The role of the controller in strategic capital investment projects: bridging the gap of multiple topoi

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Abstract

The literature on capital budgeting and investment proposals is rich with techniques, such as portfolio management and stage-gate project management, which rely on a rational approach to strategic capital investment projects. There is, however, a lack of research on the process of managing and coordinating strategic capital investment projects where investment proposals and decisions are seen as human constructions. The controller is an important but seldom noticed actor in this process. This paper draws on a pragmatic constructivist framework to create an understanding of the controller role in strategic capital investment projects and how the controller acts to contribute to create a functioning construct causality in such projects. We conducted a case study of a mining company, which had recently decided on strategic capital investments resulting in the moving of two towns to enable continued operations. Based on a two-step thematic data analysis, our results illustrate that the controller is an essential actor in strategic capital investment projects with high degrees of uncertainty and multiple decision-participants. By using the pragmatic constructivist framework we find that gap-bridging between multiple decision-participants is an essential role for controller, in order to create successful investment proposals. The case study further illustrates that controllers need to learn to speak technical and operational language and to become knowledgeable about business operations to gain trust in order create a functioning construct causality. Our study provides an actor-focused understanding of the organizational and managerial processes within strategic capital investment projects, illustrating how the controller contributes to construct causality therein.

Keywords Role of the controller · Strategic capital investment projects · Pragmatic constructivism · Multiple topoi · Case study

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1 Introduction

There is a vast literature in accounting on capital budgeting and investment proposals which relies on a rational approach to strategic capital investment projects (SCIPs), emphasizing managerial tools and techniques for planning and decision-making (e.g. Coad 1996; Segelod 2002; Tuomela 2005; Alkaraan and Northcott 2006). From this point of view, investment decisions are the result of formal considerations of calculated numbers affording top management a way to manage and control organizations (Broadbent and Laughlin 2009). However, this instrumental rationality perspective has been criticized for neglecting the complex organizational and institutional processes of investment decisions in organizations (e.g. Miller 1991; Miller and O'Leary 2007; see also Allen 2004).

Instead, researchers argue that investment decisions are the result of a complex social process where top management only forms a small part of the decisions (Miller and O'Leary 2007). According to this view, investment decisions are human constructions constructed by several different actors, rather than single decisions made by top management. Therefore, researchers should pay more attention to the processes for managing and coordinating capital budgeting processes and the actors involved therein (Nørreklit et al. 2016; Miller and O'Leary 2007).

One group of actors, which are especially important in planning and decision-making processes are the management accountants, also called controllers (Zoni and Merchant 2007). Although controllers typically do not make investment decisions, they support decision-making and the actors in the investment processes. Controllers are often viewed as the link between operational actors and top-level managers across hierarchical structures. Thus, controllers are a key group of organizational actors, as they are providers, analyzers, and communicators of financial information (Gullberg and Lindvall 2016; Jönsson 2009). Although the controller role has been discussed extensively in the management accounting literature (e.g. Granlund and Lukka 1997; Burns and Baldvinsdottir 2005; Nørreklit et al. 2010; Weber 2011) calls have been made for more in-depth research about the role and its construction in practice (Goretzki et al. 2013).

In this paper, we present our study of controllers and other actors working in SCIPs. We were interested in finding out more about what the controller role is and what makes controller work successful in SCIPs. Reporting their words and actions, we find that rarely do the controllers, project managers or top-management mention the benefits of managerial tools and techniques. Rather, our study reveals that one of the most important roles for controllers in SCIPs is to align the different views among the multiple actors involved in SCIPs in order to create successful investment proposals. As we were unable to find support for our results in previous controller role research, we turned to the accounting literature and found the pragmatic constructivist framework (Nørreklit et al. 2016; Pianezzi and Cinquini 2016; Seal and Mattimoe 2016) which helped to explain our findings.

We selected the pragmatic constructivist framework because it acknowledges assumptions and elements from mainstream management research and social

constructivism, viewing plans and investment decisions as human constructions, where organizational actors can use accounting tools and techniques to develop and support successful organizational outcomes. Similarly, to the social constructivist view, pragmatic constructivism assumes that individual and organizational actors construct their relationship to the world (Nørreklit et al. 2016; Pianezzi and Cinquini 2016; Seal and Mattimoe 2016). However, the pragmatic constructivist framework highlights that in order to create a successful basis for undertaking actions, the four dimensions of reality; facts, possibilities, values and communication, need to be integrated (Nørreklit et al. 2017). For the actors to make their plans work in practice, i.e. for creating construct causality, the projected constructs must be integrated with facts (Nørreklit et al. 2016). For organizations to create successful outcomes, a pragmatic integration of the four dimensions has to be accomplished. Thus, some human constructions might function and others not.

In a recent study, Nørreklit et al. (2017) found that in complex projects involving multiple decision-participants, the different actors are governed by their own ways of conceptualizing their relations to the world (their topoi). In such situations it is especially challenging to form a functioning construct causality, because the act of integrating facts, possibilities, values and communication is not an individual one. Although Nørreklit et al. (2017) provide clues about the production and use of management accounting information, they stress that more research is needed to understand how actors form a functioning construct causality in organizational planning and decision-making. Accordingly, this paper examines the issue of how the controller contributes to a functional construct causality in accounting practice (e.g. Seal and Mattimoe 2016; Nørreklit et al. 2017). Two research questions have been formulated:

- What is the controller's role in SCIPs, which are complex, involve high degrees of uncertainty and consist of multiple decision-participants?
- How does the controller contribute to the creation of a functioning construct causality in SCIPs?

Our empirical evidence derives from a case study in a mining company, in which we conducted interviews, analyzed documents, and made observations. The case organization had recently decided to make a strategic capital investment, which was the organizations largest investment decision through history, resulting in the moving of two entire towns to enable continued operations. This is a unique and complex case, which involves high levels of uncertainty and multiple topoi (e.g. technical, marketing and sales, financial and supply chain). We use pragmatic constructivism to understand the role of the controllers in constructing and communicating management accounting information for the organization's planning and decision-making related to the decision to move the towns.

We find that controllers are important actors in SCIPs, because they bridge the gap of multiple topoi and align the different perspectives among multiple decision-participants. We believe that this perspective can contribute to provide an alternative understanding of the controller role and explain why controllers act the way they

do, thereby providing new insights pertinent to the existing debate on the controller role (e.g. Hartmann and Maas 2011; Burns and Baldvinsdottir 2007). Moreover, we suggest that our data set allows us to explore how controllers contribute to the creation of a functioning construct causality in the organizational planning and decision-making of SCIPs. In this way, we contribute to the emerging accounting literature on pragmatic constructivism where calls for more empirical research have been made (e.g. Seal and Mattimoe 2016; Nørreklit et al. 2017).

The paper proceeds as follows. In the next section, we present three streams of literature which help ground this research. Then we provide information about our case organization, its context, and our procedures for data collection and interpretation. Thereafter, we present the case study and our interpretations based on the pragmatic constructivist framework. Finally, the research questions are answered and recommendations for future research are provided.

2 Pragmatic constructivism as a lens to understand the role of controllers in strategic capital investment projects

The theoretical foundations of this paper are based on three streams of literature: the accounting literature on capital budgeting and investment proposals, the management accounting literature on the controller role, and pragmatic constructivism, which helps explain our findings. First, we provide a summary of relevant accounting literature on capital budgeting and investment proposals that highlights the knowledge gap that we address in this paper. Second, we present a selective review of research on the controller role, which underscores the need for the present study. Third, we present the theoretical lens that we use to interpret the findings from our study in greater detail.

2.1 Capital budgeting as a social process with multiple decision-participants

As discussed in the introduction, the accounting literature on capital budgeting is dominated by a rational and instrumental view on organizational planning and decision-making. The tools and techniques which managers use to plan and make effective investment decisions have been discussed extensively. For example, stage-gate processes in development projects (e.g., Van Oorschot et al. 2010; Behrens et al. 2014), multistage capital budgeting (Johnson et al. 2013) and option-based stochastic valuation modeling (Kauffman et al. 2015) have been addressed. However, other researchers claim that the rational perspective alone is unlikely to provide a full understanding of strategic capital budgeting processes. Sociologists (e.g. Miller and O'Leary 2007) argue that instead of focusing on capital investment decisions as a single event made by the top management, researchers should direct their attention towards the complex managerial and institutional processes embedded in the investment process. We attempt to fill in some of this gap by viewing SCIPs as complex investment processes consisting of multiple decision participants which together construct investment proposals and make investment decisions. In particular, we are

interested in the controller, representing a significant while poorly recognized actor in this process.

Studying the controller role in managing and coordinating SCIPs requires paying attention to the strategic nature of this type of situation (Butler et al. 1991; Schoemaker 1993; Harris 2014). Managing SCIPs ultimately aims toward the creation of competitive advantage (Lu and Heard 1995; Carr and Tomkins 1996). Such efforts often demand considerable resources (Slagmulder et al. 1995; Slagmulder 1997) and are characterized as long term and complex (Carr et al. 2010). Northcott and Alkaraan (2007) emphasize that SCIPs involve uncertainties related to new products, gaining market share, exploiting opportunities, or improving production yields through process development. Although different investment projects have some similarities to each other, often related to the monitoring of financial fulfillment (Turner and Müller 2003), controllers frequently have no obvious example to follow. In turn, this makes SCIPs complicated to manage and coordinate (Northcott and Alkaraan 2007).

2.2 The role of controllers

It is well established that roles are important to organizations since they coordinate actors' behavior and provide guidance for how tasks should be carried out (Biddle 1979). In the psychology literature, the work role can be categorized into tasks and skills. According to this line of thinking, tasks refer to work-oriented aspects (generalized work activities) and skills refer to worker-oriented aspects related to how individuals perceive and judge social information (Dierdorff and Rubin 2007). Moreover, the expectations from the work role are important to understand (*ibid.*).

In the management accounting literature, the controller role is associated with tasks and responsibilities (e.g. Järvenpää 2007). The role of the controller has been separated into different archetypes based mainly on controllers' work tasks. Mainstream research within management accounting commonly portrays the bean-counter as an objective, emotionally detached person (Baldvinsdottir et al. 2009; Hartmann and Maas 2011; Weber 2011) charged with the managerial task of providing the top-level managers and other actors with financial information (Hopper 1980; Friedman and Lyne 1997; Granlund and Lukka 1998; Weber 2011). From this point of view, the controller is seen as an internally oriented support function providing financial information to peers and superiors or handling accounting tasks (Coad 1996; Byrne and Pierce 2007; De Loo et al. 2011). The traditional view of the controller role also involves tasks such as the use of formal information-based control systems to guide managers to reach the stated goals of an organization (Tuomela 2005; Linsley and Linsley 2014).

Contrary to the traditional view of the controller role, Hopper (1980) provides insights into the service role. The service role is more concerned with communicating information, analyzing problems, and supporting subordinates, peers, or superiors to make informed decisions. The service role of the controller is an early notion of what later has been referred to as a business partner role (Hartmann and Maas 2011; Weber 2011). The notion of a business partner implies a controller role

operating as a cooperative and critical counterpart to top-level managers and other actors throughout organizations (Hartmann and Maas 2011; Weber 2011; Linsley and Linsley 2014). According to Weber (2011), the controller role emerges from a specialization in accounting. Experience and organizational knowledge allows the construction of a business oriented controller role (Laine et al. 2016). Previous research findings by Lindvall (2009), Weber (2011) and Hartman and Maas (2011) suggest that the controller is neither a bean counter nor a business partner. Instead, the controller role has evolved into a hybrid accountant, serving as a producer and user of management accounting information.

When it comes to the controller role in SCIPs, our review suggests that both the accounting literature on capital budgeting and previous controller role research have largely had a rational and instrumental view, focusing on controller tasks and responsibilities in the investment process. However, there seems to be a dearth of studies that address the complex managerial and institutional processes embedded in the investment process and the actors along with their actions in practice (Carr et al. 2010; Nørreklit et al. 2017). Accordingly, in this paper we focus on the controller role and the actions of controllers in the organizational planning and decision-making of SCIPs.

2.3 Pragmatic constructivism as a theoretical lens

Pragmatic constructivism is an actor-focused theory, providing a holistic view of the accounting practice of actors through the integration of facts, possibilities, values and communication. From the perspective of these dimensions, pragmatic constructivism provides a way to explore, understand and theorize the construction of actors' accounting practice (Nørreklit et al. 2017). Figure 1 below illustrates the integrated dimensions of pragmatic constructivism.

2.3.1 The integrated dimensions of pragmatic constructivism

Facts exist independently of actors and can be anything to the practicing actors. According to Nørreklit (2017) facts are not a special ontological category. Facts can be shared understandings of the world that concern phenomena which are objective, subjective or socially constructed (Nørreklit et al. 2010). Epistemologically, it must be possible to present evidence for a fact (Nørreklit 2017). An actor or a group of actors must also acknowledge a fact for it to have a use (Nørreklit et al. 2006). Facts related to objectively existing (physical) phenomena can refer to buildings, machines or mines. Facts referring to ontologically subjective phenomena can for example be institutional or individual matters. Subjective facts can also be assumptions, language or management accounting knowledge (Jakobsen and Lueg 2014; Nørreklit et al. 2016). Accounting facts such as revenue estimates and profit predictions are human creations and socially constructed (Nørreklit et al. 2010).

The dimension of possibilities is important because facts without future possibilities have no meaning or relevance for the practicing actors (Nørreklit et al. 2017). Possibilities relate to future actions and hence do not exist yet, but for

Fig. 1 Reality as integration Adapted from Nørreklit (2017, p. 33)

possibilities to be real and produce future facts, they should built on already existing facts. One example is management accounting information (i.e. facts) where several financial projections represent multiple possibilities for the practice of the actors. Possibilities must be integrated with facts, otherwise the possibilities will have no use or consequence for the practice of actors (Mitchell et al. 2013).

The value dimension is an ever-present force in the here and now that motivates the actors practice (Mitchell et al. 2013). Values are subjective and individual. Subjective reasoning develops through a socially influenced process over time (Nørreklit et al. 2010). For the practice of actors, values are important because what individuals subjectively value can rule out some possibilities through their individual preferences (Nørreklit et al. 2006). While values are subjective and individual, there are values that can be more concrete. For example, most individuals value personal prestige, power or monetary gains or collectively value the success of work practices (Nørreklit et al. 2006). Thus, there is a need for a value-based motivation to advocate certain choices between possibilities.

For the practice of actors, the communication dimension is central to achieve goals, promote ideas, interact and cooperate across organizational boundaries (Nørreklit et al. 2010). In organizations, facts without communication are isolated and disembodied from the social context of possibilities and values. Action cannot be accomplished without communication (Brown and DuGuid 2000, p. 21; Mitchell et al. 2013).

2.3.2 Construct causality

The success of an organizational practice depends on the actors' abilities to establish construct causality. Construct causality requires the organizational actors' integration of the four dimensions of facts, possibilities, values, and communication (Nørreklit et al. 2017). The actors' specific way of integrating the four dimensions can be grasped through their topoi (Nørreklit et al. 2010; Seal and Mattimoe 2016).

However, within an organization there are multiple groups of actors, each having their own specific topos (Nørreklit et al. 2017; Pianezzi and Cinquini 2016). For example, engineers tend to be more concerned about technical values and communicate through a technical language (i.e. Cardin et al. 2008) while controllers tend to be more interested in the financial facts of the different alternatives. Thus, at least two topoi exist at the same time and these need to be aligned to create successful outcomes. Accordingly, in organizations with multiple groups of actors, it is important to align different perspectives in order to create successful organizational practice (Nørreklit et al. 2017; Pianezzi and Cinquini 2016).

2.3.3 Multiple actors' creation of construct causality

When multiple topoi exist, the creation of knowledge to establish construct causality is not an individual act of integrating facts, possibilities, and values (Nørreklit et al. 2017). Instead, it can be viewed as a social process, where the individual efforts to create construct causalities are interconnected and have to be aligned into a complex set of functioning construct causalities. Nørreklit et al. (2017) calls it orchestrating the co-authorship of multiple actors and presuppose that management is involved in this process. In this paper we are interested in the controller as an actor in this process. Thus, our study investigate the controller role in SCIPs and explore how the controllers contribute to the creation of a functioning construct causality in SCIPs.

3 Research methods

This paper addresses the controller role in complex mining industry SCIPs with high degrees of uncertainty and multiple decision-participants. We conducted an explorative case study at LKAB, a Swedish mining corporation (see Sect. 4.1 for a presentation of the case organization).

The mining industry is concerned with the extraction of scarce natural resources. Investments are typically capital intense, large and affecting the surrounding community (PWC 2012). Investment decisions in the mining industry often have long-term repercussions for local communities and regions (Ejdemo and Söderholm 2011) and the mining context is characterized by other dynamic, intangible factors and regulations, including environmental, legal, and political conditions and logistics (Cortese et al. 2009; Ejdemo and Söderholm 2011). Alone or in combination, these factors may halt entire investments, leaving only costs for the exploration and evaluation. Hence, investment projects in the mining industry are complex, involve high degrees of uncertainty and several different decision-participants. For these

reasons, mining constitutes a suitable context for studying the role of the controller in contributing to functioning construct causality in strategic capital investment projects.

3.1 Sources of empirical evidence

The sources of empirical evidence for this study include interviews, documents, and direct observations. We interviewed controllers, project managers, and the group CFO during two field trips, using semi-structured interview questionnaires. The first round of interviews was explorative and aimed at discovering and understanding controller work (Starrin and Svensson 1996, p. 55), using interview questions designed to uncover areas of responsibility and role descriptions. We also asked questions regarding how other actors besides the controllers engaged with and interacted in the strategic capital investment projects, and what (if any) type of accounting information that they requested. The interviews lasted between 1 and 2 h and were recorded and transcribed. Four controllers, one project manager, and the group CFO were interviewed on different occasions.

In the second round of collecting empirical evidence, the interviews were conducted with a particular emphasis on the controller role in the process of constructing financial projections, a key task in managing strategic investment projects.¹ The interview questions were designed to cover preparatory work preceding a typical investment decision and information about how accounting information was created and communicated in strategic capital investment projects. These interviews lasted from 1 h to 90 min each and were recorded and transcribed. Two controllers and one project manager were interviewed. Examples of interview questions used are included in appendix A. In addition, the first author spent one working day as a full participant in a capital budgeting training program for company controllers and project managers. Participation in the company's learning program provided us with formal documents and guidelines and an understanding of the management perspective on the controller role in strategic capital investment projects. In addition, the first author had ample opportunity for informal discussions about how the controllers themselves viewed and executed their role in investment projects and the project managers' view thereof.

Two types of documents were collected. General information about the organization, for example organizational charts, internal guidelines, role descriptions and management accounting information used for planning, monitoring and control in different investment projects were gathered. We also collected project specific information, including flow charts and templates. During the study, we had the opportunity to participate in meetings with company officials. On one occasion, we met with group finance staff members (including the group CFO, treasury manager, taxation specialist, and heads of group accounting and risk management) for a presentation of their strategic objectives and organizational structure, as well as a discussion

¹ This data collection was broader than the purpose of the present paper. Here, we use only the empirical evidence collected that concerns the role of the controller in strategic capital investment projects.

Table 1 Overview of data sources during fieldwork

Interviews round 1	#
Capital investment controllers	4
Chief financial officer	1
Project manager	1
Interviews round 2	
Capital investment controllers	2
Project manager	1
Documents	
Research diary and field notes	Ongoing
Flow charts and time plan for strategic capital investment projects (SCIPs)	1
Internal guideline-documents	
Management control process	1
Capital investment process	1
Introductory accounting and control procedures	1
Controller role and work descriptions	1
Template for the presentation of capital investment proposals to the board	2
Organizational chart, controller group	1
Document of ongoing SCIPs	1
Document showing number of SCIPs handled by one capital investment controller	1
Observations and attendance at meetings	
Participation in company learning programs (sessions)	3
Workshop presentation	1
Presentation at company headquarters	1
Various on-site meetings (days)	5

about this study. We also met with the group CFO and the head of group controlling to plan the continuation of our study and to discuss the controller role in LKAB. In addition, we participated in a workshop with the head of the controlling department to discuss preliminary findings and deepen our understanding of internal views on the controller role and the policies and procedures associated with the portfolio and management of strategic investment projects. Written notes were taken during these occasions. See Table 1.

3.2 Interpretations of the empirical evidence

We used a qualitative approach to select, code, categorize, and interpret the empirical material and pragmatic constructivism as the theoretical lens to explore and create an understanding of the controller role in SCIPs (Lukka and Modell 2010). The analysis was done in two steps. First, we identified first-order descriptive findings of “what controllers do” in strategic capital investment projects, which aimed to address our first research question. When analyzing the internal documents, investment appraisals, and project descriptions we searched for formal descriptions on the

controller role in SCIPs. In this first stage, we mainly identified issues related to the traditional controller role. For example, in a project description we found that the controller is in charge of producing management accounting information and deliver it to top-management. However, when analyzing the interview data other issues were mentioned by the controllers, top-management or project managers as important for managing and coordinating SCIPs. During the interviews, the interviewees constantly brought up issues of dealing with conflicting values in SCIPs and the importance of aligning the multiple views among the actors involved in SCIPs. These issues resulted in two themes; the dual controller role and gap-bridging.

After we had identified the two themes we went back to the theoretical framework which helped us to obtain theoretical explanations of the controller role in SCIPs and how the controllers would act in these processes. We focused particularly on explaining how the controllers contributed to the creation of a functioning construct causality in strategic capital investment projects, which was our second research question.

When interpreting the empirical evidence, we relied on the following operationalization of the pragmatic constructivist framework. Facts refer to observations that are socially constructed, reliable, and to which it is possible to make a clear reference (cf. Jakobsen and Lueg 2014). Possibilities/logic refers to the analysis of facts and the resulting implications for future possibilities. Values represent positions taken concerning what is desirable and used as a basis for making choices. Communication is based on the fundamental tool of language and enables people to cooperate (cf. Nørreklit et al. 2006). According to the pragmatic constructivist framework, integrating the four dimensions is necessary for actors to take successful action (Nørreklit et al. 2017). Finally, an important assumption is that plans and investment decisions are human constructions, where organizational actors can use accounting tools and techniques to develop and support successful organizational outcomes. We used this framework to explain how the investment proposals were created and what role the controller had in managing and coordinating this process. Three central issues surfaced during the iteration between the theoretical framework and our themes: trust, the ability to speak technical and operational language and becoming knowledgeable about business operations. All of them are essential for explaining how controllers act in SCIPs to bridge the gap of multiple topoi.

4 Strategic capital investment projects with multiple decision partners in the mining industry

In this section, we provide empirical evidence of the controller role in strategic capital investment projects at LKAB. First, the case organization, its production process, and several of the strategic capital investment projects, which were conducted during the time of this study, are presented. Then, the formal and rational view of the controller function in LKAB is outlined. Thereafter, we illustrate the different views among the actors involved on the controller role(s) in strategic capital investment projects. Finally, we address how the controllers act to bridge the gap between

multiple decision partners in strategic capital investment projects to establish a joint set of functioning activities resulting in successful action.

4.1 The case organization

LKAB is an international organization operating in 14 countries that employs around 4000 people, mostly in Sweden. At the time when the study was conducted, LKAB sales amounted to some EUR 20 billion, deriving from deliveries amounting to 26 million tons of ore products with a profit of approximately EUR 57 million. LKAB was the single largest industrial investor in the nation, with a mining operation dating back more than one hundred years in time.

Operating the largest underground mines in the world is complex. In 2008, the board of directors decided that an overall increase in extraction capacity of iron ore was needed to meet the increased demand on the market. This decision had substantial impact within the organization and the local mining communities. One of the most percussive consequences of the decision was that the company had to move the towns of Kiruna and Malmberget. Both towns were built in vicinity to the mining operations of LKAB and over time the sub-level caving and extraction of iron ore below these towns created fissures and cracks in the bedrock, causing seismic events threatening the towns. Subsequently, the mining organization oversees an investment of municipal transformation (i.e. moving the towns to a new and safe location). The decision made in 2008 resulted in several strategic investment projects within the entire value chain ranging from new mines to investments in logistics and transportation. As the mining sites are located above the Arctic Circle in the northernmost parts of Sweden, logistics and transportation are important concerns in the value chain.

The production at LKAB runs non-stop and is less labor-intensive because of an automated and technically advanced process. Consequently, LKAB frequently maintains its production through large investments in technology, making it a major energy and capital-intensive process. The production and distribution processes of LKAB stretch from the ore mines to the end customer. The process starts in the mines with the *extraction of the ore*. The ore is drilled, blasted, and subsequently loaded by machine into dump trucks, this process repeats at the next level and so forth. After the extraction of ore, *transportation of the ore to a crusher facility* follows. The trains or trucks empty the ore into large rock bins for onward delivery to the crushers. The crushers break the ore into pieces measuring around 10 cm. The ore is loaded automatically into skips, which hoist it to the surface. The processing of the roughly sorted ore continues further in the sorting and concentration plant separating the ore from waste rock in magnetic separators, a cheaper, cleaner and less chemical based process possible due to the unique magnetic ore found only in a few locations in northern Sweden and USA, Eastern Canada, Brazil and Australia.

This process refines the ore into pure iron ore products (i.e. fines, mica and mineral sand). Fines is a finely crushed iron ore product to be used in blast furnaces, mica is used as reinforcements and heat shields and mineral sand is used for welding, bricks and as foundry sand. However, these products are secondary to iron-ore

Fig. 2 Decision-making investment process (LKAB 2013)

pellets, which is LKAB's most important product. Most of sorting and concentration plant output of fines is transported to the pelletizing plant. In the pelletizing plant, a clay mineral, bentonite, is added as a binder in the iron ore concentrate. The pellets are formed in large rotating drums heat melts the iron ore particles partially together creating a stable and easy to ship product. Following this, *trains transport* the ore to harbor ports in Narvik and Luleå, for shipping to the global market.

To summarize, the decision made by the board of directors to move the towns of Kiruna and Malmberget involved several complex investment projects with multiple decision partners from different areas of expertise. LKAB invests frequently in its mining operation, yet not all investments are strategic and few of them are as important as the decision to move the towns. The focus of this study is not a particular strategic capital investment project, instead we take a general view of the controllers' role within the case organization after the decision to move the towns of Kiruna and Malmberget.

4.2 The controller function at LKAB

At the time of our study, LKAB had 24 controllers who were part of an organizational support unit directly subordinate to the CEO. The overall function of the controller unit was to serve as a support for the operational areas of the organization, management, the CEO, and the board of directors. The controllers were involved in all capital investment projects within the production process, from mining operations to shipping the final product. As a staff function, the controllers were responsible for the development of processes to safeguard good internal compliance, governance, risk management, and control. Depending on the amount and size of the capital investment projects, different decision-participants were involved. For example, when it comes to investment projects above 2 million EUR, the controllers would handle information-based information flows involving project managers,

department managers, division managers, the CFO, and the board of directors. See Fig. 2 for an overview of the multiple decision-participants involved in capital investment projects in LKAB.

The case organization's internal guidelines state three main areas of responsibility for controllers in capital investment projects. These are: (1) monitoring and follow-up of budgets and outcomes, (2) monitoring the progress of the capital investment plan, and (3) providing financial information to project managers, project leaders, top-level managers, and the board of directors. For the controllers, this means an expectation to guide managers toward the stated goals. These guidelines are important for the controllers since they provide a framework for their role and highlight the tasks considered to be important by the organization. However, the guidelines do not address that the organization consists of multiple groups of actors, each having their own actor-world relationship (their *topoi*), which affects their actions and choices or the decisions they make in investment projects. The different actors would also have varying expectations of what controllers should accomplish in the strategic capital investment projects undertaken in the company.

4.3 The role of controllers in strategic capital investment projects at LKAB

The different actors involved in the SCIPs have their view of what the controller should do in order to support and provide trustworthy management accounting information. The CFO explains his view on the controller role in the following way:

Many controllers trust too much in financial information from the mining operation through BI [business intelligence] systems. Managers want to know what is real. To help the managers to see this, the controller must be a part of the operational team and have an understanding of the mining operations.

This indicates that the CFO expects that the controller role in strategic investment projects involves more than merely reporting accounting facts. In order to make meaningful use of financial information the controller need to understand the factual possibilities and organizational values related to the technical and financial aspects of the projects. These are communicated either through capital budgeting models or by reasoning and dialogue. It is important that the controllers have an understanding of the mining operations so they can critically evaluate the facts that are used to create investment appraisals. Thus, the controller has an important role in contributing to successful plans and actions in SCIPs. One controller made the following statement about expectations related to the controller role:

The reporting is the simple part of the controller role; basically, we gather and add financial information and prepare the report. The most important thing for a controller is getting to know the capital investment project and to develop an understanding of the reality behind the numbers.

Here the controller emphasizes the importance of understanding the reality behind the numbers. This statement is similar to the preceding quote from the CFO. Both can be interpreted as evidence of how critical it is for controllers to understand the

mining operations and the factual possibilities in order for successful investment proposals to be constructed. However, the controller also pinpoints that material facts are not enough for understanding the reality behind the numbers. Here, other dimensions such as values and communication are important for creating successful investment proposals (Mitchell et al. 2013). Getting to know the capital investment project means that the controller needs to understand other issues than the financial parts of the planned investment. These issues could both be related to how the planned investment affects other areas within and outside the organization. For example, the decision to move the town of Kiruna had a large impact on the local society and the people who lived close to the mine. Consequently, it was important for the controller to understand the context in which the investment proposal was created, not only focusing on the financial parts of the investment proposal.

Again, this suggests that the controller role in SCIPs is broader than reporting and communicating financial facts to top management in accordance with the traditional controller role (Hartmann and Maas 2011). We suggest that, in combination with the pragmatic constructivist framework (Nørreklit et al. 2006), these results reveal how the controller can be understood as an important actor for undertaking successful action, contributing to the creation of a functioning construct causality by acknowledging factual possibilities, aligning them with organizational values and communicating them to managers and other actors in the SCIP.

The controllers agree that the management of large-scale strategic capital investment projects demands the capability to recognize costs so as to analyze them properly. A more experienced controller elaborates on the role:

First, we have the reporting work and this is something we cannot abandon completely. The reporting stage is when we gather and pass on the financial information from the mining operation to senior managers. Then we have analysis and strategy work, which is a significant and advanced part of the controller role. Analysis work refers to analysis of the gathered financial information from mining operations. Strategy work refers to how the controllers use financial information from the reporting stage in combination with what we learn in the analysis stage, and how that gives meaning to the financial information.

This statement indicates that the controller role is different depending on whether the capital investment project is strategic or not. Here the controller highlights that strategy work is more complex and advanced than ordinary investment projects. For example, in SCIPs there are generally more experts involved in creating the investment appraisals than in ordinary investment projects, thereby making SCIPs more difficult to coordinate and manage. The decision to move the towns of Kiruna and Malmberget certainly were fraught with complexity and involved many different group of actors that participated in the decision-making processes.

The controllers find that the reporting stage is present in all investment projects but in strategic projects, the uncertainty dimension typically is higher. In the reporting stage it is decided what facts that should be recognized and what possibilities these facts include. Here, the controllers are essential actors. The following analysis stage concerns the making of choices about what possibilities that should be developed. This stage is often completed by means of dialogue among

the controllers and other actors in the investment team. To the controllers, analysis and strategy work typically mean that a lot of time is devoted to values and the selection of possibilities. The selected possibilities are then communicated to senior managers and the management team. Thus, for a strategic investment project to be successful, all four dimensions of reality must be integrated (Nørreklit et al. 2010). The controller is a significant actor in this process who is actively engaged in creating a functioning construct causality.

When asking a project manager about what constitutes important accounting information in strategic capital investment projects and how project managers communicate financial information, the answer is:

I have to be able to explain my operational reality not only to a board of directors that seldom if ever has even been down into a mine. In order to explain how the various processes relate to extracted tonnages and how the different alternatives affect each other, facts often are the best way to communicate.

The project manager describes the important accounting information in SCIPS similarly to the group CFO and controller. From his point of view, he needs to explain and communicate his reality to the board of directors. He uses accounting information and translates the extracted volumes and the various processes into calculations that he refers to as facts. The project managers provide information from their operational reality such as tonnages and tangible delivery measures to the controller, who translates this information into accounting information and communicates it to the board of directors. This indicates that it is part of the controller role to translate the information provided from the project managers to top management in order to create successful investment proposals, i.e. to establish construct causality. This translation process involves several different issues, which will be discussed in more depth in Sect. 4.4. The quote above illustrates that communication is central for the practice of these actors and for creating successful investment proposals (Mitchell et al. 2013).

4.3.1 The dual controller role in strategic capital investment projects

Most of the capital investment projects in the case organization are organized in cross-functional teams consisting of different experts from various departments. One controller articulates: “I have never in my life seen another organization where we have to collaborate and communicate with this many specialists representing different areas of expertise.” This statement indicates that there are multiple groups of actors involved, each having their own topos (Nørreklit et al. 2006) making it difficult to manage and coordinate the SCIPs in the organization. The controller is a part of the management team responsible for investment projects, working together with managers across different levels of the organization. At the same time, the controller monitors the same people and reports on how the investment project is performing to top-level management. This dual role is sometimes challenging for the controllers. Another controller describes this circumstance as follows:

The controller is a member of the capital investment project team, but at the same time being a controller means to report deviations. The controller should make sure that management of investment projects is by the book. At the same time, the controller has to turn forecasts into meaningful information to the top-level decision makers so that they can follow and understand the investment projects.

This quote indicates that the dual role involves conflicting values for the controllers. On the one hand, the controller acts as a corporate police (e.g. Weber 2011) who is oriented towards the reporting of accounting facts and deviations. On the other hand, the controller supports top management with relevant and valuable accounting information (Linsley and Linsley 2014). This suggests that the controller role is a mix or hybrid (Hartmann and Maas 2011), both producing and using accounting information. This quote also suggests that the controllers select what type of accounting facts and possibilities they want to report to top management, based on their own subjective and individual preferences (Nørreklit et al. 2006). They communicate accounting information in a certain way, making it useful to other actors. A third controller describes the controller's role in investment projects as a dual one:

Top-level management has too much on their table, and that goes for the project managers too. Only we the controllers see and know the whole picture and the other actors do not need that much information.

This statement suggests that the controller sees himself and the other controllers as the only actors who are in control of the accounting information. This is an example of the controllers' topos and their strong focus on financial aspects of the SCIPs. The controllers are the financial experts in the organization and tend to see themselves as superior in managing and coordinating SCIPs compared to other groups in the investment process. Further, the controllers select what facts that should be turned into possibilities, based on personal and organizational values. This reinforces the controller's position in the SCIPs. However, there are several different groups of actors in the SCIPs having their own specific topos. This makes the planning and decision-making process complicated. In order to construct successful investment proposals it is important to integrate the different topoi that exist within the organization (Nørreklit et al. 2017).

When asked further about the flow of financial information between controllers and other actors, one controller states:

Different people, like project managers and engineers, want us only to report information, while top-level management wants us to move more toward analytical and strategic work.

It would seem that operational actors need the controller as a language translator between their factual views on financial information whereas the top-level managers need the controllers to select, interpret, and communicate relevant and meaningful accounting information. As multiple topoi exist in the organization, the controller needs to adjust the accounting information presented and how they communicate with the different group of actors in the SCIPs. Thus, the controllers in SCIPs need

to be flexible and adjust how they act depending on the actors and their specific topoi.

4.4 How the controller acts to bridge the gap of multiple topoi in strategic capital investment projects

In the case organization, it is important that the controllers have an understanding of the mining operations. To develop and enhance the understanding of mining operations, LKAB has a program where controllers visit large-scale strategic capital investment projects to see and learn about the daily operations. The program can be interpreted as an effort to strengthen the controllers' technical and operational language. One controller describes this program in the following way:

The project managers are almost exclusively engineers and they gain a much higher trust in and use of us, the controllers, if they feel that we understand the technical and operational aspects behind the numbers. I wish all controllers had this opportunity to get to know our organization.

By increasing the controllers' understanding of the meaning behind the numbers and allowing them to see the mining operations with their own eyes, the intention is that more accurate and reliable investment proposals will follow. The program also represents an opportunity to get to know and gain the trust of project managers and project leaders. If we use the pragmatic framework to interpret the controllers' visits at different SCIPs, other aspects than the technical and operational aspects behind the numbers appears as important for managing and coordinating SCIPs. The visits seem to give the controllers insights about how the engineers think and act in the specific SCIP. These insights are important as many of the strategic investment proposals are conducted collaboratively by several different decision-participants. To make the plans work in practice, the controllers need to be able to understand the different perspectives among the actors involved in the particular SCIP. The results of the study also indicate that the actors in the selected SCIPs sometimes would have different opinions about the overall aim of a SCIP and why it is important. One controller elaborates on this:

Project managers have a strong focus on delivering and less focus on money. They do not want to be disturbed when they are doing something they find important. Then we controllers might have to force the issue to get their attention. Of course, they want to take appropriate action, do the right thing, but they might not always like it.

This statement shows that project managers sometimes have a different focus than controllers. Differences in orientation suggest that it may be difficult to establish construct causality in SCIPs which are characterized by the existence of multiple topoi. The project managers are engineers and their goals and responsibilities are formulated in tons of iron ore, thereby resulting in an orientation towards production. The controllers are the financial experts in the SCIPs and their focus are on

costs, revenues and meeting the budget targets. Thus, at least two different topoi needed to be aligned in this particular situation.

The study also illustrates that controllers modify accounting information in order to align the views of the different decision-participants. The following statement by a controller who comments on how project managers report financial information represents an example of this type of modification:

As soon as the project manager passes us financial information, we controllers write down the information between 1 and 10% depending on the situation because we know the reality and project managers want to have a bigger piece of the pie.

This statement, made toward the end of an interview with a project manager where the controller was present, at the point when the project manager had left the room, indicates that controllers subjectively adjust or withhold information in the planning and decision-making process. This statement shows that the controller re-values the facts presented by other organizational actors, adjusting them according to the controller's subjective and individual preferences (e.g. Nørreklit et al. 2006) about the reality behind the figures. Controllers also need to act in a facilitating role in decision-making processes. As articulated by this controller:

It is important to the role of the controller in these projects to learn the business and gain trust from all actors involved. That is what makes a good controller.

This statement suggests that in order to create a joint set of functioning activities (Nørreklit et al. 2017), producing certain intended outcomes, there needs to be a trusting relationship between the actors in the SCIP and the controller. If there is a lack of trust, there is a lack of successful action. When further asked about what makes accounting information in strategic investment projects trustworthy, the controller answered:

Besides the manuals, guidelines, and our control systems, controllers also need to understand the business and have a feeling for the needs of the people involved. Without communication between the controller and other managers, there can easily be an overuse or too much trust in financial information from spreadsheets or from a business intelligence system at the expense of what is real.

This quote shows that accounting facts and future possibilities are not enough for creating successful investment proposals. Here the controller highlights the importance of communication for creating successful investment proposals. Thus, communication is important to acquire access to the others' reality construction. Thus, all four dimensions of facts, possibilities, values and communication must be integrated for creating successful outcomes (Nørreklit et al. 2016). At LKAB, the controller seems to be an essential actor in the formation of construct causality in planning and decision-making situations, such as the creation of investment proposals. Moreover, the controllers also need to convey and explicate the

operational meaning of financial information to the operational actors. One controller elaborates further on this:

The project managers and operating managers think it is crucial to have us controllers translate financial information into something they understand and can apply. It is important, even crucial, for all actors to understand the financial reality that the investments consist of. The engineers are very skilled and competent specialists in their field and they want to do a good job. As controllers, we can help them see the bigger picture.

This quote illustrates that it is important that all actors involved in the SCIP understand the accounting information, how it is produced and communicated. This is essential for a successful outcome of the investment project. The controllers translate the mining operations into meaningful financial information, which they present to top management. In this particular situation, the controllers' role seems to be to bridge the gap of multiple topoi by translating and adjusting the accounting information to the different actors in order to create successful investment proposals.

5 Discussion, conclusion and recommendations to future research

We have argued that the accounting literature on strategic capital investment projects mostly is based on a rational and instrumental perspective, which tends to neglect that investment proposals are human constructions. Following a recent line of research which suggests that strategic capital investment decisions rarely occur as single events orchestrated by top management (Nørreklit et al. 2017), we focus on the controller role, what the controller does and how she contributes to the creation of successful action and outcomes in SCIPs. Our first research question was:

- What is the controller's role in strategic investment projects, which are complex, involve high degrees of uncertainty and consist of multiple decision-participants?

The controller role has been debated during a long time in the management accounting literature and the debate revolves around two archetypical conceptions of the controller role; the traditional bean-counter and the business partner (Granlund and Lukka 1997; Burns and Baldvinsdottir 2005; Järvenpää 2007). However, more current research findings suggest that the controller often serves a hybrid role (Weber 2011). The controllers in our study acknowledge their dual role in managing and coordinating SCIPs, acting both as a member of the management team and as a corporate police. We find that in internal policies and guidelines, the controller role in SCIPs is described in a rather instrumental and rational way. The tasks and areas of responsibility for controllers in SCIPs are to monitor and follow-up budgets and outcomes, overseeing the progress of the investment plan and providing financial information to different groups of actors working in SCIPs. All of these role characterizations are in line with the dominant view of SCIPs within the accounting literature on capital budgeting and investment proposals (e.g. Alkaraan and Northcott 2006).

However, viewing our results from the point of departure of the pragmatic constructivist framework (e.g. Pianezzi and Cinquini 2016) we find another answer to the question concerning the controller role in SCIPs which are complex, involve high degrees of uncertainty and consist of multiple decision-participants. In particular, the controller role in SCIPs is mainly to align the different perspectives of the multiple decision-participants. Similarly to Nørreklit et al. (2017) our results suggest that this type of alignment is important for successful organizational outcomes. In addition, this study suggests that the controller is an essential actor for the bridging of multiple topoi in the organizational planning and decision-making processes of strategic capital investment projects, thereby enabling successful investment proposals.

Our second research question was formulated in the following way:

- How does the controller contribute to the creation of a functioning construct causality in organizational planning and decision-making, in strategic investment projects?

In this case study, we highlight how the controller is an essential actor for the creation of a functioning construct causality in SCIPs. We find that controllers are important actors for the construction of successful investment proposals in SCIPs since they are involved in all stages of integrating facts, possibilities, values, and communication (Nørreklit et al. 2010). The results of this study suggest three issues which are important for creating a functioning construct causality in the organizational planning and decision-making of SCIPs. First, trust plays an essential part in explaining how controllers can form a functioning construct causality. It is integral to the alignment of different topoi within the SCIPs. Second, controllers need to adjust how they present and communicate management accounting information to different actor groups. For example, the controllers translate financial facts delivered by the project managers and turn them into possibilities by using their own subjective values and the organizations values. Then, the controllers adjust the information to make it useful for top management, which often makes the formal investment decision. Third, controllers need to show that they know and understand the operational aspects and industry conditions of their company and that they speak the language of technology and operations.

Our study extends previous work by Nørreklit et al. (2017) by highlighting the significance of controllers for orchestrating the co-authorship of multiple actors and creating a functioning construct causality in SCIPs and by identifying trust, ability to adjust facts into meaningful management information and knowledge of business operations as decisive for the controllers' contributions to successful outcomes.

5.1 Contribution and recommendations for future studies

The paper contributes to the accounting literature on capital budgeting and investment proposals by presenting an actor-focused empirical study of organizational and managerial processes in SCIPs. The paper illustrates how the controllers act

to manage and coordinate SCIPs in the mining industry. In our case, the strategic capital investment decisions are conducted by multiple decision-participants and the controller is an important actor in this complex process. Our study illustrates that controllers are actively engaged in and affect all four dimensions (i.e. facts, possibilities, values and communication) of creating a functioning construct causality.

As strategic capital investment decisions often are complex, uncertain, and consist of multiple decision-participants, one of the main roles of controllers in SCIPs is to bridge the gap of multiple topoi and align the different perspectives among the actors working in SCIPs. This allows the organization to create successful investment proposals. We believe that this perspective provides an alternative explanation to why controllers act the way they do in complex and uncertain projects with multiple decision-participants. Further, the paper provides empirical evidence suggesting that the controller role in SCIPs is a complex mix of traditional and business partner characteristics. Hopefully, these findings can stimulate the existing debate on the controller role in the management accounting literature (Goretzki et al. 2013; Burns and Baldvinsdottir 2007).

This study was completed in an engineering-oriented mining context characterized by several actor groups, multiple and capital-intensive investment projects, and strong regulations. These circumstances can be important explanations to the findings we report. Accordingly, one suggested task for future research is to explore the extent to which our conclusions are valid in other contexts. A second suggestion for future research would be to select a specific capital investment project for longitudinal study. This type of research approach would make it possible to understand the implications of project characteristics such as duration, magnitude and distance between entities, for the role of the controller. A third option could be to investigate the controller's bridging of multiple topoi in a specific project. Such a study could enable an elaborated understanding of how bridging takes place in practice. In either case, shadowing is a promising approach for future researchers interested in understanding the role of the controller.

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Appendix 1: Examples of interview questions from round 1 and 2

Round 1

1. Background information:

What is your area of responsibility?

How long have you been working here?

What investment projects are active right now?

- a. How would you characterize these investment projects?
- b. What makes them different from operational investment projects?

2. Actors and their relations in SCIPs:
 - a. Do you consider that management accounting itself affects the actors in the investment projects?
 - b. Can you describe how controllers and other actors involved in managing investment projects interact?
 - c. Are there any challenges to this interaction? Can you elaborate?
 - d. Does the interaction between actors change over time? If so, what changes and how?
3. The controller role in SCIPs?
 - a. Is the controller role different depending on situation or context?
 - b. Does the controller role change as the investment project matures over time?
 - c. How many controllers are involved in these investment projects?
 - d. How many actors are involved in these projects?
 - e. How does the controller communicate with other actors involved in the investment projects?
4. Are there any disagreements among the actors managing investment projects?
 - a. What are the types of disagreement?
 - b. Of these disagreements, which are more frequent?
 - c. Of these disagreements, which are less frequent?
 - d. What disagreements are considered more serious?
 - e. What disagreements are considered more challenging?
 - f. How do you work proactively to reduce such disagreements?
5. What type of management accounting tools and techniques do you use for managing SCIPs?

Round 2

1. Can you describe your work role? How long have you had your current work role? How would you describe your work managing investment projects?
2. How many actors are involved in the process of creating calculations of SCIP in the pre-planning phase? What work roles do these actors have? Who are the most active actors in this process?
3. What is the most important thing you [as title] do during the process of creating calculations for SCIP?
4. How much time do you [as title] spend as a group during the process of creating calculations for SCIP during the pre-planning phase? Do you consider this work to be extensive or a limited effort? What differences are there between different SCIPs? Can you elaborate?
5. Are there several potential SCIP alternatives to consider? Who decides the final SCIP? How do they make this decision?

6. How do you view your own role when it comes to prioritizing between and deciding on an SCIP?
7. Is there always consensus in deciding on an SCIP during the calculation process prior to the decision? Can you elaborate?

References

- Alkaraan, F., & Northcott, D. (2006). Strategic capital investment decision-making: A role for emergent analysis tools? A study of practice in large UK manufacturing companies. *British Accounting Review*, 38(2), 149–173.
- Allen, K. (2004). *Max Weber: A critical introduction*. London: Pluto Press.
- Baldvinsdottir, G., Burns, J., Nørreklit, H., & Scapens, R. W. (2009). The image of accountants: From bean counters to extreme accountants. *Accounting, Auditing, & Accountability Journal*, 22(6), 858–882.
- Behrens, J., Ernst, H., & Shepherd, D. A. (2014). The decision to exploit an R&D project: Divergent thinking across middle and senior managers. *Journal of Product Innovation Management*, 31(1), 144–158.
- Biddle, B. J. (1979). *Role theory: Expectations, identities, and behaviors* (pp. 55–86). New York: Academic Press.
- Broadbent, J., & Laughlin, R. (2009). Performance management systems: A conceptual model. *Management Accounting Research*, 20(4), 283–295.
- Brown, J. S., & Duguid, P. (2000). *The social life of information*. Boston: Harvard Business School Press.
- Burns, J., & Baldvinsdottir, G. (2005). An institutional perspective of accountants' new roles—The interplay of contradictions and praxis. *European Accounting Review*, 14(4), 725–757.
- Burns, J., & Baldvinsdottir, G. (2007). The changing role of management accountants. In T. Hopper, D. Northcott, & R. Scapens (Eds.), *Issues in management accounting* (3rd ed., pp. 117–132). Pearson Education Limited: Edinburgh.
- Butler, R., Davies, L., Pike, R., & Sharp, J. (1991). Strategic investment decision-making: Complexities, politics, and processes. *Journal of Management Studies*, 28(4), 395–415.
- Byrne, S., & Pierce, B. (2007). Towards a more comprehensive understanding of the roles of management accountants. *European Accounting Review*, 16(3), 469–498.
- Cardin, M. A., de Neufville, R., & Kazakidis, V. (2008). Process to improve expected value of mining operations. *Mining Technology*, 117(2), 65–70.
- Carr, C., Kolehmainen, K., & Mitchell, F. (2010). Strategic investment decision making practices: A contextual approach. *Management Accounting Research*, 21(3), 167–184.
- Carr, C., & Tomkins, C. (1996). Strategic investment decisions: the importance of SCM. A comparative analysis of 51 case studies in UK, US and German companies. *Management Accounting Research*, 7(2), 199–217.
- Coad, A. (1996). Smart work and hard work: Explicating a learning orientation in strategic management accounting. *Management Accounting Research*, 7(4), 387–408.
- Cortese, C. L., Irvine, H. J., & Kaidonis, M. A. (2009). Extractive industries accounting and economic consequences: Past, present, and future. *Accounting Forum*, 33, 27–37.
- De Loo, I., Versteegen, B., & Swagerman, D. (2011). Understanding the roles of management accountants. *European Business Review*, 23(3), 287–313.
- Dierdorff, E. C., & Rubin, R. S. (2007). Carelessness and discriminability in work role requirement judgments: Influences of role ambiguity and cognitive complexity. *Personnel Psychology*, 60(3), 597–625.
- Ejdemo, T., & Söderholm, P. (2011). Mining investment and regional development: A scenario-based assessment for Northern Sweden. *Resource Policy*, 36(1), 14–21.
- Friedman, A., & Lyne, S. (1997). Activity-based techniques and the death of the beancounter. *The European Accounting Review*, 6, 19–44.

- Goretzki, L., Strauss, E., & Weber, J. (2013). An institutional perspective on the changes in management accountants' professional role. *Management Accounting Research*, 24(1), 41–63.
- Granlund, M., & Lukka, K. (1997). From bean-counters to change agents: The Finnish management accounting culture in transition. *Finnish Journal of Business Economics*, 3, 213–255.
- Granlund, M., & Lukka, K. (1998). Towards increasing business orientation: Finnish management accountants in a changing cultural context. *Management Accounting Research*, 9(2), 185–211.
- Gullberg, C., & Lindvall, J. (2016). Att agera controller. In F. Nilsson, C.-J. Petri, & A. Westelius (Eds.), *Strategisk ekonomistyrning—med dialog i fokus* (1st ed.). Lund: Studentlitteratur AB.
- Harris, E. P. (2014). Feel the risk: Strategic investment decisions in an uncertain world. In D. Otley & K. Soin (Eds.), *Management control and uncertainty* (pp. 343–377). Palgrave Macmillan.
- Hartmann, F. G., & Maas, V. S. (2011). The effects of uncertainty on the roles of controllers and budgets: An exploratory study. *Accounting and Business Research*, 41(5), 439–458.
- Hopper, T. M. (1980). Role conflicts of management accountants and their position within organisation structures. *Accounting, Organizations and Society*, 5(4), 401–411.
- Jakobsen, M., & Lueg, R. (2014). Balanced scorecard and controllability at the level of middle managers—The case of unintended breaches. *Journal of Accounting & Organizational Change*, 10(4), 516–539.
- Järvenpää, M. (2007). Making business partners: A case study on how management accounting culture was changed. *European Accounting Review*, 16(1), 99–142.
- Johnson, N. B., Pfeiffer, T., & Schneider, G. (2013). Multistage capital budgeting for shared investments. *Management Science*, 59(5), 1213–1228.
- Jönsson, S. (2009). The study of controller agency. In C. S. Chapman, D. J. Cooper, & P. B. Miller (Eds.), *Accounting, organizations, and institutions—Essays in honour of Anthony Hopwood* (pp. 233–259). New York: Oxford University Press.
- Kauffman, R. J., Liu, J., & Ma, D. (2015). Technology investment decision-making under uncertainty. *Information Technology and Management*, 16(2), 153–172.
- Laine, T., Korhonen, T., Suomala, P., & Rantamaa, A. (2016). Boundary subjects and boundary objects in accounting fact construction and communication. *Qualitative Research in Accounting & Management*, 13(3), 303–329.
- Lindvall, J. (2009). *Controllerns nya roll* (1st ed.). Stockholm: Norstedts Förlagsgrupp AB.
- Linsley, P., & Linsley, A. (2014). Cultural theory of risk and the motion of “management accountants as strategists.” In D. T. Otley & K. Soin (Eds.), *Management control and uncertainty* (pp. 224–238). Palgrave Macmillan.
- Lu, Y., & Heard, R. (1995). Socialized economic action: A comparison of strategic investment decisions in China and Britain. *Organization Studies*, 16(3), 395–424.
- Lukka, K., & Modell, S. (2010). Validation in interpretive management accounting research. *Accounting, Organizations and Society*, 35(4), 462–477.
- Miller, P. (1991). Accounting innovation beyond the enterprise: Problematizing investment decisions and programming economic growth in the UK in the 1960s. *Accounting, Organizations and Society*, 16(8), 733–762.
- Miller, P., & O’Leary, T. (2007). Mediating instruments and making markets: Capital budgeting, science and the economy. *Accounting, Organizations and Society*, 32(7), 701–734.
- Mitchell, F., Nielsen, L. B., Nørreklit, H., & Nørreklit, L. (2013). Scoring strategic performance: A pragmatic constructivist approach to strategic performance measurement. *Journal of Management and Governance*, 17(1), 5–37.
- Nørreklit, L. (2017). Actor-reality construction. In H. Nørreklit (Ed.), *A philosophy of management accounting: A pragmatic constructivist approach* (pp. 23–71). New York: Routledge.
- Nørreklit, H., Mitchell, F., & Nielsen, L. B. (2017). Reflective planning and decision-making. In H. Nørreklit (Ed.), *A philosophy of management accounting: A pragmatic constructivist approach* (pp. 97–116). New York: Routledge.
- Nørreklit, L., Nørreklit, H., & Israelsen, P. (2006). The validity of management control topoi: Towards constructivist pragmatism. *Management Accounting Research*, 17(1), 42–71.
- Nørreklit, H., Nørreklit, L., & Mitchell, F. (2010). Towards a paradigmatic foundation for accounting practice. *Accounting, Auditing, & Accountability Journal*, 23(6), 733–758.
- Nørreklit, H., Nørreklit, L., & Mitchell, F. (2016). Understanding practice generalisation—opening the research/practice gap. *Qualitative Research in Accounting & Management*, 13(3), 278–302.

- Northcott, D., & Alkaraan, F. (2007). Strategic investment appraisal. In T. Hopper, D. Northcott, & R. Scapens (Eds.), *Issues in management accounting* (3rd ed., pp. 199–220). Pearson Education Limited: Edinburgh.
- Pianezzi, D., & Cinquini, L. (2016). Assessing the validity of accounting for human rights: A pragmatic constructivist perspective. *Qualitative Research in Accounting & Management*, 13(3), 370–391.
- PWC. (2012). *Mine 2012: The growing disconnect*. PWC: Review of global trends in the mining industry.
- Schoemaker, P. (1993). Strategic decisions in organizations: Rational and behavioural views. *Journal of Management Studies*, 30(1), 106–129.
- Seal, W., & Mattimoe, R. (2016). The role of narrative in developing management control knowledge from fieldwork: A pragmatic constructivist perspective. *Qualitative Research in Accounting & Management*, 13(3), 330–349.
- Segelod, E. (2002). Resource allocation in a few industries: Determinants and trends. *International Journal of Production Economics*, 77, 63–70.
- Slagmulder, R. (1997). Using management control systems to achieve alignment between strategic investment decisions and strategy. *Management Accounting Research*, 8(1), 103–139.
- Slagmulder, R., Bruggeman, W., & Wassenhove, L. (1995). An empirical study of capital budgeting practices for strategic investments in CIM technologies. *International Journal of Production Economics*, 40, 121–152.
- Starrin, B., & Svensson, P. G. (1996). *Kvalitativa studier i teori och praktik*. Studentlitteratur: Lund.
- Tuomela, T. S. (2005). The interplay of different levers of control: A case study of introducing a new performance measurement system. *Management Accounting Research*, 16(3), 293–320.
- Turner, J. R., & Müller, R. (2003). On the nature of the project as a temporary organization. *International Journal of Project Management*, 21(1), 1–8.
- Van Oorschot, K., Sengupta, K., Akkermans, H., & Van Wassenhove, L. (2010). Get Fat Fast: Surviving Stage-Gate® in NPD. *Journal of Product Innovation Management*, 27(6), 828–839.
- Weber, J. (2011). The development of controller tasks: Explaining the nature of controllership and its changes. *Journal of Management Control*, 22(1), 25–46.
- Zoni, L., & Merchant, K. A. (2007). Controller involvement in management: An empirical study in large Italian corporations. *Journal of Accounting & Organizational Change*, 3(1), 29–43.

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