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Studies from the Nordic finance sector

Doctoral thesis

NTNU
Norwegian University of Science and Technology
Thesis for the Degree of
Philosophiae Doctor
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Summary

Digital technologies have facilitated changes in business processes and work organising over the last decades. The expanding use of digital technologies has been predicted to influence how managers exercise control, and how decisions are made in organisations. The advent of big data and machine learning have sparked discussions on how organizations manage control, and even of the future of the accounting profession. Through a detailed exploration of how digital technologies influence managers configurations of controls and their control practices in day to day management, this thesis contributes to the debate by empirical investigation.

In its design the thesis takes an interpretive position, and builds on two case studies, to investigate how digital technologies facilitate changes in management accountants' roles, power structures and the configuration of management controls. The cases; one insurance company and one regional savings bank, are selected from the digitally advanced financial service industry.

The analysis of the two selected cases illustrates how the particular organisational context of an organisation contributes to shape the design and use of both digital technologies and management controls. The first article finds that the digital technologies can contribute to changes in the roles and jurisdiction of management accountants. The second paper finds that digital technologies can facilitate centralisation of power, and that there is an interplay between digital technologies and organisational power structures. The third paper argues that collectively shared beliefs and values shape the design of both digital technologies and management controls.

Synthesizing the findings from the studies I argue that digital technologies contribute to changes in how organisations keep accounts of events. As a consequence, the digital technologies facilitate changes in different forms of management controls. Finally, the studies illuminate how this potential for change is handled different in different organisational and social contexts, allowing me to conclude that context strongly influence the configuration and use of digital technologies and management controls in their daily practice. The same digital technology can lead to different changes, depending on the context of the organisation.

Sammendrag

I de siste tiårene har bruken av digitale teknologier lagt til rette for endringer i forretningsprosesser og organisering av arbeid. Økningen i bruk av digitale teknologier har blitt spådd å påvirke hvordan ledere utøver kontroll, og hvordan beslutninger fattes i organisasjoner. Fremveksten i bruk av stordata og maskinlæring har inspirert diskusjoner om hvordan organisasjoner utøver kontroll, og spekulasjoner om fremtiden til de som jobber i regnskaps-og controllerstillinger. Denne avhandlingen bidrar til debatten gjennom empirisk undersøkelse av hvordan digitale teknologier er involvert når ledere konfigurerer styringsverktøy og styringspraksiser.

Avhandlingen bygger på et fortolkende perspektiv, og det empiriske grunnlaget er to casestudier fra den teknologitunge finanssektoren; ett fra et forsikringsselskap og ett fra en regional sparebank. Avhandlingen utforsker hvordan digitale teknologier legger til rette for endringer i controllerrollen, maktstrukturer og konfigurasjonen av styringsverktøy.

Analysene illustrerer hvordan den utvidede organisasjonskonteksten er viktig i utformingen og bruken av digitale teknologier og styringsverktøy. I den første artikkelen viser jeg hvordan digitale teknologier kan bidra til endringer i rollene og ansvarsområdet til controllere. Analysene i den andre artikkelen illustrerer hvordan digitale teknologier kan legge til rette for sentralisering av makt, og at det er et samspill mellom digitale teknologier og maktstrukturer i organisasjoner. Den tredje artikkelen argumenterer for at kollektive verdier og oppfattelser i en organisasjon former bruken av digitale teknologier og styringsverktøy i deres daglige praksis.

Sammenfattet viser de empiriske analysene at digitale teknologier helt grunnleggende bidrar til endring i hvordan organisasjoner fører oversikt over hendelser. Som en følge av nye oversikter over hendelser, «nye data», muliggjør de digitale teknologiene endringer i virksomhetens styringsverktøy. Dette er endringer som ofte er forventet når en organisasjon velger å digitalisere. Hovedfunn i min avhandling er imidlertid at dette potensialet for endring i styringsverktøy håndteres forskjellig i de to ulike casene jeg har studert. Konklusjonen er dermed at organisatorisk og sosial kontekst påvirker utformingen og bruken av digitale teknologier og styringsverktøy. Den samme digitale løsningen kan ha vidt forskjellige konsekvenser for ledelse, styring og kontroll, avhengig av organisatorisk kontekst.

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This research project would not have been possible without the funding from the Norwegian University of Science and Technology, NTNU Business School. Several individuals have contributed to this research project and deserves acknowledgement.

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All remaining mistakes in this text are mine.

Buvika, December 2021
Roy-Ivar Andreassen

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Papers in the thesis

Paper 1 – Digital technology and changing roles: A management accountant's dream or nightmare?

Paper 2 – Digital technologies and centralisation of power – A case study of decision-making and management control

Paper 3 – Organisational culture and digital technologies: A case study on configurations of management controls

1. Introduction

This thesis addresses how digital technologies contribute to changes in accounting practices and facilitate changes in configurations of management controls. The motivation for addressing the topic stems from previous work experiences where I have observed differences in the use of digital technologies in management control practices in Volkswagen AG, Celesio AG (now McKesson Ltd), and (Royal Dutch) Shell. These large multinational companies operate in different sectors; however, they all used the same enterprise resource planning (ERP) system (SAP) and similar IT software in general. A second observation is that they frequently use the same multinational consultancy firms (e.g. McKinsey and Boston Consulting Group) to assist in the design of their formal management controls, and the same big four audit firms; PwC, EY, KPMG, and Deloitte to validate that the formal management controls adhere to financial regulatory standards. In my positions as manager, analyst, and controller in these companies, I experienced that the use of information from SAP and similar IT systems played dissimilar roles in the organisations' management control. This variation aroused my research curiosity.

The relationship between digital technologies, accounting practices, and management control has attracted the interest of both academics and practitioners for decades (see Appelbaum, Kogan, Vasarhelyi, & Yan, 2017; Bhimani & Willcocks, 2014; Eklund, Tam, & Woodcock, 2018; Markus & Pfeffer, 1983; Rom & Rohde, 2007). Arguments from both parties have described how digital technologies can contribute to changes. The practitioners have claimed that digital technologies can facilitate radical changes in finance functions and management controls (Eklund et al., 2018; McCorkell & Shapiro, 2016), and academics have argued that digital technologies can potentially contribute to changes in management control and the role of accounting (Appelbaum et al., 2017; Bhimani & Willcocks, 2014; Markus & Pfeffer, 1983). Recent conceptual papers have raised concerns that the use of digital technologies may contribute to undermining the social dimensions of management accounting (Quattrone, 2016) or dominate human knowledge in decision-making processes (Arnold & Sutton, 1998; Sutton, Arnold, & Holt, 2018).

Research has expected and found the advances in digital technologies to contribute to changing work organising through the standardisation and automation of tasks (Benders, Batenburg, & van der Blonk, 2006; Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017; McAfee & Brynjolfsson, 2012). However, researchers have taken different scientific perspectives to explain how technologies contribute to organisational and social changes. In the early 1980s, a group of engineering and

sociology researchers presented a perspective on technology that explained it as a phenomenon that does not have law-like implications for and consequences on organisations and society. They argued that technologies are technological systems, where social elements contribute in the construction of these technologies (Bijker, Douglas, Hughes, & Pinch, 1987). According to their perspective, the application of scientific knowledge facilitates the use of materials and material objects in innovative ways. However, the applied use of the scientific knowledge, the definition of technology, is an interplay between social actors, social norms, and the power relationships between them (Bijker et al., 1987; de Sitter, den Hertog, & Dankbaarl, 1997; Trist, 1981).

Later studies refined these explanations of technology as systems of social and material elements (Orlikowski, 1992; Orlikowski & Scott, 2008). Volkoff, Strong, and Elmes (2007) argued that organisations' configuration and use of IT systems reflect their organisational routines and roles. Thus, it is not self-evident that digital technologies will contribute to generalisable causal changes in control practices.

The management accounting literature has predicted digital technologies to contribute to changes in management controls (Möller, Schäffer, & Verbeeten, 2020; Quattrone, 2016). This thesis takes one step back, and addresses the explanations in the management accounting literature on how and why organisations implement management controls from different scientific perspectives (Chua, 1986). Hopwood (1983) argued for addressing the organisational and social elements of accounting, in order to understand accounting and management control as scientific phenomena embedded in a social reality. He argued that it is important to understand the organisational and social context in which accounting exists. Throughout his research, he highlighted that the context in which accounting takes place is an integral part of what accounting *is*. Hopwood (1983) argued that the intertwined relationship between accounting and organisational and social life needs to be addressed when studying accounting phenomena, such as management control. His call for increased awareness on the relationship between *accounting*, *organisations*, and *society* contributed to the founding of the now influential journal *Accounting, Organisations and Society*. Hopwood, and other researchers, have contributed to establishing a critical perspective of accounting in their explanations of accounting as "temporally and contextually located" (Baxter & Chua, 2009, p. 70) phenomena (Baxter & Chua, 2009; Chua, 1986; Hopwood, 1983). This thesis follows the accounting research in this domain as it seeks to engage in the debates on how we

can explain management control as a phenomenon of social, organisational, and technical structures.

In drawing on organisational theories of technologies and the importance of social and organisational context for accounting, this thesis aims to explore and explain how digital technologies can facilitate changes in management controls. To do so, it addresses the following research question: *How do digital technologies influence managers configurations of controls and control practices?*

After the initial interviews with consultants, I singled out the financial service industry as an interesting empirical setting to study the use of digital technologies. The interviewees indicated this industry to be advanced users of digital technologies. Methodologically, the research project took an interpretative epistemological position (Bryman, 2016) and conducted case studies in two Nordic financial service companies, one multinational insurance company and one regional savings bank. I selected these two companies as they had chosen different approaches on how they used technology to serve their customers. One company had directed customers towards online services and large-scale call-centres, while the other had chosen to maintain a regional network of branches to serve their customers. These two case studies resulted in the three papers in this thesis.

The first paper explores and explains how digital technologies contribute to changes in the roles of management accountants in an insurance company. In an empirical case study, it finds that digital technologies can contribute to increased competition over task and knowledge claims between accountants and other professionals. Digital technologies also facilitate centralisation of control and decision-making to management accountants in the higher levels of the organisation, thus leading to divergent changes in the roles of management accountants in the higher and lower levels. The second paper explores and explains how the configuration and use of digital technologies can facilitate changes in power structures. The paper explains how digital technologies facilitate the higher levels of the organisation to access timely and detailed information. They use this information to coerce, manipulate, and dominate the behaviour of the lower levels of the organisation. The third paper explores how collectively shared values and beliefs, conceptualised as organisational culture, contribute to the configuration and use of management control and digital technologies. The paper draws on explanations of management control and technologies as elements of social and technical structures.

This thesis addresses two distinct practices; accounting practices and control practices. The accounting literature has referred to the process of recording events as

the production of accounts (Hopwood, 1973, 1978, 1983); however, researchers have defined the term accounting practices broadly and included what this thesis refers to as control practices (Miller & Hopwood, 1994; Potter, 2005). The use of the term accounting practices in the thesis refers to the practices involved in keeping records of events (accounts), while control practices refer to the control practices that managers resolve to in order to reach the organisational ends. This thesis thus narrowly defines accounting practices to refer to the practices involved in keeping a record of events.

In answering the research question, the thesis analyses digital technologies and management control at two levels. First, at a metalevel, it analyses management control and digital technologies as phenomena that are elements of social and technical structures (Alvesson & Kärreman, 2004; Chua, 1986; Hopwood, 1973, 1983; Orlikowski & Scott, 2008). Second, at a meso-level, it analyses the institutionalisation of social and technical structures in the configuration of management controls (Abernethy & Chua, 1996; Chapman, Cooper, & Miller, 2009; Kraus, Kennergren, & von Unge, 2017), digital technologies (Bailey & Barley, 2020; Orlikowski & Scott, 2008; Volkoff et al., 2007), and accounting practices (Hopper & Macintosh, 1993; Miller & Hopwood, 1994; Potter, 2005).

The remainder of the thesis synopsis is structured as follows: the following section presents a selective review of research literature on accounting practices, management controls, and technology as a social and material phenomenon. The third section presents the scientific perspective, research design, and methods for the thesis. The fourth section provides a brief overview of the Nordic finance sector. The fifth section presents an overview and summary of the papers. The sixth section discusses the papers and the synthesised contribution from the findings. The seventh and final section concludes the thesis.

2. Theoretical background

Research on how management configures controls as a means to reach the organisational ends is arguably one of the most defining topics in management accounting research. The rise of mass manufacturing created large organisations and presented unprecedented challenges in controlling and coordinating machinery and human labour (Babbage, 1832). Early studies in management accounting describe how the industrial revolution in the 19th century and mass manufacturing created large workforces and a need for more detailed control over the resources used to

produce goods (Anthony, 1965; Johnson & Kaplan, 1986). The literature describes how management controls can take on a multitude of forms, such as formalised procedures, budgets, reports, delegation of authority, performance indicators, and organisational narratives (Gerdin, 2020; Malmi & Brown, 2008; Merchant & Van der Stede, 2007).

Against this backdrop – with years of research on how organisations have configured forms of managerial controls to ensure they meet organisational ends – the current section provides a brief and selective review of literature that has addressed digital technologies, management controls, and accounting practices. The aim of this review is consequently to synthesise and present selected insights through an integrative approach (Snyder, 2019) on explanations of digital technologies and management controls from different fields and research traditions.

2.1 Configurations of management controls

Explanations of management control as a system of social and technical elements for managers to control organisations has a long history in accounting research (Burchell, Clubb, Hopwood, Hughes, & Nahapiet, 1980; Hopwood, 1973). Research in management accounting has, unsurprisingly, primarily focused on how managers can use accounts, the records of events, to control organisations (Burchell et al., 1980; Gerdin, 2020; Johnson & Kaplan, 1986).

Through different forms of controls, such as administrative, planning, output and cultural controls, management controls are configured to address organisational problems (Gerdin, 2020). The literature depicts the forms of controls as different, and at the same time complementary (Gerdin, 2020; Guenther, 2013; Malmi & Brown, 2008). Grabner and Moers (2013) argued that it is vital to address the interdependencies between forms of controls to understand, and potentially explain, the configuration of management controls.

Alvesson and Kärreman (2004) provided a comprehensive overview of different perspectives on managerial controls in accounting and organisational research. They problematised the idea of a single form of management control dominating other forms of management controls:

> The whole idea of management accounting, for example, is founded on the belief that management control is possible, important, and, indeed, necessary. Although the literature on organisational and management control suggests a wide array of forms of control, it is common to emphasise a main form of control, either in the

> form of a particular organisational structure or in the form of a specific mode of control dominating. (Alvesson & Kärreman, 2004, p. 423)

They argued that management controls typically account for and evaluate individual and collective actions and presented two forms of controls: technocratic controls as objective controls aimed at directing behavioural aspects, and socio-ideological controls as attempts to construct widely understood interpretations and meanings that are collectively shared among groups. These forms of controls are not alternatives that contradict each other, but rather forms of controls that can interface each other, according to Alvesson and Kärreman (2004).

It should be noted that there exists a wide array of taxonomies on management controls; consequently, several notable literature reviews have mapped out the different taxonomies that the accounting literature has proposed (see Grabner & Moers, 2013; Luft & Shields, 2003; Malmi & Brown, 2008). Malmi and Brown (2008) review of management controls presented five types of controls: cultural, planning, cybernetic, rewards and compensation, and administrative controls. Drawing on Otley (1980) and Chenhall (2003) studies on management controls, the authors problematised how accounting scholars have tended to focus on one individual form of control in studies of management controls. This argument resonates with the quotation from Alvesson and Kärreman (2004), where they argued that the literature is dominated by research focusing on specific forms of controls dominating in organisations. Thus, Bedford and Malmi (2015), in their article on configurations of management controls, restated the argument from Malmi and Brown (2008) that our knowledge of how different forms of control mechanism combine remains underdeveloped in the accounting literature. This thesis seeks to explore and contribute to increasing our understanding of how digital technologies contribute to the continuous configuration and use of management controls.

While claims have been made that we have limited knowledge of how different forms of management controls combine (Bedford & Malmi, 2015; Chenhall, 2003), a number of studies have yielded interesting insights. In their study of a medical non-governmental organization, Kraus et al. (2017) found that the organisation's ideology was reflected in the social controls in the organisation. They further argued that the implementation of new formal technical controls could be explained as enabled by an interplay between the institutionalised social forms of controls and the new formal technical controls. In another study, Abernethy and Chua (1996) found that institutionalised beliefs in new public management, as a social form of control,

contributed to the construction of new forms of technical management controls in public hospitals.

This thesis adopts the perspective of management controls as interdependent technical, organisational, and social forms of control that complement each other. It thus argues that in order to understand the configurations of management controls, it is beneficial to not address how one specific management control can dominate other forms of management controls. It is by addressing the interplay between the technical and social controls that we can interpret and explain different configurations of management controls (Alvesson & Kärreman, 2004; Hopwood, 1983).

2.2 Accounting and control practices in an organisational and social context

In their review of literature on accounting practice, Miller and Hopwood (1994) adapted a broad understanding of accounting practices. In their conceptualisation of accounting practices, they included what this thesis separates into two different phenomena: accounting and control practices. Miller and Hopwood (1994) identified three distinctive descriptions of accounting practice. To explain these distinctive categories, they constructed a taxonomy of descriptions of accounting practices in the literature: *technology*, *rationalisation*, or part of the *economic domain*. First, they found that accounting has frequently been described as a *technology* that intervenes in organisations. Through reconfiguration of organisations into profit centres, cost centres, and performance measures, accounting practices change the organisational reality (Miller & Hopwood, 1994). Second, accounting, by introducing language and meanings, contributes to constructing social and institutional realities. The accounting language and attributed meanings legitimise and *rationalise* accounting as a social and institutional practice. Third, it is from the *economic domain* that accounting calculative practices and knowledge are constituted and reconstituted. Through the invention of economic theories, concepts such as discounted cash flows, cost types, and income statements transform from organisational flows into financial flows through accounting. Consequently, they argue that:

> Accounting can now be seen as a set of practices that affects the type of world we live in, the type of social reality we inhabit, the way in which we understand the choices open to business undertakings and individuals. (Miller & Hopwood, 1994, p. 1)

Potter (2005), in his review of studies on accounting as social and institutional practices, drew on Miller and Hopwood (1994) typology to identify the ways in

which accounting scholars have addressed accounting practices. He argued that explanations of accounting as a set of social practices can enable studies of accounting changes that conventional studies debunk or neglect to address in their search for notions of progress or improvements. In doing so, he problematised what he described as the conventional studies that debunk changes social practices when addressing accounting and control change. A practical shift in who collects information or how they collect, collate, and process this information may occur, but researchers might not address this shift if it does not contribute to changes in their *notion of progress or improvement* (Potter, 2005) of accounting and control.

To alleviate the problem of not addressing practices that do not directly influence control practices, this thesis separates the observed changes into a taxonomy of accounting practices and control practices. This implies that not all accounting practices are a part of control practices. There can be several explanations to why organisations produce accounts, and management control is only one explanation to why organisations keep accounts. Regulatory requirements are another explanation to why accounts are produced and kept. Another reason is that digital systems increasingly require detailed records of events to be accessible to identify causes of errors, software malfunctions, or reduced performance. This thesis thus analyses the accounting practices as a foundation for control practices.

This thesis upholds that the changes in accounting practices in information collection, collation, and processing are of interest to accounting researchers in explaining the continuous configuration of management controls as a social practice (Hopwood, 1987). Even if changes in accounting practices do not contribute to changes in the control practices – which have been labelled notions of accounting progress, improvement or performativity measures (Potter, 2005) – this thesis remains open to the notion that changes in social and organisational contexts contribute to the continuous configuration of organisational roles, power structures, and collectively shared values and beliefs. Specifically, the thesis discusses how we can analyse organisational roles, power structures, and formal management controls as elements of social and organisational structures. Furthermore, it argues that what can appear as subtle changes in accounting practices can facilitate changes in interdependent forms of management controls.

2.3 The design and configuration of digital technologies

Interdisciplinary studies involving researchers from social studies and engineering have addressed technology and organisational life for decades (Bijker et al., 1987; de Sitter et al., 1997; Trist & Bamforth, 1951). Bijker et al. (1987) argued that

technology can be explained as constructed systems of material technologies and social elements. They theorised that social relations, agency, and power have contributed to influencing the design of technological systems and solutions. To support their arguments, they drew attention to a number of technologies and technological systems, such as personal transportation, and argued that social norms and actors can explain the construction of technology.

This perspective on technology as a phenomenon that consists of both a social and material dimension has had profound influences on the more recent development and refinement of organisational literature on technology. Orlikowski (1992) found and explained how social elements form a recurring relationship with digital technologies in organisations. She argued that the design and use of technology contributed to organisational changes. These organisational changes in turn contribute to changes in the design and use of technologies in organisations. The research in this domain has contributed to theories of sociomaterialty (Orlikowski & Scott, 2008), that is, theories that explain technology as having both social and material properties. The literature has identified digital information systems in particular as a technology that possesses both material properties and carries social meaning in the context of the institutions where it is applied to process information (Orlikowski, 1992; Orlikowski & Scott, 2008). Orlikowski and Scott (2008) argued that the intertwined relationship between the material and social elements makes it challenging to separate the technology and social dimensions when researching the design and use of digital technology in organisations.

Recent studies have continued to refine these ideas and explicitly stated that organisational elements are embedded in organisations' configuration and practical use of technology (Bailey & Barley, 2020; Volkoff et al., 2007). Volkoff et al. (2007) argued that organisational roles and routines contribute to shaping both how organisations configure IT systems and how these systems influence organisational practices. These recent studies have argued that technologies can facilitate organisational changes (Bailey & Barley, 2020). Some of these changes may be generalisable and without variance across organisations. However, the organisational context represents a socially constructed variance that influences how the organisations configure and use the technologies (Bailey & Barley, 2020; Volkoff et al., 2007). This critical perspective on technologies – as phenomena both socially constructed and contextual, while also having mechanical causal implications (see Bailey & Barley, 2020; Orlikowski, 1992; Orlikowski & Scott, 2008; Trist, 1981; Volkoff et al., 2007) – differs from the explanations of technologies as phenomena that are

either causal and external to the social, or social constructions (Bijker et al., 1987). Accounting studies, such as Appelbaum et al. (2017), Rom and Rohde (2007), and Al-Htaybat and von Alberti-Alhtaybat (2017), are examples of studies that explain technologies as having causal impact on accounting rather than explaining technologies as a elements of social accounting practices. The accounting literature has frequently depicted digital technology as a flat ontological phenomenon (Knudsen, 2020; Power, Brown, & Child, 1996; Rom & Rohde, 2007), a phenomenon not an element of or consisting of other phenomena. The organisational technological studies, however, describe digital technology as a multilayered phenomenon, as they explain technology as an element of at least a social and a material dimension (Orlikowski & Scott, 2008). The descriptions of technologies as multilayered phenomena – as opposed to flat, one-dimensional phenomena – facilitate interpretations that can help explain opposing or conjoining structures in different dimensions that influence the design and use of technology (Volkoff et al., 2007). Explicitly, this implies that digital technologies may have up to three dimensions, or levels, of explanations: first, the empirical level, which explains the observed use of technologies within their domain. Second, the meso-level explains the configuration and use of technologies within their contextual setting. Third, the metalevel allows discussion of the Weberian ideal types of the technological phenomena. The studies of Orlikowski and Volkoff followed in this research tradition, as they discussed how the different dimensions of technologies can explain their configuration, use, and certain elements that appear common (ideals) to the studied phenomena.

Within the accounting domain, reviews have found that recent studies have focused on how digital technologies impact accounting (Knudsen, 2020). In his systematic literature review, Knudsen (2020, p. 6) found that, "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 result that is consistent with the earlier review of literature from Rom and Rohde (2007). These reviews indicated that the accounting literature has, in large parts, focused on explaining digital technology as a phenomenon that is separate from the phenomena of work processes in accounting. The recent studies in the accounting domain have focused on the causal mechanisms that digital technologies as an externality contribute to in accounting tasks, and have paid less attention to explaining digital technologies as elements of a social context where accounting takes place. Few accounting scholars have addressed how digital technologies are dynamic (Prasad & Green, 2015) and contextual (Möller et al., 2020) phenomena. According to recent articles (Knudsen, 2020; Möller et al., 2020; Prasad & Green, 2015), there is a demand for accounting

studies exploring and explaining why and how variance in organisational and institutional structures facilitates the configuration and use of digital technologies in organisations' management controls

Earlier accounting studies on digital technologies touched upon how organisational context and social elements contribute to shaping the design and use of digital technologies in management controls (Dechow & Mouritsen, 2005; Lukka, 2007; Markus & Pfeffer, 1983). However, as noted by organisational researchers (Bailey & Barley, 2020), several of these earlier studies focused on providing ethnographic details that explain the organisational and institutional variance in the specific cases. According to the calls for more research (Möller et al., 2020; Prasad & Green, 2015), interpreting digital technologies as phenomena that are contextual and that contribute to contextual change or structural changes remains a rare perspective in the accounting domain, with some exceptions (see Caglio, 2003).

The variance in organisational context and social elements can explain the configuration and use of digital technology in specific cases (Bijker et al., 1987; Dechow & Mouritsen, 2005; Orlikowski, 1992). However, digital technologies contribute to changes that are argued to be regular in organisations and institutions (Bailey & Barley, 2020; Volkoff et al., 2007). Interpretive accounting studies addressing digital technologies less explicitly address the interaction between the varied social and organisational contexts and the regularity of changes from digital technologies, which can be interpreted as structures or mechanisms. Explicitly stated, the explanations of digital technologies in accounting has, according to the literature reviews and calls for research, to a limited extent sought to address the meso- and ideal dimensions of technologies. The explanations of why technologies are configured the way they are in their contextual setting and explanations of which common elements that contribute to the use and configuration of technologies are missing in the contemporary accounting literature – at least the reviews (Knudsen, 2020; Rom & Rohde, 2007) and calls for research (Möller et al., 2020; Prasad & Green, 2015) – indicate that this appears to be the case.

This thesis is inspired by the organisational research on technology in its enquiry into how digital technologies contribute to changes in accounting practices and the configuration and use of management controls. The thesis argues that existing roles, routines, and collectively shared beliefs and values in organisations influence how digital technologies contribute to changes in accounting practices and the configuration and use of management controls. It thus aims to expand our

knowledge and interpretation of how digital technologies can contribute to changes in management controls.

3. Scientific perspective, research design, and methods

Management accounting is a research discipline deeply linked to practice (Hopper & Macintosh, 1993; Humphrey & Scapens, 1996; Malmi & Granlund, 2009), and management accounting researchers have utilised a range of scientific methodologies and perspectives to provide explanations of the phenomena they study (Chua, 1986; Luft & Shields, 2003; Malmi & Granlund, 2009). Descriptions of accounting as a phenomenon comprised of technical, institutional, and social practices (Hopwood, 1983, 1994; Miller & Hopwood, 1994; Miller & O'Leary, 2002) closely relate to a critical realist perspective (Archer, Bhaskar, Collier, Lawson, & Norrie, 2013; Bhaskar, 1978) on accounting (Bisman, 2010; Chua, 1986) and what accounting *is* (Hopwood, 1983).

While there several understandings of critical realism, Reed (2005, p. 1631) provides a formulation that resonates with the perspective in this thesis, stating that critical realism,

> aims at discovering the underlying structures or mechanisms that produce tendencies or regularities under certain conditions through a process of model building, testing and evaluation in which complex and time-consuming procedures are required to unearth them. This leads to a view of scientific explanation as entailing the identification of underlying and unobservable structures or mechanisms acting in particular social situations and contexts so as to generate observable tendencies or regularities and their effects (Pawson and Tilley, 1997). Reed (2005, p. 1631)

This is contrary to a purely social constructivist perspective where reality and structures only exist as a product of social actions. Studies of digital technologies in organisations have criticised the social constructive perspective for underestimating the influence structures and material objects have on organising and social process (Bailey & Barley, 2020; Orlikowski & Scott, 2008; Volkoff et al., 2007). Critics have argued that implementing technologies in organisations contributes to facilitating changes that appear to be regular and related to changes in structures in the organisational and social contexts (Bailey & Barley, 2020; Orlikowski & Scott, 2008; Volkoff et al., 2007).

At the same time, positivistic perspectives, explaining technologies as forming law-like constant conjunctions on organisations' processes and routines, are criticised

for underestimating the human agency involved in organisational change processes (Bailey & Barley, 2020; Orlikowski & Scott, 2008; Volkoff et al., 2007). The argument against technologies having constant law-like effects resonates with the mixed results from accounting studies that have tried to identify the law-like effects of implementing digital technologies in accounting and management control practices (Al-Htaybat & von Alberti-Alhtaybat, 2017; Granlund & Malmi, 2002). Additionally, accounting studies have found digital technologies to be contingent on organisational and social context (Järvenpää, 2007; Vaivio, 2004).

In organisational and management studies, a critical realist scientific perspective has contributed to a number of studies on the role of corporate agency in constructing and reproducing structural mechanisms (Reed, 2005). Reed argued that:

> It is here that the underlying dynamics of the power and control struggles that shape and reshape the structure of social positions and the differentially distributed pattern of material interests and social rewards that it reproduces are most clearly articulated and most keenly contested. It is this intermediate level of analysis, located between large-scale social processes and structures and smaller-scale, micro-level situations and encounters, that provides the explanatory focus for critical realist-inspired research. (Reed, 2005, p. 1635)

In the accounting literature, studies of systems of controls and power relationships (Abernethy & Chua, 1996; Kraus et al., 2017; Kraus & Strömsten, 2016) in particular have used a critical realist perspective to analyse organisational and social structures as explanations of configurations of management controls and power relationships. This thesis follows a critical realist perspective on accounting (Chua, 1986) and digital technologies (Volkoff et al., 2007) as phenomena, consisting of structures and mechanisms, that under particular situations and contexts generates observable, regular tendencies (Archer et al., 2013; Reed, 2005). Figure 1 illustrates the structures and mechanisms that the thesis studies.

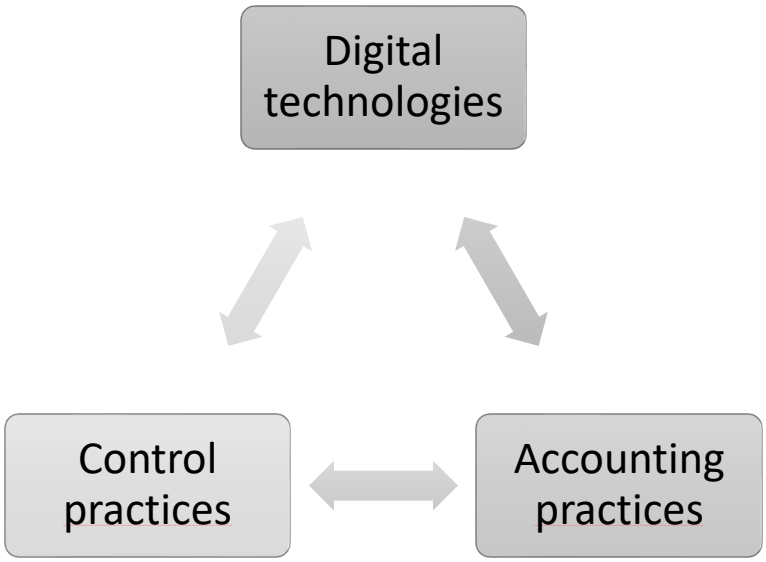

Figure 1: Studied structures and mechanisms

In order to understand how digital technologies contribute to configuring distinctive management controls, the thesis argues that the increasing volume, details, and frequency of records of events that digital technologies facilitate exist with low variance between the two case organisations. However, in order to understand how the digital technologies contribute to changes in the configuration of management controls, the thesis directs attention to, and analyses, the variance in organisational and social structures to provide an explanation of the divergent configurations of management controls.

3.1 An abductive approach and institutional theory

The research project has followed an abductive approach (Abbott, 2004; Swedberg, 2014), as it has searched for the most likely explanations for observations in the empirical data. The project was at the outset explorative in that it set out to explore if and how contemporary digital technologies relate to management controls. It started by exploring how literature reviews in accounting have explained digital technologies and management controls (Malmi & Brown, 2008; Rom & Rohde, 2007) and addressing how the literature has explained the relationship between digital technologies and management controls (Hopwood, 1978; Markus & Pfeffer, 1983). Following the review of literature, empirical data collection began. Through an iterative process (Ahrens & Chapman, 2006), the empirical data were analysed against existing theories that addressed the observed phenomena. At the end of the project, it is the theories on social roles (Abbott, 1988; Biddle, 1986), power structures

(Fleming & Spicer, 2014; Lukes, 2005), configurations of controls (Hopwood, 1973; Malmi & Brown, 2008) and technological embeddedness (Bailey & Barley, 2020; Volkoff et al., 2007) that have contributed to refining the questions that the articles seek to answer.

To explain how digital technologies can influence roles, power, values, and beliefs, the thesis draws on institutional theories. Specifically, it draws on explanations focusing on the inner workings of organisations and how they can explain the configurations and use of management controls (Dent, 1991; Miller & Hopwood, 1994). It is precisely this inner work of organisations' roles, power, and collectively shared beliefs that this thesis aims to address. Explaining management control through the inner workings of organisations is consistent with accounting literature on how management controls are phenomena that exist in an organisational and social context (Chua, 1986; Hopwood, 1983; Kraus et al., 2017).

To explain the design and use of digital technologies, the thesis draws on interpretations of technology as contingent on both the material technology and the social and organisational context of organisations (Orlikowski, 2010). While the accounting literature has described organisational and social context as institutionalised routines and processes, the technology-oriented organisational literature has focused on different configurations of organisations and society as contingency factors that facilitate the design and use of technology within organisations (Bailey & Barley, 2020; Orlikowski, 2010; Volkoff et al., 2007). It should be added that research frequently associates contingency theories in accounting with positivistic and functionalistic ontological perspectives (Gerdin & Greve, 2004), while organisational studies more frequently associate contingency theories with constructivist and critical realist ontological perspectives (Orlikowski, 2010). Contingency theory per se is merely an epistemological position that facilitates a methodological choice to explain the studied phenomena, independent of the ontological perspective of the study (Benton & Craib, 2011; Bryman, 2016; Frankfort-Nachmias & Nachmias, 1996). As this is an empirically driven thesis, it does not further address the ontological and epistemological underpinnings of explanations of phenomena in the accounting literature.

This thesis sees these two different methodological (epistemological) positions as consistent and compatible perspectives (Luft & Shields, 2003) that can facilitate analysis of the relationship between digital technologies and management controls. In the technology-oriented organisational literature, the contingency factors are

consequently what can be described as "soft" factors in the accounting literature (Gerdin & Greve, 2004).

3.2 Interpretive research and accounting

A scientific perspective of critical realism falls under the umbrella of what is described as interpretive research (Benton & Craib, 2011; Delanty & Strydom, 2003). Accounting scholars have debated the role of qualitative (Ahrens & Chapman, 2006) and interpretive accounting research (Armstrong, 2008; de Loo & Lowe, 2017; Parker, 2008) for decades. Parker (2008, p. 909) argued that there is, "a desire for a shared intellectual agenda that would permit clearer articulation of the achievements of interpretive research".

Accounting is frequently argued to be part of the overarching economic research domain, a domain which researchers argue is dominated by quantitative and positivistic-inspired studies (see Ahrens & Chapman, 2006; Parker, 2008). Accounting researchers have historically gained legitimacy by drawing on the positivistic theories from the economic domain (Miller, Hopper, & Laughlin, 1991; Power et al., 1996), theories that explain phenomena such as agency and control (Miller & Hopwood, 1994) as forming causal and stable relationships. These theories depict human agency as an element that can be modelled and expected to follow in law-like relationships within organisations (Williamson, 1989).

However, accounting scholars have also gathered inspiration from other social sciences, such as anthropology and sociology, and drawn on ideas of social structures as explanations of organisational and institutional behaviour. Geertz (1973) and Foucault (1977) are scholars that have particularly influenced researchers within the accounting domain.

Geertz (1973) ideals of providing thick descriptions that enable researchers to interpret and gain an understanding of social structures and mechanisms have influenced a number of researchers in the interpretive stream of accounting research (cf. Ahrens & Chapman, 2006; Hopwood, 1983; Miller et al., 1991). Geertz (1973) used the thick descriptions to describe the social structures and role of rituals in Balinese and Javanese culture. He argued that, "The meanings that symbols, the material vehicles of thought, embody are often elusive, vague, fluctuating, and convoluted, but they are, in principle, as capable of being discovered through systematic empirical investigation" (Geertz, 1973, p. 362).

The papers in this thesis have, by drawing on interpretive research, sought to discover and explain how symbols and symbolic acts can be understood as elements

of technical and social structures. It thus follows in in traditions of interpretive accounting research on roles (Caglio, 2003), power (Abernethy & Vagnoni, 2004; Markus & Pfeffer, 1983), and the relationship between culture and management control (Alvesson & Kärreman, 2004; Kraus et al., 2017).

The role of scientific theories in accounting remains a debated area according to Lukka and Vinnari (2014). To resolve different functional and purposeful roles theories play in in management accounting literature, they proposed a dichotomy for theories, splitting theories into taxonomies of either domain or method theory:

> A domain theory refers to a particular set of knowledge on a substantive topic area situated in a field or domain such as management accounting, while a method theory can be defined as a meta-level conceptual system for studying the substantive issue(s) of the domain theory at hand. (Lukka & Vinnari, 2014, p. 1309)

However, the distinctions between domain theory and method theory can appear ambiguous. Lukka and Vinnari (2014) argue that, "That which is perceived to have the role of method theory in one field is normally in the role of domain theory in another field" (p. 1312). How organisations control employees and resources in production is a topic that several fields and domains study. Consequently, organisational theories – such as Adler and Borys (1996) explanation of how bureaucracy can be both coercive and enabling for work organising – can end up in a undefined, limbo state between domain and method theory in the accounting literature. The argument this thesis makes is that the distinction between method and domain theories is, to some extent, dependent on the perspective of the researcher, according to the arguments made by Lukka and Vinnari (2014).

This thesis draws on a number of metalevel conceptual systems from other research domains. The first paper uses the domain theories from sociology of what is labelled social role theory (Biddle, 1986) as a metalevel conceptual tool to analyse the changes in roles of management accountants. The theory explains roles as a phenomenon that is influenced by the expectations of behaviour in societies. Thus, as societies change, the expectations of behaviour and consequently the roles of groups and individuals change also. Specifically, the paper draws on the concepts of competition over professional jurisdiction in work place settings (Abbott, 1988) to explain how digital technologies contribute to changes in the roles of management accountants. Consequently, the first paper applies role theory from the domain of sociology, in the functional perspective of Lukka and Vinnari (2014), as a method theory. The second paper uses a conceptual explanation of power from the domain of organisational studies to explain how digital technologies contribute to changes in

management control and decision-making. The conceptualisation of power as a multilayered phenomenon facilitates refined explorations and explanations of how digital technologies can contribute to changes in the power to coerce, manipulate, dominate, and subjectify the behaviour of members of organisations. The third paper draws on explanations of management controls and technologies as phenomena embedded with organisational roles and procedures, and it studies how culture and digital technologies contribute to the configuration of management controls. The paper draws on explanations of digital technologies as intertwined with social and organisational contexts, while it also draws on explanations of management controls as embedded in contexts of social and organisational culture.

All of the above concepts and theories share some underlying conceptual ideas and scientific perspectives (Delanty & Strydom, 2003; Swedberg, 2014). This can be described as a second layer of meta-conceptual systems. First, literature has argued that roles, power, values and beliefs, and embeddedness are phenomena that are institutionalised in organisations (Abbott, 1988, 2004; Alvesson, 2012; Lukes, 2005; Volkoff et al., 2007). Consequently, explanation of these phenomena must include studying the institutions and how they institutionalise such phenomena. The studies thus share the concept that institutional routines and procedures are used to explain the theories at hand. Institutional theory (Meyer & Rowan, 1977) is thus one inherent element in these theories. Second, the thesis argues that digital technologies facilitate and enable changes in organisations structures under specific contingencies. Neither the sociological nor organisational domains depict roles, power, values, and beliefs as phenomena that are non-contingent on social or organisational contexts. Their relevant research domains explain the changes in roles (Abbott, 1988) and power (Fleming & Spicer, 2014; Lukes, 2005) or from technology (Orlikowski, 2010; Volkoff et al., 2007) as contingent on social and organisational structures or mechanisms.

This thesis argues that there are at least two dimensions of method theory that are relevant to discussion in this project. The first is the institutional theory that explains various phenomena through institutionalised routines and procedures. The institutional theory is a meta-theory that is applied across disciplines in the human sciences to describe human behaviour, in domains ranging from sociology and anthropology to organisational and accounting research. This is a theory that in this setting conforms to what Foucault (2002) describes as a fundamental model. The second dimension relates to the part that the theories of roles, power, and technologies and management controls play in this thesis, that is, they contribute to specific domain knowledge (episteme) within the accounting domain. It is these

secondary models that are theories that move into the deciphering of empiricism and the domain analysis according to Foucault (2002). They thus facilitate the analysis of the accounting phenomena studied, and potential explanations to the phenomena. These two dimensions of theories facilitate the analysis and explanations of the phenomena, including the social and organisational behaviour discussed in this thesis.

This thesis is inspired by the definitions of theory in the organisational and sociological domain, which refers to theory as something that provides a form of explanation for a phenomenon (Abbott, 2004; Alvesson & Spicer, 2019). It draws on conceptual models from these domains to explore and explain how institutional behaviour contributes to shaping the design and use of digital technologies and management controls.

3.3 Sampling and data collection

To find relevant organisations and subjects, the research project started very broadly. At the outset, I interviewed partners; senior consultants from PWC, Accenture, and a national consultancy; two senior directors of Microsoft and Google in Europe; two CFOs in two large Nordic corporations; and a country manager of a bank. I also interviewed the finance manager of a large Norwegian university to gather input from the public sector. These interviews facilitated a refinement of the phenomena under investigation and contributed to increasing my understanding of how the consultants, technology companies, and CFOs view the relationship between digital technologies and management control. The interviews provided several examples of how organisations used digital technologies for operational controls in maintenance planning and scheduling, and indicated that the use of digital technologies varied between industries. Following the initial review of literature, public consultancy reports, and the initial interviews, I established a systematic approach to collect data.

One of the industries that the interviewees indicated as an advanced user of digital technologies was the financial service industry. Consequently, the research project purposefully sampled organisations (Bryman, 2016) in the finance industry for the case studies. The first case-study company was an insurance company, described in paper 1 and paper 2. This was followed by a case study in a regional bank, presented in paper 3. Case studies provide an opportunity to gain an understanding of how and which meanings individuals attribute to routines, processes, and routines that they are part of (Yin, 2009). In both the two case organisations, a broad sample of managers and management accountants

contributed. They included the CFO and two other members of the executive management team in both organisations, and the heads of the management accountants, in addition to management accountants at the group level and the local level of both case organisations. This cross-sectional sample facilitated an in-depth understanding of how different levels and roles in the organisations experienced the digital technologies and configurations and use of the management controls. Table 1 provides an overview of the interviews conducted:

Type of interview	Role	Number of interviews	Number of interviewees	Number of minutes
Expert	Partners/Senior Consultants	3	5	175
Expert	Country/Domain Director in global tech. company	2	2	72
Expert	CFO	2	2	62
Expert	Finance Manager Public Sector	1	1	47
Expert	Country Manager	1	1	54
Case	CEO	1	1	37
Case	CFO	2	2	115
Case	Other Executive Directors/Managers	3	3	173
Case	Head of Management Accounting	3	2	165
Case	Directors and Managers outside of the finance function	12	12	710
Case	Management Accountants	13	12	706
	Sum	43	43	2316

Table 1: Overview of interviews

I conducted document studies of the annual reports for the last seven years for the case companies and for a selection of finance service companies in the Nordic countries. The empirical data predominantly stemmed from semi-structured interviews from the case study of the two case companies, InsuranceCo and BankCo. The data have been gather to yield descriptions of social practices in thick descriptions (Geertz, 1973). In addition to the interviews, participation at a workshop, informal conversations, and time spent in the offices of the case companies yielded insight into the case companies' and the informants' empirical setting.

The project has adhered to the national standards on data collection and storage, and principles of informed consent as defined by the Norwegian centre for research data.[1] I informed the interviewees of their participation in a research project, and they consented to participate in the research project. As the papers address topics such as power and management controls, the interviewees have received detailed information in both written and oral form on their ability to withdraw their participation in the research project or retract their statements. In addition, they have received general information about the research project. There have been few practical concerns about ethical problems when collecting the empirical data. The data have been anonymised as far as possible without losing important nuances. I sent one sensitive quotation to its source to confirm the interpretation and inform the respondent that I intended to published it. Following the communication, I adjusted the quotation according to the respondent's wishes and requirement of anonymity.

The research design in this thesis can be described as explorative, as it combines the study of an emergent topic with purposefully selected case studies (Abbott, 2004; Bryman, 2016; Swedberg, 2014) in the digitally advanced financial sector. The topics of big data, machine learning, and integrated information systems are in their infancy within the area of accounting research.

Conducting further case studies could have potentially contributed to even more refined and granular explanations; however, this would have required significantly more time and access to additional organisations, and was therefore unfeasible for this research project.

3.4 Validity and reliability in interpretive research

Scientific validity refers to whether data accurately correspond to the objects of study (Bryman, 2016; Chalmers, 1999; Frankfort-Nachmias & Nachmias, 1996). Thick empirical descriptions can provide researchers a tool to justify that their interpretation of quantitative data adheres to scientific requirements for validity and reliability (Bryman, 2016; Geertz, 1973) and facilitates theorisation (Swedberg, 2014). In the accounting literature, there are ample examples of interpretive accounting research providing thick descriptions (see Ahrens & Chapman, 2004; Dent, 1991; Parker, 2008) that contribute to justifying the narrative of scientific texts. Thick descriptions provide rich and detailed descriptions of ethnographic data, data that can be used to advocate for the trustworthiness and accuracy of the data (Bryman,

[1] Norwegian Centre for Research Data | NSD

2016; Lukka & Modell, 2010). By generating narratives that appear authentic and plausible, researchers can obtain literary convincingness (Baxter & Chua, 2008) and claim scientific validity (Lukka & Modell, 2010). Hammersley (1992) argued that it is on the basis of the adequacy of evidence offered that we must validate the claims about truth in ethnographic studies. If we find that the evidence accurately represents those features of the phenomena that it intends to describe, explain, or theorise, we can argue that the evidence is valid (Bryman, 2016; Hammersley, 1992). Other researchers have used labels such as transferability, trustworthiness, credibility, and consistency (Bryman, 2016; Parker, 2012) to describe how evaluations of explanations of quantitative data can be argued scientifically valid.

3.4.1 Research quality in the thesis work

The thick descriptions in this thesis provide ethnographic data from case studies that aim to provide authentic and plausible interpretations. The focus on a specific sector, the financial service sector, has yielded an understanding of the language and terms used by the interviewees and in the written material of organisations in the industry. This aim of this focus has been to obtain an emic and authentic understanding of the topics that the interviewees describe. Additionally, the use of existing theories and literature has sought to illuminate the plausibility of the interpretations of the ethnographical data. These thick descriptions and the overview of interviews act as a database (Bryman, 2016) of interpretations that enables other researchers to judge the accuracy and authenticity of the interpretations.

To ensure the trustworthiness of the interpretations, I have conducted two case studies in the financial service industry. Additionally, I conducted two rounds of interviews in the final case study. The first round of interviews was conducted by research assistants, and the second, final round was conducted by myself.

In an iterative process of evaluating theoretical explanations for the phenomena observed, I have drawn on existing established theories to explain the phenomena studied. The institutional (Greenwood, Oliver, Lawrence, & Meyer, 2017; Meyer & Rowan, 1977; Potter, 2005) and contingent explanations (Gerdin & Greve, 2004; Orlikowski, 2010) to organisational behaviour have provided a framework for the interpretations and explanations of the studied phenomena. Drawing on existing theories of how roles (Abbott, 1988; Biddle, 1986), power (Fleming & Spicer, 2014; Lukes, 2005), and culture (Alvesson, 2012; Schein, 2004) influence organisational behaviour has aimed to provide trustworthy explanations of the studied phenomena.

3.5 Analysis of the data

To analyse the interview data, all interviews have been transcribed. The transcribed interviews and corresponding audio files have been analysed using NVivo, a computer software program for qualitative research. Each transcribed interview has been read and coded in NVivo, and the texts marked with both empirical and theoretical codes. A single line from an interview can thus have several codes. As an illustration, a sentence can have one code on the empirical topic of information in the Datawarehouse, another code for the use of the Datawarehouse, and a theoretical code for new controls facilitated by digital technology. The NVivo software then enabled me to find sections of interviews discussing these topics, read the transcribed text, and listen to the corresponding recording.

The annual reports have also been analysed in NVivo; however, in this case, the use of the software has played a different role. NVivo enabled an analysis and automatic coding of keywords, such as digital, online, web, and digitalisation, in the annual reports of the financial services companies' PDF annual reports. The annual reports were analysed for content related to digital technologies. The analysis found and confirmed the indications from the initial interviews, as it showed that the frequency of references to digital technologies and online banking services had steadily increased for all companies. In particular, the large multinational Nordic finance companies had steadily increased the use of words related to digital technologies in their annual reports. For the smaller banks, the use of words related to digital technologies was less obvious, which represented a significant difference to larger multinational companies.

4. The Nordic finance sector and case descriptions

4.1 The Nordic finance sector

In the Nordic countries, the first banks and insurance companies started as cooperative organisations by members of communities, operating within specified geographical areas to provide services to the members of their communities. The banks provided society with an efficient and effective exchange of goods and services (Viktor, 2015), while the insurance companies provided efficient and effective distribution of risk against financial distress from contingent events (Schneiberg, 2002).

Historically, the local savings banks and mutual insurance companies in the Nordic countries were not established as profit-maximising organisations but as tools

for society to increase capital efficiency and effectivity. The banking and insurance companies consequently distributed the financial surplus from their activities to the benefit of society. This distribution of parts of the profit to the benefit of society is still a requirement for banks regulated as savings banks in all the Nordic countries.

In order to be profitable, the banks and finance organisations offer their products through different sales channels to the customers. The products that the financial service industry offer to customers are largely generic. The difference in quality between banking or insurance services is largely negligible to consumers. Consequently, companies in the financial service industry have competed on prices by reducing the cost of providing their services, leading to fierce competition among the companies to reduce costs through gains in efficiency. However, two key elements in providing profitable financial service products lie in assessing the risk behaviour of customers and their willingness to pay. The financial service organisations can use different methodological choices to asses these two elements, as this thesis illustrates.

In their pursuit of efficiency gains banks and insurance companies were early adapters of digital information systems in the early 1970s. The early digital information systems facilitated a reduction in manual processes of journal entries and replaced them with automated entries. The use of digital IS thus contributed to increase operational efficiency and reduce manual labour in the financial service companies. In the Nordic countries, the use of cheques peaked in the 1980s and quickly declined as the banks promoted the use of debit cards. Through joint ventures between all banks in their respective countries, the banks in Norway, Denmark, and Sweden created early digital infrastructure in BankAxept, Dankort, and Swish, respectively. This contributed to the widespread use of cards and other digital payment solutions in the Nordic countries (Bose & Mellado, 2018).

4.2 Case descriptions

To study the research question, I conducted two case studies within two Nordic financial service organisations, one large multinational company in the insurance industry and one regional savings bank. They thus represent two companies that, according to initial interviews, are advanced users of digital technology. Furthermore, they represent different groups of organisations from the document study, where large multinational organisations and regional organisations place different emphasis on digital technologies in their annual reports.

I conducted the first case study in an insurance company, given the pseudonym InsuranceCo. InsuranceCo has more than 3,000 direct employees, in addition to a number of agents that offer and sells its products. The company operates in all the Nordic countries and in the Baltic countries. The company was formed as a mutual insurance company more than 200 years ago, and employs several specialised and highly educated statisticians, mathematicians, physicians, and other numeric specialists. The statistical foundation and belief in predictive statistical models in the industry and the company is influential in its configuration and use of digital technologies. Figure 2 shows the company's organisational hierarchy.

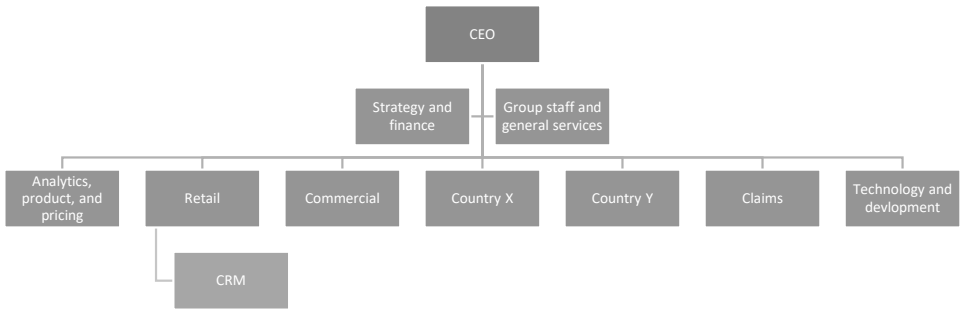

Figure 2: InsuranceCo organisational chart

I conducted the second case study in a regional savings bank in one of the Nordic countries, which was given the pseudonym BankCo. The bank has reduced the number of employees in its banking operation from more than 1,100 to around 600 over the last decades. According to the case study, digital technologies have

facilitated the reduction of employees. However, BankCo has not significantly reduced the number of bank branches it operates in the region, and the number of customers, revenue, and profits of the bank have increased over the last decades. The commitment to participate in and contribute to the development of villages, townships, and cities in the region is stated in the statutes from the bank's foundation in the early 19th century. This commitment to the region is emphasised by executive managers in the bank and found to be reflected in the collectively shared values and beliefs in the organisation. Figure 3 shows the hierarchy of the bank's operations.

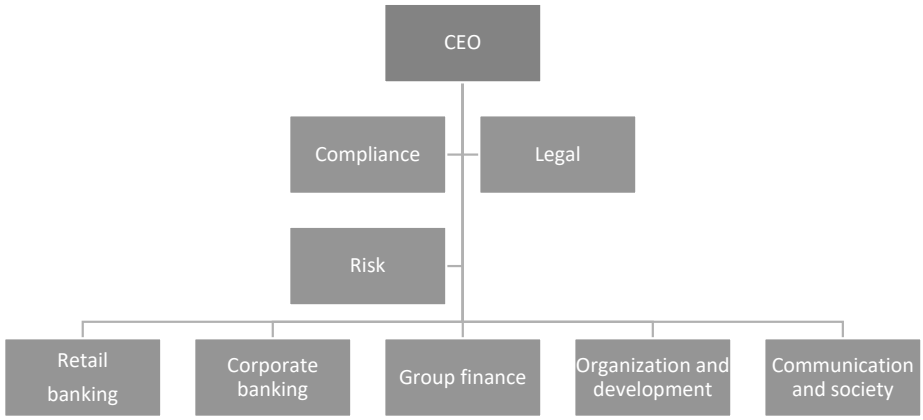

Figure 3: BankCo organisational chart

During the case studies, 14 interviews were conducted in InsuranceCo, and 20 in BankCo. Alongside the interviews were lunches and some informal time spent at a regional office and the head office in InsuranceCo. In the case study of BankCo I attended a joint workshop between BankCo, another regional bank, and the Norwegian University for Science and Technology.

5. Presentation of the papers

Before presenting the papers in detail, Table 2 provides an overview of the papers' research questions and findings.

Title	Research question	Data	Main findings
Digital technology and changing roles: A management accountant's dream or nightmare?	How do digital technologies contribute to changes in the roles and jurisdiction of management accountants?	Case study of InsuranceCo (14 interviews)	Through specialisation and changes in accounting practices, digital technologies contribute to changes in the roles and identity of management accountants. The changes in roles are divergent between the decentralised and local management accountants versus the management accountants higher in the organisational hierarchy.
Digital technologies and centralisation of power – A case study of decision-making and management control	How can digital technologies facilitate changes in power structures for decision-making and control within organisations?	Case study of InsuranceCo (14 interviews)	Access to data can facilitate the power to centrally coerce, manipulate, and dominate lower levels of the organisation. Furthermore, a shared belief in business analytics can moderate potential conflicts and tensions in the centralisation of power.
Organisational culture and digital technologies: A case study on configurations of management controls	How does organisational culture contribute to the configuration of digital technologies and formal management controls?	Case study of BankCo (20 Interviews)	The configuration of management controls is embedded with organisational culture, and the organisational beliefs and values bounds the configuration and use of formal management controls in the case organisation. The configuration and use of digital technologies for management controls is found to reflect organisational culture.

Table 2: Overview of the papers

5.1 Paper 1 – Digital technology and changing roles: A management accountant's dream or nightmare?

To illuminate the interaction between digital technology and the role of management accountants, the paper addresses the following research question: *How do digital technologies contribute to changes in the roles and jurisdiction of management accountants?* The paper builds on the theories of jurisdiction of expert labour groups (Abbott, 1988), identity (Brown, 2019), and social role theory (Biddle, 1986).

The main finding in the analysis presented in the paper is that digital technology contributes to changes in the roles and identities of management accountants heterogeneously as professions compete over tasks and influence the boundaries of management accountant roles. It argues that analysing roles as expected behavioural patterns enables more fine-grained theorising of the relationship between digital technology and management accountant roles.

The paper uses empirical data from a case study in InsuranceCo, a Nordic insurance company operating in the technologically advanced finance sector. The company has several highly educated statisticians, mathematicians, engineers, and management accountants involved in the adaptation of integrated information systems, big data, and machine learning. The high number of PhD holders, and especially the number of statisticians, in the company and the industry differentiate it from other firms and sectors. The statistical knowledge in InsuranceCo appears highly relevant for studying the adaptation of machine learning, which is closely related to statistical knowledge. Machine learning requires statistical knowledge to prepare data, select statistical methods for machine learning models, and interpret the predictive models. These findings reveal competence and belief in statistical and mathematical modelling as accurate depictions of reality among actuaries, statisticians, mathematicians, and other professions as institutionalised in the organising of work in InsuranceCo. Furthermore, the paper argues that the competence claims of these numeric professionals contribute to competition over jurisdiction on the machine learning and data analytical tasks in the company.

The study argues that digital technologies can contribute to changes in jurisdiction and expectations of behaviour for management accountants. Specifically, the access to frequently updated and detailed data from lower levels of the organisation contribute to changes in managers' expectations for management accountants. The findings show that these changes in jurisdiction in the contested domain of numerical modelling combined with changes in expectations of behaviour

facilitate divergent changes in the roles of management accountants in InsuranceCo. The expectations to the management accountants in the lower levels of the organisation become more specialised and narrower, while the expectations for the management accountants at the higher levels of the organisation expand and broaden.

The study nuances previous descriptions of expanding and broadening roles for management accountants (Burns & Baldvinsdottir, 2005; Caglio, 2003; Goretzki & Messner, 2019). Drawing on theories of roles as social structures (Abbott, 1988; Biddle, 1986; Brown, 2019), it illuminates how the interface between digital technologies and jurisdiction, identity and expected behaviour contribute to changes in the roles of management accountants. Focusing on the inner workings of the organisation, the paper directs attention to how organisational elements, such as jurisdiction and institutionalised expectations of behaviour, can contribute to explaining the changing role of management accountants.

5.2 Paper 2 – Digital technologies and centralisation of power – A case study of decision-making and management control

Building on an extended multidimensional conceptualisation of power by Fleming and Spicer (2014), the paper studies the interplay between digital technology and intra-organisational power structures. The theoretical framework facilitates a refined analysis of the relationship between digital technology and power as the paper explores the research question: *How can digital technologies facilitate changes in power structures for decision-making and control within organisations?*

This study finds that digital technologies can facilitate centralisation of management controls and decision-making. Accessing detailed and updated information enables the higher levels of the organisation to use the information to increase their power to coerce, manipulate, and dominate other levels of the organisation.

The empirical data are from the same case-study company as paper 1, InsuranceCo. In addition to the previous descriptions of InsuranceCo, the case study identified digital technologies as contributing to accelerate the centralisation of power in InsuranceCo. InsuranceCo already had social and organisational structures that facilitated centralisation of power; however, digital technologies have facilitated changes that are argued to accelerate the centralisation of control and decision-making.

The original framework by Lukes (2005) conceptualised power in three dimensions: coercive, manipulative, and dominating power, where the latter two refer to the power to set agendas for decision processes and to influence social actors' values and identities. Fleming and Spicer (2014) extended this framework by adding a fourth dimension of power, subjectifying.

The paper argues that the existing institutionalised social and organisational structures in InsuranceCo have facilitated a further centralisation of power to the executive and high-level managers. The paper describes how the access to digital information enables top managers to coerce subordinate managers and employees to follow instructions. Second, it finds that through interaction between Accounting Information Systems (AIS) and a project of creating "one-truth" in the organisation, the top managers limit the range of topics for discussion and the data used in the discussions. They thereby manipulate the subordinate managers' and employees' possibility to express and provide their input. Third, it finds that the organisation has created a collectively shared understanding of data-driven decision-making and control as the most beneficial option for the organisation. The paper describes this collectively shared understanding as institutionalised in InsuranceCo, dominating the other ideas and perspectives on how to control and make decisions in the organisation.

The paper engages in the debate on how AIS can contribute to changes in management controls (Granlund & Mouritsen, 2003; Kallunki, Laitinen, & Silvola, 2011; Scapens & Jazayeri, 2003) by extending the debate on AIS to include changes in decision-making (Dechow & Mouritsen, 2005; Jönsson & Grönlund, 1988; Scapens & Jazayeri, 2003). The study finds that the existing social and organisational structures have facilitated increasing centralisation of power to control and make decisions. Additionally, the study finds that the shared belief in business analytics and data-driven decisions can moderate potential tensions from digital technologies' influence on centralisation.

5.3 Paper 3 – Organisational culture and digital technologies: A case study on configurations of management controls

To explore the relationship between digital technologies and formal management controls, the paper draws on Flamholtz's (1996a) theories of the configuration of management controls as phenomena eclipsed by organisational culture, and Markus and Pfeffer's (1983) conclusions on the importance of aligning information systems and management controls to dominant organisational values and beliefs. Drawing on these theories, the paper analyses how the social values and beliefs are reflected in the configuration of management controls, as it seeks to answer the following research question: *How does organisational culture contribute to the configuration of digital technologies and formal management controls?*

The study finds that management controls, and digital technologies, are embedded with the collectively shared values and beliefs in the case organisation. In their explanations of management controls, the interviewees express that *local autonomy* and *unbureaucratic governance and decision-making* are important beliefs in the organisation. The collectively shared beliefs in these ideas are found to moderate the configuration and use of both formalised management controls and digital technologies.

To explore the relationship between digital technologies and management controls, this paper draws on a case study in BankCo, a regional savings bank in one of the Nordic countries. As a traditional regional savings bank, its ownership structure with politically appointed board members differentiates it from the commercial Nordic and European banks. The statues of BankCo express its organisational aim to contribute positively to its home region, stating that large parts of its profit are to be endowed to institutions that benefit the region.

The study also finds that BankCo's collectively shared beliefs and values, conceptualised as culture, have become institutionalised and incorporated into the configuration of management controls in the organisation. Schein (2004) argued that management research has analysed culture from two divergent perspectives: either as a social phenomenon that exists and influences the belief and values in all social groups, or as a purposefully made management construction. Drawing on Schein (2004) and Alvesson (2012), the paper analyses culture from the perspective that it is a social phenomenon that exists in all social groups. It thus draws attention to how social values and beliefs influence the configuration and use of management controls.

The organisational culture has arguably contributed to the configuration of formal management controls in the organisation (Flamholtz, 1996a). Specifically, the paper argues that the collectively shared belief and values in BankCo as a local unbureaucratic organisation that contributes to the development of its geographical region contribute to the configuration of management controls. Second, the paper argues that the culture has contributed to how BankCo have configured their technological systems (Markus & Pfeffer, 1983; Volkoff et al., 2007). Methodologically, the paper analyses the organisational culture as an element that moderates changes to the configuration and use of management controls. It draws attention to how collectively shared beliefs and values are embedded in in the configuration and use of digital technologies (Volkoff et al., 2007). The study readdresses former theories on the relationship between digital technologies and management controls (Flamholtz, 1996a; Markus & Pfeffer, 1983), as it argues that the social and organisational context (Hopwood, 1983) can contribute to explaining the configuration and use of management controls.

The paper thus nuances the concerns for digital technologies as a phenomenon with law-like consequences that contributes to distance accounting and accountants from the interpretation of accounting information and management control (Quattrone, 2016).

6. Discussion

This thesis aims to explore and contribute to explaining how *digital technologies contribute to distinctive configurations of management controls.* The studies show how digital technologies facilitate changes in the roles of management accountants and in power structures, and that collectively shared beliefs and values can moderate the configuration of digital technologies and management controls. Figure 4 illustrates these changes that digital technologies facilitate.

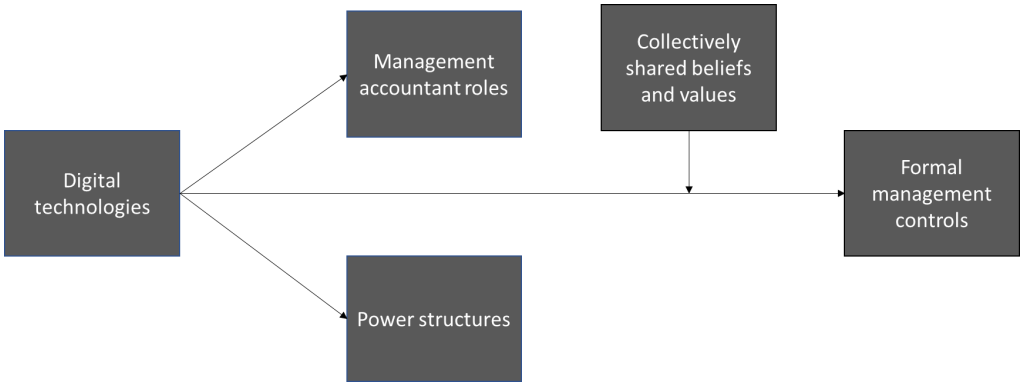

Figure 4: Changes digital technologies facilitate and the moderating effect of collectively shared beliefs and values at the meso-level of analysis

The first section of this discussion addresses the changes that digital technologies contribute to in accounting practices. It argues that the changes those digital technologies contribute to in accounting practices are generalisable across organisations. The second section elaborates how digital technologies contribute to distinctive configurations of management controls in organisations. The following section of the discussion addresses methodological implications from the thesis. Specifically, it explains how we can understand the temporal and contextual nature of digital technologies and management controls. Drawing on previous theories, this section discusses how organisations' organisational and social structures can contribute to explaining the variation in configurations and use of digital technologies in management controls. The final section discusses practical implications of these findings.

6.1 Digital technologies and changes in accounting practices

The articles in this thesis have found and described how digital technologies contribute to changes in how organisations keep records of events. This finding is consistent with other studies that have found digital technologies to contribute to increase the volume, frequency, and variety (Gandomi & Haider, 2015) of events that

are recorded. Additionally, previous studies in domains outside of accounting have clearly established that this increase in access to data influences work-organising processes (Benders, Schouteten, & Ruijsscher, 2012; Knights & McCabe, 1998; Orlikowski & Scott, 2008; Volkoff et al., 2007). These records of events, that the digital technologies facilitate the recording of, is what the accounting literature describes as accounts.

This thesis argues that the relationship between digital technologies and changes in accounting practices appear to be one with low variance across organisations. Furthermore, this position is consistent with and supported by large-scale studies which argue that digital technologies contribute to changes in work processes and organising (Brynjolfsson & McAfee, 2014; Frey & Osborne, 2017; McAfee & Brynjolfsson, 2012). Digital technologies contribute to changes in how and which events organisations recorded and kept account of. One potential explanation to why organisations record an increasing number of events might be the design of the contemporary IT systems. By default, the contemporary IT systems record vast amounts of events in their data storage. Drawing on the taxonomy of accounting practice by Miller and Hopwood (1994), this thesis argues that the changes in accounting practices in the cases studied – BankCo and InsuranceCo – are a variant of the technological type. The technological type of accounting practices is, according to Miller and Hopwood (1994), a purposeful intervention in organisations. However, the changes observed in the cases do not necessarily indicate purposeful management agency in the process of changing accounting practices. This is illustrated most clearly in the third paper, where the executive management state that they are hesitant to accept the increasing records of events as accurate objective measures of reality (Hopwood, 1973). It should be noted that the findings did not show increasing recording of events to have involved any management or accounting agency in either InsuranceCo or BankCo. The contemporary software that records customer interactions, product specifications, and so forth stores an increasing number of events in their data records, regardless of the accountants' or managers' agency in keeping these records.

Nonetheless, InsuranceCo provides a contrasting case of management agency. The project of "one-truth" indicates a purposeful interventionist action by management to change which local record of events are acceptable. Upon realising that local versions of accounting systems contributed to conflicting views from the executive managers perception of objective and accurate accounts, these local systems became illegitimate sources of information (paper 1 and paper 2). The

empirical data thus indicate that there is variance in management agency between organisations. However, in both case studies, the digital technologies contribute to an increase in the volume, frequency, and detail of accounts that are kept. The papers thus do not argue that management agency is a contingency factor that can contribute to explaining if digital technologies influence accounting practices.

Neither Miller and Hopwood (1994) nor Potter (2005) have explicitly discussed whom the change in accounting practice is purposeful for. One interpretation is that accounting researchers have focused on changes in accounting that are purposeful and implemented by managers or accountants. However, this thesis finds that changes in accounting practices can come about without the agency of either managers or accountants. The digital technologies contribute to changes in accounting practices by their design. It is by design that the contemporary IT systems generate big data sets and facilitate machine learning and exchange of information between digital technologies. The big data sets provide increasing details, history, and frequency of data, and these data are records of events.

This thesis thus argues that digital technologies contribute to changes in accounting practices. The digital technologies purposefully record events as accounts in digital systems. These accounts are frequently required by regulators and by design from the providers of IT systems. In both InsuranceCo and BankCo the studies finds that the number of events, details, and correlations between datapoints that are recorded and kept in accounts have increased. Thus, there is no indication of large variance in how digital technologies contribute to the increasing number, detail, and frequency of accounts that organisations keep.

6.2 The configuration of management controls and digital technologies

This section addresses how digital technologies facilitate changes in configurations of different forms of management controls. Management controls are, in the accounting literature, described as a systemic phenomenon consisting of different forms of controls. Research thus argues that management controls are systems that transcend the individual forms of control, and that the configuration of individual forms of control are interdependent on the other forms of management control in an organisation (Gerdin, 2020; Grabner & Moers, 2013).

The first case study showed the digital technologies to contribute to changes in roles of management accountants and facilitate centralisation of technocratic controls (Alvesson & Kärreman, 2004). Following the management controls taxonomy of Malmi and Brown (2008), these are changes in the form of administrative and

cybernetic controls. However, as indicated by the contrasting case study in BankCo, these changes are interdependent on social (Alvesson, 2012; Alvesson & Kärreman, 2004) or cultural controls (Malmi & Brown, 2008). The collectively shared beliefs and values put on data and statistical modelling as accurate descriptions of reality in InsuranceCo interface (Alvesson & Kärreman, 2004) and interact with (Kraus et al., 2017) technical forms of control in the configuration of management controls (Abernethy & Chua, 1996; Alvesson & Kärreman, 2004; Kraus et al., 2017).

In the case study of BankCo, the collectively shared belief and value put on autonomy, local knowledge, and distributed authority are important to support the social (Alvesson, 2012; Alvesson & Kärreman, 2004) and cultural controls (Malmi & Brown, 2008). In the interface with the technical and cybernetic controls facilitated by digital technologies, these forms of management controls did not conjoin. BankCo argue that the belief in local human knowledge represents a true reality and describe the data and statistical models as reduced and faint derivates of reality. In addition, the long term plan and symbolic act of maintaining a large autonomous branch network is a form of symbolic cultural control (Malmi & Brown, 2008). Thus, the technical and cybernetic controls that digital technologies facilitate do not easily interact and interplay with the social and cultural controls in BankCo. Additionally, it is this contextual interface of different forms of controls that I argue can explain the distinctive configurations of management controls in the two organisations.

Another illustration of digital technologies facilitating changes in the configuration of different forms of management controls occurs in InsuranceCo. Previously, the heads of department and division kept their own distributed local versions of records of events, conceptualised as vernacular accounting systems (Hopwood, 1978; Kilfoyle, Richardson, & MacDonald, 2013) where they recorded events that they found important at their local level. However, those in power have ensured the formal termination of keeping vernacular accounting systems and deemed local accounts of events as illegitimate sources of information. In the taxonomy of Malmi and Brown (2008), the new cybernetic forms of controls have contributed changes in the administrative forms of controls as governance structures, and policies and procedures have changed. Only the official accounts of events, as registered in the centralised digital information systems and data warehouses, are to be used in evaluations of performance and planning processes. What is accepted as true can be seen as a form of social control as described by Alvesson and Kärreman (2004). The changes that digital technologies facilitate in technical forms of controls

have thus interfaced with social control in the continuous configuration of management controls.

In analysing management controls as a phenomenon that transcends the underlying individual forms of control (Chua, 1986; Hopwood, 1983), the thesis argues that the interface of different forms of controls contributes to distinctive configurations of management controls (Alvesson & Kärreman, 2004) in organisations. It argues that organisational roles, power structures, collectively shared values and beliefs, and formal management controls are management controls that are interdependent on other forms of management controls. One contribution from this thesis is that it describes how digital technologies can, under specific conditions such as those observed in InsuranceCo, contribute to accelerating and facilitating changes the configuration and use of management controls. However, the study of BankCo illustrates how social controls (Alvesson & Kärreman, 2004) in the form of collectively shared values and beliefs can interface with, and moderate, formal controls facilitated by digital technologies.

6.3 Methodological implications for studying digital technologies and management controls

This thesis has provided thick descriptions (Geertz, 1973) on interpretations of the design and use of digital technologies and management controls. These thick descriptions provide ethnographic details, and through interpretations this thesis argues that there are actual (Bhaskar, 1978) social and technical structures that influence the phenomena of digital technologies and management controls. In an abductive approach (Abbott, 2004) the thesis has drawn on previous theories to argue for theorising digital technologies as systemic phenomena (Bijker et al., 1987; Orlikowski & Scott, 2008; Volkoff et al., 2007), consisting of both material and social elements. Additionally, it has drawn on theories of management controls as phenomena of organisational, social, and technical structures (Alvesson, 2012; Alvesson & Kärreman, 2004; Hopwood, 1978, 1983). This has facilitated two methodological insights.

First, analysing digital technologies as phenomena consisting of social and technical structures has facilitated explanations for the heterogeneity of practical configuration and day-to-day use of digital technologies in organisations (Bailey & Barley, 2020; Lukka, 2007; Orlikowski & Scott, 2008). The embeddedness of social and organisational processes and routines in technologies contributes to specific and individual configurations of the design and use of digital technologies in

organisations (Volkoff et al., 2007). This thesis illustrates how sociotechnical theories on technologies can enable accounting research, and other research domains, to analyse how the social and material elements influence digital technologies. Theorising digital technologies as multidimensional phenomena can facilitate refined and granulated explanations of how different social and organisational contexts influence digital technologies. Specifically, these explanations can contribute to providing explanations of why digital technologies have not been found to lead to generalisable causal changes across organisations in management accounting (Granlund & Malmi, 2002). The embeddedness of social and organisational routines and procedures in digital technologies can contribute to explaining why there is variance in the design and use of technologies in organisations. What digital technology, or explicitly, what an ERP or information system, *is,* can be argued to not only reflect a material reality; digital technology is also an element of a dynamic, contextual social reality.

Second, interpreting management controls as an element of technical, social and organisational structures (Chua, 1986; Hopwood, 1973, 1978, 1983; Kraus et al., 2017), the thesis has described and aimed to explicitly explain how roles, power, and culture are structures that influence the configuration and use of management controls. The interpretation in the thesis is that the actual (Archer et al., 2013; Bhaskar, 1978) structures in the form of roles, power, and culture contribute to shaping the configuration and use of management controls. Previous studies have argued that organisational culture (Dent, 1991; Flamholtz, 1996a, 1996b) and social and organisational context (Hopwood, 1973, 1978, 1983) influence the design and use of management controls. Drawing on these studies, this thesis theorises culture and context as an element of the social and technical structures (Alvesson & Kärreman, 2004) which incorporate management controls.

To explain how digital technologies have contributed to different changes in the configuration of management controls in BankCo and InsuranceCo, this thesis draws attention to the organisational context. It explains that the observed changes in the configuration of management controls as a result of the social and organisational structures that incorporate the management controls. These structures form temporal conjunctions (Bhaskar, 2008) between institutionalised practices (Miller & Hopwood, 1994), collectively shared beliefs and values (Abernethy & Chua, 1996; Kraus et al., 2017), and digital information systems (Orlikowski, 1992). The high number of highly educated statisticians, mathematicians, physicists, and engineers in the company influences the social and organisational mechanism and structures in InsuranceCo.

Theses practitioners academic and professional background have contributed to institutionalised beliefs in data and statistical models as rational and efficient tools to reach organisational ends. BankCo describes the use of social networks combined with knowledge of local communities as rational and efficient tools to reach the organisational ends. These mechanisms and structures can be seen as something that managers have purposefully constructed. However, as this thesis argues, they can also be seen as mechanisms and structures that bind management controls. There are limits to how radically managers can change the configuration of management controls. Even if digital technologies facilitate changes in the technical structures, this does lead to changes in management controls as a law-like phenomenon. The organisational and social structures limit the boundaries of the management control configuration.

At a metalevel, the explanation of management controls as elements of organisational, social, and technical structures (Alvesson, 2012; Chua, 1986; Hopwood, 1983) resonates with the arguments in this thesis. Digital technologies contribute to changes in these underlying structures and mechanisms that incorporate management controls, and the thesis argues that these structures limit the boundaries of the phenomena of management controls.

Research addressing if there are any specific social and organisational structures or mechanisms that facilitate digital technologies' contribution to changes in the configuration and use of management controls could prove a fruitful avenue for future studies. A collectively shared belief in statistical analysis combined with centralisation of control, power, and decision-making – as in the case of InsuranceCo – may be structures that influence digital technologies to have observable changes in the configuration of management controls. However, collectively shared beliefs, local competence, delegation of authority, and autonomy are elements of social and organisational structures that appear to moderate the influence that digital technologies have on the configuration of management controls. Further studies could refine these claims and produce a more granular understanding.

6.4 Practical implications

This thesis has argued that analysing configurations of management controls and digital technologies as phenomena that are temporary and contextually located (Bailey & Barley, 2020; Baxter & Chua, 2009; Hopwood, 1983; Volkoff et al., 2007) is scientifically valid, and necessary to unearth the dynamic relationship between them.

Both regulators and society put pressure on institutions to influence their internal processes. The regulators demand and detail the structure of financial organisations to adhere to legal requirements. The regulators also set minimum levels for details of accounts to be kept, and frequency levels of when they should be updated. Within in the finance sector, this has contributed to changes in accounting and control practices (Crawford, 2017; Viktor, 2015). From society, there is a normative pressure towards using digital technologies to ease the use of services and comply with regulation. However, as this thesis has found, there is variance in how the institutional pressure from regulators and society contribute to changes in organisations' configuration of management controls.

Organisations are embedded with history, values, and beliefs that have been institutionalised into the organisations' management controls over time (Hopwood, 1973, 1978, 1983; Kraus et al., 2017). The configuration of management controls is thus contingent on the external institutional pressures, as well as institutionalised values and beliefs that exist in organisations. Stakeholders promoting or requiring the implementation of digital technologies with a normative aim of improving management controls might find that digital technologies are not a panacea to the potential organisational problems they seek to address. A practical implication is thus that regulators and stakeholders who are under the impression that the use of digital technologies and standard-setting have causal and positive implications for management control might benefit from validating the reliability of their assumptions.

Another practical implication is that practitioner and consultancy claims of best practices for implementing digital technologies in management controls can be criticised from a scientific perspective for being too simplistic. These claims of best practices appear, in a scientific context, not valid and reliable when analysed against the scientific studies and empirical data. In my experience, consultants conducting surveys and focus interviews to measure digital maturity, and subsequently proposing best practice plans on how to implement new digital technologies and management controls in organisations, do not pay adequate attention to the specific social and organisational context, nor do projects that implement these technologies

address the continuous development and interdependence between digital technologies, organisational context, and management controls. The best practices embedded in these solutions aim to provide static solutions to dynamic organisational problems. This can potentially lead to a significant waste of resources as the implemented digital technologies do not account for the dynamic context that incorporate the digital technologies and management controls.

7. Conclusion

This thesis has studied and found that digital technologies contribute to changes in accounting practices and facilitate changes in the configurations of different forms of management controls. The findings reveal digital technologies to contribute to several changes in the domain of management accounting. First, digital technologies contribute to changes in accounting practices. Second, digital technologies facilitate changes in different forms of management controls. This thesis has demonstrated that digital technologies can contribute to changes in the form of technical and cybernetic controls, and in social and administrative controls. Importantly, it illuminates that changes in technical forms of management controls are interdependent on social and cultural controls. This is supported by the finding that cultural controls can moderate the configuration and use of technical and cybernetic management controls.

Methodologically, the thesis finds that digital technologies and management controls are phenomena that are elements of technical, organisational, and social mechanisms and structures. Changes in these continuously shifting structures facilitate changes in management controls. The variance in the specific organisational social and organisational context contributes to distinct configurations of management controls. Studies addressing digital technologies and management controls can benefit from applying methods and theories that address these phenomena as contextual and dynamic (Hopper & Macintosh, 1993; Miller & Hopwood, 1994; Potter, 2005).

The are several limitations to the thesis. Two of them are that its empirical data focus one a specific sector and from a specific part of the world. Studying other sectors and other parts of the world might have yielded other findings. However, this also presents an avenue for further studies, Studies that might address how structures in other sectors, and other organisational values and beliefs, contribute to shaping the configuration and use of management controls.

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Paper I

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ORIGINAL PAPER

Digital technology and changing roles: a management accountant's dream or nightmare?

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Abstract

Recent developments in digital technology have revitalized interest in the relationship between technology and management accounting. Yet, few empirical in-depth studies have assessed how digital technologies influence the roles of management accountants. This paper builds on the concept of jurisdiction to illuminate the relationship between management accountants, expert knowledge and digital technology. The study identifies and describes competition over jurisdiction between management accountants and other groups of employees. The study describes a shift for divisional management accountants towards narrower roles in their tasks and expectations, while business-oriented roles at group level are found to entail expanding tasks and expectations. In doing so, management accountants are divided into two divergent categories facing different expectations: divisional and group level management accountants. Through a case study in the technology-oriented finance sector, the paper contributes to the debate on the roles of management accountants in a number of ways. First, it describes how digital technology can contribute to narrower and more specialized roles. Second, it describes how digital technology can contribute to competition between professions. Third, it elucidates how digital technology contributes to changes in the behaviour of decision makers, and in their expectations toward, and the involvement of, management accountants. Fourth, it details how the changes contributed by digital technology in the roles of management accountants can act as mediators in the identity-work of management accountants. Finally, it empirically describes the relationships between digital technology and management accountants' roles.

Keywords Digitalization · big data · machine learning · Management accountants role · Controller role

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1 Introduction

> I think digitalization plays a role in this [the tasks of management accountants]; we can always apply new tools to automate, do things more effectively. While I think, at least as I see it in our function, it is about structuring data, structuring data sources. And in a way doing everything [in a] more unified [way so as] to be able to work with the data more easily, and in this area, I think digitalization is really, really good, it is important. But the actual use, more into machine learning and artificial intelligence, I think there is still a way to go before it takes over a management accounting role, for that requires users—or, luckily, at least currently it does. (Group-level management accountant).

Among practitioners there is increasing interest in how digital technology contributes to changing the roles of management accountants (Accenture 2018; Eklund et al. 2018; McCorkell and Shapiro 2016). The literature has predicted that automation and increased use of digital technology will have major consequences for a number of professions (Frey and Osborne 2017); in addition, the roles of management accountants are expected to be impacted by these consequences (Appelbaum et al. 2017; Bhimani and Willcocks 2014; Moll and Yigitbasioglu 2019; Quattrone 2016). The present study explores this important yet understudied relationship between digital technology and the roles of management accountants.

The ways in which digital technology may affect management accountants has been problematized in the literature (see Järvenpää 2007; Quattrone 2016; Suddaby et al. 2015). Quattrone (2016) raised concerns regarding a potential reversal of the business orientation of management accountants, where the technology contributes to management accountants returning to focusing on quantitative measurements that are removed from business operations. Historically, accounting practices have contributed to nuance in the interpretation of numbers, while data-driven decision makers contrastingly treat numbers as representing absolute truths (Quattrone (2016).

To understand how technology influences the professional roles of management accountants, this paper builds on the concepts of jurisdiction of expert labour groups (Abbott 1988), identity (Brown 2019) and social role theory (Biddle 1986). To illuminate the interaction between digital technology and the role of management accountants, the paper addresses the following research question: *How do digital technologies contribute to changes in the roles and jurisdiction of management accountants?*

To explore such role changes, this paper investigates InsuranceCo,[1] a Nordic insurance company operating in the technologically advanced finance sector. The company has several highly educated statisticians, mathematicians, engineers and management accountants involved in the adaptation of integrated information systems, big data and machine learning. The number of PhDs, and especially

[1] A pseudonym.

the number of statisticians, in the company and the industry differentiate it from other firms and sectors. This appears highly relevant for studying the adaptation of machine learning, which is closely related to statistical knowledge since machine learning requires statistical knowledge to prepare data, select statistical methods for machine learning models and interpret the predictive models.

This study contributes to the management accounting literature in a number of ways. First, it explores how digital technology contributes to changes in the roles of management accountants and how digital technology can contribute to narrower and more specialized roles nuancing descriptions of expanding and broader roles (Goretzki and Messner 2019; Holmgren Caicedo et al. 2018; Horton and Wanderley 2018; Rieg 2018). Second, by taking a perspective based on competition of professions (Abbott 1988) the study finds that digital technology influences intra-organizational competition between professions and thus contributes to changes in management accountant roles. Third, it finds that digital technology not only contributes to changes in roles as tasks of management accountants (Burns and Baldvinsdottir 2005; Rieg 2018; Weber 2011). Drawing on social role theory(Biddle 1986; Järventie-Thesleff and Tienari 2016; Simpson and Carroll 2008; Sveningsson and Alvesson 2003) the findings show that digital technology also contributes to wider and broader changes beyond tasks in management accountants' roles. Fourth, it builds on theories of roles as mediators in identity-work (Järventie-Thesleff and Tienari 2016) and finds that digital technology contributes to changes in management accountant roles which in turn influence the identity-work of management accountants. Lastly, the study provides an empirical description of the relationship between digital technology and management accountant roles and jurisdiction.

The remainder of this paper is structured as follows. Section 2 discusses existing literature on the relationship between digital technology and management accounting, and the roles of management accountants and theories of jurisdiction, identity and social role theory. Section 3 describes the research methods; Sect. 4 presents the case; Sect. 5 analyses the case; and Sect. 6 discusses this analysis and its theoretical implications. Finally, Sect. 7 concludes the paper.

2 Theoretical background

2.1 Digital technology and management accounting

Digital technology has become a topic of considerable interest (Accenture 2018; Al-Htaybat and von Alberti-Alhtaybat 2017; Bhimani and Willcocks 2014; McCorkell and Shapiro 2016; Quattrone 2016). To make the broad topic of digitalization and digital technologies more tangible, this paper conceptualizes them as concepts consisting of several elements, of which the paper addresses integrated information systems, big data and machine learning.

While integrated information systems have been described as information systems sharing a common database (Rom and Rohde 2007), the contemporary understanding adopted in this paper is that integrated information systems are information systems that incorporate exchange of data at a defined frequency between one another.

Big data in this paper refers to the increasing volume of data that is generated and accessible. However, it not only refers to an increase in the amount of data, but also to increases in velocity (timely updates) and variability (types of data), which are two other fundamental dimensions defining big data (Gandomi and Haider 2015).

Machine learning represents the applied use of algorithms and statistical models by computer systems to progressively improve their performance on specific tasks (Murphy 2012). It is closely related to theories of statistical learning (James et al. 2013), where computer systems find predictive functions that fit the data. The computer systems then evaluate the functions and select those that provide the most accurate predictions, thereby creating models that consist of a high number of functions. These mathematical and statistical functions can be thought of and illustrated as decision trees, where each node represents a separate function, creating different paths the data can follow or be grouped into create the most accurate prediction. As the amount of data generated increases exponentially (World Bank 2016) and computing power improves, this enhances the ability of computer systems to find patterns and significant correlations between variables.

In management and organizational studies of technology, there has been a dominance of research conceptualizing technology as having generalizable and unidirectional effects at a macro level. This literature, which takes a positivistic perspective, conceptualizes technology as an "external force that would have (relatively) deterministic impacts on organizational properties such as structure" Orlikowski (1992 p. 399). Similar to the management and organizational literature, several studies in management accounting have adopted positivistic approaches to technology, resulting in deterministic studies of technology dominating the field (Rikhardsson and Yigitbasioglu 2018; Rom and Rohde 2007). Consequently, a number of studies have sought to establish causal impacts of introducing technology in management accounting (Kallunki et al. 2011; Rom and Rohde 2007). Despite the dominance of this view, however, other theoretical perspectives have also been applied to technology and management accounting. Such alternative approaches have included contingency approaches (Byrne and Pierce 2007; Chapman and Kihn 2009; Chenhall 2003), structuration theory (Caglio 2003) and actor network theory (Dechow and Mouritsen 2005). These studies do not claim the effects from technology to be deterministic, nor that the impacts are applicable to all organizations. The current study seeks to engage in this stream of non-deterministic debate on how digital technology can contribute to changes in management accounting.

Quattrone (2016) addressed the importance of accountant practices and the role of accountants as interpreters of numbers, describing numbers as imperfect depictions and representations that are open to interpretation and discretionary judgements. The accounting interpretation of numbers stands in contrast to the increase in data-driven decisions based on algorithms and machine learning. Data-driven decisions treat numbers not as imperfect sets of information but as containing all relevant information (McAfee and Brynjolfsson 2012; Quattrone 2016). Data-driven decisions are portrayed as promising faster and more objective decisions, while Quattrone (2016) raised concerns that this will narrow the role of accounting, specifically the role accounting plays in enabling and contributing to discussions and interpretations of data.

2.2 The roles of management accountants and the accountancy profession

The roles of management accountants have been researched intensively in recent decades (Burns and Baldvinsdottir 2005; Byrne and Pierce 2007; Granlund and Lukka 1998; Weber 2011) and it remains an ongoing area of research (Goretzki et al. 2017; Goretzki et al. 2013; Holmgren Caicedo et al. 2018; Moll and Yigitbasioglu 2019; Rieg 2018; Schäffer and Brückner 2019). A number of these studies have adopted an understanding of accounting as a social practice that provides legitimacy and supporting claims of rationality (Miller and Hopwood 1994), rather than a functionalist perspective. In this stream of research, Suddaby et al. (2015) described how objective measures are valuable in an increasingly rationalized society.

The research on management accountant roles has focused on the tasks of management accountants. For example, Goretzki et al. (2013), Burns and Baldvinsdottir (2005), Rieg (2018) and Weber (2011) have illustrated the close connection between tasks and the theorization of management accountant roles.

Roles have been categorized into two stereotypes: bean-counters and business partners (Byrne and Pierce 2007; Friedman and Lyne 2001; Järvenpää 2007; Rieg 2018; Wolf et al. 2015). Where bean-counters are focused on practical tasks such as measuring and keeping accounts, business partners are involved in decision making and strategic tasks. Other roles that have been described include information experts, methodology experts and gatekeepers (Burns and Baldvinsdottir 2005; Byrne and Pierce 2007; Granlund and Malmi 2002; Scapens and Jazayeri 2003; Schaltegger and Zvezdov 2015).

The expanding roles of management accountants are closely related to what the literature describes as business-oriented partner roles (Burns and Baldvinsdottir 2005; Goretzki and Messner 2019; Goretzki et al. 2013; Järvenpää 2007). The increasing business orientation has been promoted by peers, top management, and education and professional bodies, as managerial tasks and involvement in strategy and general decision making have been presented as rational objectives for the role (Burns and Baldvinsdottir 2005; Goretzki and Messner 2019).

Studies exploring the relationship between technology and the roles of management accountants have also indicated a broader and expanding role for accountants, particularly management accountants, as a potential consequence of introducing technology (Caglio 2003; Dechow and Mouritsen 2005; Järvenpää 2007; Scapens and Jazayeri 1998; Suddaby et al. 2015). First, the repetitive accounting tasks of collating numbers and performing calculations are transferred to enterprise resource planning (ERP) systems and integrated information systems, enabling management accountants to spend more time providing assistance to decision-makers (Caglio 2003; Chapman and Kihn 2009; Dechow and Mouritsen 2005). Second, it has been theorized that ERP and IT can enable the decentralization of decisions (Caglio 2003; Dechow and Mouritsen 2005; Järvenpää 2007), increasing local decision makers' need for support from accountants as providers of information (Caglio 2003). A substantial body of literature has thus argued that digital technology contributes to an increasing business orientation and broadening of the roles of management accountants (Caglio 2003; Chapman and Kihn 2009; Dechow and Mouritsen 2005; Järvenpää 2007;

Suddaby et al. 2015). However, broadening and expanding roles for management accountants can be at odds with the roles and identities of other professionals within organizations.

2.3 Competition over jurisdiction

Abbott's (1988) theory from sociology, adopted by accounting studies (Caglio 2003; Goretzki et al. 2013; Suddaby et al. 2015), conceptualizes claims and competition over jurisdiction between social groups for tasks and influence. The accounting literature has drawn on the work of Abbott (1988) to address the macro-organizational level of analysis (Suddaby et al. 2015). However, a considerable part of Abbott (1988) work described and sought to address the intra-organizational "workplace" level, which has typically been labelled the meso or mid-range level of analysis in organizational and sociological studies (Fine and Hallett 2014). Abbott (1988) stated that study on this level has been lacking:

> An equally important, but less studied area is the workplace. Claims made in the workplace blur and distort the official lines of legally and publicly established jurisdictions; an important problem for any profession is the reconciliation of its public and its workplace position. (Abbott 1988 p. 59–60).

Goretzki and Messner (2019) touched upon this meso level in their analysis of management accountants' identity work. Their findings indicated that the identity of management accountants is embedded in broader organizational values and concerns. There is thus an understanding of interaction between the management accountant role and other groups in organizations (see Järvenpää 2007; Kurunmäki 2004). The role literature in accounting has described Abbott's (1988) work as depicting competition over jurisdiction in terms of overt conflicts (Suddaby et al. 2015) and focused on how professions can claim expert knowledge to create monopolies (Cooper and Robson 2006) at a macro level. However, the analysis of accountants' role in the workplace has been identified by Goretzki et al. (2013), Suddaby et al. (2015) and Abbott (1988) as an underdeveloped area of research.

Abbott (1988) highlighted that professions constantly compete for influence and tasks. He conceptualized this as competition over jurisdiction in three different dimensions: the law, public opinion and the workplace. He described the competition between law, auditing and accounting for claiming jurisdiction over tasks, such as tax-deductible forward losses, and how historically engineering and cost accounting competed for jurisdiction over the provision of operational information to support decision-making. Cooper and Robson (2006), Kurunmäki (2004) and Johnson and Kaplan (1986) identified other examples in which engineers and accountants compete over jurisdiction to provide information and decision support. The present paper will describe how the concept of competing professions can provide a theoretical lens through which to analyse how digital technology contributes to changes in the influence and tasks of management accountants in competition with actuaries and other professions.

2.4 Role theory and identities

While research on management accountant roles has broadly focused on the tasks involved therein, social role theory is a wide-ranging field within the social sciences. Role theory encompasses an array of dimensions used to define roles in society and in organizations.

> Role theory concerns one of the most important characteristics of social behaviour—the fact that human beings behave in ways that are different and predictable depending on their respective social identities and the situation. As the term role suggest, the theory began life as a theatrical metaphor. (Biddle 1986 p.68).

As the role metaphor can have different interpretations, there have been a number of different descriptions and definitions of roles. Biddle (1986) highlighted that roles have been portrayed according to three groups of interpretations: characteristic behaviour, social parts to be played or scripts for social conduct. As roles concern social expectations of behaviour, many researchers have addressed the influence of norms in role theory, while others have assumed expectations to be either subjective beliefs or individual preferences (Biddle 1986). Practical questions regarding how different expectations from groups of others can create conflicting roles for individuals in the form of role conflict represent a topic that has been extensively researched among organizational researchers (Biddle 1986) and accounting researchers (Byrne and Pierce 2007; Goretzki et al. 2017).

Syntheses and reviews of role theory research have identified various theoretical perspectives on roles, including functional, organizational, symbolic interactionist, structural and cognitive (Biddle 1986; Järventie-Thesleff and Tienari 2016; Simpson and Carroll 2008). However, functional and organizational perspectives have provided the most extensive stream of research on managerial roles. Järventie-Thesleff and Tienari (2016) argued that the functionalist perspective has been influential in describing characteristic behaviours of individuals holding positions in social systems, while the organizational perspective has addressed "the manner in which individuals accept and enact an array of roles in task-oriented and hierarchical systems that are formal organizations." (Järventie-Thesleff and Tienari 2016 p.238).

As the focus of management and organizational research has shifted towards identity in recent decades (Alvesson et al. 2008), there has been a revival of research linking and exploring the relationship between roles and identity construction and identity work (Goretzki and Messner 2019; Järventie-Thesleff and Tienari 2016; Simpson and Carroll 2008). Where roles address the expectations of others, identity has been defined as "the meanings that individuals attach reflexively to themselves, which are developed and sustained through processes of social interaction as they seek to address the question 'who am I?'"(Brown 2015 p. 23). While there are different strands of literature on this topic, research interest in the description of identity has been linked to its dynamic and multi-layered properties (Alvesson et al. 2008; Brown 2019; Simpson and Carroll 2008). However, the crucial element of identity research is the self-reflexive perspective on the self within the individual.

In this paper, role is understood from a broader perspective compared to the extant management accounting understanding of roles as tasks. This research understands the roles of management accountants in terms of expectations of behaviour patterns in the social structure within which the management accountant performs those roles. The later analysis in the paper will highlight that changes incited by digital technology are not first and foremost related to tasks but rather to behavioural patterns of decision makers. Thus, the behaviour of decision makers influences the role of management accountants and the management accountants' participation and influence in discussions of data.

3 Research methods

This research takes the form of an exploratory case study of InsuranceCo, a Nordic insurance and finance company. InsuranceCo was approached because it operates in the financial sector, which is one of the sectors reported to have been most impacted by digital technology. Additionally, the Nordic countries are among the leading countries with respect to digitalization (European-Commission 2016; World Bank 2016). InsuranceCo welcomed the request to grant access to the organization to perform the study and assisted in setting up interviews with relevant departments and divisions in the organization.

The data were mainly collected through interviews, but less formal meetings and document reviews were also conducted. The duration of the case study comprised a six-month period, with the first meetings and interviews conducted in late 2017, and additional interviews and visits in 2018, including informal lunches and discussions with interview subjects and their departments. A second round of interviews with three members of the executive management team was conducted in 2020 to evaluate the previous data collection and add new perspectives and information. The majority of the 14 interviews were conducted on the premises of InsuranceCo, and two were conducted via phone. The interviews lasted between 40 min and two hours. They were semi-structured, as the main topics were set prior to the interviews. However, there were some differences in the questions depending on the role and position of the respondent. All interviews were audio-recorded. It should also be noted that all respondents were informed that the interviews were confidential and would not be shared with InsuranceCo. They were free to withdraw from the interviews or to recall any of their statements, and in this case the withdrawal would not be shared with InsuranceCo. None of the respondents declined interviews or withdrew from the study.

The interview subjects were primarily located at head office at the group level, limiting the views from divisions. Interviews conducted at a regional office, and one interview with a divisional management accountant, were aimed at supplementing the view presented at the group level. One challenge to interviewing additional management accountants at the divisional level was that their numbers had been reduced so significantly that the largest division employed only two management accountants at the time of the study. Some divisions employed more than two management accountants; however, as it was the largest division that had reportedly taken advantage of integrated

information systems, big data and machine learning, this division was focused on during data collection. Consequently, 50% of the management accountants in this division were interviewed. Additionally, interviews with directors from the division and informal conversations probed the roles of the divisional management accountants and the use of integrated information systems, big data and machine learning.

The research proceeded through theory, data and problem stages, which contributed to refining plausible fits between the problem, theory and data (Ahrens and Chapman 2006). Empirical data collection focused on how digital technology influences management accounting. After the initial informal meetings with InsuranceCo, the information was analysed to identify potential discrepancies between the empirical data and the management accounting literature. After conducting a first round of interviews with one of the directors, and informal meetings with other employees, a more detailed overview of topics to be discussed in the interviews was prepared. The information from the interviews was used in the succeeding interviews to refine the questions and to assess the validity of the statements between organizational levels and personnel. During this process the focus on digital technology became more tangible and the interviews and later analysis focused on the three elements of digitalization in integrated information systems, big data and machine learning. The focus on these three elements was thus not arrived at a priori; it was a result of the refinement of questions and conversations during the case study. In the case company the management accountants expressed that it was the integrated information systems that most directly affected their roles, while the other roles described how big data and machine learning have enabled them to take on new tasks.

The informal discussions provided valuable supplemental knowledge in addition to understanding of historical events in the company. The informal discussions at regional and head office premises revealed very few disagreements over the use of technology and the changes that were occurring in the company. The research question could have benefited from extending the period of interviews; however, documents from the company and associated organisations, including a confidential study from 2012 on the role of management accountants in the company, augmented the interviews. In addition it should be noted that several of the interview subjects held positions as divisional management accountants in InsuranceCo prior to their current positions.

The interviews were transcribed, coded and analysed using NVivo, a qualitative data analysis software package. The transcripts were coded based on practical constructs in the empirical material. The coding provided an overview of topics covered in the interviews, enabling analysis of the responses linking these topics to the theoretical constructs in the management accountant role literature.

4 Case description

4.1 The finance sector in the Nordic countries

The Nordic countries are among the richest and most digitalized countries in the world (European-Commission 2016; World Bank 2016). Their inhabitants are some

of the most educated in the world, and the use of digital tools has had an impact on all levels of society (European-Commission 2016; Jāhāna 2016). The finance sector in particular has seen significant effects of digitalization since this has contributed to significantly reducing the number of branches (Finans Norge 2018). Customers have become accustomed to using the Internet as the preferred channel when contacting finance institutions.

Over the last two decades, finance institutions have systematically worked to utilize technology to improve profitability and customer service. Governments have promoted technology use through requiring tax reporting and other public reporting to be delivered via digital portals or systems. Financial regulation of the sector via Solvency II has also promoted digital solutions (European Parliament 2009). This regulation drives the development of IT systems to become more integrated and provide information more automatically and frequently.

Most of the price paid for insurance covers the risk premium, which is costs that calculated as likely to occur during the duration of the insurance period. Regulation in the Nordic countries prevents insurance companies from pricing insurance lower than the expected cost of providing the insurance. Insurance companies can choose to hold the risk themselves or distribute the risk and cost by reinsuring parts of their portfolio to other insurance or reinsurance companies. The largest cost element of insurance—calculation of the probability of accidents and related costs—has always played an important role for insurance companies. Historically, this calculation of risk premiums has fallen under the jurisdiction of actuaries in insurance companies.

The other cost elements in insurance are related to administrative costs, cost of sales activities, organizational development, customer service, IT function and finance functions, and so forth. The sales channel and activities vary between companies, but they rely on their own sales personnel and sales through agents. One example is car dealerships offering insurance acting as agents for insurance companies. Another example is independent agents offering insurance products through agency agreements with an insurance company.

A particularly important group of agents is banks. Some banks have their own insurance company, while others partner with insurance companies to provide insurance under the brand of the bank. Alternatively, the bank can offer the products of the insurance company without any customization or branding of products. The larger insurance companies also have retail bank divisions offering banking services. The sectors of banking and insurance are thus closely related, and developments in either sector frequently influence the other.

4.2 InsuranceCo

InsuranceCo is an insurance company with more than 3000 employees, and has a history going back over 200 years. It was formed as a mutual fire insurance company to assist local insurance companies to share and distribute risk. The formation was a consequence of small local mutual fire insurance companies' realization that they could benefit financially from cooperation to handle large pay-outs if large fires occurred in their regions (Schneiberg 2002). InsuranceCo has always had a strong

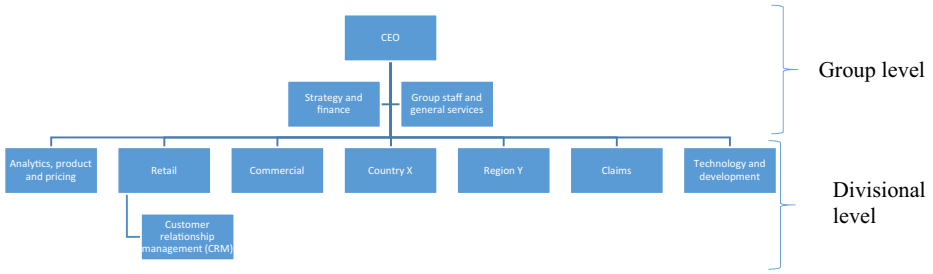

Fig. 1 InsuranceCo organizational chart

influence on coordinating activities, such as pricing products, and has provided shared services related to financial accounting to independent insurance companies. Today, InsuranceCo differs compared to the original entity. It now operates its own offices and agents and is no longer merely an administrative body for risk and profit sharing. InsuranceCo is the dominant entity among its agents and the remaining local insurance companies, setting strategy and defining financial and operational targets.

InsuranceCo has a strong presence in its home country, with several offices, some of which are fully owned while others are independent local insurance companies. International operations are slightly smaller than domestic operations in terms of the number of employees and revenue. Retail banking and pension savings represent a small proportion of turnover and number of employees compared to the insurance part of the company. Banking and pension savings have, however, been growing in recent years. Retail insurance in the home market is the largest division, while international operations are based in country or regional divisions (Fig. 1).

4.3 Introduction and use of big data and machine learning in InsuranceCo

Big data has been introduced over the last few decades in InsuranceCo as new and more advanced IT systems have been implemented. The new IT systems produce and store large amounts of data. The data have grown not only in volume, but also in variety and frequency. New systems in the company, such as phone systems, websites and claims systems, have increased the amount of internally available data. External information has also increased through access to data from public registries, third-party data providers and social media platforms. The replacement and upgrading of IT systems have enabled more frequent updates of data, improved transfer of data between systems and enabled easier access to data.

Analytical use of the data has increased as the volume, frequency and variety of data have enabled new possibilities for analyses. InsuranceCo has focused on becoming an analytics-driven company and aims to intelligently use data and analyses to utilize resources effectively and efficiently. In practice, this has resulted in increased integration between IT systems and the application of machine learning to various degrees in InsuranceCo.

InsuranceCo does not appear to have had a clear plan for how the IT systems and their data could contribute to creating a more holistic IT system or data warehouse for the organization. Rather, the directors of the divisions had separate ideas for which systems and data would be useful for their own division. This has created a myriad of professional IT systems and data in the organization, combined with the IT systems from acquired companies that often continue to use parts of their existing infrastructure.

Integrated data in the case of InsuranceCo is when the data flows between information systems at specified frequencies. Flows are either unidirectional, for extracting data, or bidirectional, for extracting and inputting data into an IT system. Consequently, InsuranceCo has several systems to support the creation of information from IT systems. It has an internal data warehouse built on a SharePoint platform; it also has SAS Visual Analytics (SAS VA) and Oracle Hyperion financial management and planning. The systems overlap in providing the same data on several elements. The software, however, relies on the same data sources for collecting the overlapping data. The Oracle Hyperion software assists in budgeting, planning and performance measurement. The data warehouse distributes information to internal users. SAS VA is used for gathering a large, detailed dataset from the professional systems and external sources for the analysts for statistical modelling and data science.

The implementation of big data and machine learning has contributed to three changes in InsuranceCo. These changes serve as a backdrop for the observed changes in management accountant roles. First, InsuranceCo has access to digitalized customer information, which enables the company to cross-reference customer details internally and externally. External details from partners such as labour unions or customer programmes provide valuable insight into the price sensitivity and risk profile of customers. Second, information about competitors, the use of distribution channels (Internet, phone, offices) and customer behaviour data from the Internet or mobile activity provide new information. InsuranceCo can obtain an overview of competitors in the market by tracking customers' online activity or via the purchase of external datasets. To some extent, the company can store information on competitors' pricing by purchasing datasets and internal data from customers who want InsuranceCo to match offers from competitors. Third, the information can be aggregated and combined across departments and divisions, providing new sets of information, extending and going beyond the previous information available to InsuranceCo. This enables analyses to be more detailed and to provide information on new dimensions that were previously unaccounted for.

4.4 The roles of management accountants in InsuranceCo

Management accountants have become more business oriented in recent decades in InsuranceCo, with the aim of assisting and interacting with managers and decision-makers to gain an understanding of the financial impacts of decisions, in both the long and short term, and taking on a proactive business-oriented role. However, the reorientation of the role to become more forward looking has

to some extent been dependent on the individual management accountant. Consequently, not all decision makers share the impression of management accountants becoming more business oriented and forward looking.

More recently, the number of management accountants has been reduced in InsuranceCo. Although difficult to quantify, as job titles vary between divisions and departments, there is a general impression that the number of management accountants has been significantly reduced in recent years:

> We have tried it ourselves [to assess the number of management accountants], it is kind of hard when we look at titles. However, we have done some reorganizing projects, to look at staff and business support, including management accounting, so it is possible to do the exercise. We have done it many times, and it has been built down quite significantly. (Manager, planning and forecasting)

The number of management accountants has been reduced across all levels, from top-level group management accountants to divisional and departmental management accountants. Most notable, however, is the change at the divisional and department levels:

> It might be primarily in the distribution units that it has been built down, for example the retail division does not have as many resources [management accountants] now versus previously. (Manager, planning and forecasting)

Contributing to the reduction of management accountants is the ability of decision makers to access information directly without the use of management accountants. This was illustrated in an interview with the director of sales in the retail division:

> Director: Yes, there are [fewer management accountants]. However, you can say, I do more myself now.
>
> Interviewer: More than previously?
>
> Director: Yes, I dare to say so. I got more reports on my desk previously. When it comes to the most obvious thing to keep control of when you are managing, when you are in control of such a large business, is that the costs do not run wild. That is very doable, just enter [the IT system]. You know the date when the reports will be in the system, and just go in and check, and drill your way down [from divisional cost levels to regions, and the individual postings on each account for each region or branch].

In the largest division of InsuranceCo, with more than 1000 employees, there are currently only two employees with roles as management accountants. The decision makers below the divisional top management team, such as department heads, office managers, team leaders and others, do not get much time for business partnering with the management accountants due to the reduction in numbers thereof.

4.4.1 Changes towards specialization

The increased sophistication of pricing models and use of various data sources and types contributes to specialization in the pricing process of InsuranceCo. Combined with increased use of data programming in R and Python, this development continues to maintain and potentially contribute to furthering the distance between analysts in the pricing and product division and management accountants in the finance function:

> It is clear that a classic finance function, in my view, does not have the model skills needed to survive today. At least as we see it, one thing is to press F3, and skip through a GLM [generalized linear model] and implement it. There are some methodological considerations that are heavier than that. I am a graduate in business and administration, I'm a bad analyst, a leader with some visions and ideas. But the subject itself, the professional considerations is something I should keep away from, in my view, should certainly not mess too much with it either. (Director, pricing)

Previously, pricing analysis and implementation were challenging and demanding to perform, and it was not considered feasible to update daily in InsuranceCo. The stored customer data and product data have become more detailed in the IT systems, more frequently updated, and integrated with the internal systems of InsuranceCo, contributing to enabling the Analytics, Product and price division to find new ways of working. The opportunities that arise from linking the data and the information systems are challenging to explain, as the following quotation illustrates:

> Does one really understand? What the possibilities are and what… a cool example then. We are talking about the fact that we need to get a report platform, and there is an employee coming to me saying, now I'll show you something cool. Then he has taken Flask, visualization for Python, and he can show me the optimization factors in geographical area and the given tariff in it. And he can bring up the factors, then he can change them, and he can simulate the effect of the change, and he can push it back to the pricing engine from a single screen. That process usually takes three weeks and involves five people and 10 systems. It is so damn powerful, and I did not know that it was that powerful. That is me in my department, imagine two levels up in the organization, they have no idea. (Director, pricing)

In InsuranceCo, technology has enabled the level of analysis of products and pricing to become more refined and frequently updated to reflect changes in the underlying data. Similarly, customer information and preferences have become digitalized in recent years, contributing to the transfer of previous local knowledge held by sales divisions to more perceived explicit knowledge in the Analytics, Product and price division. This transformation of information from local to explicit data is in line with previous research on integrated information systems (Chapman and Kihn 2009). The information on customer preferences, price

sensitivity and how likely the customer is to accept an offer from a competitor is not only transformed from local tacit knowledge to more explicit data points; the use of big data and machine learning enables new ways of analysing the information. Grouping customers into small subsets of characteristics, extracting data such as their leisure activities, travel activity, memberships and location of properties, is perceived to provide new and reliable information on price sensitivity and behaviour. In InsuranceCo information from the data-driven approach is perceived to surpass that from local sales representatives on customer price sensitivity and behaviour. The Analytics, Product and price division and the Customer Relationships Management (CRM) department have become more sophisticated in how they use data and computer power to model the pricing elements and customer behaviour:

> You can think of car insurance consisting of glass, rescue and liability and so forth, today we model on the low level [calculating a premium for each individual element]. Each of the elements and the models might well be quite different. Then we model frequency and consistency individually, and then we connect it to an actuary cost. So, you get a forest of models, and that [this way of modelling] might not be the only truth [interpretation of the data]. (Director, pricing)

Another example of changes in the role of management accountants relates to technology and can be illustrated with reference to interactions with CRM. The department analyses customers with the aim of identifying current customers who are liable to change to a different insurance company. It also analyses potential customers who could become customers of InsuranceCo if approached, and the likelihood that customers will buy additional products. Their analysis is based on large internal datasets of customer behaviour compiled over several years, combined with datasets from other internal and external providers. By using big data and machine learning, the CRM department is able to predict individual customer behaviour and prescribe recommended advice for the sales personnel, displayed on the screen of the insurance advisors and sales personnel as they are in contact with the individual customer.

Prior to the use of big data and machine learning, the individual sales personnel called who they felt were the best customers to contact, either to ensure that these customers did not leave the company or to attract new customers. The procedure for selecting customers and completing calls and meetings with them was largely up to the individual sales consultants. Gradually, the call list for sales personnel has become the responsibility of the CRM department. Currently, the sales personnel are required not to call or contact customers other than those on the list assigned by the CRM department:

> It's just because it will give more value to control it intelligently [using all available data and machine learning], because the customer manager out there does not have all the information. They do not know the lifetime values of these products, they do not know about the competitor, if the customer only says that the competitor is much cheaper, or if they have really

> decided for [the offer from] InsuranceCo, and then they get an additional 10% discount. They do not know how price sensitive that customer is, or the type of customer. (Director, CRM)

More recently, the CRM department has also begun to monitor the effects of participating in fairs and events. It has consequently taken on responsibility for deciding which events to attend and how many personnel to assign to stands. There is naturally discussion between sales managers and the CRM department. However, as the CRM department uses machine learning and big data, comprising both internal and external data, the sales managers appear to comply with recommendations from the CRM department without significant resistance:

> Part of the activity in the [local] offices is to attend on stands, fairs and similar. It was probably more up to the individual previously, now we have a purely analytical approach. If CRM says it is not profitable for us to attend a housing fair, then we do not attend the housing fair anymore. If CRM says we should use the power to support sponsorships then we'll do it, it's not up to each individual [managers and sales staff]. (Director, Sales)

This illustrates that a number of customer handling tasks have become specialized at the divisional level. Even for the group-level management accountants, there are indications that the tasks they perform have tended to become more specialized:

> I usually say that at least 60% [of the group management accountants] work fairly technically, focusing on systems and reconciliation of data, etc., and then the rest are making some sensible analyses, and of course working a lot together with the business areas. (Management accountant at group level)

As tasks have become automated, the importance of specialized technical roles has been highlighted when integrations between information systems fails. Changes in one of the many systems or programs can influence other information systems.

> We got ourselves a big surprise. In one of our processes, in property, we have automated payments to our suppliers, when they provide upfront estimated invoices [purchase order details]. Then you get the final invoice and it actually matches the invoice with the loss assessment. If there are deviations it goes to manual control, and if [it] matches it pays out. Within certain percentage and absolute sums. Then all of a sudden it ran wild, and we quickly saw that in our systems. What was it really that had happened? What it did was that it paid, it created double entries in our systems, in the financial systems, so no transfers were made to the customer. Customers got the right amount, but we got a double booking. And then suddenly one of the property products goes completely crazy. Then it started to become really stressful, is there something we've done wrong? Or is there something wrong with the terms? So, we dug deep into this. Then they found out, oh no. This is a system that has run wild, or it has been configured incorrectly. (SVP, Retail)

The respondents reported that they do not feel they have enough time to get involved in other areas outside of their specialization, which is to offer support to managers, directors and other management accountants in obtaining decision data:

> The technical part on how to connect to an external data source, to collect data from a cube [section of databases]. Very few [decision-makers and management accountants] get it, have experience, or even know about it. You just need a solution like Smart View [Hyperion-related add-in for Excel]. … You must be, I would not call it an advanced user, but intermediate, it does not require too much. About a month ago, I helped one of the directors in division Z. You press here, and then there, and then there, and voilà. "There is the data that I manually punched for hours on Sunday" [quoting the director]. It [the level of knowledge] just sounds silly. (Management accountant, group level)

The use of big data in the Analytics, Product and price division and CRM requires skills and knowledge beyond a traditional finance function and the traditional role of management accountants, according to the respondents. This contributes to new, specialized roles in InsuranceCo, which take on responsibility for accounting for customer profitability and segmentation. Management accountants have historically not played an important role in pricing products in InsuranceCo. However, the divide between Analytics, Product and price and management accounting is described as increasing, contributing to a further specialization of roles in the company.

4.4.2 Increasing divergence between divisional and group-level roles and identities

The shift in accountability for customer selection and pricing has facilitated specialized positions higher in the organizational hierarchy; consequently, the decision-making processes have become increasingly centralized in InsuranceCo. The ability for individual managers or personnel to identify customers, select which products to offer and make discretionary adjustments has been significantly reduced in InsuranceCo. The customer and pricing models at the group level limit the boundaries for discretionary decisions in the divisional levels of the organization.

Concerning the roles of management accountants, the centralization of decisions creates some ambiguity depending on where the accountants are located in the organizational structure. Those in higher levels of the organization might become more involved in business-oriented activities through interdisciplinary projects. However, management accountants in the divisions can be viewed as reverting to a more traditional measurement role, distanced from the business orientation of group-level management accountants. The divisional management accountants' local knowledge and interpretation are to some extent replaced by big data, algorithms and machine learning, controlled at the group level. As the pricing models are improved, the autonomy for the division and individual sales managers to give discounts is significantly reduced for some products. Further, the use of customer analytics by the CRM department dictates, to an increasing degree, the number of staff needed to serve customers, and which customers they should serve, thereby reducing the ability of the divisional management accountants to influence the underlying business of the division.

The divisional management accountants are responsible for reporting requested data to the group level and for controlling administrative expenses, such as ensuring that the regional offices do not overspend on office supplies or other local items. However, they are also involved in business projects related to improving routines and procedures in the divisions, although the possibilities for making independent discretionary judgements is limited, according to management accountants at the divisional level:

> Now you're touching on a sensitive topic for me. We cannot [make] independent decisions on these topics since the agenda is decided on a group level [by other departments and divisions]. Concerning operations and optimizing our operational model in the division, of course we make independent decisions. But since so much of the agenda in the corporation is driven by systems, development, new projects, and profitability discussions… this becomes…, we just can't make independent decisions on these topics.

One director specifically mentioned that InsuranceCo had lost management accountants. As the remaining tasks often become repetitive and dull for management accountants, they end up applying for more stimulating positions outside InsuranceCo:

> Director: I cannot…, we have too many good people leaving, those who end up making the stupid lists [copied and pasted from systems into Excel or a master system]. So that's not okay, especially when we have a stated goal of hiring and [retaining] them.
>
> Interviewer: Is this a problem as you see it?
>
> Director: It is not massive, but it is enough of the best people to make it a problem.

Divisional management accountants expected to serve and provide information to the specialized roles. By facilitating collection of data the management accountants are expected to contribute to support analyses for specialists in central departments of the organization. As expressed by a divisional management accountant:

> So it's like…it becomes like, my role is to constantly make sure that CRM has the prerequisites they need to optimize value creation. Because then they can monitor and measure the effects of all the activities we have.

Management accountants at the higher level of the organization experience a higher degree of business involvement and trust from their superiors in pursuing projects:

> I feel we've always been free, but we might have gained more trust, or… Now we see more problems, so we look more into issues than others did previously. So, we have the ability to be on the ball more frequently. (Manager, performance)

The group-level management accountants do have more business involvement. They not only provide information to the top management team and directors but are asked for and provide advice to them. The information that the group-level management accountants provide is more detailed as a consequence of the integrated information systems and data warehouse, with more details than historically. Additionally, they describe having an overview of informal information in the organization, which they provide to decision makers. Consequently, the group-level management accountants can be described as having a business-oriented or hybrid role in which they play a more active part in decision-making. The divisions are expected to adhere to these central decisions, as indicated in the interviews:

> CRM director: Something that has gone the other way [as opposed to centralization]? Very good question… yes, it is, for third-party channels, where you have different negotiating power. It all depends on how big our partner is, how global it is; of course, we are partnering with Google and we will be more precise in the customer journey that Google can make available to us…
>
> Interviewer: What about internally in the organization?
>
> CRM director: Yes, so they get access to a lot more of the intelligence, because they go into the CRM system and get the next best advice, the customer you should sell it to, what you should ask for and what you should take care of. That's it, that is moving it out. But it is still us who decides [who and] what to talk about then, so in reality it is limiting [and centralizing].

4.5 New roles in InsuranceCo

Another change in the role of the management accountants pertains to their job title. Only two of the respondents clearly identified with the management accountant or controller job title. Other respondents had more specialized responsibilities related to pricing, modelling or customer analysis, or to business development and provision of information; they did not belong to the finance function under the chief finance officer (CFO) in InsuranceCo. The tasks they perform are all relevant to management accounting; however, they are not performed by employees who identify as management accountants.

The insurance business has always employed statisticians and actuaries to calculate risk premiums for its products. With the focus on becoming an analytical company, InsuranceCo has increased the relative number of highly educated physicists, engineers, statisticians and mathematicians. In InsuranceCo new roles have moved closer to tasks that have historically been performed by managers. One case that illustrates this is found in claims handling, where big data and machine learning are applied to detect fraud and to speed up internal processes. Consequently, the number of employees working with claims handling has decreased in InsuranceCo in recent years:

> When we set systems online, and when we first start to automate, the monitoring and control processes related to it, then we get really involved. And

> [we] might even take on the role of claims handlers or managers held [by] the claims departments previously. Like samples, for example previously 5% of claims [were] selected for manual control; now we control them through the system [automatically] and monitoring of the system. (Analyst)

The increased use of interdisciplinary teams has extended expectations to business-oriented roles, linking technological development to business processes and the ability to analyse information:

> Those who get the combination of the operational processes, the business processes, the technology behind it, and are analytical and even a bit creative on the business development area, they are the winners in this race. It is a certain type of brains, and they are in short supply, so some become very expensive. Others become generalists, and they fall off the wagon. It is very much like that. It is perhaps what strikes me the most, that the competence requirements are completely different [compared to the past]. (Director, CRM)

As the physicists, engineers, mathematicians and statisticians take on managerial tasks based on their analytical competences and data access, it appears unlikely that InsuranceCo will resort to reports or analytical insights, other than financial insights, from management accountants. The access holders of these roles have to data can surpass that of management accountants, and the results from their operational analyses and calculations are likely to be just as valid as those provided by management accountants.

5 Analysis

5.1 Digital technology as a contributor to specialized and narrow roles

Digital technology has contributed to changes in InsuranceCo in a number of ways. Previous research has indicated expanding and broadening roles for management accountants as a potential effect of digital technology (Caglio 2003; Järvenpää 2007; Suddaby et al. 2015). However, nuancing previous research, the observations from InsuranceCo indicate that digital technology can contribute to specialized and narrow roles.

The case reveals that the use of digital technology to collect information, and to provide decision support, did not decentralize decisions in the company. Contrary to previous research (Dechow and Mouritsen 2005; Järvenpää 2007), the case provided observations and direct quotes from managers that revealed they considered it more sensible to control decisions centrally rather than distributing them. The description of how digital technology facilitated new specialist roles within CRM and the Analytics, Product and price division illustrate how tasks of customer accounting and pricing and product analyses can become highly specialized.

The access to information, most notably through integrated information systems, enables directors, managers and employees working with analyses to access information without the use of management accountants. In InsuranceCo, many of the

integrations between systems enable automatic exchange of information, without any manual or human interaction involved. The specialists who monitor or oversee the flow of information between systems can be actuaries, physicists or management accountants. However, for management accountants the digital technology contributes to a new, narrow role as technical experts who oversee system integrations and information flows between systems.

In InsuranceCo, the technical management accountant role can entail acting as an expert on the digital planning and forecast system, Hyperion. The technical role ensures that the integrated information from sales and other professional systems is collected, processed and correctly presented in the Hyperion planning and forecast system. Information on the number of new insurance policies, the profitability of product lines, the various customer segments, the number of employees, and other indicators are integrated from the professional systems into the planning and forecasting platform by the technical role, and vice versa when performance and financial data are extracted from the planning and forecast system to the CRM system, SharePoint report platform, sales or other professional systems in the organization. The technical role is expected to provide the prerequisite information and assist in implementing and constantly monitoring the consistency of planning, performance and financial information between systems as these systems are updated, reconfigured or replaced. The role thus entails a narrow technical focus, as described by the respondents. This technical role appears to be distanced from decision making and corporate strategy in InsuranceCo.

However, the business-oriented management accountants at the group level of InsuranceCo expressed that they are expected to be freer and provide decision support in an expanding and broadening array of decisions and topics. The description of management accountant roles as complex and multi-layered (Byrne and Pierce 2007; Schaltegger and Zvezdov 2015) provides a refined perspective by which to analyse how digital technology contributes to changes in the role.

5.2 Exploring the competition over jurisdiction

The following section analyses the relationship between the role of management accountants and technological change. The analysis seeks to address the intra-organizational level of analysis, which has been identified as an under-researched area (Abbott 1988; Goretzki et al. 2013; Suddaby et al. 2015), as it aims to increase understanding of how groups and technologies can influence management accountant roles.

The management accountants in InsuranceCo face competition over jurisdiction from other groups of employees, particularly from the Analytics, Product and price division and CRM. For the largest retail division, groups of CRM employees claim jurisdiction in all tasks related to customer handling, whether it is customer acquisition, expected lifetime value, how to contact customers or which customers should be targeted. As the CRM employees present knowledge claims supported by big datasets on customer behaviour in combination with statistical knowledge and the

use of machine learning to predict outcomes, the divisions and the divisional management accountants have relinquished their jurisdiction in this domain.

The changes in jurisdiction between management accountants and the CRM department result not in overt conflict but rather an acceptance of the strength of each group, corresponding to findings by Suddaby et al. (2015). Competition over jurisdiction was also observed between management accountants and the Analytics, Product and price division, where the Analytics, Product and price division claims expert knowledge of pricing and product specification. As with CRM, the Analytics, Product and price division presents knowledge claims supported by its insights derived from big datasets in combination with statistical knowledge and the use of machine learning to predict outcomes. However, the acceptance and agreement over jurisdiction do not expand the roles of accounting or of management accountants, as indicated by previous research (Burns and Baldvinsdottir 2005; Järvenpää 2007; Suddaby et al. 2015). The knowledge claims from the Analytics, Product and price division and CRM rather limit the boundaries of management accountants, as these groups, to a large extent, have autonomous control over the process and provision of information in their domains.

The knowledge of how to distribute costs across divisions and departments, and to assess the financial effects of decisions, remains within the jurisdiction of management accountants. Likewise, no other groups claim jurisdiction over financial planning; however, jurisdiction over performance measurement entails increasing competition as customer, pricing and product indicators are not disconnected from the influence of CRM and the Analytics, Product and price division.

5.3 Changes in management accountant roles and identities

This analysis of the changes in role and identity draws on Sveningsson and Alvesson (2003) description (p.1168–1169):

> When we talk about role we focus more on generalized expectations of behaviour communicated in the environment rather than prescriptions for self-understanding, thus making a clear distinction between role and identity, although there is interplay between them.

The study finds that the changes in the roles of management accountants can be described as having followed two divergent paths depending on where the management accountant was positioned in the organizational hierarchy. Changes in expectations regarding behaviour have not been identical for the divisional management accountants and the group-level management accountants.

As the tasks of analysing customers, and monitoring, measuring and directing sales activity have been transferred to specialists in the CRM department, the influence of the divisional level of the organization on these topics has been reduced. The directors or managers in the retail division expressed trust in the insights and validity of analyses presented by the CRM department, and the retail division obediently adheres to these analyses. Discussions may arise between the parties, but the

power of and trust in statistical analysis and big data remains largely uncontested throughout the organization.

Pricing models have always been, and remain, the domain of actuaries in InsuranceCo. However, the divisions' ability to make discretionary decisions through discounts and deviations from pricing models has been reduced. The integrated information systems and big data enables the Analytics, Product and price division to collect more detailed and updated price information and incorporate this information into their models. The task of monitoring discretionary judgements has thus been reduced at the divisional level, and the information has to a large extent has become transparent for the Analytics, Product and price division through the access to more detailed data from the divisions. More frequent discussions take place between the divisions and Analytics, Product and price employees than between the divisions and the CRM department, and these discussions are often related to disagreements regarding market understanding of terms and the price elasticity of customer segments. However, the trust in statistical analysis and big data generally remains secure on the part of both parties.

As the CRM department and the Analytics, Product and price division have assimilated tasks in the domains of pricing, and customer analysis and operations, expectations of the behaviour of the divisions and the divisional management accountants have changed. As described above, the retail division does not question analyses directing their operational attention to sponsorships at the expense of attention to housing fairs. The retail division respects the statistical analyses and implements operational changes indicated thereby. For pricing tasks, the Analytics, Product and price division applies pricing models across all divisions and as the division is not necessarily familiar with all products, the price of similar products or pricing elements of products can be switched during analyses. The other divisions are expected to identify and comment on direct errors in pricing models. However, the empirical data indicate that the divisions do not contest the statistical analyses, data or models unless there are clear errors in the datasets.

The role of the divisional management accountants has thus narrowed rather than broadened. Not only have the tasks become narrower, the expected behaviour patterns indicate that management accountants are to adhere to analyses from higher organizational levels. While the interviews focused on the management accountants' roles, the interviews provided indications that role changes could contribute to sensitive and soar identity conflicts at the individual level of the divisional management accountants. And examples were given of these employees leaving the company to find more stimulating positions. This indicates that they were subject not only to role changes but that role changes contributed to identity conflict (Brown 2019; Horton and Wanderley 2018).

For the group-level management accountants the integrated information systems and big data have facilitated automating the tasks of data collection and accessing more detailed information across the organization. This has contributed to some of the group-level management accountants becoming more specialized in the information systems and performing what can be described as a digital technical specialist role, combing what has been described as methodological and information specialists roles with digital technology (Byrne and Pierce 2007; Rieg 2018; Schaltegger

and Zvezdov 2015). For the non-technical group-level management accountant roles expectations of their behaviour have changed and contributed to allowing them to operate more freely and get involved in business decisions, corresponding to a business-oriented partner role for decision makers. The access to detailed and updated information from the divisions has supported the legitimization of group-level management accountants as holding a business partner role in InsuranceCo. The study did not find any indications of identity conflicts among the business-oriented group-level management accountants. They expressed alignment between their roles in terms of their freedom and their ability to pursue topics that are of interest to them.

6 Discussion

The findings illustrate that the roles of management accountants are changing in InsuranceCo, and digital technology in the form of big data, machine learning, and integrated information systems contributes to facilitating these changes. The analysis reveals four main findings.

First, digital technology has contributed to several changes in the roles of management accountants. The literature has focused on the expanding and broadening roles (Burns and Baldvinsdottir 2005; Järvenpää 2007) experienced by business-oriented management accountants; however, the case illustrates how digital technology can contribute to creating narrower and more specialized roles for management accountants.

Second, by analysing the changes through a perspective of professional jurisdiction competition (Abbott 1988), the study finds that claims of expert knowledge by actuaries, mathematicians, physicians and statisticians can limit the boundaries of management accountants' roles. The intra-organizational level of analysis, in which internal groups compete over jurisdiction (Abbott 1988; Goretzki et al. 2013), enables a broader perspective by which to analyse how digital technology contributes to interactive changes in roles and influence within organizations.

Third, digital technology does not simply influence the roles of management accountants through changes in tasks. Tasks can be important elements of behaviour patterns; however, the case indicates that the broader social contexts in which the expected behavioural patterns change (Biddle 1986; Sveningsson and Alvesson 2003) influence the relationship between digital technology and roles. The reduced expectations, and changes in behaviour, of divisional management accountants to participate in customer and pricing discussions in the case illustrate how expectations of behaviour can contribute to changes in roles.

Fourth, the changes that digital technology contributes to in the roles of management accountants can mediate the identity-work of the individual management accountants (Brown 2015; Goretzki and Messner 2019; Järventie-Thesleff and Tienari 2016). Either as the technology contributes to autonomous and free roles where the management accountant can pursue topics of interest linked to the identity of how the individual management accountant see themselves, akin to a dream come true for the management accountant. Or digital technology can contribute to roles with reduced influence, repetitive tasks and endless provisioning of requested

information to competing specialist roles. Thus, digital technology can influence individuals to see their roles as disconnected from their identity and appearing as nightmares. The empirical descriptions, indicating that identity-conflicts can be sensitive and soar topics, provides a perspective to understand how individual management accountants can find remedy in pursuing other roles closer aligned to their identity. However, it is important to underline that this is not causal interpretation of how a technology impact management accountants' roles and identity. Digital technology can facilitate, influence or contribute to changes in the roles and identity-work of management accountants. However, more research is needed to improve the knowledge of how digital technology influence the roles and identities of management accountants.

The relationship between digital technology and changes in the roles and jurisdiction of management accountants is complex. As a single case study the generalizability of this paper's findings to other industries and organizations is limited; however, for finance industry organizations pursuing strategies by which to become data or analytics driven the findings might hold some generalizability. While this explorative study focused on describing how digital technology contributed to changes in a single company, further studies in other industries and regions can provide insights to increase our understanding of the relationship between digital technology and the role of management accountants.

7 Conclusion

This paper has empirically explored how digital technology (integrated information systems, big data and machine learning) contributes to changes in the roles, identities and jurisdiction of management accountants in InsuranceCo, a Nordic insurance company. The findings reveal that digital technology contributes to changes in the roles and identities of management accountants heterogeneously as professions compete (Abbott 1988) for tasks and influence on the boundaries of management accountant roles. Analysing roles as expected behavioural patterns (Sveningsson and Alvesson 2003) enables more fine-grained theorizing of the relationship between digital technology and management accountant roles. Organizations that implement digital technologies, as well as researchers, might benefit from analysing how digital technology can influence expected behaviour patterns in organizations and potentially contribute to triggering competition between professions.

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Table 1 Details of semi-structured interviews

	Title	Functional role	Duration (minutes)	Location
#1	Director, Performance and Planning	Head of group controlling	120	Head office
#2	Director, CRM	Head of CRM	70	Head office
#3	Director, Business Intelligence	Head of business intelligence	60	Head office
#4	Director, Analytical Insight	Head of analytical insight	60	Head office
#5	Director, Process Development	Head of technological development	60	Head office
#6	Director, Retail Sales	Head of retail sales	40	Regional office
#7	Manager, Retail Business Development	Head of divisional controlling retail	60	Phone
#8	Manager, Planning and Forecasting	Group controller	90	Regional office
#9	Manager, Performance	Group controller	50	Head office
#10	Director, Performance and Planning	Head of group controlling	60	Phone
#11	Analyst	Analyst claims	40	Head office
#12	SVP, Retail	Executive management team—Director, retail	56	Head office
#13	SVP, HR and Security	Executive management team—Director, HR	53	Head office
#14	CFO	Executive management team—CFO	55	Head office
		Total	**874**	

The SVP of Retail, director of business intelligence and the director of process development held positions as management accountants in InsuranceCo prior to their current roles

Appendix 1

See Table 1.

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Paper II

Andreassen, Roy-Ivar; Bjørnenak, Trond. Digital technologies and centralisation of power: A case study of decision-making and management control.

This paper is awaiting publication and is therefore not included.

Paper III

Organisational culture and digital technologies: A case study on configurations of management controls

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Abstract

Through a case study in a regional bank, this paper explores and analyses how organisational culture contributes to the configuration and use of formal management controls and digital technologies. The paper finds that collectively shared beliefs and values in organisations, conceptualised as organisational culture, contribute to shape the design of both formal management controls and digital technologies in the case company. In its investigation, the paper contributes to the current debate on digital technologies and accounting by, first, exploring and explaining how organisational culture can moderate the use of formal management controls facilitated by digital technologies. Second, the paper finds that collectively shared beliefs and values are embedded in the configuration and use of digital technologies.

Keywords

Management control; Digital technologies; Organisational culture; Accounting information use; Management Accounting

1. Introduction

This paper seeks to explore and develop our understanding of the configuration and use of management controls, by studying (a) how organisational culture is one element that contributes in the configuration of management controls, and (b) the moderating role of organisational culture in the configuration and use of digital technologies in formal management controls.

Digital technologies contribute to increase the number, detail, and frequency of recorded events that can be used for management controls. However, if and how the increased number of recorded events contribute to changes in the configuration of management controls is a question that remains largely unanswered in the accounting literature (Möller, Schäffer, & Verbeeten, 2020). This paper aims to explore how organisational culture contributes to the configuration and use of digital technologies in management controls.

Researchers have frequently perceived the phenomenon of organisational culture from two divergent perspectives (Alvesson, 2012; Schein, 2004) in management literature: either as a purposeful construction by managers to constrain, stabilise, and provide meaning to employees, or as a social phenomenon that exists in all social groups and influences the groups' beliefs and values (Schein, 2004). Earlier research on management controls clearly recognises that purposefully constructed culture can be an important element of management controls (Ahrens & Mollona, 2007; Dent, 1991). Guenther (2013) and Malmi and Brown (2008) describe how cultural controls are an important element of management control systems. The literature further acknowledges that culture can also contribute to shaping management controls. Several studies, such as Abernethy and Chua (1996) and Hopwood (1983), argue for the importance of studying organisational culture and context to understand the phenomenon of management controls. Accounting researchers inspired by institutional theory have argued that organisational culture can become institutionalised and contribute to shape both the configuration and use of management controls (Abernethy & Chua, 1996; Alvesson, 2012; Dent, 1991; Kraus, Kennergren, & von Unge, 2017). To illuminate what culture is, this paper directs its attention to organisational and sociological researchers who have argued that collectively shared beliefs and values are elements of culture (Alvesson, 1995; Bourdieu, 1977; Schein, 2004). The description of culture in this paper harmonises with Alvesson (1995) conceptualisations of culture as knowledge, beliefs, symbols, and values possessing some depth that are difficult to grasp and subject to

interpretation, shared by a collective group to form a holistic and subjective interpretation of history and traditions.

Studies of management controls and culture in banks have presented several interesting findings. Cäker and Siverbo (2014) found and described a close alignment between the culture and strategy of decentralisation of decisions and management controls in Handelsbanken, a Nordic bank. Marquis and Lounsbury (2007) investigated and described differences in culture between community and nationwide banks in the US. In the current case study of a regional bank, BankCo,[1] the respondents underlined the importance of the organisational culture in management controls:

> There is a core [a collectively shared understanding], building culture in the sense that people act intuitively right. […] I believe in avoiding the temptations [increasing use performance measures and digital technologies] and what lies therein. We can use it for automation, but if you want to control people after that, you will […] that would have killed the motivation. I'm sure of it. (CEO)

The accounting literature has questioned how digital technologies will contribute to changes in management controls (Appelbaum, Kogan, Vasarhelyi, & Yan, 2017; Bhimani & Willcocks, 2014; Quattrone, 2016). Despite earlier research identifying that shared beliefs and values in organisations influence the relationship between digital technologies and management controls (Bariff & Galbraith, 1978; Markus & Pfeffer, 1983), the topic remains understudied (Möller et al., 2020).

Digital technologies facilitate the recording of events at unprecedented volume and frequency (Gandomi & Haider, 2015). These records of events in organisations are what the accounting literature describe as accounts (Burchell, Clubb, Hopwood, Hughes, & Nahapiet, 1980; Merchant & Van der Stede, 2007), and what is referred to as accounting information (Burns, Quinn, Warren, & Oliveira, 2013; Chua, 1986; Hopwood, 1978). The data from digital technologies can be used for performance measures and management controls (Möller et al., 2020). Studies have found that digital technologies have had a profound impact on work processes in banks, specifically in the use of digital technologies for automation of work processes, regulatory risk reporting, and customer handling through online services (Bolt & Chakravorti, 2012; Crawford, 2017; Kelly, 2014). However, several sociological,

[1] A pseudonym.

organisational (Bailey & Barley, 2020; Orlikowski, 1992; Volkoff, Strong, & Elmes, 2007), and accounting studies (Abernethy & Chua, 1996; Bhimani & Bromwich, 2009; Otley, 1980) have argued that technologies such as information systems (IS) cannot be studied in isolation from their social context. Methodologically, they have explained how analysing the joint interaction between the technology and social elements can provide explanations of how technologies contribute to change in organisations (Granlund, 2011; Orlikowski & Scott, 2008; Volkoff et al., 2007).

Building on the above-mentioned research, this paper explores and analyses how the digital organisational culture moderates formal controls facilitated by digital technologies in the configuration of management controls and management control practices in BankCo. The paper seeks to answer the research question, *how does organisational culture contribute to the configuration of digital technologies and formal management controls?*

In answering the research question, the paper contributes to the literature by, first, exploring and explaining how organisational culture can moderate the use of formal management controls facilitated by digital technologies. Second, the paper's findings indicate that collectively shared beliefs and values are embedded in the configuration and use of digital technologies.

The remainder of this paper is structured as follows: the second section presents research on digital technologies and organisational culture, before introducing research on the relationship between organisational culture and management controls. The third section describes the research design and method, before the fourth section presents the empirical case and its context. The fifth section analyses and discusses the findings from the empirical case, before the sixth section provides a short conclusion.

2. Theoretical background

2.1 Culture and the configuration of management controls

The relationship between organisational culture and management controls has been addressed by accounting researchers over several decades (Dent, 1991; Flamholtz, 1996a; Simons, 1994). Management controls have frequently been described as a system of interdependent forms of management controls (Alvesson & Kärreman, 2004; Gerdin, 2020; Grabner & Moers, 2013). In their review of accounting literature on management controls, Malmi and Brown (2008) presented a typology of five forms of controls that they conceptualise as a management control system package (see Figure 1).

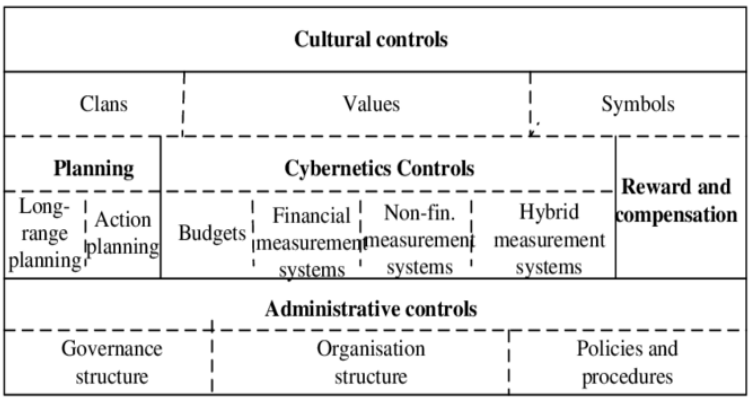

Figure 1: *A management control system package* – Malmi and Brown (2008)

As depicted in Figure 1, cultural controls are one of the five elements in the control system package. These cultural controls are placed above the four other forms of controls – planning, cybernetic controls, reward and compensation, and administrative – to illustrate their overarching role in a management control system package. Thus, Malmi and Brown (2008) position cultural controls as subtle and broad controls that provide a contextual frame for the other management controls in the organisation. Malmi and Brown's perspective on organisational culture as an overarching element of management control systems is inspired by Flamholtz (1996b) perspective and depiction of a core control system being encapsulated by organisational culture (Figure 2).

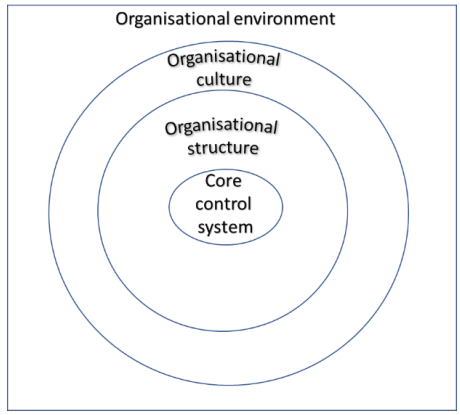

Figure 2: An illustration of core controls - Flamholtz (1996b)

This study interprets the description of cultural controls in a contextual frame in management control systems as an element that bounds and limits the other dimensions of controls. Specifically, the paper argues that cultural controls contribute to the legitimisation or delegitimisation of other dimensions of management controls (Ahrens & Chapman, 2002). The collectively shared beliefs and values in organisations contribute to both the configuration and use of management controls (Ahrens & Mollona, 2007; Tessier & Otley, 2012).

Formal management controls have been described through a number of different theoretical concepts, such as core (Flamholtz, 1996a), cybernetic (Malmi & Brown, 2008), technocratic (Kärreman & Alvesson, 2004) or formal management controls (Kilfoyle, Richardson, & MacDonald, 2013; Kraus et al., 2017). These theoretical concepts share a common theoretical core where they describe formal management controls as encapsulated, or surrounded by, culture (Flamholtz, 1996a; Kraus et al., 2017; Malmi & Brown, 2008) or interconnect to socio-ideological control (Kärreman & Alvesson, 2004). Thus, they all describe how organisational culture contributes to shape what this paper labels as formal management controls.

Historically, there have been few empirical field studies on the practical relationship between organisational culture and management controls, a research gap that previous studies have identified (Ahrens & Mollona, 2007; Berry, Coad, Harris, Otley, & Stringer, 2009). It is not self-evident that the conceptual theorising on the role of organisational culture in the configuration of management controls is reflected in management controls as a social and institutional practice (Hopwood, 1983). This underdevelopment in empirical research on organisational culture and accounting practice can be puzzling, as Busco and Scapens (2011) argued that leaders

> are increasingly relying on new initiatives of organisational transformation, driven by holistic (i.e., comprehensive, organisation-wide) performance measurement systems. Such systems both comprise and extend the traditional financial measurement systems and, as such, raise questions about the broadened role of management accounting and the processes of learning that can change organisational culture. (p. 322)

One recent study addressing the research gap on collectively shared beliefs and values and management controls practice is that of Kraus et al. (2017). In their study of formal management controls, they drew attention to ideological values and argued that collectively shared ideological values in the organisation is an essential element in enabling the implementation of new formal management controls. Drawing on compliance theory, the researchers discussed how ideological values can contribute to organisational compliance. Their case study detailed how ideological values contributed to hindering resistance towards implementing a formal management control system from the medical professionals in a medical non-governmental organisation. The findings by Kraus et al. (2017) highlighted how values and beliefs can contribute to the configuration of management controls. The study contrasts with other research on implementing formal management controls practices in medical organisations that have described resistance from medical professions, in organisations with less articulated collectively shared values, when implementing formal management control systems (Abernethy & Vagnoni, 2004; Jacobs, 2005). There are thus empirical indications and theoretical foundations for arguing that culture contributes to the configuration of formal management controls and control practices in organisations.

The collectively shared beliefs and values in organisations referred to as culture (Bourdieu, 1977; Schein, 2004) are argued to contribute to facilitating the sanctioned and legitimised systematic collection of information in organisations for management controls (Alvesson & Kärreman, 2004; Flamholtz, 1996a; Malmi & Brown, 2008) or formal management controls (Kilfoyle et al., 2013). Furthermore, studies have theorised that elements of organisational culture are important in explaining the configuration of management controls, whether through interplay (Kraus et al., 2017), interface with(Alvesson & Kärreman, 2004), or complementing each other (Abernethy & Chua, 1996)

The perspective argued in this paper is that management controls are a phenomenon configured through social processes in social systems with social structures (Chua, 1986; Tessier & Otley, 2012). This study focuses on the narrow topic of how

collectively shared values and beliefs are interpreted to contribute to the configuration of management controls, and how collectively shared values and beliefs contribute to the configuration and use of formal management controls.

To understand the role of organisational culture, this paper gathers inspiration from previous studies addressing organisational and social contexts (Hopwood, 1978, 1983; Scapens, 1994). The current study finds values and beliefs in decentralised decision-making and commitment to local communities to be reflected in the organisational routines and procedures, and collectively shared by managers and employees in the organisation. As will be described in section five of this paper, the empirical analysis shows that managers indeed have a collectively shared interpretation of the decentralisation of authority and commitment to local communities as essential elements in the management controls in BankCo.

2.2 Management controls and technological embeddedness

Both researchers (Appelbaum et al., 2017; Granlund & Malmi, 2002; Möller et al., 2020; Quattrone, 2016) and consultants (Eklund, Tam, & Woodcock, 2018; McCorkell & Shapiro, 2016) expect digital technologies to influence management controls. Empirical studies of digital technologies have indicated that such technologies facilitate central digital IS that collect accounts from diverse functional areas of organisations, as well as collecting information from dispersed physical locations (Dechow & Mouritsen, 2005; Scapens & Jazayeri, 2003).

The findings from the studies on the relationship between digital technologies and management controls are, however, ambiguous. The use of digital technologies has been found to increase standardisation and homogenisation of accounting and control information (Benders, Batenburg, & van der Blonk, 2006; Bhimani & Willcocks, 2014; Hanseth, Ciborra, & Braa, 2001), and is frequently intended to replace decentralised local IS (Kilfoyle et al., 2013). This arguably indicates that digital technology can contribute to the centralisation of power and standardisation of management controls (Bhimani & Willcocks, 2014), controls that potentially provide transparent information all the way to top management (Warren, Moffitt, & Byrnes, 2015). At the same time, studies have found that digital technologies contribute to decentralisation of controls (Granlund & Mouritsen, 2003; Knudsen, 2020; Rom & Rohde, 2007). By distributing the access to information to lower levels of the organisation, employees and lower-level managers can potentially manage themselves. The digital technologies arguably reduce the need for analytical expertise from upper and middle management in management controls (Dechow & Mouritsen, 2005).

One explanation for these ambiguous findings could be the contribution from organisational culture and context in both the design and use of digital technologies in management controls (Dillard & Yuthas, 2006). Two independent Finnish studies on digital technologies in management controls questioned the efficiency gains from the standardisation of management control information (Hyvönen, Järvinen, Pellinen, & Rahko, 2009; Lukka, 2007). Lukka (2007) argued that "It is not self-evident that the standards in use are as rational and beneficial as standardisers claim them to be" (Lukka, 2007, p. 81). Both Hyvönen et al. (2009) and Lukka (2007) found that organisations adapt the use of digital technologies and standardisation of management controls to the various context of organisational units in situ. Consequently, the various organisational units do not necessarily collectively share an understanding of how they are expected to collect, process, report, and interpret the management control information from a digital IS. Those who configured the digital IS are nonetheless likely to have an intention of how to use the information for management controls (Hyvönen et al., 2009; Lukka, 2007). Formalisation and standardisation of control information through digital technologies are thus not a panacea for management problems, argued Lukka (2007). In another study, Vaivio (2004) argued that information in digital technologies could potentially reveal internal inconsistencies within an organisation, and this could explain the resistance of local managers towards digital IS. There are thus clear indications that organisational context and social elements contribute to the use of digital technologies in the configuration of management controls.

Early research on digital technologies in accounting identified how automation and standardisation facilitated by digital technologies could potentially conflict with organisational elements such as power, beliefs, and values (see Bariff & Galbraith, 1978; Markus & Pfeffer, 1983). Markus and Pfeffer (1983) questioned the premises of rationality in decision-making that underlies accounting software, stating that "Efforts to introduce elaborate multi-indicator controls into an organization stressing qualitative evaluation will encounter resistance and potential failure. Systems stressing dimensions of the operation not previously emphasized in the culture will encounter difficulties" (p. 209). They further argued that shared beliefs in organisations are important to understand the role of digital technologies in accounting. However, recent accounting literature on digital technologies has failed to address how organisational and social contexts contribute to the design of technology at an organisational level of analysis.

The organisational literature on technology has firmly established that social elements contribute to the design of technology in organisations (Orlikowski, 1992; Orlikowski & Scott, 2008; Volkoff et al., 2007). Volkoff et al. (2007) argued that organisational design and use of technology are embedded with organisational elements such as routines and roles. To understand how technology contributes to organisational change, we thus need to explain the relationship between organisational elements and technology, according to Volkoff et al. (2007).

Volkoff et al. (2007) found that organisational elements contribute both in the configuration of IT systems and in the subsequent practices involving IT. The routines and roles that are embedded in organisations influence how IT is configured and implemented into organisational practices. How organisations understand, configure, and make use of IT is thus not only dependent on the material object, the software, or the information system per se (Dillard & Yuthas, 2006; Markus & Pfeffer, 1983; Orlikowski & Scott, 2008; Volkoff et al., 2007).

Orlikowski (1992) explained how organisational elements and material technology recursively influence each other; consequently, she argued for analysing the phenomenon of IS as a duality. The organisational elements influence the design of IS, and the design of systems influences the organisational elements in a recursive relationship, forming a duality between the technology and the social elements of IS.

Drawing on the literature presented in this section, this paper addresses how organisational culture contributes to the design and use of digital technologies in management controls. Specifically, the analysis adopts Volkoff et al. (2007) explanation of technology as a phenomenon embedded with organisational elements that influence the configuration and use of IT in organisational practices.

3. Research design and method

This research took the form of an explorative case study in a regional savings bank. The researcher approached the bank as the media portrays the finance sector, and especially banks, as being highly impacted by digital technologies. This observation of a bank with the public image of a technologically advanced organisation, contrasted with the indications of relatively manual and unchanged internal management controls, triggered the study. BankCo represents an interesting case, as it has chosen to maintain a network of bank branches in its region, while the largest banks in the Nordic countries have reduced their network of branches significantly. As a regional savings bank, BankCo has publicly expressed, and contributed to create an image, where the close connection between the inhabitants and businesses in all parts of the region is an element of BankCo's success story. To study whether these expressions of close connection to people and businesses have contributed to collectively shared beliefs and values within the organisation, a case study was found appropriate. A case study facilitates an in-depth understanding of the intra-organisational design and use of digital technologies, and the configuration and use of management controls.

An initial meeting between the researcher, two research assistants, and a group-level management accountant preceded the first round of interviews. The research assistants conducted the first round of thirteen interviews. The data were collected through semi-structured interviews, in addition to document reviews. The research assistants conducted interviews in the offices of BankCo or its subsidiaries, and audio recorded and transcribed the interviews. After analysis of the first round of interviews, the researcher conducted a second round of interviews, seven in all. The twenty interviews lasted in total more than 1,000 minutes, ranging from 35 to 86 minutes. In exploring the extent of collectively shared beliefs and values, the researcher approached a wide range of interview subjects: the top-level executive management team, middle managers, and management accountants from the top-group level to the subsidiary level. The interview subjects comprised three members of the executive management team, six department and branch managers, and 10 management accountants. In addition to the interviews, there were informal discussions, and participation in a workshop with the members of the customer relationship management (CRM) team from BankCo and another regional bank. Documents in the form of annual reports and policy documents and statues for the board of directors have contributed to the researchers' understanding of BankCo as an organisation. Demonstrations of digital IS on interview subjects' screens have

further contributed to an understanding of the digital technologies and culture in BankCo.

Through an iterative process of analysing the empirical data and theories, the approach of the study followed an abductive approach (Lukka, 2014). At the outset of the study, Cäker and Siverbo (2014) study on the alignment of management controls and organisational strategy in another Nordic bank provided a starting point to explain the configuration of management controls in BankCo. After reviewing the first round of empirical interviews, the theories of Flamholtz (1996a) explaining management controls as eclipsed by culture provided additional input to further explore how the management controls were configured. The theoretical concepts and empirical data have thus been analysed and refined after both the first and second round of interviews to disentangle insights from the study (Ahrens & Chapman, 2006).

To investigate the phenomenon, the study took an interpretive epistemological position (Ahrens & Chapman, 2006; Bryman, 2016; Chua, 1986). The empirical data have provided rich descriptions (Fine & Hallett, 2014; Geertz, 1973) of the internal processes in the case company. Conducting two rounds of interviews and using research assistants for the first round have contributed to validating that the data interpretations are authentic and plausible.

The researcher transcribed, analysed, and coded all interviews using NVivo, a qualitative data analysis software application. The interviews were coded to identify a number of empirical and theoretical concepts such as autonomy, values, beliefs, traditions, history, and performance measures and operational controls in the empirical data. The theoretical concepts were initially inspired by the five dimensions and subcategories from the conceptualisation of a management control system package by Malmi and Brown (2008). However, the researchers later introduced more refined concepts such as collectively shared beliefs as a cultural element, and revised segments with pre-existing codes to identify the more refined concepts in the coded text. Each transcription has been coded for all concepts. Thus, a single paragraph can be coded as empirical descriptions of the use of digital technologies and management controls, and at the same time coded as describing autonomy and values in the organisation. The software facilitated the processing and extraction of relevant paragraphs and sentences when analysing the empirical data.

4. 4. Digitalisation in banking and BankCo

4.1 BankCo

BankCo's history traces back to a local bank founded in the early 19th century. Through a number of mergers at the end of the 20th century, the bank increased in size and became a regional bank. Although the size of BankCo has increased over its history, it remains committed to contributing to its local communities and region. Through financial contributions, BankCo has been and remains one of the region's largest non-governmental benefactors, providing financial support to several festivals, youth sports teams, and organisations involved in recreational activities and education support for children. BankCo believes that it should act with continuity and predictability for society. The importance of predictability and continuity in the organisation is apparent: BankCo has held the same CFO for more than 30 years, and infrequently changes CEOs.

> The bank has been here for two hundred years and I'm the sixth leader since 1912. There is something [there], having the [business] model [of a regional savings bank]. There has been continuity [Few changes in the organisation]. It has been the same CEO, the same CFO, and of course development, but probably more continuity. (CEO)

In size, BankCo has reduced the numbers of employees in its banking operations significantly over the last decade, from 1,100 to around 600 currently. According to the bank, this is a consequence of digitalisation, both internally and following the customers' adoption of online banking to access services. In the same period, as the bank has almost halved the number of employees, it has tripled its income and doubled its financial result. The organisational structure has, however, remained stable despite the changes, as illustrated in Figure 3:

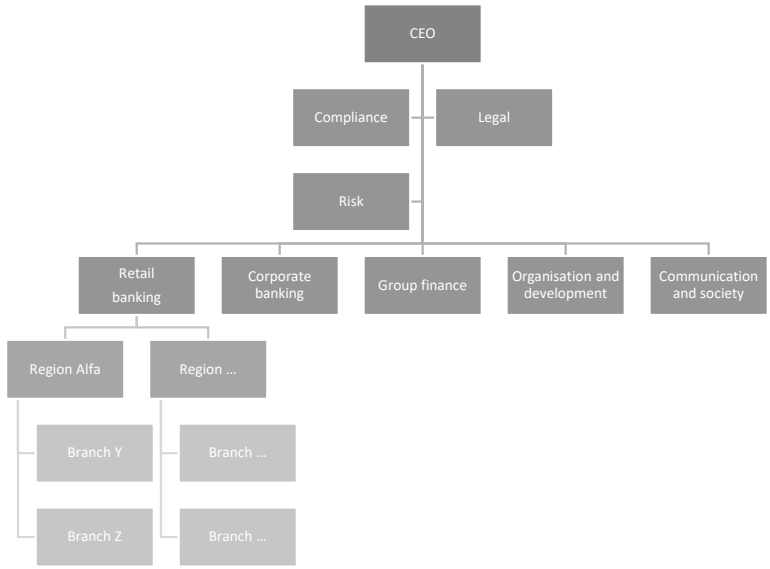

Figure 3: Organisational chart of the bank without subsidiaries and associated companies

BankCo has expanded its operations outside of banking. The bank has subsidiaries and holds majority shares in real estate agencies and a company offering accounting services. The accounting service company employees almost match the parent company BankCo's in number. Including the subsidiaries, the bank has more than 1,000 employees.

BankCo has a high degree of autonomy for managers and employees in general. The subsidiaries and local bank branches operate as separate profit centres and enjoy a high degree of trust and freedom in how they organise work. The official values of BankCo emphasise accountability and skills, where skills are described as being *down to earth and professional without creating distance*. The employees frequently underline the importance of local empowerment to make decisions. The interviewees frequently refer to local empowerment and commitment, understood as a bottom-up process from the local operational level, as an essential element that defines the bank. The managers state that the distribution of power is rational based on historical events in the bank's history and is aligned to the official values and commitment to local decision-making. The organisational belief in delegating authority is shared by employees and the executive managers:

> I worked [previously] at BankZ[2] [multinational bank], we had wide national authorisations, and we worked pretty hard with moving decisions out [to branches]. Then the financial crisis came and the CEO was summoned to the board. [The board] Saying that now we have cancelled all national authorisations. Now all credit decisions are to be decided at the [foreign] Head Office. At that point they [the board] stated that the local knowledge, it has no value. I do not think the losses were less for BankZ, on the contrary. Because then you said no to an information source. (Executive manager)

BankCo has a longstanding belief in local knowledge and autonomy as essential elements contributing to its successful history. This belief is reinforced through presentations and lectures at internal training programmes and gatherings for managers and employees. The training programmes further address the history of the bank, the values and connection to communities, ideas of trust, and local skills. This illustrates the importance of employee empowerment and autonomy to apply discretion when taking decisions. In addition to its formal training programmes, BankCo organises several social events, meetings, and internal conferences at all levels of the organisation, where the corporate values, beliefs, and organisational attitudes of challenges and accomplishments are presented.

BankCo promotes its history as a local community bank with roots in the regions and communities in where it operates. Its ownership, like the majority of regional and local saving banks in Northern Europe, has a history dating back to when the bank was founded as a non-profit organisation. Historically, the bank distributed the profits from its operations to the benefit of the regional and local communities, and the board consisted of politicians, employees, and representatives from the regional customers. Although BankCo and other regional banks have become listed companies distributing minority shares of profit to shareholders, the board of directors is still appointed by a committee of customers, shareholders, regional government officials, and employees. Almost 40% of the equity is held by municipalities and counties in the region. The regional politicians appoint a number of board members, as do the employees and customers. In addition to the direct dividends the municipalities and counties receive, the local communities and interest groups can apply for grants managed by the BankCo foundation. The foundation receives a fixed ratio of the dividends from BankCo.

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[2] Anonymised bank.

As banks have leveraged digital technologies to handle customer procedures, this has led to a reduction in the number of employees in banks in the Nordic countries. This reduction of branches and employees and transformation of banking services to a digital service has contributed to creating an image of banks as organisations at the forefront of adopting IT. However, the interviews indicated discrepancies between the use of digital technologies externally and internally in BankCo.

> There has been a high priority on digitalisation of the customers, making the customer experience digital, and that it appears as everything is digital. […], but then there are some [processes] that are digital in front [customer facing] and completely manual in the back end. (Manager)

> In this banking world, a lot has happened to the customers, but especially in the banking industry the banks' internal systems they are neglected. And especially these core systems that I talked about, the very innermost gears in the bank, that is something you do not touch or alter. […] It looks quite antiquated, so yes, there is a huge difference really to the development [internal and external]. There is more focus on it now, but there is still a huge gap. (Management accountant)

Customer-facing technologies have been prioritised along with the use of technologies to meet regulatory requirements. In the public eye, the banks appear as state-of-the-art companies in their use of IT, while internally the respondents state that they have not been granted resources to leverage IT to collect and process internal information. One illustration of the low priority of internal IT systems is the lack of an enterprise resource planning (ERP) system, or integrated IT systems to collect, process, and store general internal accounting information.

4.2 Digital information systems in BankCo

Although BankCo has no single integrated ERP or digital IS collating accounting information, the organisation has a number of digital IS containing accounting information. To give an impression of the number of digital IS, there are professional IS to assist employees in handling in of mortgages, insurances, investments, sales reporting, and funding of the bank. All of these can provide information for management controls. This section will describe three of the digital IS in more detail: the transaction system, the integrated risk management information system, and the CRM system. The oldest, and said to be most important, is the bank transaction system. This system processes interest calculations and the transactions in accounts. This system is referred to as the core system among the employees and has a history

dating back to the 1970s, in a quite different era of IT. The handling of accounting transactions, deposits, withdrawals, and interest calculations are still performed in the transaction system. New systems for customer-facing online banking services and finance advisors work on top of the old system, collecting information from the core system, and displaying the information in modern user interfaces, allowing for internet banking services and other digital solutions. Until the late 1990s, the core system was the sole source for complete financial records and many of the performance measures for profit and cost centres. Even today, the core system contains detailed accounts that are unavailable in other systems.

The data used in management control practices in BankCo, described in the following section, are collected from digital sources such as software overlaying the core banking system from the 1980s. The overlaying software presents some of the data in a more modern user interface. To analyse and present management accounting information, several digital IS have to collect substantial amounts of data. The collection of data can involve retyping data displayed on a screen in a digital IS into an Excel spreadsheet or exporting data from one system into Excel. This process enables merging of data from several systems into a spreadsheet.

> When I started here, it was very much that "you go into our accounting tool [the graphical software on top of the core system] then press the export button to Excel". Then I collected numbers from digital information systems and cut and pasted it [into a spreadsheet]. Now we have created some more automatic queries that connect directly into the database. So [now] we can press the refresh button and you get last month's [data]. However, the data extract is never complete, even if we [have tried to] standardise it. There is a lot of hustle and bustle afterwards, so we can automate some of it [the data collection]. But you have not got rid of the task [manually collecting and collating data]. (Management accountant)

The transaction system can provide rich and detailed data at transactional levels. However, in many of the reports, the data are often aggregated in predefined configurations. One example is that the mortgage portfolio of a branch is typically presented in aggregated numbers, where the average customer interest rate is displayed. As long as there are no significant deviations from expectations, the portfolio of individual mortgages is not analysed. However, if there is a significant deviation, a detailed report from the core banking system has to be requested. This report contains substantial amounts of detailed data and has to be processed before an analysis of the portfolio can be performed. The analysts or management

accountants often omit collecting detailed data, as this would be incompatible with the time allocated to provide reports.

> You probably do not have all the relevant information. There is always something more you could have known, whether it is market information, you do not find the data in the bank, […] it is well hidden in some systems which display the information in a black screen with green text [the transaction system], and we cannot use it. So, I do not go in there [the old systems] to get the details, but I would like to have… it should be possible to transfer the data to the data warehouse, it is probably something that can be done. (Management accountant)

To comply to regulatory demands, BankCo must monitor transactions for money laundering and to ensure the equity of the bank sufficiently covers losses due to unlikely events. Following the financial crisis, these regulatory demands on financial service providers have increased (Crawford, 2017). The demands require more detailed and timely monitoring of risks, and BankCo and other banks have separate risk departments to monitor all transactions and other potential risks. To adhere to the regulations, the risk department must access and collate data from the transactional system and other digital technological systems in the bank. Through connections of systems into a single digital IS, SAS Visual Analytics (SAS VA), the risk department can access, collate, and analyse detailed data from several of the digital IS and big data sets in the bank. However, as the following quote illustrates, the digital information system used by the risk department has not made large contributions to increasing the use of the IS for collecting and processing information for performance measures or management controls outside of the risk controls required by regulators.

> We have a software called SAS VA [the information systems used by the risk department], which was supposed to be a tool for analyses and analysts, and it was probably acquired about the same time as I started in the bank. There is no resistance to it, but we haven't been so good at using it, and I think one has underestimated the resources and effort required [education and training] to use the system, and the preparation [integration and cleaning] required to fix data and make some configurations and customisations. (Management accountant at group level)

Although SAS VA provides access to detailed data on a number of potential and implemented performance measures and other management controls, the system has so far not been used for performance measures or management controls outside of

the risk department. To be specific, employees could have accessed the detailed reports on deviations in mortgages through the SAS VA, rather than through the manual collation of information from various reports in the transactional system. Similarly, the calculation and measurement of new mortgages per financial advisor or branch could be performed automatically in SAS VA, rather than via the sales reporting system where the financial advisors or branch managers manually input their estimates and actual figures for new mortgages for a given period.

In 2019, BankCo implemented a new digital CRM information system which enabled personalised campaigns and offers to customers. The CRM system operates as a desktop on the computer screens of the financial advisors where they perform their daily tasks, inputting customer information and logging short memos about phone calls, emails, meetings, etc. The CRM system presents on-screen information about the customers' contact information and collects details from other digital IS, such as systems for mortgages, insurance, credit cards, car loans, savings accounts, and investments. Although the information is presented in the CRM system, the advisors can be redirected to the professional systems for customer handling, e.g., if a customer applies for an extension or a new mortgage, this is not handled in the CRM system but in the professional mortgage system. The CRM system does not directly replace the professional systems but collates the information from the IS to present it to the advisors and in one unified graphical user interface. The CRM system is built on a CRM platform provided by Microsoft and can store vast amounts of records of events on the users, customers, and the systems' data inputs.

For the managers in BankCo, the number of digital IS contribute to create an additional challenge. BankCo have promoted autonomy for the managers, and consequently the use of digital IS is fragmented across the organisation. The local bank branch managers have had great freedom in selecting how and to what purpose they should use the various digital IS. There have been no formalised processes for the use of digital IS for local management control. However, the digital IS updates and introduction of the new CRM system, with a desktop interface for internal users, has enabled local and regional managers to implement new controls in their regions and branches. This has not, however, been promoted or administered by the head office. Thus, the local managers maintain a high degree of autonomy in how they configure local controls in their department, region, or branch.

> Such systems [the new systems] allow you to choose a favourite way of seeing things, you can select your own filters [selection of data]. And it is good that they [the local managers] themselves obtain a feeling for the relationships

> [between data and financial results]. In theory, the systems can give us the opportunity to see if they [the local managers] use the information or not. And in any case the systems facilitate that we provide them the information [with structure] we have available. Not all that unstructured [information] that creates chaos and distorts an overview. And there is a lot [more changes]. When we just send PowerPoint slides, we have no control [on how the information is used]. But then there is [another situation], imagine a horror scenario where they [the local managers] use the systems [differently]. Then they can create their own version of the truth. After all, we do not monitor them that intensively […]. However, I think, all the new systems are much better than sending around Excel sheets and PowerPoints. The development is going in that direction. (Management accountant)

During the interviews, several of the interviewees provided numerous examples of new or updated professional systems over the last decade, including systems for insurance sales, card issuing, and sales monitoring and reporting. The study found variations at the regional and local level on how the branch managers described the use of digital IS for management control in their regions and branches. This indicated major differences in how branches use the digital IS in local management control practices. The central analysts and central managers can express some frustration over the difference in how the branches and departments are managed; they especially note a difference in the use of digital IS in BankCo compared to other organisations.

> I am a little influenced by the fact that I previously worked in BankX.[3] In BankX, there is not as much freedom as it is here. In BankX they state, "This is how we do it. Now we power off the old system [make the old information systems unavailable]. When a new CRM project started, everyone [was forced to] perform their tasks in the new CRM system". In BankX, there is much less individuality in that respect [choice of which systems to use]. I really feel that there is too much freedom [in BankCo], but I know that this is not a popular attitude [in BankCo]. Because it is precisely because they [managers] are given the responsibility for the total profitability, they get the greater freedom. And in that perspective, it is good. Because then they [managers] will understand the relationship between use [of resources] and results. (Management accountant)

[3] Anonymised bank.

The quotation illustrates the belief that local decision makers' discretionary judgements and knowledge contribute to the success of BankCo, and that this belief is deeply embedded in the management controls in the organisation.

4.3 Performance measures and formal management controls in BankCo

The performance measures at the group level in BankCo focus on financial results, primarily the return on equity at each profit centre. The executive managers indicate that they, in addition to financial indicators, monitor market share, employee engagement, customer satisfaction, and quality. However, the managers and management accountants predominantly describe performance measures as the financial return on equity, and at the lower levels of the organisation, the number of newly acquired customers or value of issued mortgages in the retail division. Contrary to the tight, formalised management controls found by Cäker and Siverbo (2014) at Handelsbanken, the management controls are less formalised in BankCo. There are formal controls in the company; however, the executive managers largely trust that the managers and employees share the organisational attitudes on how to run a locally rooted bank. The interviews with the executive management team, and managers of the departments administrating digital IS, indicated that the arguments for investments in digital IS were similar to that of investments in a new production machine, with increased performance and efficiency in production. Although not explicitly stated, the arguments for investments in digital IS in BankCo can be synthesised as a shared understanding in the organisation that the decreasing number of employees combined with the increasing number of customer assets requires digital IS to enable employees to access and handle information more efficiently to "produce" the services of the bank effectively. There were no traces in the interviews indicating that BankCo had implemented the digital IS to facilitate new performance measures or facilitate management controls for higher levels of the organisation. The access to timely and detailed operational information from the lower levels of the organisation can thus be described as a biproduct of the new production machines.

Implementing updated and new digital IS has contributed to a realisation among central managers and management accountants that BankCo has limited detailed and timely management information in their reports, other than revenue and the indicators of equity return on a monthly or quarterly basis. The reports and analyses that are provided by the central departments have to a limited degree incorporated information from any of the new or updated digital technologies described in the previous section. Managers of the departments that administrate the digital

technologies recognise that the information from the digital technologies could be useful management information for other departments:

> We haven't been particularly good at it [providing timely and relevant information outside of the department]. That is something which we must improve, which we are working on now. Facilitating better management information, and being better commissioners for finance/analysis on presenting the cost side in such a way that it is possible to see what it can help to influence [profitability]. (Manager)

For the administrators, analysts, and managers at the head office, there is also a realisation that the exchange of information between the departments could improve. As expressed by one executive manager:

> I think there's a lot to improve there, between us and the management accounting function. I do not feel we are any good there. I feel it is getting a bit like, when I am doing something, then I need something, then I start to ask and then I get… They probably feel they have to provide me some information, but it's not working well […] I don't feel it is…, we could have played more like we are on the same team.

The managers and users of the digital IS can request information that they believe could be useful from management accountants or other managers. However, the provider of the information and the requester can potentially have divergent interpretations of which data or performance measure the digital IS presents. As an illustration, sales can be an ambiguous item to report. In BankCo, sales typically include new mortgages; however, sales can also include refinancing of mortgages, opening of deposit accounts, investment accounts, and/or a new insurance policy for a customer who has replaced their old car. Which sales figure is reported is to some extent dependent on who requests it and who handles the request. This interpretive understanding of data in digital IS adds to the complexity of collating information from various digital data sources, as the digital data sources can apply different definitions of measures.

4.4 Culture and historical roots in BankCo

> Culture is a word that is both used and abused. In my perspective, it is the ability to act intuitively right. You can control people with instructions and procedures and all that, but then there are situations that are not included in that. If you make people act intuitively right in those situations, that is what I call culture. That is probably the main purpose for the type of, as you say,

> informal gatherings we conduct. From where I am now it [culture] is really to equip [the organisation with] a framework, which makes you act intuitively right. (CEO)

The above quote illustrates the understanding of cultural controls in BankCo. For the employees and managers of BankCo, the organisation's roots and history as an active member of local communities run deep, although there are employees who feel that this is of less importance than others. Among those who are attracted by the history and expressed values of BankCo, several express that they could not have worked for competing nationwide banks. Some of the interview subjects described that their motivation for working in the bank is tightly coupled to their individual beliefs and values. They articulate that the company's orientation and attitudes influence their identity:

> It does something to us who work here. I think we are different, I am so naive and so brainwashed and so preoccupied with the culture that I'm pretty sure we're different. Because I am quite sure some of them here [local employees], they're out of their skins every day. Every week, every month, they work as hard as they can. And I simply believe that the advisers we have, and the managers, at BankCo, we do far more than what an employer can normally expect from us. And I mean everyone in the whole organisation. I think that is culturally conditioned, and that culture has been created through the local roots. (Manager)

BankCo has a belief in the decentralisation of decision-making and culture to contribute to local communities at the discretion of local managers. According to the managers and executive managers, this requires competent and responsible managers and employees. If the local managers' competence becomes subordinate to centralised controls, this is expected to contribute to considerable tension between local managers and the executive management team:

> I think it would have been challenging to be more control oriented on details. In the sense that we are, we have both competent and responsible as our stated core values. And we have built on them [the values], both the local competence that we have, but also the professional competence that we have in different departments here at the head office. So, no, I think it would be a breach of trust [enforcing tighter management controls]. (Executive manager)

The collectively shared attitudes and beliefs among the executive managers and managers about values that are good and important are expressed at internal arenas

and management gatherings. The managers and executive managers of BankCo state that the decentralisation of decision-making alongside local managers' ability to leverage local knowledge are drivers of the organisation's competitive advantage. The local retail bank branch managers thus have a high degree of autonomy in how they operate and control their branches, as do other department managers in the bank and subsidiaries. Executive managers of the bank also share this belief in using local knowledge. Not only in speeches and use of language within the organisation, but through actions and participation at the local level of the organisation, managers and executive managers aim to lead by example rather than words.

> My experience is, on who we are [as an organisation], what we say is important and the clearer we say it, and the more consistently we say it, the better. But our actions and behaviour work even stronger. I know this from my own behaviour as well. What I say [I will do] can be important, but it is what I do that sets the standard. Copying the manager is a pretty powerful mechanism. If I said [to the employees] you have to be out with the customers to get the information from them, and I sat in my own office [at the head office telling them]. I think that would have worked poorly. (Executive manager)

Since the introduction of the CRM system, the financial advisors in the retail division of the bank have been forced to log all their interactions with customers, phone calls, emails, text messages, and sales. This logging of activity has contributed to tensions, causing some representatives of the employees to raise concerns of surveillance. In addition to the logging of activities, the financial advisors should report in the CRM system the results of sales advice generated by algorithms based on digital customer information. This information of interaction between financial advisors and customers can be, and is to various degrees, used by the retail branch managers for management control. However, although the head office of BankCo has access to all the CRM data and can monitor deviations across branches and divisions, they are hesitant to enforce a panoptic control regime based on standardised metrics and indicators of performance. There is a shared concern among the executive management team that an increased use of technologically enabled management controls could undermine the culture of BankCo.

> I think for me it really is to be able to use that data for insight. And avoid using it like many of my people [employees] want to use it, it adds complexity then [as they want to use it]. Because we can measure everything. And I have people who like to measure everything but being able to translate into insights that you can use for management, that's is what I think is part of the job. […] I remember

> meetings with divisions and meetings with subsidiaries and they put their controller and a group controller in the meeting and then the discussion was more about method and data, rather than, "Ok, given that we after all now see a picture in front of us, what do we do?" (Executive manager)

The autonomy allows local managers to discretionarily use digital IS as sources to guide their local operations. There are local managers who state that they hardly use any information from digital IS to manage their departments, while others claim to regularly use the number of calls or customer contact from the new CRM system. Most of the managers use a digital information system for sales to monitor the activity of new or refinanced mortgages and deposits in their region or branch. Some use the financial digital IS to check their operational costs on a monthly basis, while others state that they look at the operational costs in the financial digital IS around twice a year. As manager autonomy and local customisation is highly valued in the organisation, it is not surprising that the local managers use digital IS differently and that they are interested in the performance measurements which they understand important to their departments and local context. There are, however, analysts and employees at the head office who express that they see this autonomy as contributing to large variations in local management and describe these as unprofessional and conflicting with the information from digital technologies.

> I think the organisation is a little less professional. […] it can be a reason why introducing more true data-driven decisions becomes difficult. (Management accountant)

The central analysts and managers can find it challenging to convince managers and employees by using information derived from digital IS. The new and updated digital technologies have made differences in operations and use of management controls more transparent to the central staff.

> That the data that tells you that now the need here is greater than there. I think that is a very long way to go for BankCo to let the data and machines tell us that […] The explanation for this is that the expertise we have in using data, we are a small team here at the head office that can do it. And it is very weird to most people, in the organisation. A bank manager can be very…, in truth many of them are not even used to working in an Excel sheet. (Management accountant)

> I think we as a bank have a long way to go in terms of becoming a bank that governs on insight and not emotions. Traditionally, and in our culture, controlling by gut feeling and culture is at the top of mind. And in a way the

> management here in the bank has succeeded well, so it [the belief] is probably very strong [well embedded]. (Executive manager)

The quote illustrates how the embedded culture in BankCo overrides belief in data-driven decision-making. The organisation has attributed its prior success to the practices and beliefs in management discretion and local knowledge. These organisational beliefs are aligned to the management control practices in BankCo:

> It [management control] can consist of both performance management and a framework where, […] there is an awareness of who we are and our DNA. (Executive manager)

The explicit awareness of the relationship between management controls and longstanding beliefs and attitudes in the organisation were expressed by several managers. This indicates that the beliefs and values of BankCo are embedded in the configuration of its management controls.

5. Analysis and discussion

This paper analyses and discusses two findings and makes one argument from the empirical data. First, it finds support for explanations of organisational culture, reflected in the institutionalised processes and routines (Dent, 1991), and how they contribute to the configuration and use of formal management controls (Alvesson & Kärreman, 2004; Hopwood, 1983; Kraus et al., 2017) in BankCo. The paper further argues that organisational culture moderates the use of technical formal management controls enabled by digital technologies. Second, it finds that the organisational culture is embedded in the design of digital technologies (Volkoff et al., 2007) in the organisation.

5.1. Organisational culture and the configuration of management controls in BankCo

This study of BankCo draws attention to how the organisational culture is embedded and reflected in the configuration of formal management controls. The empirical data in the previous section describe a collective and shared understanding of the identity of BankCo. The interview subjects underline the importance of what they refer to as the DNA, history, and traditions of BankCo in describing how the organisation is managed. BankCo is described as an organisation with deep local roots, committed to contributing to communities and the region in which it operates. However, the commitment to local and regional communities does not appear to be limited to the institutionalised routines and procedures as described by Scapens (1994). It extends

to the concept of an organisational culture, where there is a shared collective understanding among the managers and employees of the identity, beliefs, and values (Alvesson, 2012; Alvesson & Kärreman, 2004) defining who BankCo is. This institutionalised organisational culture is found to eclipse and constrain (Flamholtz 1996a, 1996b) the accounting practices and configuration of formal management controls (Abernethy & Chua, 1996; Alvesson & Kärreman, 2004).

The institutionalised formal controls resemble the controls in larger Nordic banks as described by Cäker and Siverbo (2014). Yet in BankCo, the managers collectively shared understanding of the organisation's identity, values, and beliefs contributes to extensive socio-ideological controls rather than formal management controls (Alvesson & Kärreman, 2004) . As an illustration, the local branch managers emphasise the importance of providing financial support to organisations in local communities when there is a need, without interference from a bureaucratic centralised process. Additionally, both the executive and branch managers stress the importance of delegating authority to the local level, which enables branches or departments to find unbureaucratic solutions for struggling businesses, retail customers, or community organisations needing financial support. The managers in BankCo share the concerns raised by Lukka (2007) and Markus and Pfeffer (1983) in that standardisation and intricate multi-indicator controls do not necessarily improve the efficiency of the organisation. This arguably contributes to resistance among managers and employees towards implementing intricate multi-indicator controls that the digital technologies facilitate. As indicated by Vaivio (2004), regional managers and employees are not interested in revealing the internal intricacies in their departments by implementing new control practices facilitated by digital technologies.

This study illustrates that although data are readily available to implement formal management controls, managers can resist the *temptation* to use the digital technologies to implement formal controls. The executive managers in BankCo are wary that an emphasis on standardised formal controls, such as performance measurements, could undermine the socio-ideological controls(Alvesson & Kärreman, 2004). This indicates that the managers conceive a tension, or even incompatibility, in the interface of detailed organisation-wide performance measurements and the existent cultural controls in the organisation. This is exemplified by one executive manager expressing that the use of detailed performance measures to monitor or overrule delegated authority could be perceived as a breach of trust from the perspective of middle managers. It can be argued that

cultural controls without an element of trust can potentially be difficult to manage, and result in a decoupling of the institutional practices and formal management controls (Lukka, 2007).

The importance placed on the collectively shared beliefs and ideological values in BankCo, supporting and upholding local communities and contributing to society at large, is considered to be of great importance to its managers. Kraus et al. (2017) found that in a context of financial distress and resource scarcity, the implementation of formal coercive controls was not resisted by professional employees. They argued that a shared understanding of the situation among the employees and a strong cultural control system facilitated the implantation of formal controls. In the case of BankCo, the financial situation is the opposite. The organisation has successfully increased its revenue, number of customers, and profitability. There is thus no resource scarcity that would facilitate executive managers to advocate for implementation of new formal management controls in the organisation. The organisation's culture is depicted as an element that has contributed to the perceived success of BankCo as an organisation. Consequently, the executive managers are reluctant to dismantle the cultural controls to replace them with standardised performance measures and formal management controls.

These findings indicate that organisational culture contributes to explaining the configuration of formal management controls (Alvesson, 1995) in BankCo. Both the institutionalised routines and processes (Scapens, 1994) and the collectively shared understanding of BankCo's identity, beliefs, and values (Alvesson, 2012; Alvesson & Kärreman, 2004) contribute to limiting the use of centralised performance measures and intricate multilevel formal management controls. However, the paper extends this argument by claiming that organisational culture can moderate the formal technical management controls, both in the configuration of the controls and in their use.

In the interviews, BankCo's identity is described as the DNA of the organisation. The collectively shared beliefs and values about who BankCo is – as a decentralised, unbureaucratic local community bank – are cherished as an important trait of the organisation. The narrative in the organisation is that BankCo's success is attributed to local autonomy and delegation of authority. The interviews describe how governing by what is described as intuition, gut feeling, and collectively shared values and beliefs is an essential element of the organisation. These beliefs and values are institutionalised and embedded into power structures, roles, and decision structures in BankCo. However, these cultural controls are only one element of

management control configurations. The organisational context (Hopwood, 1983) in the form of cultural (Flamholtz, 1996a, 1996b) and socio-ideological controls interface the formal controls in the configuration of management controls, according to Alvesson and Kärreman (2004).

The standardised process and performance measures facilitated by implementing digital technologies (Benders et al., 2006; Hyvönen et al., 2009; Lukka, 2007) have not materialised into changes in formal management controls at the group level of BankCo. The executive managers express that they *resist the temptation* to implement technocratic controls, arguing that these controls can conflict with the configuration of management controls and practices in the organisation.

This paper consequently argues that organisational culture can moderate the configuration and use of formal technical management controls enabled by digital technologies. Explaining the configuration and use of management controls as moderated by organisational culture indicates that the use of digital technologies might contribute to less change in management controls than the accounting literature has conceptualised (Appelbaum et al., 2017) or raised concerns over (Quattrone, 2016).

5.2 The design of digital technologies in BankCo

In this case study, the digital technologies in BankCo have been implemented as a response to two external forces. First, new financial regulation requires financial institutions to monitor and report financial risks frequently and in detail. Consequently, to meet the regulatory requirements, BankCo has implemented digital technologies to enable detailed and timely risk monitoring and reporting, as specified by the financial authorities (Crawford, 2017). Second, software vendors such as Microsoft, SAS, and Adobe require customers to update IT systems in order to receive support and security updates and enhancements. As a result, the digital technological systems have been renewed and updated as previous digital IS and technologies become obsolete and unsupported by the vendors. The new or updated systems have required restructuring of digital IS, while they have simultaneously introduced new features and capabilities in the digital technological systems. The new features and capabilities facilitate centralised business analytics processes and performance measures. These capabilities in handling big data sets and integrating multiple data sources are essential to modern standardised digital technologies and are incorporated features of the implemented digital technologies. As a consequence of these two forces – regulatory changes and software updates – BankCo has material

digital technologies and a technological software environment that can provide detailed, timely, and centralised control information.

To explain why the digital technologies in BankCo are configured with little integration across digital systems, this paper draws on explanations of digital technology adoption as a phenomenon embedded within organisational roles and procedures (Volkoff et al., 2007). Organisational studies of technology have argued for the importance of addressing the social context in which technology is configured in organisations (Bailey & Barley, 2020; Orlikowski & Scott, 2008; Volkoff et al., 2007). However, within the accounting literature, digital technologies have frequently been indicated as a phenomenon external to the organisation (Appelbaum et al., 2017; Bhimani & Willcocks, 2014; Möller et al., 2020), and with expectations of digital technologies having causal impacts or effects on accounting and control practices (Granlund & Malmi, 2002; Rom & Rohde, 2007).

The requirements to implement and configure digital technologies in accounting practices can be characterised as coercive isomorphic pressures to implement digital technologies and controls (Lukka, 2007) in order to meet legal requirements (Crawford, 2017; Tessier & Otley, 2012). However, Volkoff et al. (2007) described the configuration of digital technologies as embedded with organisational roles and procedures. The collectively shared beliefs and values in BankCo to maintain autonomous managers and employees are reflected in the configuration of the organisation's digital technologies. Consequently, the digital technologies have not been configured to integrate information across roles and procedures. Although the digital technologies facilitate implementation of centralised roles and procedures, Bank Co has not configured them to do so.

Drawing on Orlikowski and Scott (2008) and Volkoff et al. (2007), this paper argues that the organisational roles and procedures that are embedded in the configuration of the digital technologies in BankCo reflect its collectively shared values and beliefs.

6. Conclusion

This paper has explored and analysed how organisational culture contributes to the configuration of and use of formal management controls and the design and use of digital technologies in a case study in a regional bank. It presents two arguments: first, by drawing on research on organisational culture and management controls (Flamholtz, 1996a, 1996b; Markus & Pfeffer, 1983; Scapens, 1994) the paper argues that organisational culture can moderate how digital technologies contribute to changes in the configuration of management controls in organisations. Specifically, it finds that collectively shared beliefs and values can moderate the configuration and use of formal technical management controls that digital technologies facilitate. Second, by drawing on Volkoff et al. (2007), the paper argues that collectively shared beliefs and values in organisations are embedded in their configuration of digital technologies. These arguments contribute to the debate on digital technologies in the accounting literature (Appelbaum et al., 2017; Bhimani & Willcocks, 2014; Quattrone, 2016) by reintroducing organisational culture (Bariff & Galbraith, 1978; Markus & Pfeffer, 1983) as an important element in the study of management controls and digital technologies.

The study finds that despite access to timely and detailed accounting information, it can remain unused in formal management controls. This finding adds nuance to the predictions and expectations of direct and causal effects and implications of digital technologies on management accounting (Bhimani & Willcocks, 2014; Quattrone, 2016; Rikhardsson & Yigitbasioglu, 2018).

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