs' involvement. (Sustainability Manager – Company D)

The organisational manager of Company C confirmed this perspective:

> All managers seek their support, not for merely producing information, but for analysis. […]. The MA, having full access to data and a comprehensive

> understanding of the organisation, can identify correlations between different information. This ensures that the data used for decision making is less likely to be misleading and more accurately aligned with the situation. (Organisation Manager – Company C)

Thus, in inter-functional decisions, where choices' effects influence multiple functional domains, MAs' support becomes particularly important. In this regard, the MA of Company A stated this:

> In the context of performance analysis, it can be observed that they (the managers) have largely achieved a balance, as they gain autonomy in that context. However, greater guidance becomes essential when the level of complexity increases – particularly as the analysis extends beyond the commercial domain, or, in any case, into other functions. (Management Accountant – Company A)

Therefore, the MAs support managers' decision making '*when a cross-functional perspective is needed*' (Sustainability Manager – Company D). MAs' unrestricted access to BI&A dashboards enables them to advise operational managers on relevant information and its interpretation, facilitating decision-making processes. Thanks to their comprehensive understanding of business processes, MAs can identify links between organisational decisions, as they '*are aware of the impacts their decisions may have on other processes'* (Management Accountant – Company E). For inter-functional decision-making processes, operational managers, themselves, recognise the pivotal role of MAs in supporting their decisions and soliciting their involvement. The sustainability manager of Company D explained this aspect:

> [There is] an awareness of when I need to check it with the MA, when I need the MA's support because I know it could impact, for example, on cost calculation which in turn impacts on profitability. MAs will see profitability on their dashboard, while I don't have access to this information on my dashboard. […]. Because it's the MA who, being at a higher level, definitely has the possibility to have a better perspective than mine. (Sustainability Manager – Company D)

The sales manager of Company A confirmed this perspective:

> We use BI to measure customer profitability and to make decisions regarding the commercial domain. […]. However, when planning a promotional campaign for a specific product during a specific period, in a specific area, I involve the MA to assess the potential impact on the income statement and gain insights into margins. (Sales Manager – Company A)

The IT manager of Company B reinforces the pivotal role of MAs in supporting inter-functional decision-making processes by comparing his role with MAs, considering that both have full access to the company's BI&A system. In particular, he explained that the support that MAs can provide depends not only on their full access to infor-

mation but also, more importantly, on their deep knowledge of business and internal processes as well as their skills in interpreting the entire information flow:

> I can see all the data the MA sees, but he has a comprehensive view of the company that I don't have. […]. While I may be able to see the specific data I need, I don't have the same 360-degree perspective of the company that he does. (IT Manager – Company B)

In summary, the technical properties of BI&A systems affect the way MAs support the operational decision-making processes, creating affordances and constraints for both MAs and operational managers related to what happens to information once it reaches managers. The interactive data exploration of BI&A (e.g. drill-down features) enhances operational managers' autonomy, especially for intra-functional decisions, by allowing them to analyse data independently. However, for inter-functional decisions where the implications of a decision could affect multiple functions or the company, managers require MAs' involvement. In this scenario, MAs provide fruitful insights and guidance to decision-making processes thanks to the BI&A-enabled integrated data landscape. This reinforces their overarching comprehension of business processes (Fig. 4).

5 Discussion and conclusion

This study examined whether and how the use of BI&A systems influences how MAs support the decision-making processes of operational managers within organisations. Drawing on the concepts of properties, affordances and constraints of technological artefacts (Leonardi, 2011; Leonardi & Barley, 2008; Orlikowski, 2000), the paper illustrated how MAs and operational managers effectively and purposefully leveraged BI&A properties to pursue their goals and how this reshaped the dynamics between MAs' and operational managers' local decision-making processes. Specifically, the inherent features of BI&A systems afford and/or constrain the fulfilment of activities during the flow of information (Catasús & Gröjer, 2006; Catasús et al., 2007) to MAs and operational managers. The degree of involvement of MAs in decision-making processes depends on how these actors leverage BI&A properties to perform their tasks and, ultimately, to play their roles within organisations.

Regarding the production of information, previous studies note that BI&A properties can diminish the role of MAs at this step of the information flow (a) (e.g. Gärtner & Hiebl, 2018; Rikhardsson & Yigitbasioglu, 2018; Ippolito et al., 2024). Our paper confirms and extends this perspective by depicting that the BI&A capabilities for data cleansing, standardisation and loading tasks reduce MAs' room for action, as they previously manually performed these activities. Despite MAs' lower involvement, BI&A properties significantly enhanced the accuracy of the information and, consequently, reduced conflicts between MAs and operational managers over its reliability. However, at this step, the BI&A inherent capability of integrating a large volume of data from different sources fostered more intensive engagement between MAs and operational managers in management accounting practices. This result aligns with

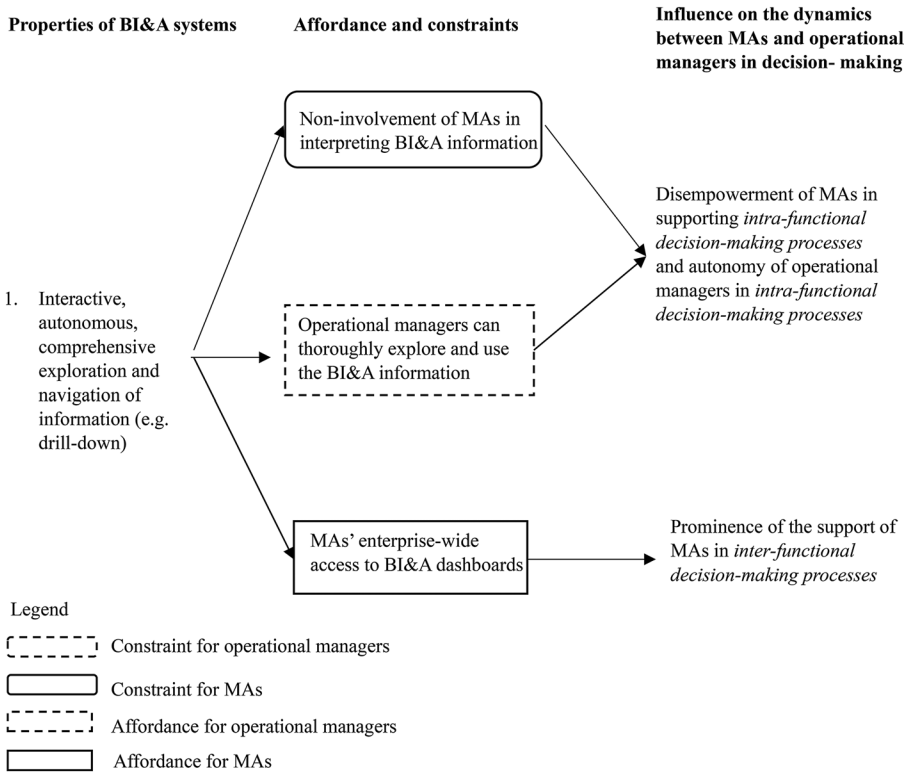

Fig. 4 Affordances and constraints for MAs and operational managers in information reception through BI&A systems

the extant literature, which illustrates how BI&A properties can enable closer interactions between MAs and operational managers, promoting the diffusion of management accounting logics throughout the organisation (b) (e.g. Cobb et al., 1995; Kasurinen, 2002). Notably, our findings show that this BI&A property afforded MAs the generation of new indicators and helped operational managers actively request additional measures relevant to their functional domains, broadening management accounting logics across organisations.

Findings also reveal that the properties of BI&A systems influence how MAs transmit information to operational managers and how the latter access this information, highlighting a complex interplay between what one manager described during interviews as the 'democratisation of information'. This permits everyone within organisations to have information. In addition, the structured management of the information flow is needed to avoid misinterpretation and the incorrect use of information. Borrowing on studies indicating that BI&A properties can decrease the involvement of MAs in providing information (d) (e.g. Becker & Heinzelmann, 2017; Arnaboldi et al., 2021), this study indicates that the use of data visualisation techniques and the ability to customise reports granted operational managers greater autonomy in accessing and interpreting information. Interestingly, our study enriches

the view of MAs' less involvement, illustrating that managers' autonomy remains intrinsically linked to the role played by MAs. Significantly, in most companies, MAs establish the available information framework for each operational manager, selecting only the relevant information and structuring its presentation to ensure coherence with the specific needs to be met. Consequently, operational managers' independence in handling information remains limited by the informational boundaries set by MAs. More precisely, the way MAs afford the possibility of easily customising the information to transmit gives them the possibility of playing the role of 'orchestrators' of different information flows within organisations. This finding resonates with studies that highlight that BI&A properties can enable MAs to act as orchestrators of the informational flow in the backstage (c) (e.g. Goretzki et al., 2018; Goretzki & Messner, 2019; Ippolito et al., 2024). The orchestration of information flows is critical for information systems where information becomes available to everyone and there is a need to balance the democratisation of information and the anarchy of its use.

Regarding what happens once the information is received by operational managers, previous studies state that BI&A properties can limit or enhance operational managers' autonomy in decision-making processes (e) (e.g. Arnaboldi et al., 2021; Ippolito et al., 2024; Labro et al., 2023). Our findings extend this view, depicting that BI&A properties afford or constrain certain actions to both MAs and operational managers, highlighting differences between two decision-making processes, intra-functional and inter-functional. In the former decision-making processes, decisions belong to a single organisational function and do not generate significant impacts on other functions or on the organisation as a whole. The data navigation and drill-down properties of BI&A systems lead to the greater independence of operational managers, who can autonomously explore and use information to make decisions. Such independence corroborates papers observing that BI&A properties can enable operational managers to interpret information independently, diminishing the need to seek support from MAs (g) (Arnaboldi et al., 2021; Arkhipova et al., 2024; Dunne et al., 2013). Building on this, our analysis indicates the disempowerment of MAs in supporting these decision-making processes. Yet, this disempowerment is only apparent, as managers' autonomy in intra-functional decision making depends on the informational boundaries previously defined by MAs during the transmission phase. Although managers perceive MAs as less important for this type of decision, MAs benefit from their earlier orchestration work. It frees them to focus on more complex, higher-value decision-making processes. Indeed, for inter-functional decisions, where the results of such decisions have cross-functional implications, operational managers actively seek MAs' involvement. This observation corresponds with studies indicating that BI&A properties allow MAs to exhibit their ability to interpret information during front-stage interactions with operational managers (f) (e.g. Goretzki & Messner, 2019; Järvenpää et al., 2023; Mack & Goretzki, 2017). This occurs because MAs' enterprise-wide access to BI&A data and their expertise in the business allow them to understand the company-wide implications of decisions in advance.

This paper contributes to the extant literature on MAs' 'local responsibility' (Byrne & Pierce, 2018; Maas & Matějka, 2009; Pierce & O'Dea, 2003). This work offers a complementary view of how MAs can fulfil this responsibility when a technological artefact, BI&A systems, with its inherent properties, mediate and reshape the dyadic

relationship between MAs and operational managers by affording and constraining certain actions for both professional groups. In particular, the paper finds that when providing managers with information on BI&A systems, MAs recognise themselves as 'orchestrators of the information flows' (Ippolito et al., 2024). This study adds depth to the understanding of the orchestrator's role by illustrating how it works in practice and what enables it. More specifically, by leveraging the properties of BI&A systems, particularly the ability to tailor information to operational managers, MAs not only identify informational needs or prioritise content (Ippolito et al., 2024) but also define the informational perimeter they consider relevant to each manager's responsibilities within which those managers can make decisions. The definition of such a perimeter by MAs is enabled by their unrestricted access to company information and, more importantly, by their technical skills and knowledge of the business. These enable them to establish a comprehensive and coherent information framework within BI&A systems and configure a customised pool of information for each operational manager. In this regard, the paper also adds to studies focusing on tactics that MAs can employ to support managers' decision making (Mack & Goretzki, 2017; Goretzki et al., 2018), demonstrating that BI&A properties enable MAs to leverage their 'panoramic knowledge' of the business (Mack & Goretzki, 2017). By structuring and tailoring managers' informational boundaries, MAs align information with local needs while preserving consistency across the organisation (Granlund & Lukka, 1998).

The role of the orchestrator of information that MAs attribute to themselves is acknowledged by operational managers only when the latter acknowledge the need to involve MAs in inter-functional decision-making processes. On the contrary, for their intra-functional decisions, operational managers gain greater autonomy from MAs. The role of orchestrator remains 'hidden' behind the BI&A system. Therefore, this study shows that the necessity of involving MAs in decision-making processes depends on the nature of the decisions that operational managers must handle. Notably, in BI&A systems, the recognition of MAs as business partners (Järvenpää, 2007) or managers' scepticism to involve MAs in decision-making processes (Mouritsen, 1996; Pierce & O'Dea, 2003; Lambert & Sponem, 2012) hinges on the degree of autonomy that managers have in accessing, navigating and interpreting information, as well as on their perception of their decisions' implications. Our paper presents a nuanced perspective, showcasing that operational managers clearly recognise the types of decisions where MAs' involvement is essential. Following this reasoning, MAs can act as hidden business partners in inter-functional decision-making processes, playing a crucial role behind the scenes when defining the informational boundaries of operational managers, enabling them to leverage high-value, relevant information. This activity occurs within management accounting departments, where MAs engage in backstage interactions (Goretzki & Messner, 2019) with other accounting professionals, without any direct involvement with operational managers. Conversely, their contribution as revealed business partners becomes evident in specific decision-making scenarios, particularly those with cross-functional implications, where operational managers explicitly seek MAs' support. These situations represent a specific set of front-stage interactions (Goretzki & Messner, 2019), in which the opportunity for MAs to act as business partners is explicitly enabled by

operational managers who recognise MAs' ability to support inter-functional decision-making processes.

This study also adds to the recent literature examining the influence of BI&A systems on the dynamics between MAs and operational managers (e.g. Arnaboldi et al., 2021; Becker & Heinzelmann, 2017; 2018; Fehrenbacher et al., 2022). Accordingly, interactions between MAs and operational managers are likely to intensify only when decisions have cross-functional implications. In this context, MAs adopt a consultative role in supporting managers in the use of the outputs of BI&A systems, leveraging their 'feel for the numbers' and their business acumen (Elbashir et al., 2011; Al-Htaybat & von Alberti-Alhtaybat, 2017; Becker & Heinzelmann, 2017). For other types of decisions, collaboration between the two professional groups is limited because, once MAs have structured and tailored information (Mudau et al., 2024), operational managers can act autonomously. However, unlike previous studies that report an increased autonomy of operational managers that results in the 'marginalisation' of MAs in supporting decision-making processes (Becker & Heinzelmann, 2017; Arnaboldi et al., 2021), this paper illustrates that the disempowerment of MAs is, to some extent, 'illusory' since operational managers' autonomy for intra-functional decisions is shaped by the MA's preceding role in tailoring the informational perimeter of each operational manager. This finding adds to Labro et al. (2023). They state that predictive analytics centralises control over information flows. That is, predictive analytics constrains operational managers' decision-making autonomy by illustrating that MAs leverage this property of the system to enforce their control over information by defining and structuring the entire information flow that underpins decision-making processes and by devoting time to high-value, complex and cross-functional decisions. In doing so, our study suggests that, while acting as 'hidden business partners', MAs centralise information at a corporate level.

However, our paper intentionally focused on the dyadic relationship between MAs and operational managers. Correspondingly, further research might investigate whether and how BI&A systems might enforce MAs' 'functional responsibility' (Maas & Matějka, 2009) and eventually how the systems can increase 'role conflicts' arising from supporting both operational and top management decision-making processes (Goretzki et al., 2018; Indjejikian & Matějka, 2006; Mack & Goretzki, 2017). Accordingly, investigating the key challenges MAs encounter in playing their 'orchestrator's role' would be another valuable avenue for research. Additionally, this study offers a snapshot of the dynamics between MAs and operational managers following the adoption of BI&A systems without delving into how these dynamics may change as experience with systems accumulates. Future research could address this limitation by conducting longitudinal, single, in-depth case studies to explore how increasing familiarity with BI&A systems might foster more effective collaboration between MAs and operational managers or, conversely, lead to the emergence of new tensions and frictions over time. Although the paper strictly focuses on the use of BI&A systems, this study has the merit of introducing the concepts of properties, affordances and constraints of technological artefacts within the intricate relationships between MAs and operational managers. These concepts can serve as a foundation for future research exploring the implications of other technologies.

Appendix

Table 1 Overview of the case companies

Company	Dimensions	Business sector	Introduction of BI&A systems	Purposes for the introduction of BI&A systems
Company A	Large	Dairy	2001	To homogenize data and improve data accuracy
Company B	Large	Musical instruments	2013	To improve timeliness of data and improve data accuracy
Company C	Large	Furniture	2007/2008	To homogenize data and make data reliable
Company D	Large	Lighting engineering	2012	To create a new integrated reporting system
Company E	Large	Wood and glass paints	2006/2007	To integrate information and develop shared knowledge

Table 2 Details of interviews

Company	Interviewees	Date	Duration
Company A	Management accountant	16/07/2022	1 h 34 min
		09/02/2024	57 min
		24/10/2024	1 h 3 min
	Sales manager	09/02/2024	30 min
		24/10/2024	26 min
Company B	Management accountant	02/07/2022	37 min
		08/01/2024	55 min
		17/10/2024	43 min
	IT manager	25/01/2024	54 min
		17/10/2024	35 min
Company C	Management accountant	25/07/2022	40 min
		15/12/2023	1 h 01 min
		08/11/2024	25 min
	HR manager	15/12/2023	26 min
		11/11/2024	21 min
	Organization manager	15/12/2023	25 min
		08/11/2024	20 min
Company D	Management accountant	27/07/2022	33 min
		14/12/2023	1 h 04 min
	Sustainability manager	19/12/2023	44 min
		24/10/2024	24 min
Company E	Management accountant	26/07/2022	53 min
		17/01/2024	55 min
		07/11/2024	35 min
	Chief Financial Officer	17/01/2024	30 min
		07/11/2024	25 min
	HR manager	17/01/2024	30 min
		07/11/2024	22 min
Number of interviews		**28**	

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Data availability The data that support the findings of this study were obtained through interviews with participants and through document analysis of the participant organizations. Thus, they are not publicly available, but they are available from the authors upon reasonable request and with the permission of the participating organizations.

Declarations

Competing interests The authors declare that they have no competing interests that are directly or indirectly related to the work submitted for publication.

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