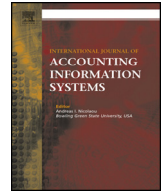


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## Elusive boundaries, power relations, and knowledge production: A systematic review of the literature on digitalization in accounting

Dan-Richard Knudsen

NHH Norwegian School of Economics, Department of Accounting, Auditing and Law, Helleveien 30, 5045 Bergen, Norway

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### ABSTRACT

A third wave of technological advancements, which is often referred to as “digitalization,” is affecting organizations across the board. This paper aims to present a comprehensive synthesis of the extant scholarly work on digitalization in the accounting literature. It does so through a systematic literature review that focuses on articles on digitalization published by the highest-ranked accounting journals in the period 2007–2017. By conducting a thorough review, we extend Rom and Rohde’s (2007) literature review on integrated information systems (IIS) in management accounting. Furthermore, we utilize a modified version of the framework proposed by Rom and Rohde (2007) to classify and interpret the literature. This allows us to understand the differences between IIS and digitalization in accounting, and to illuminate avenues for future research. The paper concludes with an overview of three main differences in how IIS and digitalization have influenced accounting, and three concurrent avenues for future research on digitalization in accounting: the elusive boundaries of accounting, power relations, and knowledge production for decision making.

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### 1. Introduction

The objective of this paper is to synthesize and critically review the extant literature on digitalization in accounting. In doing so, it aims to flesh out how digitalization affects accounting in new ways and, thereby, suggest avenues for future research.

Digitalization, the third phase of technological advancement, is currently creating an upheaval in organizational reality (Horlach et al., 2016; Porter and Heppelmann, 2014), especially in the accounting and finance functions (Bhimani and Willcocks, 2014). There has been an enduring interest in the relationship between technology and accounting in the accounting literature (Granlund and Mouritsen, 2003). Even though an extensive stream of literature examines technology’s impact on accounting (see, e.g., Rom and Rohde, 2007, for an overview), commentators have argued that the extant research focuses on outdated technologies or is too narrow from an accounting perspective (e.g., Granlund, 2011). Critics argue that more research on technology’s impact on accounting is needed, as technology is a dynamic organism (Prasad and Green, 2015). Consequently, its impact on accounting is also dynamic. Other researchers have specifically asked for more studies on the relationship between digitalization and accounting (Arnaboldi et al., 2017b; Payne, 2014). These calls are important because digitalization is expected to affect organizations in new ways—it enables the acquisition, collation, and use of new types of information (Arnaboldi et al., 2017a), it can lead to the reconfiguration of power relations (Scott and Orlikowski, 2012) and the introduction of novel decision-making practices (Quattrone, 2016).

In order to unravel how digitalization changes accounting and to identify key avenues for future research, we present a systematic literature review. The review includes material published in renowned and established accounting journals from 2007 to 2017. To analyze the material, the paper utilizes a modified version of an analytical framework proposed by Rom and Rohde

E-mail address: [dan-richard.knudsen@nhh.no](mailto:dan-richard.knudsen@nhh.no).

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(2007), who conducted a systematic review of the literature on integrated information systems (IIS) in management accounting. By comparing and contrasting the literature on digitalization with the literature on IIS, we are able to demonstrate that digitalization does not necessarily represent a sudden paradigm shift. Instead, it is a third wave of (interconnected) technologies that have profound social and technical implications for accounting and accountants. Furthermore, this paper contributes to the literature on digitalization in accounting by clarifying the pervasive concept of digitalization. In addition, the paper sheds light on three possible areas for future research: the elusive boundaries of accounting, changing power relations within and outside organizations, and the complex production of knowledge for decision making.

Historically, the work of accountants has evolved in line with IT developments (Granlund and Mouritsen, 2003). Granlund and Mouritsen (2003, p. 78) even argue that “from its early days, accounting information and technology were related”. The literature speaks of two technological phases that had deep consequences for organizations.

The first phase of technological advancements that significantly altered how organizations and accountants operated was the emergence of computerized information systems (Granlund and Mouritsen, 2003; Porter and Heppelmann, 2014). These systems, which were introduced throughout the 1960s and 1970s, enabled accountants to record data in a more detailed manner and to produce more accurate analyses. The second phase was mainly characterized by the advancement of the World Wide Web and IIS (Porter and Heppelmann, 2014). In this context, IIS are systems that support management accounting (Rom and Rohde, 2007). In the late 1990s and early 2000s, IIS in general and enterprise resource planning (ERP) systems in particular were some of the in-vogue topics in IT. In fact, Davenport (1998, p. 122) claims that, despite the wide-ranging media attention paid to the internet, “the business world’s embrace of enterprise systems may in fact be the most important development in the corporate use of information technology in the 1990s.” Rom and Rohde (2007, p. 43) maintain that “ERP systems are examples of transaction-oriented information systems.” Such systems allowed accountants to provide and acquire information across the organization in a different and much more efficient manner.

A third phase of technological advancement is currently evolving. The joint emergence of a number of technologies has profound impact on how organizations operate, including the work of accountants. This third phase is commonly referred to as “digitalization” (Karimi and Walter, 2015; Parviainen et al., 2017). Although digitalization entails significant alterations in accounting practices, both IIS and digitalization can be understood as IT, because IT is generally conceptualized as “bundles of material and cultural properties packaged in some socially recognizable form such as hardware and/or software” (Orlikowski and Iacono, 2001, p. 121). From a technological point of view, one can argue that digitalization emerged from several previous technological advancements, including IIS. At the same time, IIS is viewed as a somewhat narrow example of IT (i.e., software), while digitalization represents IT in a broader sense (i.e., a number of technological artefacts bundled with socio-technical properties). Hence, distinctions between the two can be made from a technological point of view. More importantly, there are reasons to make the distinction from an accounting perspective. Digital technologies transform and expand the types and sources of data used by accountants. They also alter important accounting processes (Arnaboldi et al., 2017b). In that light, we suggest that the IIS-digitalization distinction is appropriate.

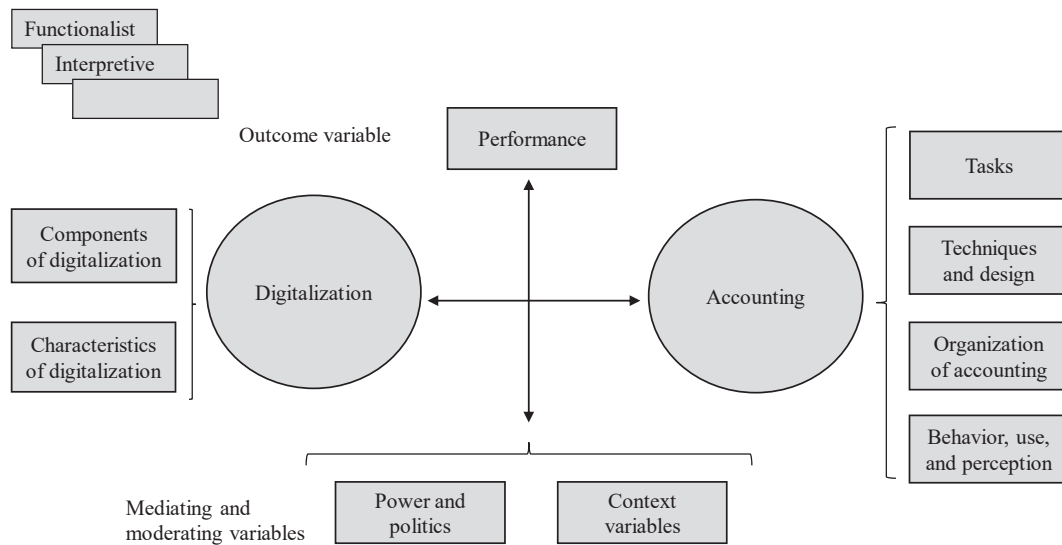
A uniform understanding of the term *digitalization* is lacking. It is often used interchangeably with other related terms, such as *digitization* or *digital transformation*. Moreover, the term is typically used under the assumption that the reader intuitively understands it. However, there are some fruitful distinctions to be made between digitalization and other related terms that help establish the boundaries of digitalization.

Digitalization is not to be confused with *digitization*. The latter refers to the technical process of encoding analog information into a digital format, which makes the digitized content programmable, addressable, traceable, and communicable (Hylving and Schultze, 2013; Yoo et al., 2010). As such, digitization is a less comprehensive change than digitalization. On the other hand, *digital transformation* entails major organizational changes driven by digital technologies and, consequently, profound alterations in strategy and the conduct of business (Bharadwaj et al., 2013; Fitzgerald and Kruschwitz, 2013). *Digitalization* lies somewhere between digitization and digital transformation. It involves more than a mere technical process (e.g., digitization), but it does not necessarily entail a reconfiguration of strategy or profound changes in the conduct of business (e.g., digital transformation). However, digitalization is associated with important changes related to socio-technical structures (Yoo et al., 2010). Those structures are reconfigured through the questioning of the underlying assumptions for the design and use of digital technologies (Thorseng and Grisot, 2017).

This paper reviews the extant research on digitalization in accounting by conducting a systematic literature review. Based on the findings from the literature review, the paper seeks to answer the following research questions:

How is digitalization influencing accounting practice and how do those effects compare to the effects of IIS on accounting practice? What are the most important avenues for future research on digitalization in accounting?

The literature review suggests that digitalization represents a third technological phase with deep organizational consequences. The findings show that digitalization influences accounting practice in a number of new ways, three of which we view as particularly significant. First, digitalization makes the boundaries of accounting increasingly elusive. Second, digitalization is driving new forms of power relations. Third, digitalization raises new issues related to the production of knowledge for decision making. These three observations highlight key questions for future research: How does digitalization affect the boundaries of accountants’ work and the accounting profession itself? How will digitalization affect the relative power of various organizational actors in organizations and who will determine how digitalization is adopted and implemented? How does digitalization affect the production of knowledge relevant for decision making?



**Fig. 1.** Modified framework for research on accounting, where the two main constituents have been replaced: digitalization has replaced IIS and accounting has replaced management accounting. Original source: Rom and Rohde (2007).

The remainder of the paper is organized as follows. The theoretical framework for synthesizing research within the field is described in Section 2. The method used for the literature review is presented in Section 3. In Section 4, we present the literature review, which centers on concepts and their relationships to accounting by identifying: (i) the theoretical logic, (ii) the research findings, and (iii) the applied research methods and paradigms. In Section 5, we draw our conclusions and suggest directions for future research.

## 2. Analytical framework

When conducting a systematic literature review, the analysis should to be structured in accordance with an analytical framework. The use of a framework reduces the risk of summarizing the literature in a tedious and nebulous manner (Massaro et al., 2016). Silverman (2013) suggests developing focused and critical reviews in order to alleviate such risks. Similarly, Massaro et al. (2016) argue that researchers should develop frameworks derived from previous reviews in related fields. By building a review on existing frameworks, researchers are better able to demonstrate how and why the emerging literature differs from the extant literature, which is the aim of this paper. Furthermore, Eisenhardt (1989) suggests that contrasting extant and emergent literature is essential in theory building. As such, conducting well-crafted literature reviews that contrast extant and emerging literature is an imperative task for researchers aiming to advance knowledge within a field.

In order to structure and analyze the emerging literature on digitalization in accounting, we modified a framework from the literature on information systems in management accounting, namely the framework developed by Rom and Rohde (2007). Their framework is a generic but detailed framework that helps scholars map and analyze research on information systems in accounting. We chose to utilize a modified version of Rom and Rohde's (2007) framework, as this framework offers an adequate description of the components of (management) accounting based on Booth et al. (2000).

We argue that digitalization will not change the components of accounting (the components in the framework; see Fig. 1) but rather its inner workings (the dynamics within the framework's general components). For example, robotic process automation (RPA) will not remove tasks altogether, but it will clearly change the tasks that need to be handled by human actors. In other words, accountants will still play a role in organizations, but digitalization seems likely to substantially challenge that role. Thus, we propose that Rom and Rohde's (2007) framework is adequate for analyzing digitalization. Digitalization appears likely to not only bring about important changes in accounting but also push the boundaries of how accounting will be conducted and by whom. Furthermore, Rom and Rohde's (2007) framework appears relevant for painting a picture of how dominant technologies have shaped accounting over the past two decades.<sup>1</sup> Thus, their review serves as an appropriate foundation for critically assessing how digitalization is influencing accounting. As such, we are able to create a continuous picture of the impact of prevalent technologies on accounting in recent years.

<sup>1</sup> We considered Mauldin and Ruchala's (1999) framework for accounting information systems (AIS) research as an alternative, but we deemed it too task oriented.

### 2.1. Description of Rom and Rhode's framework

Rom and Rohde's (2007) framework serves as a mapping tool for research within IIS and management accounting. This framework allows for the identification of research gaps within management accounting.

The main constituents of the framework are the following. First, the two core elements in the framework—management accounting and IIS—are introduced. Second, IIS is decomposed into components and characteristics. The most relevant example of an IIS component is the ERP system. In terms of characteristics, Rom and Rohde (2007) highlight integration. Third, the authors divide management accounting into four subparts: tasks (Booth et al., 2000); techniques and design (Granlund and Malmi, 2002); organization of management accounting (Quattrone and Hopper, 2005); and behavior, use, and perceptions (Dechow and Mouritsen, 2005). Fourth, the authors explain the relationship between management accounting and IIS. They ascertain that the two elements stand in a bidirectional relationship: IIS might affect or enable management accounting (Granlund and Malmi, 2002), while management accounting might have an influence on IIS (although this influence works at a slower pace). Hence, they draw a bidirectional arrow between the two core elements of the framework. Fifth, the authors introduce both mediating and moderating variables in the relationship between management accounting and IIS. In this regard, they point to context variables as well as power and politics as possible examples. Sixth, they include performance as an outcome variable. Although not directly a part of the relationship between management accounting and IIS, a “relatively large stream of research investigates the performance effects of investments in IT, especially in the literature on information systems and accounting information systems” (Rom and Rohde, 2007, p. 44). The authors view the relationship between performance and management accounting as bidirectional, as “management accounting can in some studies be considered as the driver of performance and in other studies as a part of the performance measure as a leading indicator” (Rom and Rohde, 2007, p. 44). Seventh, the framework is understood as independent of any one research paradigm, such that constructs and interrelationships can be researched using a functionalist, interpretative, or critical research paradigm (Rom and Rohde, 2007).

We developed a modified version of Rom and Rohde's (2007) framework by changing the two core elements. First, our modified framework examines digitalization instead of IIS. Second, we extend the domain from *management accounting to accounting*, as digitalization is a novel concept only recently embraced by accounting scholars. Hence, in order to present a fruitful overview of the extant literature, it was relevant to broaden the scope. In addition, digitalization brings changes to information acquisition and provision both internally (management accounting) and externally (financial accounting).

The modified framework, which is shown in Fig. 1 below, serves as a tool for examining the relationship between digitalization and accounting.

## 3. Research methodology

Knowledge of prior relevant literature is an essential feature in all academic work, as it forms the foundation for new knowledge creation (Webster and Watson, 2002). Massaro et al. (2016) cite Light and Pillemer (1984, p. 169), who argue that “the need for a new study is not as great as the need for the assimilation of already existing studies.” Literature reviews offer an effective way to synthesize the extant literature and to uncover the accumulated insights of a number of scholars within a field.

In order to derive a comprehensive picture of the extant literature on digitalization in accounting, we conducted a systematic literature review. Systematic literature reviews require rigorous and precise examination of the search results (Kitchenham, 2004; Okoli and Schabram, 2010). Massaro et al. (2016) distinguish between “systematic” and “structured” literature reviews, but situate both at the rigorous end of a continuum ranging from “no rules” to “rigid rules.” Rigid literature reviews do not have a rich history in accounting studies, although notable exceptions can be found (e.g., Guthrie et al., 2012; Hoque, 2014). Nevertheless, their application in accounting is appropriate, as both quantitative and qualitative studies are commonly accepted (see Appendix 4) and as systematic literature reviews represent an appropriate way of synthesizing studies' results (Britten et al., 2002; Massaro et al., 2016).

### 3.1. Planning the literature review

The review process began with two meetings during which we discussed our research goals with scholars from the management accounting field and the information systems field. After clearly defining the goals of our research, we formulated our research questions. In order to answer the research questions, we found a systematic literature review to be the most appropriate methodological approach. Systematic literature reviews are suitable when the goal is to derive an overview of an emerging issue or concept (Webster and Watson, 2002), such as digitalization. In addition, a systematic literature review appears relevant when the researcher aims to shed light on future research opportunities (Massaro et al., 2016), which is in accordance with the aim of this paper. Thereafter, we developed a review protocol that included the research strategy as well as inclusion and exclusion criteria.

### 3.2. Inclusion and exclusion criteria

In order to identify the targeted articles, we established four inclusion and exclusion criteria. First, using the Scopus online database, we limited the search for relevant literature to published articles, and excluded proceedings and other unpublished material. Second, only articles written in English were considered. Third, to ensure academic rigor and quality, we exclusively reviewed



articles published in the highest-ranked accounting journals. More specifically, we limited the search to articles published in the 27 journals<sup>2</sup> ranked 3 or 4 in the Association of Business Schools (ABS) list. We made one exception to this rule—we included the *International Journal of Accounting Information Systems*, as this journal was likely to have published material pertinent to this review (see [Appendix 1](#) for a publication overview by journal). Fourth, our search was limited to research published between January 1, 2007 and December 31, 2017 (see [Appendix 2](#) for an overview of the number of publications per year). This allowed us to build on [Rom and Rohde's \(2007\)](#) literature review on IIS in management accounting in terms of crystallizing how digitalization's impact on accounting differs from the impact of earlier technologies discussed in the accounting literature. Much of the research on IT's impact on (management) accounting in the 2000s revolved around IIS in general and ERP systems in particular ([Sangster et al., 2009](#)). Today, the center of attention is shifting towards digitalization and the effects of its related features (see, e.g., [Appelbaum et al., 2017](#); [Arnaboldi et al., 2017b](#); [Bhimani and Willcocks, 2014](#); [Quattrone, 2016](#)).

### 3.3. The search process

The search process was organized in keeping with the recommendations of [Webster and Watson \(2002\)](#) and [Kitchenham \(2004\)](#). The literature search included the following steps:

- 1 Keyword search using the Scopus online database,
- 2 Review of relevant articles (see [Appendix 4](#))
- 3 Review of references to publications identified in steps 1 and 2, and
- 4 Identification of publications citing the key publications.

The search process was initiated with a keyword search of the Scopus<sup>3</sup> online database aimed at detecting relevant articles on the subject of digitalization in accounting. We set out by searching for articles using “digitalization”<sup>4</sup> in the title, abstract, or keywords. As expected, few articles employed the exact term “digitalization.” Most researchers focus on a specific feature of digitalization without employing the term “digitalization.”

Consequently, we broadened the keyword search to identify other relevant articles. In this process, we included keywords closely related to digitalization: “digital,” “big data,” “analytics,” “cloud,” “cyber,” “mobile,” “social media,” “robotization,” “automation,” “artificial intelligence,” “blockchain,” “platforms,” and “internet of things.” These keywords were included because they appear as part of an academic definition of digitalization (see [Nwankpa and Roumani, 2016](#)), in influential articles on the topic (e.g., [Bharadwaj et al., 2013](#)), in acknowledged books (e.g., [Westerman et al., 2014](#)), or in the business media's discourse on the topic. We found it appropriate to include features of digitalization appearing outside the academic discourse, as business practice tends to be ahead of academia in discussions of new technologies and emerging fashions ([Abrahamson, 1996](#)). By employing a broad search scope, we reduced the likelihood of overlooking relevant articles.

This broad search scope (see [Appendix 3](#) for the full query string from Scopus) resulted in a set of 103 articles. The second step in the process was to review this set of articles to determine which articles were pertinent for further examination. We found that about 20% of the 103 articles had been included in the search results due to the occurrence of the word “platform” in the abstract even though the articles were not related to digitalization. Moreover, another 20% of the articles subscribed to the auditing literature, which is beyond the scope of this review.<sup>5</sup> Another set of articles was deemed irrelevant due to a lack of emphasis on novel digital technologies or digitalization as a concept. After excluding this last group of articles, we were left with 33 relevant articles.

The third step in the process was to review the reference lists in these 33 articles in order to identify other relevant literature not captured in steps 1 and 2. This step did not provide us with any additional material and neither did step four, which confirmed the comprehensive catchment area of the chosen database.

Of the 33 articles analyzed, 37% were conceptual studies, 33% deployed a quantitative method, 20% used a qualitative method, and 10% drew on mixed methods. A detailed overview of the methods used in the articles discussed in this review is provided in [Appendix 5](#).

## 4. Data description and analysis

[Rom and Rohde's \(2007\)](#) framework guides the structure of our data analysis. Under each constituent of the framework, we analyze: (i) the logic of the relationship between digitalization and accounting, (ii) the reported findings, and (iii) the prevalent research methods and paradigms in the extant literature. This structure enables us to systematically crystallize the impacts of digitalization on accounting practices and to compare them to the influence of IIS. We present the analysis by first looking at the relationship between digitalization and each of the four constituents of accounting (tasks; techniques; organization; and behavior, use, and perceptions) in [Sections 4.1–4.4](#). Thereafter, we analyze the relationship between digitalization and performance

<sup>2</sup> The *British Tax Review* (level 3) was not available in Scopus or any other database accessible by the author. Consequently, eventual relevant publications in this journal were not included in this study.

<sup>3</sup> <https://www.scopus.com/search/form.uri?display=basic>.

<sup>4</sup> The use of a question mark in “digitalization” allows for detection of articles written in British English (“digitalisation”) and American English (“digitalization”).

<sup>5</sup> The review indicates that digitalization is altering information-acquisition and information-provision processes. In this sense, it was deemed useful to investigate both the management accounting and the financial reporting literature, as management accounting focuses on internal information provision, while financial reporting focuses on external information provision ([Horngren et al., 2015](#)).

(Section 4.5) before concluding our analysis by studying power (Section 4.6) and context as moderating or mediating variables (Section 4.7).

#### 4.1. The relationship between accounting tasks and digitalization

##### 4.1.1. The logic of the relationship

Rom and Rohde (2007) find that most research on the relationship between management accounting and IIS looks at IIS as the independent variable and management-accounting tasks as the dependent variable. All articles in our review use digitalization—or a specific feature of digitalization—as the independent variable and accounting tasks as the dependent variable. A more granular analysis of the articles reveals that social media and big data are the most commonly used independent variables, while accounting tasks rarely appear unaccompanied as the dependent variable.

##### 4.1.2. Findings: the relationship between accounting tasks and digitalization

Rom and Rohde (2007) build on Booth et al.'s (2000) decomposition of management-accounting tasks into three parts: transaction processing, reporting, and decision support. Based on the IIS literature, Rom and Rohde (2007) report that ERP systems are particularly effective in improving the supply of transaction data.

The literature investigated in the present study devotes some space to information processing in general and transaction processing in particular. Bhimani and Willcocks (2014) endeavor to contribute insights into how the new digital reality may alter transaction-processing dynamics in organizations. In the past, organizations “designed accounting systems to produce formal information which systems users purposefully deploy to gain an understanding of how economic transactions reveal information about the types and trends of consumer purchases” (Bhimani and Willcocks, 2014, p. 475). These authors also observe that information previously discarded by organizations due to a lack of a direct link to economic transactions is now viewed as a valuable resource in business analytics. In fact, organizations such as eBay and Amazon now monitor buyer and seller activities even when no transactions take place (Bhimani and Willcocks, 2014). This development, which represents a move beyond a transactional focus, raises important questions regarding what accounting is and will be in an ever more digital future. The move beyond a transactional focus suggests that the boundaries of accounting are becoming more elusive.

A number of the studies covered in our review examine how digitalization affect reporting—both internal reporting (e.g. Agostino and Sidorova, 2017; Viale et al., 2017) and reporting to external stakeholders (e.g. Lee et al., 2015; Yang and Liu, 2017). While Rom and Rohde (2007) found that ERP systems did not change reporting despite their ability to handle vast amounts of data, we find that digital technologies have changed reporting. In terms of internal reporting, Agostino and Sidorova (2017) scrutinize how social media changes actions in organizations. They discover that information on an organization's social-media performance (e.g., number of followers, critical comments) become an important internal report, notwithstanding skepticism from controllers who still need to be convinced of social media's importance. This demonstrates the tendency towards conflicting perceptions among professional groups with regards to the inclusion of new sources of data in accounting practices. Both in this case and in the study by Arnaboldi et al. (2017a), members of the digital department or the marketing department gained influence relative to accounting departments, as top management became increasingly interested in social-media performance.

In terms of corporate reporting, numerous scholars have pointed to the major opportunities that analytics can provide (Al-Htaybat and von Alberti-Alhtaybat, 2017; Bhimani and Willcocks, 2014; Vasarhelyi et al., 2015). For example, digital technologies may facilitate faster and broader provision of financial information to stakeholders (Bellucci and Manetti, 2017). Nevertheless, Payne (2014) calls for a cautious approach to the implementation of big data and analytics due to societal concerns, such as privacy and cybersecurity. Recent developments in China, where the implementation of a social-rating system is pending (Financial Times, 2018), point to the wide-ranging, privacy-related consequences of the employment of big data and analytics. Analogous systems, like the Chinese social-credit system, may easily be converted to organizational settings. In western communities, however, regulations like the EU's General Data Protection Regulative (GDPR) and US security policies appear to inhibit similar developments.

Quattrone (2016) raises the concern that the accounting dialogue may be lost in analytics, which could have implications for corporate reporting. He urges accountants and managers to aim for reasonable—not rational—decision making. Corporate reporting will always present simplified information. As such, it should be subject to discussion before decisions are made. A central realization in Quattrone's (2016) argument is that information does not equal knowledge. Increased real-time provision of information amplifies such concerns, because real-time reporting enables managers to make decisions even faster than in the IIS era.

Scott and Orlikowski (2012, p. 39) add to the discussion about the reporting-knowledge production interface. They find that user-generated reporting leads to “practices of detachment” which play an integral role in knowledge production in social media. The result is what they refer to as “quasi-formalized knowledge,” which yields “a new species of authority” (Scott and Orlikowski, 2012, p. 39). According to the authors, this raises questions about how organizations will handle this kind of knowledge production. In a similar vein, Arnaboldi et al. (2017a) cite Miller and Skinner (2015, p. 222), who maintain that “changes in information technology, the media, and securities markets interact to affect the ways in which information about firms is produced, disseminated, and processed.” These authors also argue that social media has the potential to open up for a “hybridization of reporting, which has a direct impact on the managers' decision making and actions” (Arnaboldi et al., 2017a, p. 840).

In terms of decision support and decision making, findings from the IIS literature suggest that ERP systems did not change how managers made decisions. Reporting and decision-making had become institutionalized activities in organizations (see, e.g., Fahy and Lynch, 1999; Granlund and Malmi, 2002), resulting in slow adoption and change. The digitalization literature stresses that although digital technologies, such as big data and analytics, may provide decision makers with support, achieving such an outcome requires effort. According to Al-Htaybat and von Alberti-Alhtaybat (2017), the expression “data is the new oil” implies that big data needs to be refined, structured, and processed before it can generate useful insights. The authors also find that accountants view the predictive possibilities of data analytics as useful for internal decision making, but that they need additional skills in order to use data analytics to make a contribution in practice. Consequently, they conclude that there is a need to update accounting curricula to ensure that accountants possess a relevant set of skills. Through an empirical study, Agostino and Sidorova (2017) endorse the view that centers of calculation connected to social media can change “action at a distance” (Latour, 1987). One distinctive finding in this regard is that social media tends to blur the distinction between the periphery and the center. This is explained by social media’s tendency to blur the lines between the organization and its external environment. Lastly, Schneider et al. (2015) discuss how data analytics can change the task processes that provide decision makers with inferences, predictions, and assurance, and argue that the impact of data analytics on accounting tasks needs further examination.

The findings on the relationship between accounting tasks and digitalization provide a few key insights. First, the review indicates that a move beyond a transactional focus makes the boundaries of accounting more elusive, which stands in contrast to Rom and Rohde’s (2007) findings from the IIS literature. Second, cybersecurity and privacy issues are expected to become increasingly important, as information spreads faster and broader thanks to new digital technologies. Third, a number of studies problematize the rise of user-generated reporting and its consequences for managerial decision-making. As a result, the lines between the accounting domain and the external environment blur. Accountants and decision makers will need a new set of skills to analyze and interpret newfangled types of information.

#### 4.1.3. Research method and paradigm

Rom and Rohde’s (2007) literature review indicates that research into the relationship between management accounting tasks and IIS has generally applied the survey method. In-depth case studies are absent.

Our review demonstrates that three main methods are applied in studies of digitalization in accounting: case studies, content analysis, and conceptual papers. However, only three papers are empirical case studies. Hence, we find that accounting literature offering in-depth empirical findings on the effects of digitalization on accounting is scarce. More empirical research is warranted in this domain.

### 4.2. The relationship between accounting techniques and digitalization

#### 4.2.1. The logic of the relationship

Rom and Rohde (2007) state that a unidirectional relationship is expected in most studies, such that IIS is believed to affect management-accounting techniques. This unidirectional relationship is partly explained by the fact that ERP systems are hard to change (Davenport, 1998; Granlund and Malmi, 2002). Thus, management accounting can only affect ERP systems to a certain extent in the post-implementation phase. If management accounting is to affect ERP, it should do so prior to implementation.

Our review of the digitalization literature indicates that the relationship between management-accounting techniques and digitalization is not unidirectional. Much of this research investigates how a certain feature of digitalization affects accounting. When discussing management-accounting techniques, the literature rarely pays attention to “heavyweight software systems” (Bygstad, 2015), such as ERP systems. Instead, the focus is on how digitalization affects accounting techniques in terms of how accountants acquire, interpret, and report information (Schneider et al., 2015). We also observe more endogenous and organic adoption and implementation of digital technologies (Suddaby et al., 2015), which are partly explained by the lightweight nature of digital technologies (Bygstad, 2015). This lightweight nature makes these technologies easier to change in both the pre-implementation and post-implementation phases.

#### 4.2.2. Findings: The relationship between accounting techniques and digitalization

Rom and Rohde (2007) point to empirical research in the IIS literature that demonstrates that organizations struggle with disintegrated information systems (Granlund and Malmi, 2002; Malmi, 2001). They also find that management accounting techniques and IIS are not independent from each other.

In the emerging literature on digitalization, several novel accounting techniques are discussed. The inroads that social media and data analytics have made in organizations represent the basis for the emergence of new key performance indicators (KPIs). The goal of these new KPIs is to help make sense of economic performance, such as the conversion rate associated with a given action by a web user. The conversion rate could, for instance, indicate the number of shopping carts validated in relation to the number of visitors to a web page over a given period of time (Viale et al., 2017) or the number of tickets sold to a cultural event as a direct result of a post on Facebook (Arnaboldi et al., 2017a). Additional studies similarly unveil the effects of social media and big data on the development of performance indicators (Agostino and Sidorova, 2017), thereby responding to the call made by Ittner and Larcker (2009) to study accounting techniques, such as nonfinancial performance measures. Digitalization seems to be paving the way for the introduction of new KPIs based on new types of information and governed by new groups of professionals.

Other accounting techniques are also emerging as a result of digitalization. Tang (2017) and Arnaboldi et al. (2017b) suggest that the technological development enables a shift from forecasting to “nowcasting.” Nowcasting refers to the prediction of the present or very near future, and it is a technique based on real-time web-search data. Most studies on nowcasting examine market reactions, but nowcasting also gives rise to opportunities in the accounting domain. For example, management accountants may use this technique to predict customer sentiments regarding the launch of a new product, or, as stated by Tang (2017), financial accountants may predict the demand for financial information prior to earnings announcements. In general, more studies looking at the implications of nowcasting are warranted, as the decision-making implications of this technology have thus far been overlooked (Arnaboldi et al., 2017b).

Big data has also stimulated the emergence of new visualization tools that privilege increasingly aggregated views over detailed numbers (Arnaboldi et al., 2017b)—a development that might facilitate and improve decision making. At the same time, over-abstraction could impede an individual's appreciation for important details, nuances, and heterogeneity in the data (Cuganesan and Dumay, 2009). Moreover, big data bears the potential to rejuvenate the balanced scorecard (BSC) by stimulating new visualizations. Innovative and transformed visualizations can give rise to new narratives that fuel “the rhetorical machine” functions (Arnaboldi et al., 2017b; Busco and Quattrone, 2015) of the BSC, laying the groundwork for improved discussions and knowledge generation. The inclusion of dynamic data visualizations in the BSC exemplifies a development from the IIS era, when the main emphasis was on system integration (Rom and Rohde, 2007).

The ways in which managers reflect upon numbers and visualizations are important for decision making. A central issue in this context is how decision makers interpret aggregated information. This is important given our knowledge of the power of numbers (Porter, 1995). It may be tempting to blindly follow the numbers wherever they may go, especially when powerful predictive models produce those numbers, which arguably limits the space for human judgement (Quattrone, 2016).

In terms of how accounting is shaping digitalization or vice versa, Arnaboldi et al. (2017a) indirectly discuss how the need for new decision-relevant information is influencing the development of data-analytics tools for social media. Social-media platforms are offering information relevant for an increasingly wider selection of KPIs, which form the basis for what social-media platforms monitor and report. This signals that accounting is shaping social media to some degree, just as social media is shaping accounting.

In summary, the emerging literature on digitalization in accounting points to several ways in which digitalization is changing accounting techniques. The rise of real-time data allows for novelty in KPI production, the shift from forecasting to nowcasting offers new predictive opportunities, and significant progress in data visualization can improve accounting techniques, such as the BSC. Notwithstanding these improvements, decision makers should be familiar with the potential risks of becoming overly reliant on data-driven numbers and visual representations.

#### 4.2.3. Research method and paradigm

The research methods employed in studies on IIS are best described as diverse, but field studies are common. In these studies, findings are often tied to one setting (Rom and Rohde, 2007). In terms of research methods, the emerging literature on digitalization is largely limited to conceptual papers that either theorize about digitalization's impact on accounting or employ content analysis. A few studies (Al-Htaybat and von Alberti-Alhtaybat, 2017; Arnaboldi et al., 2017a) make use of in-depth qualitative case studies.

Rom and Rohde (2007) report that research on management-accounting techniques has primarily been conducted from a functionalist point of view. Research on digitalization and accounting techniques cannot be characterized as single tracked like the IIS literature. Studies on digitalization that explain their findings using economic factors are not significantly overrepresented relative to studies employing theoretical lenses that highlight other factors. A handful of studies emphasize stakeholder dynamics (see, e.g., Bellucci and Manetti, 2017; Manetti and Bellucci, 2016), or increases and decreases in organizational actors' involvement in digitalization processes (see, e.g., Agostino and Sidorova, 2017; Arnaboldi et al., 2017a). These studies are best described as subscribing to an interpretive paradigm. However, a number of studies accentuate economic factors (see, e.g., Blankespoor et al., 2014; Yang and Liu, 2017). They are consequently understood as functionalistic studies.

#### 4.3. The relationship between the organization of accounting and digitalization

Rom and Rohde (2007, p. 52) find that in the 1980s, management accounting was a centralized task and that “management information was in the custody of the management accountants”. However, they portray a different reality for management accounting in the new millennium. Their findings suggest a broadening of the accountant's role. More specifically, management accountants may carry out tasks traditionally performed by general management, while general management can perform management-accounting tasks.

Our study of digitalization in accounting suggests even more fundamental changes. While Rom and Rohde (2007) demonstrated that management accountants enjoyed organizational promotion in the IIS era,<sup>6</sup> the same is not true in the digital age. A number of new studies now allude to a reality in which management accountants' organizational positions are challenged by other professional groups. Even though the picture is not complete, the literature implies an increasing tendency towards blurred

<sup>6</sup> Rom and Rohde (2007) refer to a number of studies that report an organizational promotion for management accountants (moving from bean counters to business consultants).



lines and elusive boundaries (Hazgui and Gendron, 2015)<sup>7</sup> in the accounting profession itself (Agostino and Sidorova, 2017; Arnaboldi et al., 2017b; Suddaby et al., 2015).

#### 4.3.1. The logic of the relationship

In terms of the logic of the relationship, Rom and Rohde (2007) suggest that a bidirectional relationship is plausible—IIS may drive changes in the accountant's role,<sup>8</sup> while shifts in professional roles may influence IIS. In this review of digitalization, we also view a bidirectional relationship as plausible. That is, digitalization may be the impetus that drives changes in the organization of accounting (including the accountant's role), while changes in the organization of accounting may shape the use of digital technologies.

#### 4.3.2. Findings: the organization of accounting

Research on the organization of (management) accounting primarily focuses on the role of the accountant. Rom and Rohde (2007) find that management-accounting tasks may be performed by a range of organizational actors at all levels. This finding is, in part, driven by ERP systems, which contribute to the automatic capture of management-accounting data in organizations. Therefore, Rom and Rohde (2007, p. 54) maintain that “management accounting has become a dispersed activity”. Moreover, they emphasize that the ability of ERP systems to distribute information led to a decentralization of control.

New accounting research provides examples in which digitalization drives professionals to cross occupational boundaries as well as examples of situations in which the lines between professions are blurred. A telling example is provided by Arnaboldi et al. (2017a), who show how media marketers entered the field of performance management (i.e., the accounting domain) by taking the lead in social-media management. Their study indicates that when professionals cross organizational boundaries, hybridization of professional roles becomes evident. In Arnaboldi et al. (2017a), hybridization refers to a situation in which organizational actors move into other organizational domains, such as when marketers enter traditional accounting terrain or when accountants take charge of digitalization initiatives. In one case, the advent of social media served to relax occupation boundaries, which resulted in hybridization (Arnaboldi et al., 2017a). In other words, the development of digital tools and techniques is the engine of change.

In another influential article, Scott and Orlikowski (2012) explore the organizational influence of the social-media platform TripAdvisor.<sup>9</sup> They conclude that TripAdvisor had significant implications for management practices because it reconfigured “relations of accountability” (Scott and Orlikowski, 2012, p. 26). Such reconfigurations might signify a dilution of accountants' accountability, as accountability is directed into the domain of other professionals in the organization or even into the domain of actors outside the organization. Agostino and Sidorova (2017) echo Scott and Orlikowski's (2012) view that digitalization might redistribute accountability relationships. Agostino and Sidorova (2017) state that social media's “wisdom of the crowd” mechanism implies a redistribution of accountability. Furthermore, they argue that “all previous studies recognize that the emergent social media calculative practices are shaping accounting and accountability, by reconfiguring new organizational roles and positioning, experts and expertise, and accountability-type relationships” (Agostino and Sidorova, 2017, p. 780). The profound re-configuration of roles, expertise, and accountability relationships raises important questions about what constitutes accounting in a digital world and the role of accountants in that world. Suddaby et al.'s (2015, p. 52) study corroborates the notion of increasingly blurred lines and elusive boundaries, as it demonstrates how “social media professionals, in pursuing their own professional project, generate change in the professional domain of accountancy”.

In terms of organizational control, Bhimani and Willcocks (2014) argue that digitalization leads to centralization and standardization. Low-value work is increasingly being standardized through automatization, and novel digital tools enable wide organizational control, which leads to the centralization of specific tasks. These changes thus represent a shift away from the decentralizing effects of ERP (Rom and Rohde, 2007), as business analysts and decision-support staff need to be situated closer to top management. However, Bhimani and Willcocks (2014) do not base their discussion on empirical data but on their conceptualization of the potential effects of digitalization.

Quattrone (2016) worries about more than a mere reconfiguration of accountants' occupational boundaries. He fears annihilation of the profession as we know it. In particular, he warns that digitalization is forcing organizations into a search for “truth” when examining big data and that this search for “truth” will mean the end of the accountant. His rationale is that accountants have historically contributed with insightful judgements about acquired information, but digitalization no longer leaves room for judgement or debate, as decisions are increasingly driven by data. Hence, digitalization puts accountants on the backburner where they might be relegated from the decision-making sphere.

Just as technology affects the configuration of organizational roles and boundaries, the configuration of roles and boundaries can influence technology. As demonstrated by Arnaboldi et al. (2017a), accountants tend to be sidelined by marketers leading the digital processes in organizations. This might affect an organization's expectations for a technology. In other words, other technological features and KPIs might emerge when marketers head digital development than would have been the case if accountants took the lead. Therefore, accountants' lack of involvement arguably shapes digital development within organizations.

<sup>7</sup> In their article “Blurred roles and elusive boundaries,” Hazgui and Gendron (2015) investigate the interplay among key actors as well as shifts in role boundaries in a distinct regulatory space. The study illustrates the elusiveness of the boundaries of actors' roles in contemporary forms of professional regulation.

<sup>8</sup> The reviewed literature often refers to management accountants in discussions of “the role of the accountants.”

<sup>9</sup> TripAdvisor, Inc. is the world's largest travel website with >315 million users and >500 million user-generated reviews. It was an early adopter of user-generated content.

In summary, the extant literature seems to suggest that digitalization, especially social media, challenges the conventional understanding of accounting, occupational boundaries, and the role of accountants. Accountants have traditionally been instrumental in acquiring and promulgating information in organizations, which served to fortify their importance. However, the studies covered in this review imply that, in the words of Miller and O'Leary (1993, p. 203), "accounting expertise [...] no longer automatically holds untrammelled sway."

#### 4.3.3. Research methods and paradigms

Rom and Rohde (2007) report that most publications on IIS apply the case-study method and that the literature is generally devoid of research based on survey methods. In terms of research paradigms, most studies make use of such theories as institutional theory (Burns and Scapens, 2000; Dimaggio and Powell, 1983), structuration theory (e.g., Giddens, 1976), or actor-network theory (e.g., Latour, 1987). Therefore, Rom and Rohde (2007) conclude that most research on IIS and the role of the management accountant adopts an interpretive stance.

Most of the studies in our review that focus on the organization of management and the changing nature of the accountant's role make use of case studies or content analysis. The studies employing a case-study method rely on such theories as boundary objects (Arnaboldi et al., 2017a), action at a distance (Agostino and Sidorova, 2017), or institutional theory (Lee et al., 2015). The content-analysis studies are more geared towards stakeholder theories, such as dialogic accounting (Bellucci and Manetti, 2017; Manetti and Bellucci, 2016). In terms of research paradigms, publications that focus on the role of accountants in organizations tend to observe the micro-dynamics at play in organizations. The theories employed in these studies reflect an interpretive stance. The first property of the boundary-objects theory employed by Arnaboldi et al. (2017a) is "interpretive flexibility," which nicely encapsulates the paradigmatic view of most research on organization and roles found in the literature on digitalization in accounting.

#### 4.4. The relationship between behavior, use, and perceptions, and digitalization

##### 4.4.1. The logic of the relationship

"Behavior, use and perception are important aspects of management accounting," according to Rom and Rohde (2007, p. 54). They argue that if the implementation and adoption of management-accounting techniques do not lead to changes in behavior or use, then those management-accounting techniques have no value for the organization adopting them.

The widespread use of technological features, such as big data, data analytics, and social media, is likely to influence behavior, use, and perceptions in organizations. Conversely, actors' behaviors, use, and perceptions may change the nature of digitalization. We organize the remainder of part 4.4 in line with Rom and Rohde's (2007) review. More specifically, we present the findings on behavior and use in one subsection (Section 4.2.2) and the findings on perceptions in another (Section 4.4.3).

##### 4.4.2. Findings: behavior and use in relation to accounting and digitalization

IIS studies indicate that information systems have stabilizing potential, which inhibits double-loop learning. Furthermore, the way in which IIS is used depends on the managerial level—lower-level managers do not rely as much on accounting information as higher-level managers (Rom and Rohde, 2007).

With regard to behavior and use in relation to accounting and digitalization, Al-Htaybat and von Alberti-Alhtaybat (2017) suggest that big data and analytics may illuminate irregular client or customer behavior, which then affects accountants' behavior. However, adopting a specific behavior based on statistical trends carries a certain risk. In their empirical analysis, these authors also find that organizations need not only appropriate systems to generate insights from big data but also people who can make proper use of the data. In another study, Suddaby et al. (2015) conclude that the adoption of social media in the accounting profession results in new practices that have the potential to bring about larger changes in behavioral norms among accountants. Bhimani and Willcocks (2014) paint a broad picture of digitalization's implications for accounting, and propose that the use of technologies, such as social media, big data, and analytics, is likely to lead to management and accounting dilemmas related to privacy and legitimacy. Interestingly, Warren et al. (2015, p. 400) discuss how big data can play a role in detecting "behaviors correlated with specific goal outcomes." In this context, they note that the BSC collects data in four areas and that "big data can identify new behaviors that influence respective goal outcomes" (Warren et al., 2015, p. 400). For example, measures based on digital activity can better indicate the degree to which organizational members are achieving specific learning goals.

Tang (2017) finds that social media can pressure stakeholders to conform with the actions of the majority. The mechanism that drives such conformist behavior is what Tang refers to as the "wisdom of crowds," which is clearly at play in social media. The "wisdom of crowds" effect influences people's assumptions about proper behavior. In relation to accounting, Tang (2017) argues that this mechanism can affect, for instance, the level of sales through the dissemination of production information on Twitter.

Kornberger et al. (2017) demonstrate how reputation systems on platforms such as Uber or TripAdvisor are characterized by "evaluative infrastructures"—infrastructures that describe accounting practices (e.g., rankings) and enable platform-based organization. The authors stress that such infrastructures can affect future behavior: "evaluative infrastructures embody expectations about the future. This can lead to self-fulfilling prophecies and other forms of reversed causality in which expectations of future behavior shape present behavior" (Kornberger et al., 2017, p. 92). Such self-fulfilling prophecies together with the new predictive capabilities of technologies represent a significant development in digitalization that can have far-reaching implications for accounting and accountants.

Lastly, [Arnaboldi et al. \(2017b\)](#) maintain that digitalization represents a change in the nature of decision making because social media and big data bring externally generated data into internal decision making. This could alter how accountants and decision makers acquire and use information, and how they make decisions.

When summarizing the relationships between behavior, use, and perceptions and digitalization, we find that social media can have several behavioral consequences. The adoption of social media in the accounting realm results in new practices that may change the role of accountants. Furthermore, social media can spur conformism among stakeholders. In addition, social media data fuel ranking-based evaluative infrastructures, which have the potential to shape future behavior through self-fulfilling prophecies. While the (lack of) learning effects of ERP systems was a central finding in the IIS literature ([Rom and Rohde, 2007](#)), few studies in the digitalization literature have shed light on this aspect. Hence, more studies that embrace the role of accounting as a learning machine ([Burchell et al., 1980](#)) in the digital age are needed.

#### 4.4.3. Findings: perceptions and translations in relation to accounting and digitalization

[Rom and Rohde \(2007\)](#) highlight interpretative studies on IIS and accounting, where the main message seems to be that human actors relate to non-human actors in the organization. For instance, one study testifies to how ERP systems can be used to both collapse and maintain the distance between the controller and the controlled ([Quattrone and Hopper, 2005](#)).

A number of studies examine how technology-enabled platforms, such as social media, can be utilized to influence stakeholders' perceptions of the organization ([Bellucci and Manetti, 2017](#); [Lee et al., 2015](#); [Manetti and Bellucci, 2016](#)). In their study, [Lee et al. \(2015\)](#) point out that accountants can take advantage of social media to communicate with stakeholders and fill the information vacuum in the wake of undesirable incidents. In so doing, they can reduce stakeholders' negative perceptions of the firm.

Moreover, [Al-Htaybat and von Alberti-Alhtaybat \(2017\)](#) refer to Heidegger's view on technology when discussing actors' perceptions. [Heidegger \(1969\)](#) suggests that technology is more than just an instrument; it is also an artefact with the ability to alter how we perceive the world. In this regard, [Al-Htaybat and von-Alberti-Alhtaybat](#) also draw on [Jarvenpaa and Lang \(2005\)](#), who propose that mobile technology is paradoxical, like a Janus face, as it both fulfils needs and creates new ones. As such, mobile technology represents an example of a digital technology that functions as an artefact that shapes our perception of the world.

[Quattrone \(2016\)](#) claims that decision makers perceive convincing numbers and visualizations stemming from data analytics as "the truth." When technologically-derived data are perceived as the truth, it "limits the space for judgement to the very last" ([Quattrone, 2016](#), p. 3). While research on IIS highlighted that management accountants were becoming involved in general management as business consultants (e.g., [Granlund and Mouritsen, 2003](#); [Scapens and Jazayeri, 2003](#)), [Quattrone \(2016\)](#) warns that management accountants may no longer be needed in the decision-making sphere because the solutions derived from data analytics are perceived as reflecting the truth.

[Solomons \(1991, p. 287\)](#) argues that "the task of accountants is to provide information as free from bias as possible that will be useful to decision makers." This view encompasses the realist assertion that the information provided through accounting information (numeric or textual) can, in fact, mirror the true world. In a digital reality, the assertion that accounting numbers may mirror the objective truth becomes increasingly challenging. The rise of user-generated reporting through evaluative infrastructures ([Kornberger et al., 2017](#)) and online rankings ([Scott and Orlikowski, 2012](#)) creates mountains of "knowledge" that managers can use to make decisions. However, there are definite risks associated with decision making based on this kind of knowledge.

First, the production and use of such knowledge risks becoming overly de-contextualized from the situation in which the information was generated. Second, user-generated information is arguably too opaque to be used in decision making. For example, writing sham five-star reviews has become a business ([The Economist, 2015](#)). This business intentionally creates results that present a skewed picture of the world. The power of a ranking, [Scott and Orlikowski \(2012, p. 39\)](#) argue, "is its capacity to present itself as objective fact, to reflect truth." As such, rankings impose a way of seeing, without being seen ([Roberts, 1991](#); [Scott and Orlikowski, 2012](#)). These issues feed into the discussion on the language of accounting and raise relevant questions regarding the extent to which accountants are able to engage in "successful reality constructions" ([Kure et al., 2017, p. 211](#)).

In summary, digital technologies seem to alter how accountants and stakeholders perceive the world. Social media enables organizations to engage with stakeholders and shape their perceptions in ways not seen before. Furthermore, ubiquitous data-driven analyses and widespread use of convincing visualizations present information that users easily perceive as objective truths, thereby throttling the exercise of human judgement. Lastly, user-generated content and (possibly deceptive) rankings represent new forms of information that entail a risk of bias, which challenges accountants' abilities to provide information that is as free from bias as possible.

#### 4.4.4. Research method and paradigms

As noted above, the IIS literature is largely divided into two research streams: studies that take a functionalist view and studies that take an interpretative view. Our review of the literature on digitalization in accounting reveals a corresponding pattern. Of the few empirical studies, the majority are exploratory case studies, which are often associated with an interpretive paradigm.

### 4.5. The relationship between digitalization and performance

#### 4.5.1. The logic of the relationship

Do investments in IIS or digitalization affect financial performance? [Rom and Rohde \(2007\)](#) ascertain that this relationship is of interest. They find that the most commonly investigated relationship in the IIS literature is whether an improved IIS combined with improved management accounting can affect firm performance and market value.

#### 4.5.2. Findings: effects on performance

Rom and Rohde (2007) report that research on the payoff from IT investments has shown varying results over time. In the 1990s, firms investing in IT did not do significantly better than their peers. However, later research indicated that returns on IT investments were rising. Research on returns on ERP investments yielded ambiguous results, as demonstrated by the study of Poston and Grabski (2001) on the financial impact of ERP implementations.

An investigation of the literature on digitalization in accounting reveals that few studies have examined the relationship between digitalization initiatives and financial returns. However, more studies on this relationship would not necessarily improve the comparison of returns on IT investments in the IIS era and the digitalization era. From Rom and Rohde (2007), we learn that nearly all studies in the IIS era focus on ERP systems (i.e., one technological solution). In the digitalization literature, numerous technologies are discussed. As such, aggregated numbers assessing the financial returns of digitalization initiatives would not prove useful for comparisons with aggregated numbers on financial returns from IIS investments.

Despite the lack of research on the relationship between digitalization initiatives and financial returns, Warren et al. (2015) suggest that big data can assist organizations in keeping track of their costs, thereby improving their financial results. In general, Warren et al. (2015) propose that big data has the potential to improve cost control, productivity, and other aspects of the organization and, thereby, enhance a firm's financial performance. However, more research is needed before conclusions can be drawn about the profitability of digital initiatives. It is plausible that high-performing firms invest more in digital initiatives with the result that digital initiatives appear to be attractive investments. Scholars need to observe the returns on investments in digital initiatives in the years to come in order to infer whether embracing digitalization is truly a profitable endeavor.

To summarize, few scholarly studies in the accounting literature examine the financial performance of digital investments. Despite the promises made by a cohort of consulting firms (e.g. Bughin et al., 2017), more studies are needed to clarify the rate of return on digitalization projects.

#### 4.5.3. Research method and paradigm

In the IIS literature, most research on financial performance following IT investments applies quantitative methods, although there are a few exceptions. All studies are conducted from a functionalist perspective.

As none of the studies included in this paper explicitly investigate the relationship between digitalization investments and financial performance, there is no sample of papers on which to report on the research-method aspect. The few articles touching on this interesting relationship do so from a conceptual and functionalistic stance.

### 4.6. Power as a moderating or mediating variable

#### 4.6.1. The logic of the relationship

Rom and Rohde (2007) cite den Hertog and Wielinga (1992), who argue that the impact of control systems depends, in part, upon power relations. Furthermore, Rom and Rohde (2007, p. 59) explain that "as a moderating variable, power changes the effect that the independent variable has on the dependent variable." Power can also be seen as a mediating variable, such as when the introduction of an IIS changes power relations.

#### 4.6.2. Findings: power as a moderating or mediating variable

Rom and Rohde (2007) find that ERP systems lead to a decentralization of control. Thus, we argue that the implementation of ERP systems leads to vertical power shifts—power and control are transferred vertically from employees in the organization's upper echelons to employees at lower levels through the dissemination of information. Consequently, the information monopoly formerly enjoyed by top management is dissolved. Moreover, power only travels intra-organizationally, moving from one locus in the organization to another.

Al-Htaybat and von Alberti-Alhtaybat (2017) conduct a case study in which they interview accountants about digitalization's influence on power relationships. One respondent "warned against ignoring such developments, as it may sideline the accounting profession" but also that "such development gives us [the accountants] more power but at the same time will also put more pressure on us" (Al-Htaybat and von Alberti-Alhtaybat, 2017, p. 865). In another study, the importance of digital expertise becomes apparent—the holders of this crucial know-how are able to legitimize their status (Viale et al., 2017). These results imply that if tasks previously handled by accountants are taken over by other professionals with more digital know-how, accountants risk losing legitimacy as well as power. This trend is portrayed in the study by Arnaboldi et al. (2017a), which shows that marketers increase their influence and power relative to accountants by collecting and providing information from the digital sphere, which becomes important material for managerial decision-making. Thus, in contrast to the effects of ERP systems, digitalization seems to lead to horizontal power shifts. The digitalization literature, on the other hand, focuses on how power may shift among professional groups at corresponding organizational levels.

Scott and Orlikowski (2012, p. 39) "expands current knowledge on how social media accounting practices perform when more power is assigned to the crowd." Online platforms may have the ability to transfer the power center from inside the organization to outside "the black box," so that it ends up in the hands of consumers. Unlike the IIS literature, this study focuses on how digitalization can lead to *extra-organizational* power shifts by transferring power to external stakeholders. This point is also sketched out by Brivot et al. (2017), who empirically show that social media poses a threat to corporations' traditional controls



and institutional power. This is particularly true for large and bureaucratic organizations, which are slow to adjust—social media, by its very nature, requires quick and fluid interactions with actors outside the organizational boundaries (Agostino and Sidorova, 2017).

Lastly, Kornberger et al. (2017) discuss how power is placed in the hands of platform owners in today's digital age. When a platform increases its user base, the platform owner simultaneously increases its influence. This tendency is what drives most of the winner-takes-it-all mechanism in the digital economy. Power is distributed across fewer and fewer hands, resulting in unnatural monopolies or oligopolies (The Economist, 2019). As Kornberger et al. (2017) conclude, digital platforms represent a disruptive phenomenon in contemporary capitalism that redistributes wealth and, concomitantly, power.

In short, digital technologies have wide-ranging implications for power as a variable that shapes accounting and the role of accountants. Initial studies indicate that accountants must compete in horizontal power struggles—not vertical, as in the IIS era (Rom and Rohde, 2007). Moreover, social-media platforms and rankings are imperative forces that may redistribute organizational power to extra-organizational actors, while digital platforms seem to lay the grounds for uneven power relations by assigning more power to platform owners.

#### 4.6.3. Research method and paradigm

Rom and Rohde (2007) find that case studies are frequently used in investigations of power relations. Moreover, case studies on power relations are often conducted from an interpretative stance. In studies subscribing to the functionalist view, theoretical reasoning and archival studies are more common.

Similarly, we find that most studies on digitalization in accounting that assess power as a variable do so from an interpretative stance. Methodologically, the majority of the papers discussing power in our review utilize the case study method. Interestingly, all three studies published in *Accounting, Organizations and Society* (AOS) in our review devote significant attention to power relations.

### 4.7. Context variables as moderating or mediating variables

#### 4.7.1. The logic of the relationship

In their review, Rom and Rohde (2007) comment that although context variables are not among the primary variables in their framework, such variables contribute important insights on the relationship between IIS and management accounting. The same line of reasoning holds true for the literature on digitalization. However, few studies direct attention to how context variables may influence digitalization.

#### 4.7.2. Findings: context variables as moderating or mediating variables

Rom and Rohde (2007) build their treatment of context variables on contingency theory, as this theory is particularly interested in context variables. They conclude that few articles explicitly study context variables in the relationship between IIS and management accounting, but they stress changes in the environment as an important context variable.

Of the papers included in this review, Schneider et al. (2015) devote a section to discussing contingency theory in accounting. The authors state that contingency theory examines how context variables affect accounting-system choices. Similar to Rom and Rohde (2007), Schneider et al. (2015) mention the external environment as an important context variable along with firm size, firm structure, and production technology. Thereafter, these authors present a range of possible research questions related to data analytics. More specifically, they set out to identify certain organizational areas in which data analytics may create a competitive advantage or enhance a firm's innovative capacity. Furthermore, Bhimani and Willcocks (2014) discuss the external environment as a context variable and point out that digitalization is rapidly disrupting organizations' external environments. They argue that this disruption "is forcing deep changes in the *modus operandi* of management structures, decisions and strategies" (Bhimani and Willcocks, 2014, p. 475). Bhimani and Willcocks (2014) also suggest that these deep changes challenge the Chandlerian premise that strategy dictates organizational structure, which establishes the frame for accounting systems. They conclude that "what comprises relevant information [...] has to be reconsidered" (Bhimani and Willcocks, 2014, p. 475). In other words, digitalization is expected to force profound changes in how accountants think of information acquisition, information provision, and the use of information in decision making.

Brivot et al. (2017) indirectly add to the discussion of contingency variables by focusing on turmoil in the external environment. Their discussion centers on organizational control with an emphasis on organizational actors who try to reinvent control in dynamic and volatile environments. Their main message is that "professional knowledge templates are ephemeral, being subject to meaning contests" (Brivot et al., 2017, p. 811). This is particularly true when a field or domain experiences turmoil brought on by profound changes in the environment. For accounting, the changes resulting from digitalization may support Brivot et al.'s (2017) conclusion that professional knowledge is ephemeral. Their conclusion inevitably forces accounting scholars to contemplate the need for changes in accounting curricula.

In short, this review shows that the external environment is the most important and widely discussed context variable. Digitalization is forcing deep changes in the external environment that may challenge the definition of relevant information, how to best structure organizations, and the kind of professional knowledge that will be critical in the future.

#### 4.7.3. Research methods and paradigms

According to Rom and Rohde (2007), IIS research that includes context variables applies both quantitative and qualitative methods. In the literature on digitalization in accounting, the studies that treat context in a somewhat explicit manner (e.g., Bhimani and Willcocks, 2014; Schneider et al., 2015) are mainly conceptual papers.

#### 4.8. Synthesis of findings from data description and analysis

Based on the framework in Fig. 1, Sections 4.1–4.7 reported findings from the literature on digitalization in accounting and assessed how emerging digital technologies are influencing accounting. The data description and analysis unveil how digitalization is adding new sources of data to accountants' tables. The data are often derived from external sources, can be user-generated, and may come in many forms. Texts, images, and other types of non-transactional data are becoming the new normal. As the data are vast and often unstructured, risks arise for the providers and users of data-driven information. In addition, the literature stresses that the introduction of new technologies paves the way for reconfigured power relations. At the same time, the review shows that the extant literature is silent on how digitalization has influenced firms' financial performance. Researchers might find that the time is ripe for more research on this relationship. Moreover, our review indicates that little research has been conducted on the relationship between context variables, such as the external environment, and digitalization.

### 5. Conclusions and directions for future research

In this paper, we have reviewed the current work on digitalization in the accounting literature. The paper is timely and relevant, as this third phase of technological advancements is heavily influencing organizations. By forming and contrasting a comprehensive picture of the state-of-the-art literature on digitalization in accounting with extant literature on IIS in accounting, the paper develops knowledge by connecting the past with the future (Massaro et al., 2016). Thus, it provides researchers with a foundation for future research in the IT-accounting domain.

The paper initially asked: *How is digitalization influencing accounting practice and how do those effects compare to the effects of IIS on accounting practice? What are the most important avenues for future research on digitalization in accounting?*

With reference to the first research question, our findings suggest that digitalization influences accounting practice in many new ways, but we highlight three notable differences between the effects of digitalization and IIS on accounting. First, we point to digitalization's impact on the *boundaries of accounting*. This finding emanates from the discussion of the move beyond a transactional focus (Bhimani and Willcocks, 2014) and how social media is driving changes in accounting (Agostino and Sidorova, 2017; Arnaboldi et al., 2017b). Second, we highlight how digitalization is *changing power relations*. This finding is related to the first in that the more elusive boundaries of accounting have implications for what accountants do, what they do not do, and what they are responsible for, which again affect their influence and power in organizations (Arnaboldi et al., 2017b; Kornberger et al., 2017; Scott and Orlikowski, 2012; Suddaby et al., 2015). Third, the review indicates that some scholars voice important questions regarding how digitalization affects the *production of knowledge for decision making* (Quattrone, 2016; Scott and Orlikowski, 2012).

Given the rapid proliferation of digital technologies and their impact on organizations and accounting, we argue that these and related issues deserve attention in future research. We therefore ask researchers to examine digitalization's impact on accounting from a number of perspectives. The need for more field studies is especially conspicuous, as the extant literature is still in a rather conceptual stage (see Appendix 4). In the following, we elaborate on how digitalization is influencing accounting practice and the concurrent avenues for future research.

#### 5.1. Increasingly elusive boundaries of accounting

##### 5.1.1. Concluding findings

First, digitalization is the impetus for *increasingly elusive boundaries of accounting*. This finding first and foremost applies to management accountants, whose role is more widely discussed in the reviewed literature. As digitalization enables a move beyond transactional tasks (Bhimani and Willcocks, 2014) and significant alterations in information acquisition and use (Arnaboldi et al., 2017b), the boundaries of the accounting role and the accounting profession itself become more unclear than in the IIS era. Organizations now harness torrents of non-transactional data to capitalize on customers' digital traces, which denotes a shift in information acquisition that moves the boundaries of accounting. Furthermore, while data acquisition in the IIS era typically focused on structured data, the acquisition of non-structured data is becoming the new norm (Al-Htaybat and von Alberti-Alhtaybat, 2017; Warren et al., 2015). The harvesting of non-structured data is enabled by yet another technological advancement—the automatic collection of data from new sources, such as social-media platforms (Viale et al., 2017). Such new data sources extend the data ecosystem from which organizations may harvest data. In and of themselves, these developments may seem like nothing more than incremental technological developments. However, the joint emergence of these technologies, which we refer to as digitalization, represents a major technological shift that is making the boundaries of accounting ever more elusive.

In addition, other professional areas, such as IT and marketing, are utilizing digital technologies to leap into the accounting domain (Arnaboldi et al., 2017a). In other words, digitalization is bringing accounting into non-accounting functions. As such,

hybridization fueled by digitalization is in part driving the increasing elusiveness of accounting's boundaries. This gives rise to questions about what accounting is and what the role of the accountant should be in the digital age.

### 5.1.2. Directions for future research

Future research on digitalization should investigate how the increasingly elusive boundaries of accounting are shaping the accounting profession. In this regard, there are several possible avenues for future research. The increasingly elusive boundaries of accounting and the accounting profession involve threats as well as opportunities. One opportunity lies in the adoption and implementation of digital technologies. Top management often drives the adoption of IIS (like ERP systems) because the implementation of these large and complex systems requires massive organizational effort and resources (Davenport, 1998). In the words of Bygstad (2015), ERP systems are heavyweight systems that are highly complex, require extensive resources, computational power, and expertise. The implementation process of these systems is typically formalized and involves a range of actors (Granlund and Malmi, 2002). In contrast, digitalization initiatives are often adopted by individuals or groups in the organization (see, e.g., Arnaboldi et al., 2017a). This represents a more endogenous and organic adoption of the technology, and the same actors might drive the implementation process (Suddaby et al., 2015). The lightweight nature of digital technologies (Bygstad, 2015) enables such organic adoption and implementation.

This kind of implementation process is rather informal, akin to vernacular accounting systems: systems that are “self-generated by managers and/or employees and not officially sanctioned in the organizational hierarchy” (Kilfoyle et al., 2013, p. 382). Thus, pro-active accountants can seize the opportunity arising from the more elusive boundaries of accounting to become key constituents in their organizations. They can do so by combining digital curiosity with business insights. Future research should empirically investigate how accountants operate in the adoption and implementation processes of digital technologies, as their influence in these processes will shape the future boundaries of accounting. For example, researchers could investigate how accountants can utilize new data sources to maintain relevance in their organizations. Such studies are important for assessing the future role of accounting and (management) accountants. Echoing Bromwich and Bhimani (1989), Rom and Rohde (2007, p. 53) conclude that “the proactivity of management accountants is important if they want to define their future role themselves.” Based on our review, we argue that this observation still holds and that it is arguably even more relevant today. We suggest that accountants would be remiss if they failed to take charge of defining their own future.

## 5.2. Changing power relations

### 5.2.1. Concluding findings

Second, digitalization entails *changing power relations* both within and outside the organizational boundaries. Within the organization, IIS allowed for *vertical power shifts* through increased decentralization (Dechow and Mouritsen, 2005; Granlund and Mouritsen, 2003), as lower-level employees were given access to information that was previously in the custody of middle-level and higher-level managers. Today, accountants' reluctance to take the lead in digital initiatives may lead to *horizontal power shifts* in organizations, as power seems to accrue in those professions that flaunt their digital know-how. The accounting profession's apparent lack of digital savviness result in reduced legitimacy, which can lead to horizontal changes in power relations. Conversely, accountants may leverage their critical insights into business processes. Knowledge is power—by exploiting their financial prowess, accountants can play a pivotal part in reengineering business processes and business models.

The extant literature on digitalization in accounting has not devoted much attention to explicit discussions of horizontal power relations, but this issue becomes discernable through the concept of hybridization (Arnaboldi et al., 2017a, 2017b; Suddaby et al., 2015). Hybridization is driven, in part, by the mobility and transferability of tools and techniques (Caglio, 2003; Hopwood, 1992; Miller, 1998). In the IIS era, hybridization mainly occurred between related professional roles, such as between management accountants and financial accountants (Caglio, 2003). However, in the emerging digital era, hybridization is evident between more divergent professional roles, such as marketers and accountants (Arnaboldi et al., 2017a).

Moreover, digitalization leads to changes in power relations outside the organizational boundaries, thereby opening up for *extra-organizational power shifts* by placing more power in the hands of external stakeholders. The literature on IIS technologies mainly emphasized power shifts *within* organizations, but the digitalization literature opens up a wider discussion (Scott and Orlikowski, 2012; Suddaby et al., 2015). The ways in which digitalization allows for extra-organizational power shifts and the pace of those shifts represent uncharted waters for organizations. These shifts incur uncertainty and risks for organizations. Previously, the power of accountants was, in part, rooted in their capacity to reduce complexity to a single number. (Miller, 2001). When the numbers by which organizations govern are increasingly generated externally (and not necessarily for business purposes), the information's veracity carry greater risk and imply the potential for reduced power for accountants. As online user reviews and evaluative infrastructures shift the dynamics in certain industries (Jeacle and Carter, 2011; Kornberger et al., 2017), customers are gaining more influence in organizations, while the power and accountability of accountants are at risk of becoming diluted.

### 5.2.2. Directions for future research

We see several interesting research opportunities tied to the discussion of changing power relations. To what extent will the apparent lack of digital know-how challenge accountants' influence within the organization? If accountants remain reluctant to engage in digital development, do they risk becoming obsolete? Will digitalization lead to increased centralization, which could

benefit accountants? Some functionalistic studies have sought to compute the extent to which certain jobs are susceptible to technological developments (Frey and Osborne, 2017), but more empirical studies are needed to untangle the future of accountants' work. Moreover, additional research is needed to investigate how new digital tools and techniques are driving hybridization as well as the concurrent consequences. Do some digital technologies benefit or harm the power and influence of accountants more than others? How will the new digital relationship between organizations and their stakeholders (e.g., in digital ecosystems) lead to fluxes in power relations? Suddaby et al. (2015, p. 53) cite Hoskin and Macve (1994), who claim that prior research has focused on the accounting domain as being continually in flux and constantly extending in terms of both "power and scope." We call for more research into the potential oscillations of power inside and outside organizations resulting from digitalization.

### 5.3. Production of knowledge for decision making

#### 5.3.1. Concluding findings

Third, digitalization raises new questions related to the *production of knowledge for decision making*. In their examination of the IIS literature, Rom and Rohde (2007) report that the implementation of new technologies, such as ERP systems, improved both the supply of data and the flexibility of information provision. Yet, it did not entail inclusion of new types of information. The accounting literature on digitalization, on the other hand, emphasizes how new types of information enter the organization and the fact that new decision-making practices will have consequences for knowledge production.

Digitalization allows new types of data and information to enter organizations, such as non-transactional data (Bhimani and Willcocks, 2014) and new KPIs based on social media (Agostino and Sidorova, 2017; Viale et al., 2017). Simultaneously, digital tools and techniques give rise to new practices of organizational decision making among employees at managerial levels. In this vein, Quattrone (2016) raises important questions about the future of accounting in the digital age. He points out that "the effects of the digital revolution on management accounting and decision-making are still unclear" (Quattrone, 2016, p. 1), and warns that a digital move in decision making results in less space for valuable human discussions and the exercise of judgement.

In such an environment, actions occur quickly after the acquisition of information. Scott and Orlikowski (2012, p. 39) ask how organizations should handle the production of user-generated "quasi-formalized knowledge." Although the vast amounts of data entail a wealth of opportunities, organization needs to recognize the challenges of making quick decisions based on externally generated data. Those data are characterized, at least in part, by dubious veracity, as opposed the clean data acquired in the IIS era. The increasing reliance on data-driven decisions based on analytical "truths" raises plenty of new considerations for accountants with regard to decision-making processes. Organizations and accountants need to consider the degree to which algorithms should be trusted when making decisions. Relatedly, how opaque can an algorithm be before it becomes a problem for accountants and decision makers?

Furthermore, the discussion of the language of accounting illustrates that decision-making based not only on algorithms but also on "the wisdom of the crowd" might yield suboptimal outcomes. To some extent, this is due to the factual possibility of creating intentional results. Real-time reporting adds another layer of complexity to today's decision-making processes, as it reduces the time allotted to discussion and reflection prior to decision making.

#### 5.3.2. Directions for future research

Future research in this area could go in many directions. The extent to which data-driven decision making is used remains unclear. Surveys are needed to map the proliferation of these practices. In addition, there is a clear need for more qualitative studies that unravel how accountants and decision makers perceive data-driven decisions based on algorithms. For example, how does the increased use of visualizations shape managerial decision making? What are the major obstacles, potential pitfalls, and tensions associated with basing decisions on analytical truths? Such considerations are important, and likely to be fruitful avenues for future research. Will the reduced space for judgement not only lead to quick actions but also to a need for revised actions as a consequence of misjudgments? Poor judgments on issues like cybersecurity may have long-lasting and severe implications. Recent examples in the media, such as the Facebook case,<sup>10</sup> demonstrate the negative effects that organizations may experience if personal data goes astray. Consequently, we argue that accounting scholars should delve into the organizational effects of digital moves in decision making.

### 5.4. Contributions, practical implications, and limitations

Our study makes three contributions to the accounting literature. First, we clarify the concept of digitalization and highlight the potential implications of this ubiquitous concept for accounting. Second, we synthesize the emerging literature on digitalization in accounting and contrast this stream of literature the literature on IIS in accounting. By comparing the findings of our review with findings from the IIS literature, we are able to crystallize how digitalization influences accounting in new ways. Moreover, by presenting a comprehensive overview of the literature on digitalization in accounting, the paper offers a clear basis for future research on a number of issues. Third, we point to several novel research paths. Just as Chapman and Chua (2003, p. 91) addressed the need for more studies on ERP because of "their potential to radically alter the field of accounting," we make similar arguments for studies on digitalization in accounting. Given the widespread attention paid to digitalization in

<sup>10</sup> <https://www.ft.com/content/257d4598-2cb9-11e8-a34a-7e7563b0b0f4>.



society, we expect that the topic of accounting and digitalization will increasingly attract interest among accounting scholars. Thus, we believe that this literature review can serve as a valuable starting point for future research on the topic. We urge accounting scholars to examine how digitalization affects the boundaries of accounting as well as intra- and extra-organizational power struggles, and to analyze the impact of new digital tools and techniques on the production of knowledge for decision making.

The conclusions in this paper also have several practical implications. Accountants are expected to deliver reliable, high-quality inputs for decision making. At the same time, they might be expected to include more externally generated data, which is associated with risks related to veracity and representativeness. This tension requires accountants to begin to analyze the trustworthiness of information. Moreover, new ethical dilemmas arise when accountants must exercise professional skepticism<sup>11</sup> (IESBA, 2018) in their assessments of assumptions and the quality of inputs in digital processes. Such analytical and ethical dilemmas give rise to a need to exhibit high levels of digital proficiency, which accountants might not have the required training to undertake. At the same time, accountants may play a crucial role in the design process of technology implementations, as they are the primary holders of vital business knowledge.

We carefully considered our methodological approach when conducting this study, but limitations still exist. First, when conducting a systematic literature review, there is always a risk that relevant publications might be overlooked. For this paper, database issues might have clouded our overview of relevant published material. Scopus's coverage of the chosen journals was limited in a handful of cases. However, we addressed the concern about potentially overlooked relevant material by cross-checking our search in additional databases.<sup>12</sup> Second, some readers might find the scope of the papers to be too narrow. Although we exceed the scope of Rom and Rohde's (2007) review by studying the accounting literature, we do not include publications focused on auditing, as the need to delineate the boundaries of our review resulted in a narrow focus on publications in management and financial accounting. Third, others researchers may not draw the same conclusions given the same material. However, we are confident that the study's conclusions reflect and expand the main issues discussed in the literature thus far.

Our review suggests that the literature on digitalization in accounting is still immature and that there are a number of possible avenues for future research. Importantly, more empirical research is required to understand the impact of digitalization on accounting.

### Declaration of competing interest

We are grateful for the funding from Equinor. The funding has been provided in an unconditional basis and without any specification regarding how the funds should be used.

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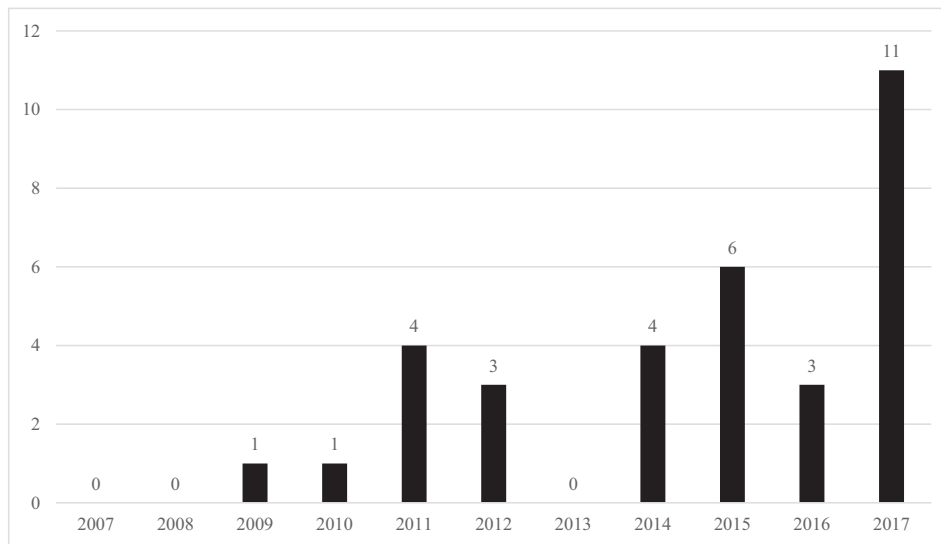
### Appendix 1. Number of publications per research outlet

Research Outlet	Number of publications
<i>Accounting, Auditing and Accountability Journal (AAA)</i>	8
<i>Accounting and Business Research (ABR)</i>	4
<i>Accounting Horizons (AH)</i>	2
<i>Accounting Review (AR)</i>	2
<i>Accounting, Organizations and Society (AOS)</i>	3
<i>Critical Perspectives on Accounting (CPA)</i>	2
<i>International Journal of Accounting Information Systems (IJAIS)</i>	6
<i>Journal of Accounting Research (JAR)</i>	2
<i>Management Accounting Research (MAR)</i>	2
Other	2
Total	33

<sup>11</sup> According to the International Accounting Education Standards Board (IAESB), "professional skepticism" is not limited to auditing but applies to "the broader context of a role as a professional accountant" (IESBA, 2018, p. 13).

<sup>12</sup> This exercise returned one article: "Do Auditor-Provided Tax Services Enhance or Impair the Value Relevance of Earnings?" published by Cook in the *Journal of the American Taxation Association* in 2013. This article was not included, as it subscribes to the auditing literature, which is beyond the scope of this study.

## Appendix 2. Number of publications per year, 2007–2017



## Appendix 3. Query string from the online database Scopus

TITLE-ABS-KEY (digital?ation OR digital OR "big data" OR "analytics" OR "cloud" OR "cyber" OR "mobile" OR "social media" OR "robot?ation" OR "automati?ation" OR "artificial intelligence" OR "blockchain" OR "platforms" OR "internet of things" ) AND PUBYEAR > 2006 AND PUBYEAR < 2018 AND ( LIMIT-TO ( EXACTSRCTITLE,"Accounting Auditing And Accountability Journal " ) OR LIMIT-TO ( EXACTSRCTITLE," Abacus " ) OR LIMIT-TO ( EXACTSRCTITLE," Accounting And Business Research " ) OR LIMIT-TO ( EXACTSRCTITLE," Accounting Forum " ) OR LIMIT-TO ( EXACTSRCTITLE," Accounting Horizons " ) OR LIMIT-TO ( EXACTSRCTITLE," Accounting Review " ) OR LIMIT-TO ( EXACTSRCTITLE," Accounting Organizations And Society " ) OR LIMIT-TO ( EXACTSRCTITLE," Auditing " ) OR LIMIT-TO ( EXACTSRCTITLE," Behavioral Research In Accounting " ) OR LIMIT-TO ( EXACTSRCTITLE," British Accounting Review " ) OR LIMIT-TO ( EXACTSRCTITLE," British Tax Review " ) OR LIMIT-TO ( EXACTSRCTITLE," Contemporary Accounting Research " ) OR LIMIT-TO ( EXACTSRCTITLE," Critical Perspectives On Accounting " ) OR LIMIT-TO ( EXACTSRCTITLE," European Accounting Review " ) OR LIMIT-TO ( EXACTSRCTITLE," Financial Accountability And Management " ) OR LIMIT-TO ( EXACTSRCTITLE," Foundations And Trends In Accounting " ) OR LIMIT-TO ( EXACTSRCTITLE," International Journal Of Accounting " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of Accounting And Economics " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of Accounting And Public Policy " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of Accounting Literature " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of Accounting Research " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of Accounting Auditing And Finance " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of Business Finance And Accounting " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of International Accounting Auditing And Taxation " ) OR LIMIT-TO ( EXACTSRCTITLE," Journal Of The American Taxation Association " ) OR LIMIT-TO ( EXACTSRCTITLE," Management Accounting Research " ) OR LIMIT-TO ( EXACTSRCTITLE," Review Of Accounting Studies " ) OR LIMIT-TO ( EXACTSRCTITLE," International Journal Of Accounting Information Systems " ) )

## Appendix 4. List of articles sorted by publication year

Article ID	Accounting area	Source	Title	Method	Year	Author(s)
J1	Financial accounting	<i>Accounting, Auditing and Accountability Journal</i>	Big data and corporate reporting: Impacts and paradoxes	Qualitative	2017	Al-Htaybat K., von Alberti-Alhtaybat L.
J2	Financial accounting	<i>Journal of Accounting Research</i>	Wisdom of crowds: Cross-sectional variation in the informativeness of third-party-generated product information on Twitter	Quantitative	2017	Tang V.W.
J3	Financial accounting	<i>Accounting and Business Research</i>	Accounting narratives and impression management on social media	Quantitative	2017	Yang J.H., Liu, S.

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(continued)

Article ID	Accounting area	Source	Title	Method	Year	Author(s)
J4	Management Accounting	<i>Accounting, Auditing and Accountability Journal</i>	How social media reshapes action on distant customers: Some empirical evidence	Qualitative	2017	Agostino D., Sidorova, Y.
J5	Management Accounting	<i>Accounting, Auditing and Accountability Journal</i>	Governing social media: The emergence of hybridised boundary objects	Qualitative	2017	Arnaboldi M., Azzone G., Sidorova Y.
J6	Management Accounting	<i>Accounting, Auditing and Accountability Journal</i>	Accounting, accountability, social media and big data: Revolution or hype?	Conceptual	2017	Arnaboldi M., Busco C., Cuganesan S.
J7	Management Accounting	<i>Accounting, Auditing and Accountability Journal</i>	Facebook as a tool for supporting dialogic accounting? Evidence from large philanthropic foundations in the United States	Mixed methods	2017	Bellucci M., Manetti G.
J8	Management Accounting	<i>Accounting, Auditing and Accountability Journal</i>	Reinventing organizational control: Meaning contest surrounding reputational risk controllability in the social media arena	Qualitative	2017	Brivot M., Gendron Y., Guénin H.
J9	Management Accounting	<i>Accounting, Organizations and Society</i>	Evaluative infrastructures: Accounting for platform organization	Conceptual	2017	Kornberger M., Pflueger D., Mouritsen J.
J10	Management Accounting	<i>Accounting, Auditing and Accountability Journal</i>	From "mad men" to "math men": The rise of expertise in digital measurement and the shaping of online consumer freedom	Qualitative	2017	Viale T., Gendron Y., Suddaby R.
J11	Management Accounting	<i>International Journal of Accounting Information Systems</i>	Impact of business analytics and enterprise systems on managerial accounting	Conceptual	2017	Appelbaum D., Kogan A., Vasarhelyi M., Yan Z.
J12	Financial accounting	<i>Accounting, Auditing and Accountability Journal</i>	The use of social media for engaging stakeholders in sustainability reporting	Mixed methods	2016	Manetti G., Bellucci M.
J13	Management Accounting	<i>Management Accounting Research</i>	Management accounting goes digital: Will the move make it wiser?	Conceptual	2016	Quattrone P.
J14	Management Accounting	<i>Management Accounting Research</i>	Management accounting in context: Industry, regulation and informatics	Conceptual	2016	Van der Stede W.A.
J15	Financial accounting	<i>Journal of Accounting Research</i>	The role of social media in the capital market: Evidence from consumer product recalls	Quantitative	2015	Lee L.F., Hutton A.P., Shu S.
J16	Financial accounting	<i>Accounting, Organizations and Society</i>	Twittering change: The institutional work of domain change in accounting expertise	Mixed methods	2015	Suddaby R., Saxton G.D., Gunz S.
J17	Financial accounting	<i>Accounting and Business Research</i>	Institutionalising XBRL for financial reporting: Resorting to regulation	Qualitative	2015	Troshani I., Parker L.D., Lymer A.
J18	Financial accounting	<i>International Journal of Accounting Information Systems</i>	A note on an architecture for integrating cloud computing and enterprise systems using REA	Conceptual	2015	Geerts G.L., O'Leary D.E.
J19	Management Accounting	<i>Accounting Horizons</i>	Infer, predict, and assure: Accounting opportunities in data analytics	Conceptual	2015	Schneider G.P., Dai J., Janvrin D.J., Ajayi K., Raschke R.L.
J20	Management Accounting	<i>Accounting Horizons</i>	How big data will change accounting	Conceptual	2015	Warren, Jr. J.D., Moffitt K.C., Byrnes P.
J21	Financial accounting	<i>Accounting Review</i>	The role of dissemination in market liquidity: Evidence from firms' use of Twitter™	Quantitative	2014	Blankespoor E., Miller G.S., White H.D.
J22	Management Accounting	<i>Accounting and Business Research</i>	Digitisation, big data and the transformation of accounting information	Conceptual	2014	Bhimani A., Willcocks L.
J23	Management Accounting	<i>Accounting and Business Research</i>	Discussion of digitisation, big data and the transformation of accounting information by Alnoor Bhimani and Leslie Willcocks (2014)	Conceptual	2014	Payne R.
J24	Management Accounting	<i>International Journal of Accounting Information Systems</i>	On governance structures for the cloud computing services and assessing their effectiveness	Quantitative	2014	Prasad A., Green P., Heales J.
J25	Financial accounting	<i>Critical Perspectives on Accounting</i>	The SEC's retail investor 2.0: Interactive data and the rise of calculative accountability	Conceptual	2012	Lowe A., Locke J., Lymer A.
J26	Financial accounting	<i>International Journal of Accounting Information Systems</i>	IFRS taxonomy and financial reporting practices: The case of Italian listed companies	Quantitative	2012	Valentinetti D., Rea M.A.
J27	Management Accounting	<i>Accounting, Organizations and Society</i>	Reconfiguring relations of accountability: Materialization of social media in the travel sector	Qualitative	2012	Scott S.V., Orlikowski W.J.
J28	Financial accounting	<i>British Accounting Review</i>	Functional fixation: Experimental evidence on the presentation of financial information through different digital formats	Quantitative	2011	Ghani E.K., Laswad F., Tooley S.

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(continued)

Article ID	Accounting area	Source	Title	Method	Year	Author(s)
J29	Financial accounting	<i>European Accounting Review</i>	Artificial intelligence measurement of disclosure (AIMD)	Quantitative	2011	Grüning M.
J30	Management Accounting	<i>Accounting Review</i>	The role of organizational absorptive capacity in strategic use of business intelligence to support integrated management control systems	Quantitative	2011	Elbashir M.Z., Collier P.A., Sutton S.G.
J31	Management Accounting	<i>Critical Perspectives on Accounting</i>	Beyond disciplinary enclosures: Management control in the society of control	Conceptual	2011	Martinez D.E.
J32	Financial accounting	<i>International Journal of Accounting Information Systems</i>	Environmental reporting on the internet by America's toxic 100: Legitimacy and self-presentation	Quantitative	2010	Cho C.H., Roberts R.W.
J33	Financial accounting	<i>International Journal of Accounting Information Systems</i>	Towards the global adoption of XBRL using international financial reporting standards (IFRS)	Quantitative	2009	Bonsón E., Cortijo V., Escobar T.

## Appendix 5. Methodological overview

Methods deployed in analyzed articles	
Method (freq. propor.)	Section
	Section 4.1: Accounting tasks and digitalization
Conceptual	3 (38%)
Quantitative	0 (0%)
Qualitative	4 (50%)
Mixed methods	1 (12%)
	Section 4.2: Accounting techniques and digitalization
Conceptual	2 (33%)
Quantitative	3 (50%)
Qualitative	1 (17%)
Mixed methods	0 (0%)
	Section 4.3: Organization of accounting and digitalization
Conceptual	2 (33%)
Quantitative	0 (0%)
Qualitative	3 (50%)
Mixed methods	1 (17%)
	Section 4.4: Behavior and use in relation to accounting and digitalization
Conceptual	5 (41%)
Quantitative	2 (17%)
Qualitative	2 (17%)
Mixed methods	3 (25%)
	Section 4.5: Performance and digitalization
Conceptual	1 (100%)
Quantitative	0 (0%)
Qualitative	0 (0%)
Mixed methods	0 (0%)
	Section 4.6: Power as a moderating or mediating variable
Conceptual	1 (14%)
Quantitative	0 (%)
Qualitative	5 (72%)
Mixed methods	1 (14%)
	Section 4.7: Contextual variables as moderating or mediating variables
Conceptual	2 (67%)
Quantitative	0 (0%)
Qualitative	1 (33%)
Mixed methods	0 (0%)

## Appendix 6. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.accinf.2019.100441>.

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