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# In the eyes of the beholder: On innovation metrics

## A study on innovation metrics in changing strategic contexts

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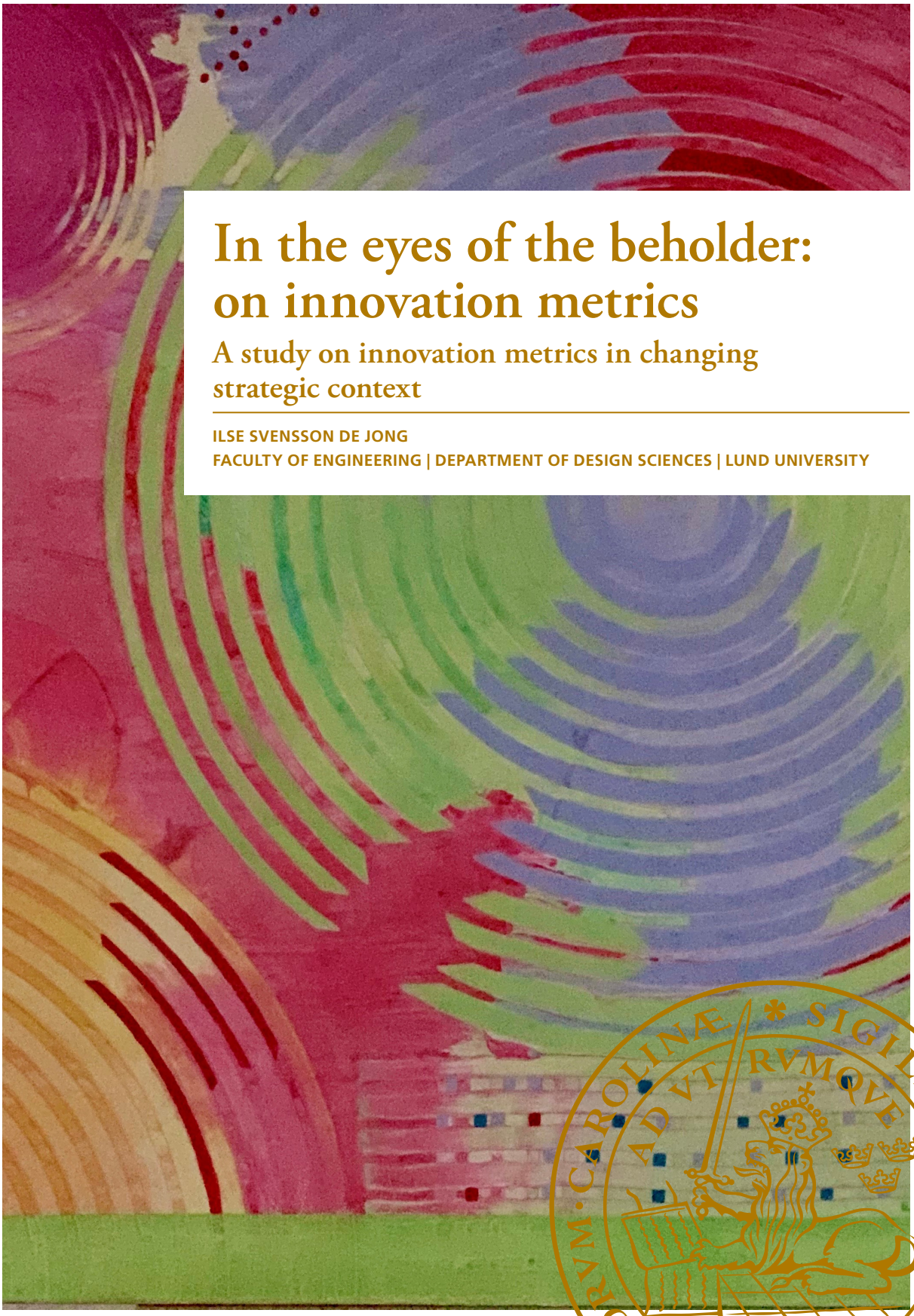

# In the eyes of the beholder: on innovation metrics

## A study on innovation metrics in changing strategic context

ILSE SVENSSON DE JONG
FACULTY OF ENGINEERING | DEPARTMENT OF DESIGN SCIENCES | LUND UNIVERSITY

# In the eyes of the beholder: on innovation metrics

On her entrepreneurial adventure, Ilse observed that some organizations were able to innovate and financially thrive while others seemed unable to capitalize on their innovation, which initiated her quest for answers. On both her academic path as well as in her career Ilse has been fascinated by the following questions:

*In innovation, what makes some organizations more successful than others, and how do innovation metrics play a role in this?*

Innovation has received considerable attention from scholars and practitioners in several disciplines over the last decade. This thesis, therefore, documents a journey of curiosity in finding out how innovation metrics guide organizations on the path towards successful innovation.

Each journey has its hurdles, discoveries, and treasures to uncover, and even though this story is reported in a linear and structured fashion, the journey of understanding innovation metrics has not been straightforward. Fundamental questions on *what* an innovation metric is, *how* innovation is measured, by *who* innovation is measured, *why* innovation is measured, and lastly, *where* innovation is measured have been explored on this elaborate journey.

In changing strategic contexts, encountered by many organizations, innovation metrics provide managers and controllers with insight and understanding on how to navigate and orchestrate innovation. Innovation, its measurement, and metrics are, however, interpreted and perceived in many ways, both in theory as well as in practice. Innovation metrics are thus "in the eye of the beholder", referring to innovation metrics being interpreted, perceived, and used by organizational members.

On this journey, inspired by companies such as Ikea and Haldex, action research was discovered as a theoretical and methodological tool to explore and develop innovation metrics in changing strategic contexts. This tool allowed the research and stakeholders to study and develop innovation metrics simultaneously, a unique combination rarely found in innovation measurement. The results show that developing innovation metrics with participatory action design requires preparation and learning, on behalf of the organizational members as well as for the researcher.

This doctoral thesis has fulfilled the requirements for Ilse Svensson de Jong to be awarded a PhD in Industrial Engineering and Management.

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# In the eyes of the beholder: On innovation metrics

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A study on innovation metrics in changing strategic contexts

Ilse Svensson de Jong

LUND UNIVERSITY

DOCTORAL DISSERTATION

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Abstract

Innovation measurement and metrics have fascinated scholars from several disciplines over the last decade. All these diverse contributions, however, have resulted in a current state of knowledge that is signified by large numbers of articles without clear integration and synthesis. Therefore, this thesis aims to increase the theoretical, empirical, and practical understanding of innovation measurement and metrics in changing strategic context and thereby augment the possibilities for improved practices and performance in organizations.

The research consists of the findings of four studies presented in four appended papers. The first part of this thesis presents the state-of-the-art in innovation measurement and metrics and provides an explorative overview of the research field of innovation measurement and metrics. This state-of-the-art is then connected to how action research has and can be used as an analytical, theoretical, and methodological tool in this field. Paper one provides an overview of the state of art in the field of innovation and measurement, it presents the window of opportunity for action research as an analytical, theoretical, and methodological tool.

The second part of this thesis consisting of two qualitative studies has a more explorative and explanatory character. Based on a case study that focuses on understanding how innovation metrics are used in an organization, two papers were developed. Paper two tries to provide a real-life case example of how innovation metrics and measurement work in practice and raise understanding of how organizational members perceive and use innovation metrics. The third paper focuses on understanding how room for organizational error occurs when innovation metrics are used by organizational members in changing strategic context.

In the last part, paper four provides an empirical example of how action research, specifically participatory action design, can be used to develop innovation metrics in changing strategic contexts.



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MADE IN SWEDEN

*To my loved ones*

You look at science (or at least talk of it) as some sort of demoralizing invention of man, something apart from real life, and which must be cautiously guarded and kept separate from everyday existence. But science and everyday life cannot and should not be separated." – Rosalind Franklin

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# Abstract

Innovation measurement and metrics have fascinated scholars from several disciplines over the last decade. All these diverse contributions, however, have resulted in a current state of knowledge that is signified by large numbers of articles without clear integration and synthesis. Therefore, this thesis aims to increase the theoretical, empirical, and practical understanding of innovation measurement and metrics in changing strategic context and thereby augment the possibilities for improved practices and performance in organizations.

The research consists of the findings of four studies presented in four appended papers. The first part of this thesis presents the state-of-the-art in innovation measurement and metrics and provides an explorative overview of the research field of innovation measurement and metrics. This state-of-the-art is then connected to how action research has and can be used as an analytical, theoretical, and methodological tool in this field. Paper one provides an overview of the state of art in the field of innovation and measurement, it presents the window of opportunity for action research as an analytical, theoretical, and methodological tool.

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In the last part, paper four provides an empirical example of how action research, specifically participatory action design, can be used to develop innovation metrics in changing strategic contexts.

# Populärvetenskaplig sammanfattning

Innovation är en kraft som står bakom förändringen i vår vardag. Till exempel att prata med någon på andra sidan jordklotet med en mobil eller beställa dina matvaror eller skor på din smarta mobil. Det var otänkbart för mindre än 40 år sedan.

Vi vill naturligtvis att innovationer i vårt samhälle ska fortsätta förbättra våra liv. Men innovationsverksamhet och att generera nya produkter, tjänster, affärsmodeller och processer är utmanande. Trots höga ambitioner blir resultatet av många innovationssatsningar inte alltid framgångsrikt. Risken är om företag allt för ofta misslyckas med innovation så skapas det ej värde för kunderna, för samhället och för det företag eller organisation som försökte skapa innovationen (Frishammer & Björk 2019). Frågan är då, hur säkerställer vi att innovationer fortsätter att produceras och uppmuntras?

Denna avhandling handlar om hur vi kan mäta och följa upp innovationsverksamhet på ett sätt som gör att samhället och företagen fortsätter gynnas. Att mäta innovation är fullständigt centralt för att få innovation att hända i praktiken. Mätning gör det möjligt för organisationer att kunna rikta deras innovationsansträngingar mot dem mål de vill uppnå (Frishammer& Björk 2019).

Denna avhandling börjar med att studera vår syn på innovation. Över tiden kan vi se att innovation ha förändrats från att främst handla om att utveckla en fysisk produkt på en forsknings- och utvecklingsavdelning till att främst handla om att utveckla nya tjänstelösningar ofta med hjälp av många aktörer i och utanför organisationen (tänk Uber). Denna förändring i synen på innovation och innovationsverksamhet speglas i innovationslitteraturen över de senaste 40 åren och också i definitionen av innovation som vi använder idag.

Det finns tydliga indikationer som pekar på att innovation har blivit en mer diffus och distribuerad verksamhet och kan bestå av ett komplext samarbete mellan flera aktörer båda inom och utanför en organisation. För mätning av innovationsverksamhet kommer det att betyda att innovation är svårfångat i kvantitativa och finansiella mätetal och ofta kan bara en del av utvecklingsarbetet fångas inom organisationen. Även om innovation har förändrats verkar mätsystem av innovation i organisationer idag inte riktigt hängt med i denna utveckling.

Vidare redovisar denna avhandling ett antal casestudier om vad som är utmaningen med att mäta innovation i en organisation. Dessa casestudier kan öka förståelsen av vilka utmaningar som finns i praktiken och varför det finns en skillnad mellan strategisk intention och praktiskt genomförande i mätetal för innovation. Casestudierna visar sig innovation i den studerade organisationen berör många och har många inblandade aktörer. Detta har gjort att mätetal av innovation ofta speglar bara en del av i innovationsverksamheten den delen som går att mäta som är

finansiell och kvantitativ. Detta betyder att mätetal i organisationer ärofullständiga. Ofta är emellertid aktörer medvetna om att det finns ”mörkertal” i mätetalen och att det därför behövs tilläggsinformation eller förklaringar för att mer fullständigt fånga värdet av innovation.

Till sist, har avhandlingen tittat på delaktighet i utformning av mätetal till innovation i företag. Här jobbar jag med ett unikt tillvägagångssätt som används väldigt lite i styrningssystem, som heter participatory action design som utformar mätetal till innovation där företagsmedlemmer är delaktiga. Denna avhandling inte förneka nyttan av mätandet i innovation som sådant, utan betona att mätandet alltid måste underordnas en reflekterande, omdömesgill subjektivitet där betraktaren ska läsa mätetal mellan radarna (Bornemark, 2018: 15)

# Acknowledgments

First, I would like to express my gratitude to my supervisor Lars Bengtsson who dared to believe in me and provide guidance and a clear vision to construct and create this thesis. Thank you, Ola Alexanderson, for your valuable insights and depth in our reflective conversations. Another special thank you to my colleague from Service Management, Mia Larson, for her support in my academic career.

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Many thanks to my friendly and knowledgeable colleagues at Lund University. Special thanks to all wonderful Ph.D. students (past and present) with whom I share the joy and misery of the Ph.D. journey: Izabelle, Camilla NM, Kajsa. From Forskarskolan MIT, I would like to thank all my opponents, Alf Westelius, Lars Frimansson and Fredrik Nilsson. Thank you, Cilla, Robert, Susanne, and the Service Group for all the support.

Finally, I would like to thank my friends (Linda, Jeanette, Martina) and family for all the support you have given me. My (current and former) partners in life, Erik and Alex, thank you for being there for me by giving me a harbor. My children, Sigrid, Malcolm and Emanuel, and Margot who show me every day why living matters.

Lund, 2021

Ilse Svensson de Jong

# Appended Papers

The research presented in this thesis comprises four papers that are listed below. A summary of the appended papers is provided subsequently, while the full version of each paper is appended at the end of the thesis.

*PAPER I:*
de Jong, I.S. (2021). A window of opportunity: action research in innovation measurement

Under review in *Journal of Innovation management*.

*PAPER II:*
de Jong, I. S. (2021). Misfit? The Use of Metrics in Innovation. *Journal of Risk and Financial Management*, 14(8), 388.

*PAPER III:*

de Jong, I. S. (2021). When Wrong Is Right: Leaving Room for Error in Innovation Measurement. *Journal of Risk and Financial Management*, 14(7), 332.

*PAPER IV:*
de Jong, I. S. (2021). Under construction: action research in innovation measurement. *International Journal of Managing Projects in Business*, 14(1), pp. 87-107.

# Related Papers and publications

de Jong, I. S. (2018). Is innovation out of control? The state of the practice of innovation performance measurement. Presented at *Nordic Accounting Conference.*

# Introduction

*This chapter outlines the overview of the dissertation. It starts with the research background and empirical context, research purpose, and research questions along with the outline of the appended papers and the rest of the thesis.*

## Background

In today's competitive environment, large companies have increased their investment in innovation to avoid being Netflix-ed or Uber-sized (Kirsner, 2015). Innovation, as a result, is on the mind of most executives and is part of almost every company's strategic plan (Brattström, Frishammar, Richtnér, & Pflueger, 2018; Kim & Mauborgne, 2005). Innovation metrics are a commonly accepted means of increasing the effectiveness and efficiency of organizational actions (Janssen, Moeller, & Schlaefke, 2011). Both practitioners, as well as scholars, seem to struggle with the use of innovation metrics to assess innovation and its performance (Frishammar, Richtnér, Brattström, Magnusson, & Björk, 2018; Kuratko, Covin, & Hornsby, 2014). In the case of practitioners, comparing the lists of best practices and benchmarks reveals that there are indeed more questions than answers (Cooper & Kleinschmidt, 1995; Frishammar et al., 2018). Practitioners indicate a relation between innovation metrics and improved innovation performance however clear academic validity and clarity seem to be difficult to establish (Dewangan & Godse, 2014; Dziallas & Blind, 2019).

Innovation is often perceived as a difficult process and outcome to control and measure. At best, sophisticated selection procedures can impose discipline and guidance to contain costly errors (Brattström et al., 2018; Miller & Olleros, 2008). There are a variety of metrics being used to measure innovation, however, there is a lack of consensus on the best way forward (Muller, Välikangas, & Merlyn, 2005). Even though the perfect innovation metric is elusive, five commonly used innovation metrics are, 1) revenue generated by new products, 2) number of projects in the innovation pipeline, 3) Stage gate specific metrics, i.e. projects moving from one development stage to the next, 4) Profit and Loss or another financial impact 5) number of ideas generated (Kirsner, 2015).

Innovation impacts not only the external environment; it changes the way internal elements of the organization such as strategy, structure, and processes work (Davila, Epstein, & Shelton, 2012). Previous studies indicate that in the use and development of innovation metrics, one should take consideration of them as means to enhance or kill differing abilities of organizations to obtain benefits from innovation (Christensen, Kaufman, & Shih, 2010; Dodgson, Gann, & Phillips, 2014). Innovation metrics, however, seem to play a central role in enabling managers to fulfill the primary purpose of innovation, to create new opportunities or to exploit existing ones (Damanpour & Wischnevsky, 2006; Dodgson et al., 2014; Drucker, 1998).

Innovation is a complex, dynamic, socio-technical, socio-economic, and socio-political phenomenon that needs to be approached holistically to be properly measured and assessed (Carayannis, Goletsis, & Grigoroudis, 2018). The vast amount of literature on the distinct topics of "innovation" and "performance measurement", indicates that research in "innovation measurement" is complex (Bititci, Garengo, Dörfler, & Nudurupati, 2012; Nudurupati, Bititci, Kumar, & Chan, 2011). Innovation metrics that are particularly needed for the strategic management of innovation are still prominently missing (Keupp, Palmié, & Gassmann, 2012). As evidenced by the research there are no commonly accepted metrics or measures of innovation (Dziallas & Blind, 2019). In all sectors, the measurement and evaluation issues related to innovation metrics thus still need clarification from a conceptual as well as empirical point of view (Haldma, Nasi, & Grossi, 2012).

# The changing strategic context

Traditionally, the strategic context is associated with an industrial setting, characterized by mass production, and economies of scale were important elements (Alawattage & Wickramasinghe, 2012). The techniques and methods developed during this era are characterized as mechanistic in nature (Barros & da Costa, 2019). The use of metrics in this traditional context was influenced by managerial movements, such as Taylorism and Fordism, which lead to the fragmentation of work and processes, the standardization and rationalization of production systems, and the reduction of skills of the workforce and as a result increasing productivity (Alawattage & Wickramasinghe, 2012). In this traditional strategic context of innovation, more bureaucratic forms of organization were implemented to act in accordance with the principles of standardization that signified the traditional industrial era (Barros & da Costa, 2019).

Innovation metrics originating from this traditional industrial context, have been thought to have a negative impact on innovation due to their command and control approach (Davila, Foster, & Oyon, 2009) bureaucratic and centralized decision-making structure (Barros & da Costa, 2019), and emphasis on accounting-based techniques and information (Davila, 2000) all of which appear inappropriate for – and likely counterproductive to – innovation(Fagerlin & Lövstål, 2020). In this traditional empirical context, the primary functions of metrics are standardization and control of production activities (Alawattage & Wickramasinghe, 2012). In changing strategic context, innovation metrics should instead contribute primarily contribute to flexibility and autonomy (Barros & da Costa, 2019). The traditional industrial economy has now been transformed into a knowledge economy, in which innovation is regarded as one of the main driving forces, if not the only driving force, of sustained economic growth (Carayannis et al., 2018). In this transition toward the knowledge economy, strategy, innovation, and metrics are affected as can be seen in Figure 1. This shift calls for new forms of organization, management, and measurement (Ollila & Yström, 2020). Organizational shifts from a traditional setting into contemporary and creative settings are thus affecting the way innovation metrics are used and designed (Davila & Ditillo, 2017; Goshu & Kitaw, 2017).

Each industry has its own set of requirements for how innovation is measured, managed, and controlled (Bromwich & Scapens, 2016; Messner, 2016). The processing industry, which is the industry studied in this dissertation, is subject to commoditization. Commoditization is defined as a distinct phenomenon of evolving marketing competition characterized by increasing product homogeneity, increased price sensitivity among customers, lower switching costs, and increased industry stability (Matthyssens & Vandenbempt, 2008; Reimann, Schilke, & Thomas, 2010: 188). Previous research has shown that commoditization is not limited to a single industry, but rather is a general trend affecting a growing number of industries (Goffin, Beznosov, & Seiler, 2021; Kashani, 2006; Reimann et al., 2010). As a strategic shift, commoditization has an impact on innovation metrics(Messner, 2016). In essence, commoditization will require innovation metrics to continually adjust to complex situations (Okwir, Nudurupati, Ginieis, & Angelis, 2018).

Several studies have looked into the effects of commoditization on strategy, and they imply that when faced with commoditization, firms tend to pick strategies that create value and differentiation (Matthyssens & Vandenbempt, 2008). The present literature suggests moving away from basic product offerings to service-based value concepts (Matthyssens & Vandenbempt, 2008). Both academia and practitioners emphasize the significance and difficulty of this transition towards service-based value offerings (Kowalkowski, Windahl, Kindström, & Gebauer, 2015). Auguste, Harmon, and Pandit (2006) add that companies should not only understand the new strategic rules of commoditization, but they (companies) should integrate the rules in their existing internal operations.

Innovation metrics are affected by the changing strategic context and industry pressures such as commoditization (Bromwich & Scapens, 2016; Messner, 2016). Scholars have proposed several strategies in recent decades to make this transition to service-based value concepts, most recently, digitalization and Industry 4.0 (Kowalkowski, Gebauer, & Oliva, 2017; Kowalkowski et al., 2015; Vendrell-Herrero, Bustinza, Parry, & Georgantzis, 2017). The ever-changing dynamics of competition require metrics to function as the link between strategy, execution, and ultimate value creation (Melnyk, Bititci, Platts, Tobias, & Andersen, 2014). Competitive pressures such as commoditization, are driving the traditional innovation measurement towards more "intelligent" and contemporary systems (Barros & da Costa, 2019; Franco-Santos, Lucianetti, & Bourne, 2012). The role that innovation metrics play in this transition has not been explored by many scholars.

# Research problem

According to Adams, Bessant, and Phelps (2006), innovation metrics seem to measure infrequently, in an ad hoc fashion and rely on dated, unbalanced or under-specified models of the innovation phenomenon. Davila et al. (2012) argue that expecting a perfect measurement system to automate decision-making is a typical fallacy. According to the authors, innovation measurement systems have limits and will never be able to substitute judgment. Innovation metrics have many challenges in practice as nowadays more stakeholders and ecological systems are involved in the framework of value (co-) creation (Yang & Sung, 2016). Much of the research in innovation measurement develops and tests theories about existing phenomena and practices (Kaplan, 1998). Despite the increased number of published works on innovation measurement and metrics, the use of innovation metrics and the idiosyncrasies of innovation are both complex realities that make studying the combination of the two difficult and complex (Fagerlin & Lövstål, 2020). Figure 1 constitutes levels of understanding of innovation metrics and innovation measurement, which can be studied statically or dynamically. In literature, there has been a shift in focus from the right design in theory towards the usage, impact, and emergence of metrics in practice (Bititci, Garengo, Ates, & Nudurupati, 2015; Bourne, Franco-Santos, Micheli, & Pavlov, 2017). Hence, the literature needs to focus on managers' use of metrics to develop empirically validated recommendations regarding how to successfully implement innovation metrics and measurement systems (Janssen et al., 2011).

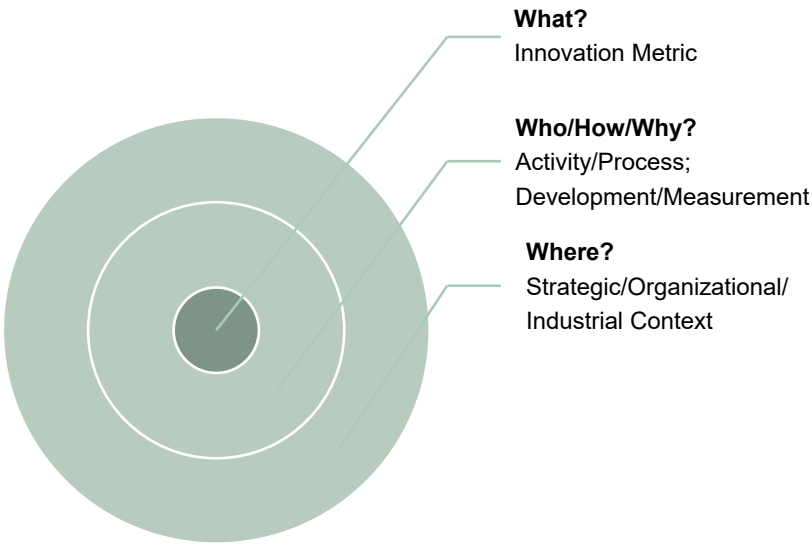


**Figure 1** Levels of understanding of innovation metrics and measurement

Not only the conceptualization of innovation is problematic, finding the right metric to fit the underlying context seems to be even more daunting (Fried, 2017; Melnyk et al., 2014). The main issue once moving towards more contemporary innovation metrics is, as Janssen et al. (2011: 108) pose, how can innovation metrics be designed to support their beneficial use within innovation [processes]? The alignment, congruence, and contingency of the innovation metrics with strategy, structure, and processes have been studied by academics from various disciplines for example Otley (2016), Chenhall (2009), Jannesson, Nilsson, and Rapp (2014), and Melnyk et al. (2014). These studies seem to be inconclusive in which innovation metrics should be appropriate to measure innovation in which circumstances. Based on the aforementioned prior works it can be seen that innovation measurement and its metrics outdate incredibly fast and can easily lose their relevance to context (Bourne, Melnyk, & Bititci, 2018; Johnson & Kaplan, 1991; Neely & Bourne, 2000).

On each of the levels introduced in Figure 1, another understanding is uncovered and observed. To further understand the dynamics between the presented levels, a combination of qualitative studies can assist to capture insights in measurement and development, the context in which innovation metrics operate, and what innovation metrics can be observed (Näslund, Kale, & Paulraj, 2010). Qualitative methods have rarely been used to uncover the dynamics between several levels of understanding

and the inherent complexity of innovation (Fagerlin & Lövstål, 2020). There thus seems to be a need for qualitative approaches to study the role of innovation metrics in changing empirical context. Qualitative research with long-term field contacts has the ability to examine the processes in their natural settings, which are profoundly rooted in the perceptions, reality, and behaviors of the actors (Barros & da Costa, 2019). In other research fields, such as supply chain and operation management, action research has been suggested for studying metrics (Alfaro-Tanco, Avella, Moscoso, & Näslund, 2021; Naslund & Norrman, 2019; Näslund et al., 2010). Action research is equipped to navigate these dynamics as it facilitates a researcher to work collaboratively with other relevant stakeholders to bring about change in a real-world situation (Daiberl, Oks, Roth, Möslein, & Alter, 2019). With its aims pertaining to research and practice, action research can serve as a legitimate option for bridging between the high ground of rigor and lowlands of relevance (Smith, 2020).

# Purpose and research questions

The overall research purpose of this thesis is to increase the theoretical, empirical, and practical understanding of innovation measurement and metrics in changing strategic context and thereby augment the possibilities for improved practices and performance in organizations. Understanding the unique dynamics of innovation metrics can contribute to looking beyond the functionality or congruence of these metrics, which often is encountered in the underlying fields, performance measurement (Bourne et al., 2018) and innovation management(Dodgson et al., 2014). This aim thus challenges the assumptions made in innovation measurement, such as inferences about context, strategy, structure, and innovation metrics (Alvesson & Sandberg, 2011, 2014a). An overview of the research field and the connected assumptions is explored in Paper I.

The following research questions are used to fulfill the defined purpose:

> RQ1: How are innovation metrics perceived and used (in practice) by organizational members involved in innovation in changing strategic context?

Until now, the literature on innovation metrics tells us little about how metrics are actually put to use by organizational members (Brattström et al., 2018). This first research question thus captures the request made by these authors. By breaking down innovation, its strategic context, into its various and overlapping types, sources, or stages, it becomes clear that each organizational member responds differently to different types and uses metrics, both individually and in combination (Davila et al., 2009; Richtnér, Brattström, Frishammar, Björk, & Magnusson, 2017).

Previously, innovation management literature has primarily used a contingency and systemic approach to innovation measurement (Brattström et al., 2018). In Paper II and III organizational members involved in innovation are observed on several levels of analysis allows uncovering how innovation metrics are interpreted and used adding insights and ontology (see Figure 1).

This multi-level approach in the first research question is also encouraged in related research fields such as performance measurement research. In this subfield, the need of using diverse measures and perspectives that secured together offer a holistic view of the organization is promoted (Kaplan & Norton, 1996a; Taticchi, Balachandran, & Tonelli, 2012). In support of this request, Paper II and III offer the perspectives and diverse innovation metrics found in a particular context, one where commoditization is influencing how innovation metrics are used and perceived. As these Papers show, these diverse metrics and perspectives are secured together in unexpected ways, involving explanations like reading-between-the-lines information and room for organizational errors, which are important research contributions. The dynamicity of innovation metrics, another important concept in performance measurement, appears when analyzing each organizational member's use and perception and comparing it to the "misfit" with the internal and external environment, objectives, and priorities (Fried, 2017; Taticchi et al., 2012). This adds to the literature as it highlights that in the relationship between measurement and innovation, the metrics themselves might not be as important as the ways in which they are mobilized within and beyond the organization (Brattström et al., 2018). To further study and develop innovation metrics, action research has been chosen to deepen and extend the findings in the first research question.

> RQ2: How can action research be used to study and develop innovation metrics in changing strategic context?

In literature, a complex picture of the relationship between measurement, metrics, and innovation is described (Brattström et al., 2018). As a multidisciplinary field, innovation measurement is influenced by both developments in the practice fields of performance measurement, and innovation management, all identified as applied fields (Bourne et al., 2018; Dodgson et al., 2014). Recently, action research has been suggested as suited for studying innovation and its measurement and metrics (Guertler, Sick, & Kriz, 2019; Guertler, Kriz, & Sick, 2020; Ollila & Yström, 2020). By means of the second research question, blind spots in the current research on innovation metrics are addressed. These blind spots and assumptions of the research field of innovation measurement are presented in Paper I. In Paper I, it can be seen that the research field of innovation measurement is dominated by quantitative studies. Following Näslund et al. (2010: 327) "Naturally, it will be hard to develop any research field if all researchers belong to the same paradigm and culture, and do the same kind of research with the same kind of research methods." Thus, action

research has been used to break this existing box in research on innovation metrics (Alvesson & Sandberg, 2014a). Action research, as a qualitative and interpretative stance, can develop, add and advance both research and practice of innovation measurement and is well-suited for applied fields (Näslund et al., 2010).

Paper IV, further develops research question two and studies how action research (AR), especially participatory action design (PAD) can be used as a methodological and theoretical contribution in the research field of innovation measurement. Here, the knowing and changing in changing strategic context is observed and documented (Scaratti, Gorli, Galuppo, & Ripamonti, 2017). Each of the organizational members is studied while innovation metrics are developed in a PAD, illuminating the strengths and weaknesses of using AR in innovation measurement. Here, it seems that precaution is warranted while using tools such as AR and PAD, to be able to reap the benefits of these theoretical and methodological tools and enjoy both the high ground of rigor and lowlands of relevance (Smith, 2020).

# Definition of concepts

In this thesis, the concepts of innovation and innovation metrics will be used. These concepts will in turn be defined.

## Innovation definition

Whilst there is some overlap between the various definitions of innovation, overall the number and diversity of definitions lead to a situation in which there is no clear and authoritative definition of innovation (Baregheh, Rowley, & Sambrook, 2009). Scholars use the concept of innovation in different ways and some overlaps exist among concepts (Adams et al., 2006; Baregheh et al., 2009; Crossan & Apaydin, 2010; Edison, Bin Ali, & Torkar, 2013). As Adams et al. (2006) state it "the innovation literature is a fragmented corpus, and scholars from a diversity of disciplinary backgrounds adopt a variety of ontological and epistemological positions to investigate, analyze and report on a phenomenon that is complex and multidimensional". The problem is further developed by Baregheh et al. (2009: 1324) as follows: "Innovation is of interest to practitioners and researchers across a range of business and management disciplines, and has been discussed variously in, for example, the literature on human resource management, operations management, entrepreneurship, research and development, information technology, engineering and product design, and marketing and strategy. Each of these different

disciplines proposes definitions for innovation that align with the dominant paradigm of the discipline."

Another explanation of the definition of innovation is aligned with the dominant paradigm of the discipline can be found in Arias Aranda and Molina-Fernández (2002: 289) "Traditional innovation theories consider innovation as a radical act generated by the introduction of a new element or a new combination of already known elements in a determined product (Kuhn, 1970; Schumpeter, 1934). For the technological-economic paradigm (Dosi, 1982, 1988) the innovation process emerges in the R&D department from a scientific basis. On the other hand, the entrepreneurship paradigm (Kent, Sexton, & Vesper, 1982) considers entrepreneurship as the main innovative process (Kanter, 1983; Pinchot III, 1985) Stewart, 1989). Finally, marketing science develops the strategic paradigm of innovation (Kotler, 1984) from which business strategy is considered the main determinant of innovation (Moss Kanter, 1989; Nyström, 1979, 1990; Porter, 1990; Rumelt, Schendel, & Teece, 1994; Teece, 1987) For this paradigm, innovations emerge not only from inside but also from outside the organization."

In this thesis, the view on innovation is that it encompasses the chain from idea generation to execution and value capture (Davila et al., 2012). It, therefore, has a broader view of innovation, encompassing several organization levels, such as individual, group, and firm level, as well as different loci, in terms of closed or open processes (Crossan & Apaydin, 2010). This view is a synthesis and inclusive view of innovation that includes the adoption of any new product, process, and administrative innovation as suggested by using the OECD Oslo Manuel (Eurostat, 2018; Mortensen & Bloch, 2005) and the original Schumpeterian definition (Schumpeter, 1934). In this definition, where innovation encompasses the (value) chain from idea generation to execution and value capture, both the research streams of new product development (NPD) and research and development (R&D) are included. By including both of these streams the definition reflects the overall tendency towards an organizational view on innovation instead of the traditional departmental or part of commercialization or engineering(Adams et al., 2006).

## Innovation metrics definition

Innovation metrics are part of formal management systems and are commonly accepted means of increasing the effectiveness and efficiency of organizational actions (Janssen et al., 2011: 211). In this dissertation, innovation metrics are defined as performance metrics, which are used to quantify the efficiency and/or effectiveness of innovation actions (Koufteros, Verghese, & Lucianetti, 2014; Melnyk et al., 2014; Neely, Gregory, & Platts, 1995: 80). A performance measure by definition is functioning as a leading indicator of performance against strategic

goals and initiatives (Keong Choong, 2014). No matter for what purpose it is used, (that is, to influence behavior or appraise strategies or merely to take stock of every metric affects organizational actions and decisions (Koufteros et al., 2014). The word “metric” in innovation metrics is sometimes referred to as measure; metric; and indicator in literature (Keong Choong, 2014). Several academics say that there is no scarcity of discussion regarding metrics because the importance has been deemed to be vital and shown to be useful(Koufteros et al., 2014). Keong Choong (2014: 904) show that “there is no consensus of their [performance] meanings; and at times, the meaning is the same for different things”.

In this thesis, a clear conceptualization of innovation measures and metrics, and KPIs are necessary (Franco-Santos et al., 2007). Innovation metric or innovation key performance indicator (KPI) is seen as a performance measure of innovation in this thesis.

# Thesis outline

This thesis is structured traditionally. In the next chapter, a frame of reference is presented within the domains of innovation and measurement literature. Subsequently, the research methodology including the research process, strategy, and design are discussed. Next, a summary of the main findings of the appended Papers is given and a synthesis of the findings is presented. In the last chapters, the research findings will be discussed. The conclusion of the research is presented, and the research questions are addressed. The final chapter describes the major theoretical and practical contribution of the research and provides suggestions for further research.

# Frame of reference

*This chapter presents the literature that is of significance to innovation measurement. It starts with a conceptualization of the intersectional field of innovation measurement. This is followed by an introduction of the domain theory, innovation measurement. Thereafter the method theories, innovation management, and performance measurement are discussed, and theoretical developments are outlined.*

The frame of reference of this research is based on concepts and theories from different scientific areas: innovation and (performance) measurement. To understand a sound conceptual specification of the constructs of interest to a particular research problem involves producing precise, agreed-upon meanings of the constructs (Bisbe, Batista-Foguet, & Chenhall, 2007).

## What is innovation?

In innovation research, scholars from a diversity of disciplinary backgrounds investigate, analyze and report on a phenomenon (innovation) that is complex and multidimensional (Adams et al., 2006; Baregheh et al., 2009; Crossan & Apaydin, 2010). As there is no unified theory of innovation, clear theoretical framing of innovation is necessary (Baregheh et al., 2009). Innovation as a concept is defined on page 20. In this thesis, the view on innovation is that it encompasses the chain from idea generation to execution and value capture (Davila et al., 2012). To further conceptualize innovation measurement and metrics, this thesis will outline the origin of innovation studies and management. The last sections will highlight the shift towards contemporary innovation management. Here is the developments innovation management as a research field has experienced during its existence.

# Overview innovation as a research field

## The origins: innovation studies

Recent studies on the knowledge base of innovation (Baregheh et al., 2009; Fagerberg, Fosaas, & Sapprasert, 2012; Fagerberg, Mowery, & Nelson, 2005) show how innovation studies as a field have evolved. The origin of the knowledge base of innovation can be traced back to Joseph Schumpeter (1912/1934, 1942), "who advanced a theory in which innovations, and the social agents underpinning them, were seen as the driving force of economic development "(Fagerberg et al., 2012: 1133). According to Fagerberg (2004) and Fagerberg et al. (2012) "many ideas that are central in the innovation literature today can be already found in earlier works of Joseph Schumpeter, such as the definition of innovation as "new combinations" of existing knowledge and resources; the distinction between invention (new ideas) and innovation (implementing these in practice); the classification of innovations into a product, process, and organizational innovation, and the keen interest in how radical their social and economic impacts are (with the associated distinction between revolutionary, radical and marginal or incremental innovations)." In Fagerberg et al. (2012: 1147) the largest cluster of scholars using innovation are the "Social sciences and humanities" group, followed by "Management", "Economics" and "Business". A clear shift can be found after the 1980s, during the mature phase of innovation studies, in this period Management has become the dominant user cluster in innovation studies (Fagerberg et al., 2012).

## The origins: innovation management

From the 1990s innovation management became the dominant cluster using innovation theory in its research. Innovation management is an increasingly covered topic in scientific and management literature over the past 35 years(Eveleens, 2010). Innovation management is thus a still growing and dominant subfield in innovation studies (Dodgson et al., 2014). Innovation management is an applied field driven by its practice (Dodgson et al., 2014). There are, however, diverse theories that can help explain various aspects of innovation management as a social and economic process (Dodgson et al., 2014). Innovation management is a subfield of innovation studies that study the active and conscious organization, control, and execution of activities that lead to innovation (Dodgson et al., 2014; Eveleens, 2010; Hansen & Birkinshaw, 2007). Organizations manage innovation, rather than leaving it to chance, by creating supportive structures, practices, and processes (Dodgson et al., 2014). Innovation management includes studies in new product development (NPD) and research and development (R&D) (Adams et al., 2006; Crossan & Apaydin,

2010; Dodgson et al., 2014). Literature in innovation management conceptualizes innovation in a variety of ways in the literature, as a process, and an outcome or both (Crossan & Apaydin, 2010; Damanpour & Wischnevsky, 2006; Dodgson et al., 2014).

Early work on innovation management-focused mostly on innovation driven by technical change, usually in the manufacturing sector (Brem & Viardot, 2013; Salter & Alexy, 2014). In this early work management of innovation is often considered equivalent to technology management or the management of research and development (Brem & Viardot, 2013; Salter & Alexy, 2014). Unfortunately, general-purpose management tools are in most cases not useful as innovation management tools (Brem & Viardot, 2013; Salter & Alexy, 2014).

Over time, researchers and managers in innovation management shifted their focus from technological innovation to other types of innovation. Much of contemporary innovation is not primarily "technological" in nature (Eveleens, 2010; Salter & Alexy, 2014). Phenomena such as the Internet or globalization caused many corporations to shift away from R&D-led models of innovation and focus on more open and distributed models (Huizingh, 2011; Salter & Alexy, 2014). These more contemporary innovation models still acknowledge R&D as a critical resource for firms in addition to other mechanisms that support innovation and learning that operate within the firm (Eveleens, 2010; Salter & Alexy, 2014).

Over the years, innovative outcomes have received the most research attention (Crossan & Apaydin, 2010; Dodgson et al., 2014; Edison et al., 2013; Salter & Alexy, 2014). Traditionally research in innovation management has focused on new and improved products, followed by operational processes, with services lagging a long way behind (Dodgson et al., 2014; Edison et al., 2013; Eveleens, 2010). In contemporary innovation management, the boundaries between product, processes, and service innovation are becoming blurred (Davila & Oyon, 2009; Davila et al., 2012; Dodgson et al., 2014). In contemporary innovation management challenges such as new market innovation, ways of the organization (administrative innovation), and business model innovation are also addressed (Bedford, 2015; Chenhall & Moers, 2015; Davila et al., 2012; Dodgson et al., 2014; Fried, Götze, Möller, & Pecas, 2017). Innovation management in contemporary studies is showing a more interdisciplinary and multidisciplinary character (Dodgson et al., 2014). As innovation outcomes and processes are continually evolving, understanding contemporary practices is crucial (Dodgson et al., 2014).

# What is performance measurement?

## Origins of performance measurement research field

In the last decades, performance measurement (PM) has been studied and defined in an ever an ever-increasing number of academic fields (Bititci, Bourne, Cross, Nudurupati, & Sang, 2018; Bourne et al., 2018; Folan & Browne, 2005; Koufteros et al., 2014) Scholars from various functional disciplines have examined a wide range of issues related to performance measurement (Bititci et al., 2018; Bourne et al., 2018; Ittner & Larcker, 2003; Micheli & Mari, 2014; Neely, 2005). In the PM literature, there are a lot of developmental challenges that are derived from changes in global trends, business trends, natural trends, and technological trends which force the field of PM to evolve. (Bititci et al., 2012; Goshu & Kitaw, 2017).

Over the years, the field of PM has moved away from a traditional backward-looking accounting-based measurement and metrics towards a more modern view on PM (Bititci et al., 2012; Franco-Santos et al., 2012). Recent literature reviews reflect this shift in both the evolution and revolution of performance measurement (Goshu & Kitaw, 2017; Kennerley & Neely, 2002; Neely, 1999, 2005; Olsen et al., 2007; Salloum, 2013; Srimai, Radford, & Wright, 2011). Its evolution and revolution have been studied in response to the growing dissatisfaction during the 1970s of traditional backward-looking accounting systems (Neely, 1999; Nudurupati et al., 2011). It should be noted that none of the systematic literature reviews has a similar conceptualization of PM, PMS (Performance measurement systems), and PMMS (Performance measurement and management systems). As a result, the account of the evolution and revolution will here focus on the revolution and evolution of PM (performance measurement) and all its associated components. The account of the evolution and revolution will describe the background of the shift to a more contemporary PM.

Different authors have traced the evolution of PM in several ways (Goshu & Kitaw, 2017), following the early Papers of Neely (1999), Kennerley and Neely (2002), and Neely (2005). More recent reviews show a shift from operations to strategic, measurement to management, static to dynamic, and economic-profit to stakeholder focus (Goshu & Kitaw, 2017; Nudurupati et al., 2011; Olsen et al., 2007; Srimai et al., 2011). Goshu and Kitaw (2017) show that a clear explanatory and directional shift in the performance measurement was made from the industrial age to the information age. It is argued that “between the 1960s and 1980s, there was a directional shift in the economic engine from the supply side to demand side resulted in the shift in the focus of PM towards new dimensions of performance, such as quality, time, flexibility, and customer

satisfaction" (Goshu & Kitaw, 2017: 387). In addition to this, Bititci et al. (2018); Bourne et al. (2018); Bourne, Melnyk, Bititci, Platts, and Andersen (2014) highlight a shift from interest in the design of PMS towards an interest in the implementation of strategic PMSs. This is in line with Srimai et al. (2011) that show an evolutionary shift from operational to strategic, from measurement to management, and from static to dynamic performance measurement, from shareholder to stakeholder PMS.

All authors show in their reviews that the evolutionary path of PMSs concerning what organizations should fulfill, changes from the sole measure characteristic being effectiveness, in the 1950s and beyond to multiple requirements, that is, effectiveness, productivity, efficiency, flexibility, creativity, and sustainability, in 2000s (Goshu & Kitaw, 2017; Nudurupati et al., 2011). This particular shift in the 1980s is however referred to as the PMSs revolution by Goshu and Kitaw (2017). In this revolution, the traditional PMSs comprise sole financial or productivity measures shift towards modern PM, which includes the use of financial as well as non-financial performance measures linked to the organization's business strategy (Goshu & Kitaw, 2017).

Two critics of traditional PMSs, that are most cited in the PMS revolution are Kaplan and Norton (1996b) and Neely (1999). Goshu and Kitaw (2017) summarize that the PM revolution can be divided into changes in five major elements: focus, dimensions, drivers, targets, and desired benefits. This revolution is part of the explanation for the shift from a traditional PMS towards a contemporary PMS (Franco-Santos et al., 2012; Goshu & Kitaw, 2017).

# What is innovation measurement?

The vast amount of literature on the distinct topics of "innovation" and "performance measurement", indicates that research in "innovation measurement "is complex (Bititci et al., 2012; Davila et al., 2012; Fried et al., 2017; Moll, 2015; Nudurupati et al., 2011; Richtnér et al., 2017). Innovation measurement has been conceptualized both in the innovation (management) literature as well as in the performance measurement (systems) literature (Brattström, Frishammar, Richtnér, Bjork, & Magnusson, 2016). The vast amount of literature accumulated across disciplines is considerable (Edison et al., 2013). The reported challenges concerning the performance measurement of innovation are manifold (Henttonen, Ojanen, & Puumalainen, 2016). As a consequence, in practice, a variety of approaches for innovation performance measurement can be found (Birchall, Chanaron, Tovstiga, & Hillenbrand, 2011).

Historically, innovation has not always been measured and has not always been measured within organizations with metrics. The origins of innovation (management) and (performance) measurement demonstrate that innovation measurement and metrics are quite a recent phenomenon (Brattström et al., 2018; Fagerberg et al., 2012). The origin of measurement stems from the 13th century when double-bookkeeping was instated. (Bititci et al., 2012). The measurement of innovation by metrics came (much) later, as innovation originally was seen as an individual, not an organizational endeavor (Fagerberg et al., 2012; Schumpeter, 1934). The birth of innovation measurement as a research field can be found in the post-war period, with the work of Schumpeter (1934) as a point of departure. Innovation measurement is an applied field and therefore might lack the necessary theoretical underpinnings like many related measurement fields (Bititci et al., 2018; Micheli & Mari, 2014).

Innovation measurement provides different tools and mechanics that are necessary for the process of moving ideas into value (Davila, 2012; Davila et al., 2009; Davila et al., 2012). It is one of the sets of tools found in innovation management and performance measurement (Bourne et al., 2014; Dodgson et al., 2014; Henttonen et al., 2016). The literature on innovation measurement can be characterized by a diversity of approaches, prescriptions, and practices that can be confusing and contradictory(Adams et al., 2006). As before mentioned, difficulties with innovation measurement stem partly from the diverse conceptualizations of innovation and measurement (Birchall et al., 2011; Micheli & Mari, 2014). As was discussed in previous sections, a modern days concept of innovation including more intangible aspects of innovation, such as service and digital innovations, has challenged the quantification of innovation (Birchall et al., 2011; Brattström et al., 2018). According to some scholars, both academics, as well as managers, currently lack requisite metrics to make informed decisions about innovation (Adams et al., 2006; Jørgensen & Messner, 2009; Muller et al., 2005). In the academic field of innovation measurement there do not exist agreed-upon conceptual constructs of innovation and its measurement(Adams et al., 2006; Fried et al., 2017). This lack of agreed-upon constructs increases the risk that different operationalizations will produce conflicting findings, and that theoretical advances become lost in the different terminologies that resist the accumulation of knowledge (Adams et al., 2006; Edison et al., 2013; Haldma et al., 2012; Micheli & Mari, 2014).

In the state of the art, presented in Paper 1, the author presents, based on a systematic literature review performed in 2014, the current innovation metrics found in the field. In this Paper, innovation metrics have been captured on three distinct levels of analysis. The first level of analysis captures whether innovation metrics can be related to the individual, the team, the product, or the organization (Edison et al.,

2013). The second level of analysis refers to whether the studies included metrics that address the input, process, output, or outcome of innovation (Davila et al., 2012, Edison et 9 al., 2013). The third level of analysis divides financial and non-financial metrics into innovation. The results are presented in the table below:

**Table 1** Innovation metrics, state of the art

| | % | % | % | % | % |
|---|---|---|---|---|---|
| Level 1 | Individual<br>1% | Team<br>5% | Product<br>6 % | Organizational<br>77% | Unspecified<br>12 % |
| Level 2 | Input<br>4 % | Process<br>3 % | Output<br>72 % | Outcome<br>11% | |
| Level 3 | Financial<br>84 % | Non-financial<br>11% | | | |

The results confirm earlier studies done by Edison et al. (2013) and Adams et al. (2006), that is in the majority of the studies on innovation metrics, the metrics were focused on the organizational, output, and financial aspects of innovation. Richtnér et al. (2017) confirm as well, they argue that managers often use quantitative performance indicators. Traditionally in literature, it is shown that innovation measurement centers around measuring financial, innovation outcomes (Adams et al., 2006; Brattström et al., 2018; Richtnér et al., 2017). Contemporary innovation, in contrast, encompasses multiple performance objectives which require a combination of different (quantitative and qualitative) metrics (Adams et al., 2006; Brattström et al., 2018; Richtnér et al., 2017). In modern innovation management, there seems to be a need for more adaptive approaches to innovation measurement to fulfill multiple objectives in innovation (Adams et al., 2006; Brattström et al., 2018; Richtnér et al., 2017). Metrics in innovation measurement, traditionally, should be chosen to align with external and internal conditions and adapted to firm-specific objectives of measurement. A contingency and systemic approach to innovation measurement is thus most prevailing (Bititci et al., 2012; Brattström et al., 2018).

One way to overcome this problem is given by Richtnér et al. (2017) they suggest that the crux of effective innovation is to understand the problem that measurement should solve for the organization and, based on that insight to design and implement a useful and usable innovation measurement framework appropriate to the organization's strategic objectives. Following this suggestion, the current innovation measurement systems and their integrated measures should serve as an "aspirational" way of measuring innovation(Davila, 2012; Davila et al., 2009; Davila et al., 2012).

According to Brattström et al. (2018), innovation management literature shows important insights about what to measure mostly by using a contingency approach.

In other streams of literature in innovation measurement (Barros & da Costa, 2019; Fagerlin & Lövstål, 2020) there has been more focus on how metrics are put to use by organizational members, such as performance measurement and management control literature. In this literature, how innovation metrics are mobilized and used determines the effect on innovation (Brattström et al., 2018). Central in innovation management is the relationship between measurement and innovation, not how measures themselves are mobilized within and beyond the organization (Brattström et al., 2018). Another stream of literature in innovation measurement, shows that measures can be used diagnostically or interactively (Simons, 1994), in a way that is enabling or coercive (Adler & Borys, 1996), and can be designed as a package to balance countervailing pressures and achieve strategic aims (Kaplan & Norton, 1996b). Thus, a measure is not in itself a hindrance or crutch for innovation, but that the way that it is used within the organization (to control or question, for instance), interpreted (diagnostically or interactively), and understood (as a leading or lagging indicator) moderates its effects (Brattström et al., 2018). Similar to insights put forward in innovation management literature, a contingency approach is advocated in this stream of literature (innovation measurement), where it is emphasized that measures and their various uses relate differently to various kinds, sites, stages, etc. in the innovation process (Bititci et al., 2012; Brattström et al., 2018).

The below figure shows the intersectional field between innovation and performance measurement. As was explained in this chapter, innovation as well as (performance) measurement have been defined and used in several different kinds of literature disciplinary of economics, innovation and entrepreneurship, business and management, and technology, science, and engineering (Baregheh et al., 2009; Bititci et al., 2018; Chenhall & Langfield-Smith, 2007; Davila, 2012; Fagerberg et al., 2012; Neely, Gregory, & Platts, 2005). Each of these fields is different when it comes to their development and directions in the practice and theory fields, as can be seen in the figure, and is indicated by the arrows. As each of these fields has its theoretical traditions and paradigms on which they draw the dynamics and development (in)between the theoretical fields within the intersectional field can be depicted in many ways (Markóczy & Deeds, 2009; Siedlok & Hibbert, 2014; Zahra & Newey, 2009). The various types of research in each of the fields in innovation measurement can be independent, conflicting, mutually exclusive, cannibalizing (referred to as multidisciplinary), collaborative, dependent, co-dependent (more referred to as interdisciplinary). In short, in intersectional fields, there may occur different levels of interdisciplinary integration (Siedlok & Hibbert, 2014). The specific paradoxical dynamics of the field of innovation measurement calls for specific tools (Alvesson & Sandberg, 2011). In the next section, this theoretical positioning is explained.

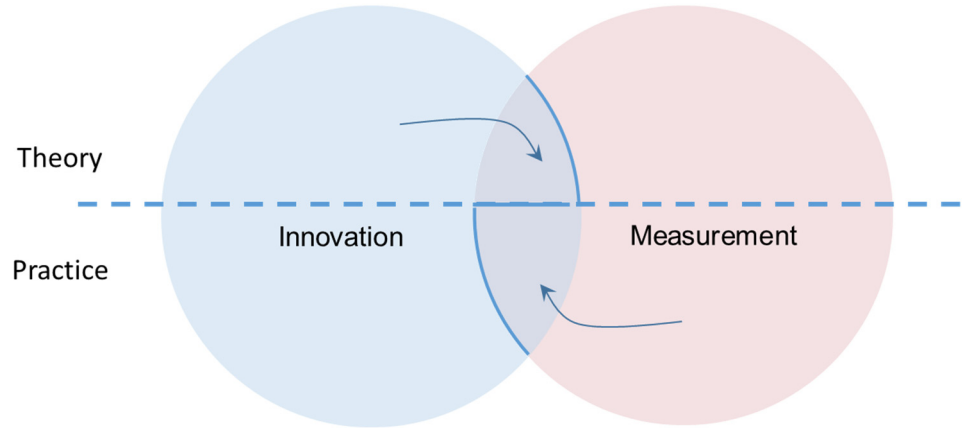


**Figure 2** Intersectional field of innovation measurement

# Theoretical positioning

As can be seen from the figure innovation measurement draws on interdisciplinary research, and tries to find explanations of phenomena involving humans, technical artifacts, or information systems (Lukka & Vinnari, 2014). It follows the rationale that it is difficult to categorize and generate knowledge only within the narrow scopes of various disciplines (Lukka & Vinnari, 2014). How this dissertation is positioned theoretically is outlined in Table 2 below.

**Table 2** Theoretical positioning

| Research Questions | Research fields | Methodological stance |
|---|---|---|
| How are innovation metrics perceived and used (in practice) by organizational members involved in innovation? | Innovation Studies<br>Business Management<br>Measurement Studies | Interpretative/Relational stance |
| How can action research be used to study and develop innovation metrics in innovation? | Innovation Studies<br>Management Accounting<br>Performance Measurement | Action Research |

In innovation measurement, a variety of ontological and epistemological positions are found to facilitate the investigation, analysis, research on a phenomenon that is complex and multidimensional(Adams et al., 2006). As innovation measurement encompasses several organizational levels as well as different loci, in terms of closed or open processes, the iterative and learning character of action research (AR)

brings advantages (Crossan & Apaydin, 2010; Guertler et al., 2019; Gustavsen, 2005). AR enables engaging both researchers as well as participants in both the inquiry and its context (Bradbury, 2015; Brydon-Miller, Greenwood, & Maguire, 2003; Heller, 2004; Raelin et al., 1999; Scaratti et al., 2017). AR has the specific ability to navigate and clarify unprecedented and unclear problems in a complex field as innovation measurement (Guertler et al., 2020; Ollila & Yström, 2020; Scaratti et al., 2017).AR has been used to study many processes involving interventions in organizations that have the dual purpose of bringing about practical transformation and of advancing knowledge (Coghlan, 2019; Huxham & Vangen, 2003). AR is part of a 'family of approaches' (Reason & Bradbury, 2008) that can work with and report about the instability of contexts (Raelin et al., 1999). In innovation measurement, AR can focus on the dynamic and complex situation that people face (Guertler et al., 2020; Ollila & Yström, 2020; Scaratti et al., 2017). As the state of the art and the state of practice of this dissertation indicate, there has been a tendency to research innovation measurement quantitatively (Adams et al., 2006; Brattström et al., 2018; Brattström et al., 2016; Richtnér et al., 2017). The methodological stance of this dissertation is both qualitative. In the next chapter, the methodological and theoretical contributions of this dissertation will be further specified and exemplified. Action research is used as a method theory in positioning this dissertation in the landscape of innovation measurement (Lukka & Vinnari, 2014). Action research as a method theory can be more problem-oriented, human-centered, and interdisciplinary in innovation measurement (Guertler et al., 2020).

*In sum, this section has described the origins of innovation measurement. In this section, it is shown that innovation measurement has moved from a more traditional towards more contemporary models, tools and practice. These developments might affect the metrics used in innovation. In upcoming sections, the way innovation metrics are interpreted, used, and constructed is presented.*

# Research Methodology

*This chapter presents the research methodology used. It starts with a discussion of the research approach and the personal motivation for pursuing this research. It is followed by a description of the research process itself. The section ends with a presentation of the research design and reflections on research quality.*

## Research journey

In my earlier years as a student in both the Netherlands and in Denmark I have found myself fascinated by management and behavioral accounting/control. My professors in the Netherlands in management accounting Slagmulder and van Veen-Dirks have made me theoretically interested in the design, implementation, and change of performance measures. A key concept that has always fascinated me is the process of goal alignment that is aligning the organizational goals with individual goals (Brickley, Smith, Zimmerman, Zhang, & Wang, 2004).

As a practitioner, in the years 2000-2003, my journey has been versatile, starting by understanding the bottom-up view of controlling. I finished my studies at the University of Tilburg, with my skills in quantitative research (2004). On my exchange years (2000-2005) I studied at Lunds University and Copenhagen Business School in Denmark, focusing mainly on innovation and technology management. In Denmark, management control research was performed mainly qualitatively, under the supervision of Sof Trane and Jan Mouritsen.

In my function as a controller, I learned my profession from a practitioner's point of view. Here my interest in management control systems and performance measurement systems in practice started to grow and develop. In 2010, in pursuit of a lifelong dream, I decided to change my career path, from being a controller to testing my wings as an IT entrepreneur. This shift gave me first-hand experience in the field of innovation and entrepreneurship. In 2012 I got the opportunity to become an incubator CEO, here I learned the systems, networks, and institutions build up to make start-ups grow.

Both my scholarly and professional paths combined have motivated me to do this research in the area of innovation and controlling, more specifically on innovation and measurement. My experience in both the field of management control, as a practitioner, as well as my experience in the field of innovation has given me particular insight into the intersection of both. My scholarly training has taught me to combine both quantitative and qualitative methods. At my first university (Tilburg University) I was trained in a positivistic manner, at my subsequent years at Lunds University and Copenhagen Business School I was exposed to other schools of phenomenology, structuralism, and postmodernism. My years as a professional have given me a more normative point of view. This particular background gave me the skills to methodological lenses and use rigorous methods in doing so.

# Research process

The research process of this thesis can be identified as an eclectic research process (Creswell & Creswell, 2017; Reilly & Jones III, 2017). As studying innovation metrics requires a multidisciplinary perspective, this process is well-suited to provide insight into the mechanisms and boundaries of complex phenomena and enables a researcher to examine a problem or topic iteratively, both quantitatively and qualitatively (Reilly & Jones III, 2017).

In this eclectic research process, both inductive, as well as deductive approaches, are combined to build theory. The timing of the research process can be classified as concurrent; collect and analyze both quantitative and qualitative data at the same time and independent from each other (Clark & Ivankova, 2015). The deductive approaches can be found in Study A, where the existing theory is reviewed. A more inductive approach is used in Study B and C A more inductive approach is used in Study B and C where empirical studies are used as inputs in the research process (Bryman & Bell, 2015). The eclectic research process implies that throughout this thesis both inductive well as deductive approaches are used to guide theorizing (Weick, 1995).

A systematic literature review was chosen as a theoretical starting point for this thesis (Study A). The findings of the systematic literature served as an input for studies B and C, and the researcher got the opportunity to do a case study in a company that was reviewing their innovation measurement and metrics. This parallel, serendipitous, event has given a unique insight into innovation metrics in real-time (Study B). In the extension of this case study, a participatory action design study (Study C) was created to see how new metrics could be constructed with the active involvement of diverse stakeholders on several organizational levels.

In the introductory essay (kappa), a synthesis is made of these four studies combining the unique insights from each of them. The research overview is presented in Figure 3.

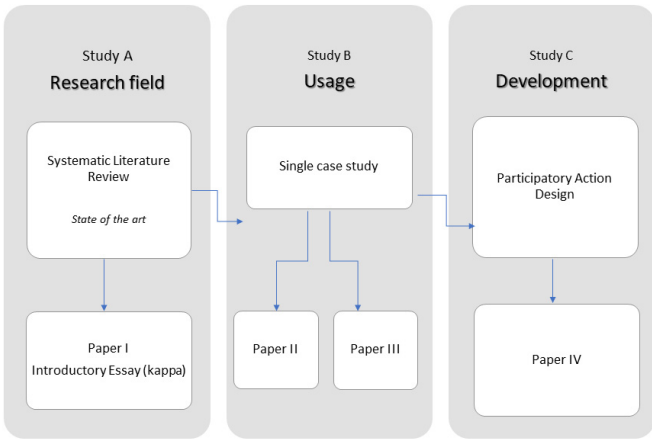


**Figure 3** Research process of thesis

# Research design and methods

The research design refers to the overall strategy that you choose to integrate the different components of the study coherently and logically, thereby, ensuring you will effectively address the research problem; it constitutes the blueprint for the collection, measurement, and analysis of data. (De Vaus & de Vaus, 2001). Table 3 summarizes applied methods for data collection and study as well as the unit of analysis.

**Table 3** Summary methods for data collection, data analysis, and unit of study

| Study | Data collection | Data analysis | Unit of study |
|---|---|---|---|
| **A** | Systematic Literature Review | Presenting a state-of-the-art field, innovation measurement based on level of analysis | Innovation Measurement ***definitions*** |
| **B** | Case Study<br>Semistructured interviews<br>Secondary data | Showing in real-life practice how innovation metrics, KPIs, are used in organizations | Innovation Measurement ***usage of*** |
| **C** | Participatory<br>Action<br>Design Study (PAD) | Showing in real-life practice how innovation metrics, KPIs, are constructed in organizations with PAD | Innovation Measurement ***co-creation of*** |

The following sections present and discuss the design of each study, as well as the methods selected.

## Study A: systematic literature review

Study A explores the state of the art of innovation measurement. This was done by conducting a systematic literature review. The literature review was carried out to establish the research's authority and credibility, as well as to lay the groundwork for making a meaningful contribution. The purpose of the literature review was to highlight research issues and provide critical and conceptual analysis of the research challenge. The keywords were tested and chosen to cover the concept, and based on a validated study published by Edison et al. (2013). The search was undertaken in four wide-ranging databases, considering that the topic is multidisciplinary. All peer-reviewed scientific journal publications identified were considered for inclusion, and after an initial subject screening and a final screening for relevance, 108 publications remained.

**Data collection/Data analysis**: The analysis of the remaining 108 publications was done using a framework developed by Edison et al. (2013), this was used as guidance and adapted to the specific industry and context. The process of categorization was used following the suggestions made in the protocol of Edison et al. (2013) but reflecting the work of earlier reviews such as (Adams et al., 2006). This can be seen as a forward and backward snowball sampling at the beginning and the end of the systematic literature review (Palinkas et al., 2015).

Study A contributes to the frame of reference, and it presents a state of the art of field innovation measurement and will be reported in Paper I. The findings of this study have been used as a point of departure for Study B and C.

## Study B: case study

Study B was conducted as a case study, it shows how innovation metrics (KPIs) are used in a company in the processing industry. For this study, a case study was chosen as a qualitative research method.

**Data collection/Data analysis**: In the empirical portion of this study a case study method was used. When the research needs to address contextual factors, the case study is an adequate tool to use (Yin, 2014). Surveys can deal with the phenomenon of interest and context, but they are severely limited in their ability to study context. The study undertaken in this research is interpretive, which means they look into a phenomenon in a real-life environment where the boundaries between the phenomenon and the context are blurred (Yin, 2014).

The fieldwork of this study started in September 2017. Over 5 months, 28 interviews were conducted within this organization regarding innovation metrics. The interviews with innovation personnel, project management, business/sales, and senior management mostly lasted between 20 min and an hour. The respondents were selected to give their views on the existing KPIs in innovation, in place and were asked a set of 10 questions. All interviews were semi-structured, with an initial set of questions to respondents relating to their role, individual responsibilities and tasks, and their view on innovation. This was followed by open-ended discussions regarding the KPIs in innovation in use, perceptions regarding KPIs functionality, development possibilities, and challenges. Different informants were thus asked very similar questions, to acquire different perspectives on the same issues and/or to confirm individual accounts. Finally, the internal documents were reviewed, such as presentation slides from meetings or distributed after meetings, as well as public documents, such as the parent company's recent annual reports.

Study B contributes to answering RQ1 and resulted in Paper II and III.

## Study C: participatory action design research

Study C was conducted as a field study– participatory action design research.

**Data collection/Data analysis:** Much of the research in innovation measurement develops and tests theories about existing phenomena and practices (Kaplan, 1998). In action research, on the other hand, the researcher works collaboratively with other relevant stakeholders to bring about change in a real-world situation (Daiberl et al., 2019). With its aims pertaining to research and practice, action research should be a legitimate option for bridging between the high ground of rigor and lowlands of relevance (Smith, 2020). Although the potential of action research (AR) in innovation measurement has been acknowledged, until now AR has only played a minor role in innovation measurement and has a legitimacy issue (Guertler et al., 2019; Guertler et al., 2020; Smith, 2020).

The fieldwork consisted of a workshop series based on participatory action design (PAD) developed together with the researcher and stakeholders at the innovation department. The PAD was created at the beginning of 2018. During and after the workshops, PAD enabled the researcher and stakeholders to interact and develop an innovation metric collectively. This study had a build-in schedule as the deadline to provide an innovation metric to senior management was before July 2018. This PAD study involves multiple stakeholders in collecting data, analyzing data, and re-defining the research question and the research method. The first workshop focused on collectively investigating and defining the research problem at hand. The second workshop

evaluated the chosen and developed innovation metric in workshop one. The third workshop evaluated the revised and developed innovation metric in workshops one and two.

Study C contributes to answering RQ2 and resulted in Paper IV.

# Research context and case selection

The research context of this study has been described in the introduction of this dissertation, as the processing industry undergoing a strategic change in terms of commoditization and the subsequent pursuit of value-enhancing innovations such as customizing products and developing services. This is the changing strategic context in which empirical studies have been made. The literature review in study A gave an overview of the developments in the research field of innovation measurement and metrics. Before the commencement of study B, and partly in response to overview in study A the changing strategic context appeared as one of the key contextual factors in this study. As mentioned earlier, competitive pressures from commoditization have made it important for companies to be innovative in new ways, causing a strategic shift affecting the context of innovation.

In this research context, qualitative studies allow the researcher to gain new and creative insights, develop new theory, achieve a high level of validity with the ultimate users, and increase the understanding of actual events as well as richer data (Eisenhardt & Graebner, 2007; Eisenhardt, Graebner, & Sonenshein, 2016). As research on innovation metrics in this particular empirical context are still scarce, an exploratory study using qualitative studies is chosen as the preferred methodology to build knowledge about the phenomenon (Yin, 2014). This exploration, according to Stebbins (2001) is a broad-ranging, purposive, systematic, prearranged undertaking designed to maximize the discovery of generalizations leading to description and understanding of an area of social science. In this exploration, the phenomenon is examined in its natural setting, allowing meaningful relevant theory to be created from the knowledge obtained from observing actual practice. It also enables an answer to the questions of why, what, and how with a relatively thorough grasp of the nature and complexity of the entire phenomena (Yin, 2014). As the research topic here is innovation metrics, as a phenomenon, and a (multidisciplinary) research field, innovation measurement, it makes sense to conduct a case study and action research. Case studies are particularly suited to exploratory and explanatory research, where various variables remain unclear and the phenomenon is little understood (Bansal & Corley, 2011).

The case was selected based on a declaration of interest from company management and snowball selection of respondents by different stakeholders in the innovation process at the case company. The case selection was thus not random, and thus a selection bias exists (Gerring, 2004, 2006; Seawright & Gerring, 2008). Two other factors influencing the selection of this case were the availability of information and the proximity of the company. The company was generous in providing access to written documents and internal documentation relevant to the case. Considerable time has been spent in the field, using multiple methods of observation, and being aware of one's behavior as a field researcher (Ahrens & Chapman, 2006: 312; McKinnon, 1988). Both informal and formal meetings were attended, and days on location were deliberately scheduled. In this study, the researcher has moved back and forth between data, theory, and related literature to make sense of the made observations (Ahrens & Chapman, 2006; Jørgensen & Messner, 2010). The possibility of in-depth qualitative studies (Study B and C) enabled the researcher to address contextual factors, including the changing strategic context, and complement current (quantitative) understanding by qualitative studies (Naslund & Norrman, 2019; Näslund et al., 2010). Study B and C, at this case company, provide insight into what innovation metrics exist in this specific industry, the process industry (Messner, 2016). It shows innovation metrics, as a practice that is a dynamic process, not a static one. By including several levels of observation the dynamics can be captured less functionally and more in a relational way (Moll, 2015).

The research of studies B and C was conducted at an innovation department, which was instated at least a decade ago, within a company in the process industry that operates global production sites and sales offices. The parent company generates annual revenues of more than roughly 1.5 billion euros and the headquarter is located in a Nordic country. It has sales and production in the Americas, Asia, and Europe, but the majority of its business is within European countries. The organization has end customers in a large number of sectors, including Automotive, Construction, Electronics, Medical, Feed, and Food. Like those at many other large organizations, the innovation department and its teams are cross-functional. In addition to R&D and engineering, people from marketing and manufacturing are also involved in the projects to obtain a nuanced view. Because the innovation department is diffused globally, project members usually work internationally, located in different subsidiaries. The innovation department is a dispersed organization with multiple departments functioning in several regional markets. As a result, the innovation metrics and organization in this study can be thought of as a singular case with multiple subcases (Yin, 2014). The case company's name is kept anonymous, due to a non-disclosure agreement.

As previously highlighted, in the case context for this company commoditization can be identified as the main driver of strategic change. Several strategic responses

are possible to the competitive pressures of commoditization as can be seen in Figure 4. At the horizontal and vertical axis of Figure 4 value-added strategies are suggested that are related to the bundling of existing products and services and segmentation and customization. To accommodate these strategies the case company has distributed its innovation department organization-wide to implement strategies that can provide the value-added needed. The extensions in the organization have been made in three areas, system development, the add-on of new technologies, new products, and services. Solution innovation can be defined as process innovation and the building or re-building of performance in and outside factories. Targeted extension represents a strategy that aims to add value by stretching the firm's core offer into more segments, to better meet special needs. The sustainability aspect is of growing interest in this segment. To meet the needs of the customer and to continue to add value the case company has distributed its innovation organization and the accompanying strategy.

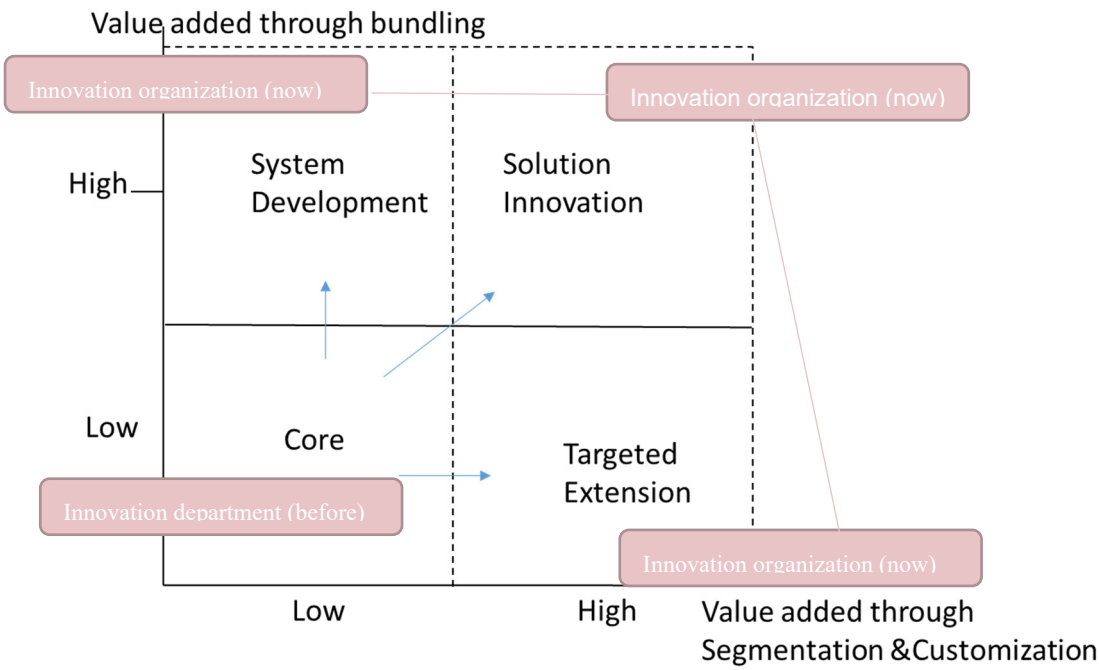


**Figure 4.** Strategies to fight commoditization (Kashani, 2006)

Innovation at this company can be portrayed in a global project model in a stage-gate fashion. It is generic, and it goes from step to 0 to step 5. The first step is referred to as discovery, which involves research and development, idea generation (Milestone 0), idea selection (Milestone 1), concept development, and strategy release (Milestone 2). The third step, referred to as the development step, includes detailed planning, project release (Milestone 3), The fourth step, referred to as the delivery step, includes project execution, and technical release (Milestone 4). The fourth step implies commercialization and involves new product launch preparation, product release (Milestone 5), The fifth step includes evaluation.

As a response to commoditization, the case company started to review and adjust its innovation metrics. Study B shows the innovation metrics were established in 2014, referred to as the "official KPIs", and subsequently compared to the perceptions of the organizational members in 2017. Figure 5 illustrates this situation.

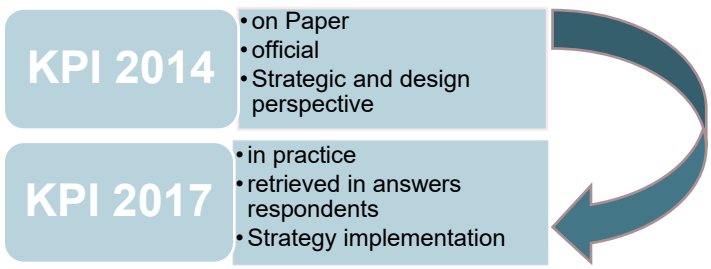


**Figure 5**. Empirical evidence illustrated Study B (inspired by Fried (2020))

In studies B and C organizational members at an innovation department were observed. As is well recognized, the term case study is ambiguous, referring to a heterogeneous set of research designs (Gerring, 2004, 2006). Following Seawright and Gerring (2008: 296) "a narrow definition of "case" is chosen in this study: the intensive (qualitative or quantitative) analysis of a single unit or a small number of units (the cases), where the researcher's goal is to understand a larger class of similar units (a population of cases)". Translated to the current thesis, the researcher is studying the case of "using and interpreting innovation metrics" by organizational members (study B) and when "developing a new innovation metric" (study C).

# Methodological point of departure

The research approach of this thesis is 'problem'-driven not 'methodology driven (Flyvbjerg, 2006). As the research problem in this thesis is a combination of both finding an *explanation* of the why, as well as an *understanding* of the how and what

mixing types of qualitative research seem the appropriate research approach (Stake, 2000). Moving into the age of combination, where all things are considered known but the combination of things are unique fits the choice to mix methodological lenses as an interpretative bricoleur (Denzin & Lincoln, 2000; Schumpeter, 1934). This will enable us to uncover the complexity of the undertheorized fields that are studied, by using the zoom-in and zoom-out functions of methodological lenses, in this dissertation case study techniques are complemented by action research. This diversity of methodological lenses chosen in this study are a way to cultivate methodological diversity (Bansal & Corley, 2011; Bansal, Smith, & Vaara, 2018; Elsahn, Callagher, Husted, Korber, & Siedlok, 2020).

# Methodological approach and positioning

The nature of the phenomena and research questions in combination with my acquired skills as a researcher calls for a qualitative methodological approach designed to explore the multiple dimensions and properties of the phenomenon. (Bansal & Corley, 2011; Bansal et al., 2018). Qualitative research can bring the reader closer to the phenomenon being studied (Bansal & Corley, 2011). A new methodological lens, such as action research, can enrich and complement the traditional lenses and data sources used in the case-based study (Bansal & Corley, 2011). This is a response to the principle outlined by Bansal et al. (2018: 1193); *Authors must see their work as unique and seek to continue to innovate and develop qualitative methods to avoid orthodoxies. We also maintain that juxtaposing methodological approaches against one another can help inspire innovation within and across genres (see Gehman et al. (2018)).* Thus, the author has chosen to combine case study methods with action research methodology to uncover the multiple dimensions and properties of innovation measurement.

Paper I presents which research methods are used in the field of innovation measurement in the period between 1984-2012. The below Figure 6 presents the research methods used in innovation measurement. The figure shows what research methods were applied to study innovation measurement in the period between 1984-2012.

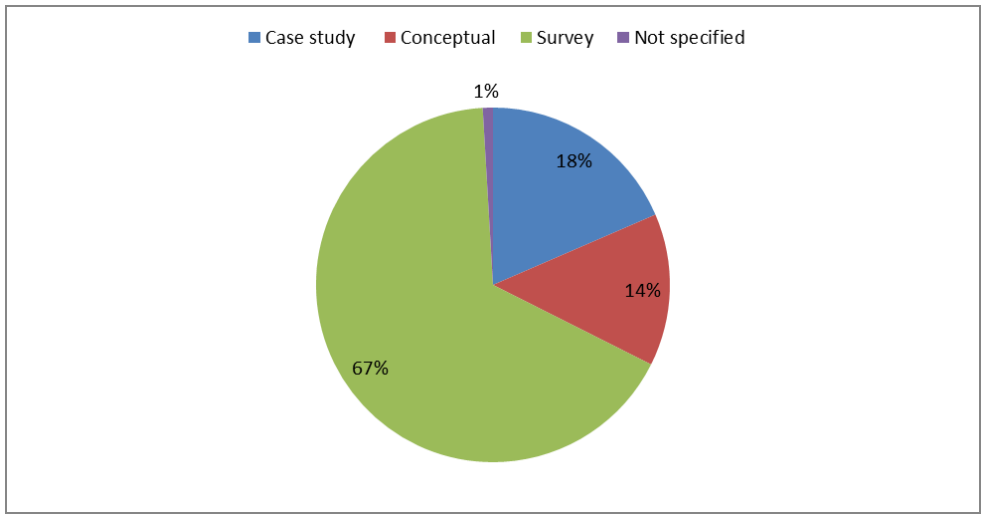


**Figure 6.** Research methods in innovation measurement

Quantitative studies, survey studies, seem to dominate the primary studies in innovation measurement. This domination of quantitative studies may in part be explained by the history and origin of the research field of innovation measurement which has a strong rooting in quantitative research (Fagerberg, Fosaas, & Sapprasert, 2012). Another explanation why quantitative studies dominate can be related to the current biases and publication preferences in contribution to the existing knowledge base in innovation measurement (Cunliffe, 2011; Fagerberg et al., 2012). As can be seen in Figure 6, qualitative methods are only used in a minority of the studies (conceptual and case studies).

### Comparing action research with case-study research

Action research and case studies, are qualitative research approaches, enabling studies of social processes and social worlds (Ollila & Yström, 2020). Both case-study research and action research are concerned with the researcher's gaining an in-depth understanding of particular phenomena in real-world settings (Blichfeldt & Andersen, 2006). Both approaches adopt a mode of 'inquiry from the inside'(Ollila & Yström, 2020). Moreover, the approaches share the potential to provide closeness to living emergent systems and generate rich insights. However, the engagement in and with the social setting varies between the two approaches (see Table 4) (Ollila & Yström, 2020).

The purpose of the case-study approach is to study the case, not to change the case (Ollila & Yström, 2020). The case-study approach has the potential to provide closeness to living emergent systems and generate rich insights similar to action research (Ollila & Yström, 2020). Action research, however, considers practitioners

not as distant subjects, but as research partners (Guertler et al., 2020). In case studies, interviewing and observing people in situ can generate rich insights, while interventions initiated by the researcher generate additional rich insights in action research (Ollila & Yström, 2020). Although both case-study research and action research deal with context-bound knowledge, action research offers a greater role to the participants in defining the issues to be addressed (Blichfeldt & Andersen, 2006). The degree of practitioner involvement in the action research project can range from a limited and rather distant observing to a close almost co-researcher collaboration (Guertler et al., 2020). In case studies, interviewing and observing people in situ can generate rich insights, especially about dynamics, while interventions initiated by the researcher generate additional rich insights, especially about practices (Ollila & Yström, 2020).

To conclude, even though there are similarities between action research and case studies, there are differences in their origin and purpose (Ollila & Yström, 2020). Action research is not primarily aimed at understanding social arrangements; it affects desired change as a path to generating knowledge (Bradbury-Huang, 2010). Action research links research to practice; research informs practice and practice informs research, synergistically. In action research, the researcher tests a theory or practice with practitioners in real situations, gains feedback from this experience, modifies the theory or practices, and attempts again. Each iteration of the action research process may contribute to theory. A summary of the comparison of action research and case studies regarding the benefits of the two qualitative methods is presented in Table 4 (Ollila & Yström, 2020).

**Table 4** Action Research compared to Case studies (adapted from (Ollila & Yström, 2020))

| Type of qualitative research | Providing closeness to living emergent systems | Generating rich insights | Generating knowledge both rigorous theory development and change in practice |
|---|---|---|---|
| | | | |
| Action research | The researcher is an insider as an actor<br>In situ:<br>Research design and processes adaptable to researcher and practitioner needs | Interventions trigger new and additional practices in areas related to research and practitioner interest<br>Scope for trying out a theory with practitioners in real situations and gaining feedback from this experience | Active collaboration with practitioners<br><br>Research and practice are integrated across time and space |
| Case-study research | The researcher is an insider or outsider as a spectator<br>In situ or retrospective<br>Research design and processes adaptable to researcher needs | Studying dynamics in settings related to specific research interest<br>Scope for adapting research methods to emerging research needs | Access to the case setting<br>Research and practical implications are separated across time and space |

# Epistemological and ontological viewpoints

This thesis entails both epistemological and ontological viewpoints that are regarded as critical realism and pragmatic. Since both of these stances and applications are different in philosophy and metatheory, the implication and application to the current research are explained. Innovation measurement is associated with accounting and operations management disciplines and has therefore been more closely relating to a positivistic epistemology where the emphasis has been on the creation of rational early warning control systems based on leading indicators (Bititci et al., 2012; Speklé, van Elten, & Widener, 2017). In this thesis, Study A is performed in a more positivistic tradition, where the discerning of patterns are central in research. In the literature on innovation measurement, there is a clear shift and call towards more interpretative epistemological and ontological viewpoints. Here innovation measurement is more seen as an integrated social system, holistically, within the ever-emerging context. (Bititci et al., 2012). Study B, C is more interpretative epistemological and ontological viewpoints. Study B has taken a more critical realist perspective on the description and the explanation of the usage of innovation metrics. Paper I and II describe the interaction between human agency with several other material/immaterial agencies, such as key performance indicators and read-between-the lines information and organizational errors (Davila & Ditillo, 2017; Moll, 2015). The understanding of the symbolic meaning of innovation metrics and the limitations of innovation measurement is in line with other critical realists that have discussed the inherent incompleteness of metrics (Jordan & Messner, 2012; Wouters & Wilderom, 2008).

Study C is more associated with the pragmatic traditions in interpretative stances (Goldkuhl, 2012; Micheli & Mari, 2014). This pragmatic stance can be found in Paper III and IV, where action research is drawn upon and a participatory action design is applied. This paper shows that the creation of innovation metrics is more than a strive towards more and more precise measures (Goldkuhl, 2012; Micheli & Mari, 2014). The implications of the proposed pragmatic standpoint are many, ranging from the definition of measurement processes and the attributes of ‘good’ measurement to the use of measurement results (Goldkuhl, 2012; Micheli & Mari, 2014). In this thesis, all of these aspects are influenced by pragmatic viewpoints.

# Data collection and analysis

### Case-study research

During the case study, the data was collected primarily through semi-structured interviews complemented by onsite observations, and reviewing documents such as internal reports, meeting notes, presentations. In addition, considerable time was spent in the field, using multiple methods of observation, and being aware of one's behavior as a field researcher (Ahrens & Chapman, 2006; McKinnon, 1988). Both informal and formal meetings were attended, and days on location were deliberately scheduled. Acquiring data from multiple sources and in various forms allowed to triangulate data for authenticity. In this study, the researcher has moved back and forth between data, theory, and related literature to make sense of the made observations (Ahrens & Chapman, 2006; Jørgensen & Messner, 2010). Data was collected throughout one and a half years and revisits up to two and a half years in total (until December 2019). This has allowed me to collect unique data, that not only shows the usage and perception of innovation metrics at the innovation organization but also shows subtle differences in the development of existing and new innovation metrics and their implementation.

In the first stage, two meetings were held at the company's headquarters. The purpose of these meetings was to understand the empirical context, ensuring willingness to cooperate. Here, the researcher met the innovation controller and the senior innovation advisor for the initial exploratory meeting. During these two initial sessions, notes were collected and documentation describing the company's innovation organization over the years was provided. It was critical in these preliminary interviews to understand what the "official" innovation metrics were. An internal document was provided, which stated these agreed-upon metrics. These are referred to as the "official" innovation metrics or innovation KPIs and compared to the respondents' answers. This information was synthesized into an interview protocol and used in preparation for the interviews.

**Table 5** Second stage of interviews illustrated (Paper II/III)

| Interviewee position | Level in hierarchy | No. of interviews | Length of interviews in total (h) |
|---|---|---|---|
| ***Top management*** | | | |
| **CEO** | Executive | 1 | 1 |
| **Vice-president** | Executive | 1 | 1 |
| **Director of Innovation** | Executive | 2 | 3 |
| **Director of Business** | Executive | 3 | 5 |
| **Director of controlling** | Executive | 1 | 1 |
| **Global director of engineering** | Executive | 1 | 2 |
| ***Middle management*** | | | |
| **Senior innovation staff** | Middle | 4 | 6 |
| **Project leader** | Middle | 5 | 6 |
| ***Staff*** | | | |
| **Innovation staff** | Low | 10 | 13 |
| **Total** | | 28 | 38 |

In the second stage, 28 interviews were conducted with innovation staff, project management, business/sales staff, and senior management, mostly lasting between 20 minutes and an hour. Interviews were typically conducted in offices or conference rooms. Most interviews were recorded and transcribed. In informal settings, the researcher took notes during or after the meetings. Sometimes follow-up mail conversations clarified the noted. The proximity of the case company made informal meetings feasible, but due to security and safety precautions, these meetings needed to be pre-arranged. Using the prepared interview protocol and internal documentation on innovation metrics, the respondents were asked about the existing innovation metrics, of innovation in use. The initial questions related to the role of the individual, their responsibilities, their tasks in the organization, and their perceptions/definitions of innovation. Next, the respondents were asked about the innovation metrics in use, innovation metrics functionality, development possibilities, and challenges. Different organizational members were asked similar questions to gain different perspectives on the same topic and/or confirm individual accounts. In the last stage, the referenced internal documents, such as presentation slides from meetings or distributed after meetings, and public documents, such as the parent company's recent annual reports, were gathered and compared to supplement the interviews.

The research interview is one of the most important qualitative data collection methods and has been used in Study B to collect data in the case study (Qu & Dumay, 2011). According to Qu and Dumay (2011), there is no one right way of

interviewing, no format is appropriate for all interviews, and no single way of wording questions will always work. Interviews are, without a doubt, a valuable tool for revealing the truth about social conditions and people's experiences through accessing data, and they also produce specific representations of something(Alvesson, 2010). However, interviews as the primary source of empirical data have been reported to have flaws. One way to overcome these flaws is by the selection of questions in the interview. Although study B was a semi-structured interview with an interview protocol, the interviewer allowed the interviewees to freely talk about their views on innovation, innovation metrics, daily work routines, and ongoing projects.

The choice of respondents was based on the identification and validation of key respondents as well as the need for several perspectives (Qu & Dumay, 2011). The interviews were taken and company feedback was collected. The data was then checked. The interview questions focused on innovation, innovation definition, and perception, innovation metrics selection, identification, change of innovation metrics over time, information associated with innovation metrics. By varying the type of questions used, as suggested by Qu and Dumay (2011) and Kvale (1994), the interview becomes less locked into a certain point of view and opens up for reflective reasoning(Alvesson, 2003). In summary, the risk of attaining politically-guided interview accounts can be diminished by utilizing different questioning techniques (Qu & Dumay, 2011).

The chosen method for data analysis is a content analysis method based on the guidance of the prior literature (Bloomberg & Volpe, 2018; Brinkmann & Kvale, 2015; Schreier, 2012). In the case study, the researcher moved back and forth between data, theory, and related literature to make sense of the made observations (Ahrens & Chapman, 2006; Jørgensen & Messner, 2010). The data analysis aimed to understand what innovation metrics are used to measure innovation and how these identified metrics were interpreted and used by the interviewees. Through a series of iterations between data collection, analysis, and literature review, the data analysis progressed incrementally from raw data to theoretical interpretation (Eisenhardt & Graebner, 2007; Graebner, Martin, & Roundy, 2012).

For Study B the data analysis consisted of iterative steps of coding and data reduction. The a priori categories were based on the results of Study A, which showed which innovation metrics are found in existing scholarly literature. Simultaneously, the a priori themes were compared with the topics that emerged from empirical data (in-vivo codes). The a priori categories consist of the perceptions and interpretations of organizational members of innovation and associated metrics. The influence of industry context and strategy on innovation and metrics is another theme that was identified in the observations and later matched to the a priori themes. Through the coding process, emergent patterns emerged.

These patterns were then analyzed and abstracted to form thematic categories, “innovation definition and perception”, “innovation metrics identified and described/used”, “translation”, “completeness”. In the next step of condensing the data was read and re-read in a structured manner and compared to the thematically structured data. This analytical process consisted of iterative steps of coding, data reduction, and analysis, as well as check-ins with the stakeholders of the companies and peer-researchers, to create a deeper understanding of the interviewees’ perceptions and interpretations of the innovation metrics. In Paper II the phenomenon studied was related to the concept of the in-vivo codes “reading-between-the-lines”, which was highlighted as an empirical finding regarding innovation metrics. In Paper III, the phenomenon studied was related to the concept of the in-vivo codes “organizational errors”, another finding regarding innovation metrics. In the last phase, the interview material was interpreted in the light of present literature to carve out the finding and identify a contribution to the innovation measurement field.

**Action research – participatory action design**

During the participatory action design (PAD) study the processes of collecting data, analyzing data, and re-defining the research question and the research method are parallel and not separated (Chevalier & Buckles, 2019; Coghlan, 2019). The main characteristics of this participatory action design study are that it involves multiple stakeholders in collecting data, analyzing data, and re-defining the research question and the research method (McIntyre, 2008).

In a PAD study, a researcher is an insider as an actor (Ollila & Yström, 2020). During the PAD study, the role of the researcher may shift and can be influenced by the needs of the stakeholders. In this case, it was the first time for the researcher to conduct a PAD study and perform AR. The researcher, however, was experienced both as a researcher and a practitioner in similar projects. For guidance in the execution of a PAD study, the researcher consulted peer research experts at the university. The challenge with using the PAD study is balancing the stakeholders’ needs versus the research needs (Mackenzie, Tan, Hoverman, & Baldwin, 2012). The stakeholders' needs are usually concerned about the material improvements result of the PAD study, here a constructed KPI of innovation (Mackenzie et al., 2012). The researcher’s needs are linked to the extent to which the work allows for an original contribution to the research field (Mackenzie et al., 2012). A researcher in the PAD study thus needs to apply sensitivity to balancing the needs of the stakeholders with the needs of the researcher (Mackenzie et al., 2012; Ollila & Yström, 2020).

In this research, it has been chosen to perform the PAD study in three workshops at three different points in time. Based on action research (AR), each workshop has been designed in four recurring stages: plan/design, action/development,

observe/evaluate, and reflection/analysis (Bilandzic & Venable, 2011; Coghlan, 2019; Mackenzie et al., 2012). Through multiple cycles of these stages, improvements to the knowledge and understanding of those involved in the inquiry lead to social action, and reflections on actions lead to new understanding and open up new areas of inquiry (Greenwood and Levin, 2003). This iterative process forms the foundation for continual improvement and understanding. Kemmis and McTaggart (2005) argue the stages are in reality likely to overlap and merge as learning occurs. This time in between workshops is referred to as cycles in action research and it allows the stakeholders and researcher to reflect, complement, and observe the design and development of the KPI in action. Below an overview of the overall research process is given in Figure 7. as well as the details in Table 5.

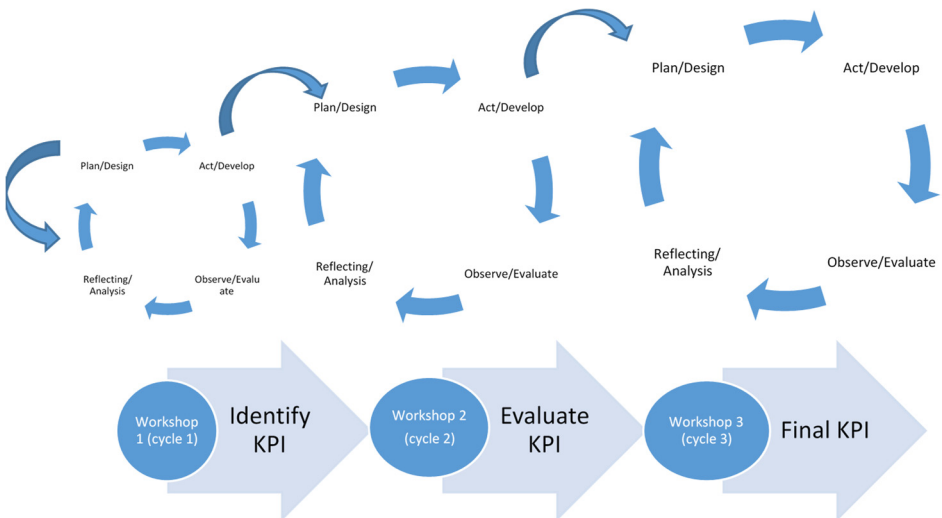


**Figure 7**. The overall research process of PAD (Paper iV)

**Table 6:** Details of the PAD process (Paper IV)

| Name workshop | Purpose of workshop | Date of workshop | Number of participants | Stakeholders role | Data collected |
|---|---|---|---|---|---|
| Pre-study | Pre-study<br>PAD | Autumn 2017<br>Spring 2018 | 22 | Innovation personnel (5), controller(3), sales manager(3), R&D manager, sales and technical support manager,<br>Senior consultant innovation, project manager, program manager, business managers, production managers (2), patent manager, CEO, director innovation. | Interviews,<br>Notes,<br>Reports<br>Powerpoints<br>Presentation<br>Emails |
| 1 | Define issue or problem | March 2018 | 7 | Innovation personnel (2), controller, sales manager, R&D manager, sales and technical support manager,<br>Senior consultant innovation | Recording<br>Notes<br>Powerpoints |
| Follow-Up | Collect email and documentation in between sessions (feedback and feeding) | April 2018 | 6 | Innovation personnel (2), controller, R&D manager, sales and technical support manager,<br>Senior consultant innovation | Emails<br>Notes<br>Powerpoints<br>Excel sheets |
| 2 | Evaluate chosen KPI | May 2018 | 6 | Innovation personnel (2), controller, R&D manager, sales and technical support manager, controller,<br>Senior consultant innovation | Recording<br>Notes<br>Powerpoints |
| Follow-Up | Collect email and documentation in between sessions (feedback and feeding) | June-July-August | 6 | Innovation personnel (2), controller, R&D manager, sales and technical support manager,<br>Senior consultant innovation | Emails<br>Notes |
| 3 | Construct final KPI | September 2018 | 6 | Innovation personnel (2), controller, sales manager, R&D manager sales and technical support manager,<br>Senior consultant innovation | Recording<br>Notes<br>Powerpoints |

# Scientific relevance and rigor

This research has used several qualitative methodological lenses in the presented Papers. In effect, both the strengths as well as the weaknesses of each of the qualitative methods will be encountered. In this synthesis of the research, the ambition is to show how both of these research methods have complemented each other.

Study A is quantitative. The main focus of this part of the study is variation and patterns of association (Bryman & Bell, 2015). It is used to establish the state-of-the-art of the research field of innovation measurement. The quantitative research method is usually accompanied by the risk of having a small, non-random group of practitioners associated with the research as such. This will pose challenges to the relevance, reliability, and validity of the study. Another problem can be related to ambiguity about the direction of causality and can be related to issues of internal and ecological validity (Bryman & Bell, 2015).

Study B and C are qualitative studies. As Study A shows, there is still scarce literature on the intersectional field of innovation measurement. Thus, an exploratory study using a case study is chosen as a research method to build knowledge about the phenomenon (Yin, 2014). This research method is often criticized for its lack of rigor, inability to generalize the results, limited replicability, and that there is a clear tendency for researcher bias (Bryman & Bell, 2015).

In turn, each of the validity threats in this thesis will be discussed. C*onstruct validity* refers to choosing the right measure for the concept under the study as a foundation of this thesis (Runeson, Host, Rainer, & Regnell, 2012). In Study A a systematic literature review has been chosen following validated and peer-reviewed data protocol (Edison et al., 2013; Kitchenham et al., 2009), this subsequently served as a foundation of this thesis. Study A has furthermore been scrutinized in several academic and practitioners' conferences, something that mitigates risks associated with construct validity. Following Gibbert, Ruigrok, and Wicki (2008) suggestions, Study B and C have addressed construct validity in several ways. In Study B construct validity has been improved by data triangulation, using archival data, and recording all data of the conducted 28 interviews. All manuscripts were sent to key informants and subsequently to peers. All interviews were done 1-to-1, securing no outside influence or management pressure exerted. Informal meetings and onsite meetings accompanied the interview series. *Internal validity* is present in Study A. To ensure internal validity only previously validated protocols and questionnaires were used and adapted using industry and academic experts (Bryman & Bell, 2015; Edison et al., 2013). The exploratory nature of the case study in Study B and C makes internal validity less prominent than other researchers have suggested (Luft & Shields, 2003). Interview protocols were reviewed by key informants and

academics to limit personal bias in data collection. Case study protocol and database has been created to enhance internal validity. *External validity* refers to the ability to generalize the study findings (Bryman & Bell, 2015; Runeson et al., 2012). The findings of Study A can easier be generalized than the findings in Study B and C. However, Study A, the systematic literature review can show the state of the art in a given time period using a validated protocol (Edison et al., 2013). If any change is made in the chosen time measured, databases used, or chosen protocol the results may be different and difficult to generalize. Thus, the findings in Study A are, ceterus Paribus, generalizable to the research field of innovation measurement. Innovation measurement is not a static field so a state-of-the-art should be taken regularly as the field is subject to continuous development and has to deal with challenges as big data and contemporary measurement and control systems (Franco-Santos et al., 2012; Tan & Zhan, 2017). Study B and C are less generalizable as the studies are representable but bounded to the process industry and other associate contextual variables (e.g. the changing strategic innovation context). However, analytical generalization and transferability of findings are possible, based on Study B and C (Gibbert et al., 2008) and will be address in the end of this introductory essay.

Last but not least, *reliability* is the ability to replicate the same study with the same results (Runeson et al., 2012). As Study A is conducted using a validated and reviewed protocol and it is thus possible to replicate this study and retrieve similar results. To address the reliability concerns in Study B and C several techniques were used. Study B has used reviewed the protocol and multiple data sources. To further increase the reliability interviews were recorded and summary validation by the key informants has been conducted. Study C has used reviewed setup for the participatory action design workshops and complemented this with multiple data sources. The workshops were recorded, and summaries were reflected upon in each consecutive workshop.

# Ethical considerations

This study needs to address the ethical considerations that should be taken into account when studying innovation measurement. These ethical considerations are both connected to the research ethics of this dissertation as well as ethics related to measurement and controlling.

The research ethics of this study is concerned with the interaction between researchers and their research objects. This research has explicitly worked with the consent of the case company and the researcher has signed a confidentiality agreement before conducting her study. In the written contract between the

researcher and case company issues were governed regarding (i) the research project, (ii) the backgrounds and motivations of the researchers, (iii) the duration of the research, and (iv) what information was expected from the participants. This explicit contract regulated the conduct of the researcher and assured that the research outcomes were communicated broadly and anonymously.

All participants were assured confidentiality in the reporting of the results before the data was collected. Most of the results have been reported in an aggregated manner and for the obfuscation of the names of individuals and the firms, pseudonyms were used to ensure privacy. The documents that were used were publicly available or willingly shared with the researcher by the participants.

Next, the ethics concerning measuring and controlling humans should be addressed. The focal point of this research is measuring innovation which has an impact on the behavior of participants. Measuring individual innovative performance or a team's innovative performance is a task of providing "information to people within the organization to help them make better decisions and improve the efficiency and effectiveness of existing [innovation] operations" (Hirth-Goebel & Weißenberger, 2019: 292). This implies that measuring innovation involves judgment and which might be a mix of objective observations and subjective interpretation. The confidential information reported in innovation measurement makes it important that information is only reported responsible with confidentiality and authenticity concerns (Hirth-Goebel & Weißenberger, 2019). Research in innovation measurement needs to address similar ethical considerations and needs to consider the political ladeness of the information reported by innovation metrics. The interpretation of measurement of innovation is likely to affect the behavior of participants and the rest of the organization. Furthermore, the measurement of innovation is usually done in systems that control performance and assure the realization of objectives, and the effectiveness of certain strategies (Hirth-Goebel & Weißenberger, 2019), Consequently, innovation measurement plays a central role in administrative control of innovation (Hirth-Goebel & Weißenberger, 2019). In innovation measurement, there is a need for truthful reporting and prevention of gaming or distortions for organizations to make sound decisions (Hirth-Goebel & Weißenberger, 2019). In innovation, however, understanding what should be measured and controlled is not clear-cut, due to the issue of quantification. Time and resources in innovation may also be unrelated to innovation outcomes and output. Dealing with innovation measurement and conducting research in this field thus requires researchers to apply theses ethical considerations.

# Summary of appended Papers

*The summary of the four appended papers is presented in the upcoming sections that build the foundation of my thesis. The title of each paper is stated along with a brief background to the study and its main findings and contributions. The reader is referred to the respective paper for more detailed reading.*

## Paper I

Title: Window of opportunity: action research in innovation measurement

As divergent approaches have been used to study innovation metrics it is difficult to aggregate results in the literature and offer a theoretically coherent account of them. To overcome this hurdle, the purpose of Paper I is to present a synthesis of the literature published on innovation measurement and provide a state of the art of literature. For this purpose, a systematic literature review has been used. This systematic way of organizing literature helps to define and classify key concepts in innovation measurement and identifies the undertheorized areas of innovation measurement. After presenting the state of the art of innovation measurement in the period 1984-2012, the results are related to the role that AR has played in innovation measurement and how this creates present and future research avenues.

The figure below shows the publication pattern of the 108 primary studies. There seems to be a trend that the number of published studies, especially after 9/11 has been steadily increasing every year and it seems that this trend is continuing. This indicates the growing interest in the subject of innovation and control in the time to come. The area is still undertheorized and not yet mature, as it is fragmented literature still does not have one dominant way of conceptualizing innovation measurement.

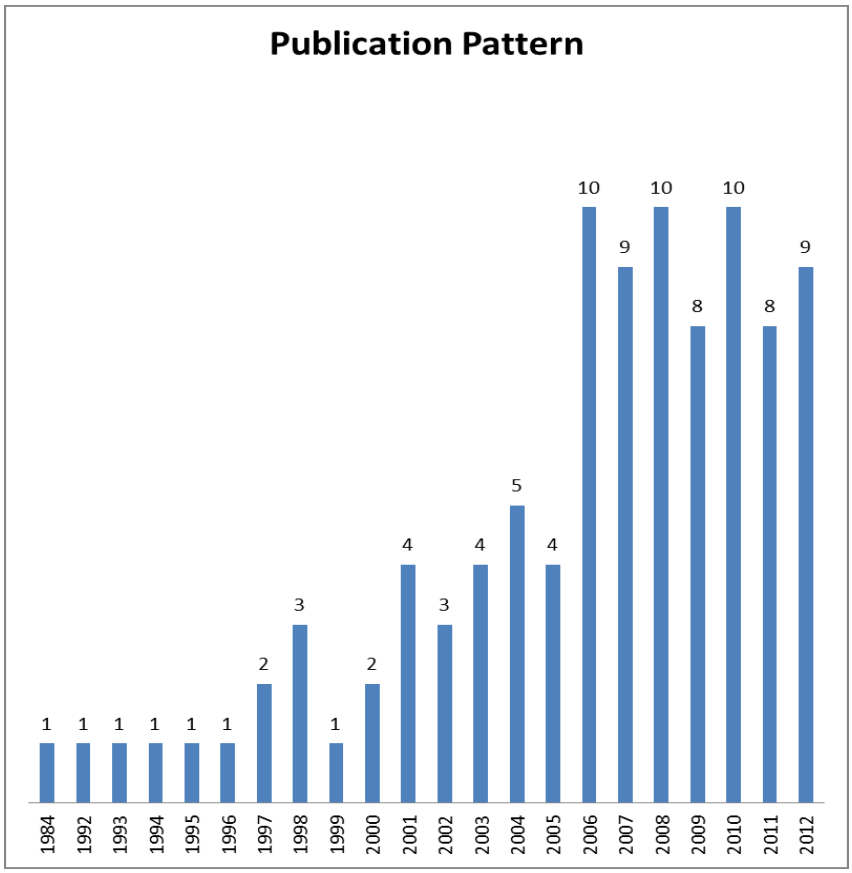


**Figure 8**: Publication patterns

In Figure 8, the survey studies seem to dominate the primary studies included in the state of the art. This may in part be explained by the history of the field as well as the current biases in contribution to the existing knowledge base on innovation. The conceptual and case studies are applied in several studies and it would be interesting to investigate whether it has changed over time compared to the publication patterns mentioned earlier. The interest in case studies in this field might be a signal that the relevance to practitioners is present. Further investigation might show whether this is increasing or not among the increased number of publications found in the table showing the publication pattern.

Based on Adams et al. (2006) review it will be examined whether the primary studies focus on financial, organizational, and output metrics. It can be seen that there is 77 % of the metrics in the primary studies were concerned with innovation on the organizational level and that 12 % of the studies did not specify the

underlying asset that was measured. Focus on the group and individual levels seem to be only 5 % respective 1% of the metrics being reviewed.

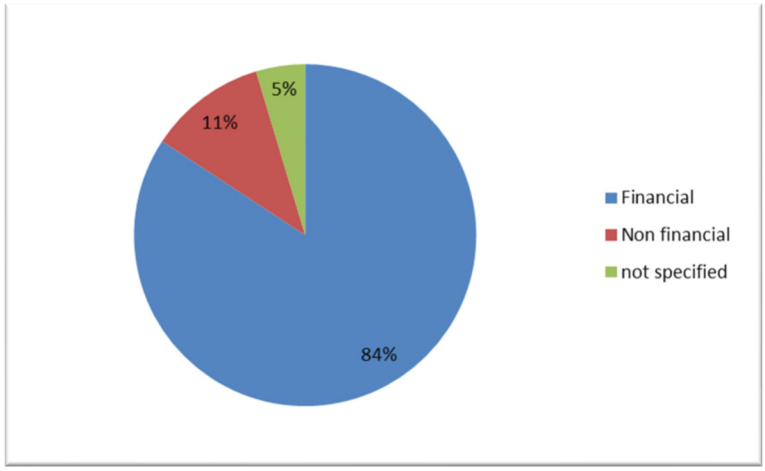


**Figure 9:** Innovation metrics: financial and non-financial

In line with previous results and confirming the study done by Adams et al. (2006) the figure above the studies included confirms that financial metrics, that 84 % of the studies are the main metrics used to capture innovation or innovation performance. A mere 11 % targets the non-financial part of innovation. As the metrics predominantly can be categorized as financial the future challenges in innovation studies, such as service innovation, radical and open innovation might stay unnoticed. The quantification issues regarding innovation are likely to compound in light of the innovation challenges ahead, that is the more radical, open, and service-orientated innovation will get the less quantifiable it might get. Furthermore, this might mimic the results found in the reluctance of the adoption and diffusion of the BSC in innovation practice.

The findings suggest that most mainstream methods are applied in the field of innovation measurement. This combined with the rising complexity and intangible nature of innovation opens a window of opportunity for the action research field, innovation and performance measurement applies quantitative methods in most of its research. However, the developments in the field of innovation, as well as the field of performance measurement, show that an action research approach is called for. The complexity and intangible nature of innovation will make it harder to only apply quantitative approaches and will make the call for qualitative approaches such as action research increase. Performance measurement literature shows a similar tendency, showing a shift towards measurement systems that encompass more than financial metrics

The contribution of this paper is a presentation of the state of the art of the research field of innovation measurement. In addition, it shows how and why action theory should be used in the field of innovation measurement. Backed by an elaborate literature review, this study shows the research opportunities now and in the future of action research in the innovation measurement field. To date, this action theory as a methodology is rarely used in this intersectional field but can be considered a good complement to the prevailing survey studies.

# Paper II

Title: Misfit: The use of metrics in innovation

The measurement of innovation is a challenging task for management control practitioners and researchers alike. To tackle this task, innovation metrics can be used to measure and follow up on innovation. The objective of Paper II is to explore how innovation metrics, designed for measuring innovation, are used in practice. A qualitative case study has been undertaken to explore how these innovation metrics are perceived and used by organizational members involved in innovation.

*Innovation metrics: an accounting inscription*

To achieve the objective in Paper II, the author draws upon literature on business performance in accounting and innovation yet moves away from the functional view. Instead, the author focuses explicitly on how organizational members, through their use of KPIs in innovation, make sense of conflicting interpretations and integrate them into their practices. This view identifies innovation metrics as an accounting inscription, which outlines the social-political aspects of accounting ((Robson & Bottausci, 2018). By regarding innovation metrics as an accounting inscription, one acknowledges the ability of accounting numbers to be "interpreted" and "translated" by organizational members and creates a transformation through which an entity becomes material into a sign, an archive, a document, a piece of paper, or a trace (Busco & Quattrone, 2017, 2018; Latour, 1983). Viewing accounting as an inscription enables one to make sense of its limits as a representational device, of the impossibility for accounting to work as an "answer machine" (Burchell, Clubb, Hopwood, Hughes, & Nahapiet, 1980; Busco & Quattrone, 2018).

*Innovation organization*

The evidence in Paper II suggests that each of the organizational members involved in innovation has their unique view and perception of what innovation is. Furthermore, there are many organizational members and organizational

levels involved in innovation, as the case document: *"innovation should not be done as a standalone process; it should be done with an understanding of the customer promise and deliver on it'"* (official documentation of case company)". The official documentation, thus, underlines that innovation is not a standalone process and that innovation requires organizational effort. The official documentation, in addition to the perceptions of the organizational members, illustrates that innovation in this organization encompasses the entire chain from idea to value (Davila et al., 2012). Until a modification to the global project model was implemented in 2014, research and development were functionally organized within the organization. Now, it appears that innovation involves many in the organization. The CEO, controller, sales team, innovation, and R&D teams, and project management teams all are involved.

*Strategic change and innovation metrics*

Industry context, described in Paper II, is a phenomenon that can be found in many industries and creates a particular set of challenges when controlling for innovation (Bromwich & Scapens, 2016; Messner, 2016). The empirical evidence suggests that strategic change, attributed to commoditization, affects the predetermined innovation metrics. Notably, these innovation metrics are used, despite their poor fit to innovation subject to commoditization. In face of commoditization, a customer-focused strategy is chosen which requires the organization to keep the innovation metrics up to date. In this context, innovation metrics do not always provide organizational members with the information they need or want, and do not always meet the set intentions and expectations. From an interpretative perspective, this paper indicates that in innovation, metrics usually are complemented by or supplemented with other information, as stand-alone innovation metrics exhibit a great deal of incompleteness.

The main contribution of this paper advances our understanding of how innovation metrics are perceived and used by organizational members involved in innovation in changing strategic context. The interpretative perspective is used to document a real-life empirical example of how innovation measurement and metrics function in an organization in a particular industry context. This perspective on innovation metrics uncovers the complexity of accounting and innovation that involve many different angles and organizational levels.

# Paper III

Title: When wrong is right. Leaving room for error in innovation measurement

Measuring innovation has never been an exact science. Errors in measuring innovation are common, as they are in many other aspects of organizational life. Existing literature identifies issues with innovation metrics that stem from the complexities of quantifying, evaluating, and managing innovation practices and competence (Davila et al. 2012, Tidd and Bessant 2018). Paper III delves deeper into the phenomenon known as organizational errors in the use of innovation metrics to study these unintended deviations between what should and should not be measured in innovation.

Organizational errors are unintended deviations from organizational expectations about how to carry out work, and they typically involve multiple individuals acting in formal organizational roles; these errors can be harmful, and they are primarily caused by organizational conditions such as values and rewards (Edmondson & Verdin, 2018; Harris & Tayler, 2019; Lei, Naveh, & Novikov, 2016). “Errors” are essentially unintended deviations from rules or procedures and should be distinguished from failures (Goodman et al., 2011). Errors are stated to be an unavoidable part of organizational existence, and as such, they ought to be studied as a distinct phenomenon with growing theoretical and management implications (Goodman et al., 2011; Hofmann & Frese, 2011; Lei et al., 2016).

In an ideal world, innovation metrics should be tailored to the context in which it occurs, innovation has become increasingly complex, according to recent studies(Okwir et al., 2018; Ollila & Yström, 2020). As a result of this increased complexity, innovation metrics appear to have evolved into more "intelligent" and modern performance measurement systems (Franco-Santos et al., 2012). Because of the complexity of innovation, innovation metrics must be updated regularly, which may explain the occurrence of organizational errors. Despite the fact that links have been established between innovation metrics, innovation, and errors, the ‘error proneness of innovation necessitates special attention to the use of metrics in innovation and the occurrence of organizational errors. (Edmondson & Verdin, 2018; Harris & Tayler, 2019).

Ideally, innovation metrics should align with external and internal conditions, such as strategies, and are adapted to firm-specific objectives of measurement (Bititci et al., 2018; Goshu & Kitaw, 2017). Insights into innovation metrics show that research is shifting away from traditional, mostly financial metrics—measuring the rate of return on investment, cash flow, and profit margin—and toward more integrated and modern metrics (Franco-Santos et al., 2012; Goshu & Kitaw, 2017). These necessary alterations in strategy and/or metrics are rarely automatic, and they

can lead to organizational errors by causing deviations from processes at multiple levels(Nixon & Burns, 2012). Based on the findings in Paper III, three explanations are presented on how organizational errors occur when innovation metrics are used.

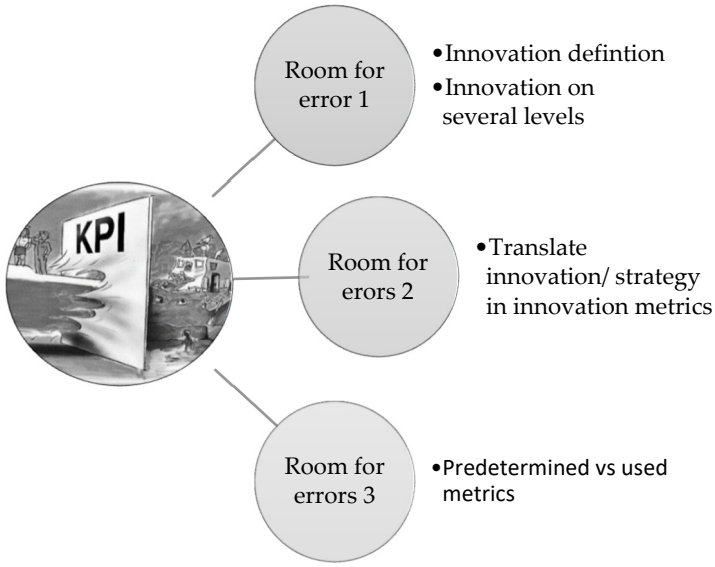


**Figure 10** Summary of room for organizational errors in innovation metrics

Innovation necessitates the production and capture of value by a variety of stakeholders both inside and outside the organization (Garcia, Wigger, & Hermann, 2019). Organizational errors can be linked to the definition of innovation because each member has their own definition of innovation, and an organization does not have a shared definition of innovation. As a result of the different definitions of innovation held by each member of the organization, room for organizational errors is created. When acted upon, these various definitions of innovation may result in organizational errors. Thus, organizational errors explain the challenge that arises as a result of the discrepancy in the definition of innovation that exists at multiple levels of the multi-stakeholder network. Secondly, the deviations between innovation, strategy, and metrics may also leave room for organizational errors. Finally, the numerous individuals and organizational levels involved in innovation and its measurement might lead to organizational errors.

Several contributions have been made in Paper III. First, it adds to the body of knowledge on innovation metrics and organizational errors. Following Frese and Keith (2015: 678), innovation and error management are related, and knowledge on how innovation and organizational errors interact has been documented in Paper III. Another contribution of this paper is the connection between measurement, metrics,

and organizational errors in changing strategic context. Third, it adds to the body of knowledge on performance measurement, metrics, organizational errors, and learning. As has been documented in Paper III, the room for organizational errors between strategy and metrics at multiple organizational levels can generate learning opportunities that are critical to positive organizational outcomes in innovation (Frese & Keith, 2015). Finally, it demonstrates that organizational members' actual use of innovation metrics can differ from strategy-as-planning using multilevel analysis (Edmondson & Verdin, 2018).

# Paper IV

Title: Under construction: action research in innovation measurement

> 'As with all great things, it had no single inventor. Nobody discovered it, it was the result of an atmosphere rarefied by the clash between clear-cut scientific explanations and a rough reality.' – Alfredo Molano; in Swantz (2008: 31)

As seen in the above quote, to develop innovation metrics that guide innovation requires an atmosphere rarefied by the clash between clear-cut scientific explanations and rough reality. In Paper IV a specific form of action research (AR), a participatory action design (PAD) has been chosen to create this atmosphere. The PAD is chosen to assist the researcher to encourage the involvement, engagement of multiple stakeholders in the KPIs construction process. The purpose of Paper IV is to outline several implications of using action research for the development of innovation metrics. Specifically, three types of implications will be examined: implications of using a PAD for research on the development of innovation metrics, implications for researchers using PADs, and implications for practitioners developing innovation metrics.

Collaboration amongst stakeholders is needed to manage and measure innovation (Brattström et al., 2016; Edmondson & Nembhard, 2009; Ollila & Yström, 2020). When developing innovation metrics, the interdisciplinary nature of innovation activity, as well as industry trends, must be taken into account (Edmondson & Nembhard, 2009). An innovation metric should enable professionals from various functions to collaborate on innovation projects to produce the highest quality solution in the shortest amount of time (Edmondson & Nembhard, 2009). The development of innovation metrics thus requires the facilitation, mediation with several stakeholders. Action research offers a deeper understanding of group dynamics and their effects on innovation and innovation metrics (Guertler et al., 2019; Guertler et al., 2020). Related research on the innovation metrics suggests

involving certain stakeholders in the construction process, through employee participation (Groen, Wouters, & Wilderom, 2012, 2017). Employee participation in metric development makes employees more positive about the developed metrics. (Groen et al., 2012) It furthermore will make employees perceive the innovation metric as a credible resource (Wilderom, Wouters, & van Brussel, 2007), which will make employees more likely to accept their output and use innovation metrics to improve their work (Groen et al., 2012). Research shows the benefits of using employee participation in developing innovation metrics, therefore action research is chosen to facilitate and offer a more integrated approach that bridges the gap between ethnography and action-taking or design (Ollila & Yström, 2020). There is an active collaboration between the researcher and the stakeholders in the development of innovation metrics using AR (Guertler et al., 2019; Guertler et al., 2020; Ollila & Yström, 2020).

Paper IV documents how participatory action design (PAD) created interlevel collaboration and group dynamics in developing innovation metrics. The knowledge that was shared during the PAD workshops enabled an understanding of the process of developing innovation metrics, where stakeholders design and implement simultaneously. The findings show that action research, in particular a PAD, can, under certain conditions, be an important tool to capture the tacit aspects embedded in practices and processes.

The main contribution of this Paper is to enhance our empirical understanding of applying PAD to develop and study innovation metrics. This study adds to the growing interest in literature to find innovation metrics that have been developed with committed interest from all stakeholders. It contributes by showing how a PAD facilitates inquiry from the inside and uncovers not only explicit knowledge of managing and organizing innovation in collaborative contexts but also tacit knowledge that is embedded in the skills, practices, ideas, and experiences of people (Ollila & Yström, 2020).

# Discussion

*In this chapter, the four papers encompassing this research project are discussed and put in the bigger picture. Each paper is related to the relevant research question and their contribution to the existing body of literature is discussed. This part of the thesis is to make a coherent account of the phenomena innovation metrics and measurement and provide explanation and understanding.*

## Revisiting the research questions

The overall research purpose of this thesis is to increase the theoretical and practical understanding of innovation measurement and metrics in changing strategic context and thereby augment the possibilities for improved practices and performance in organizations. The research questions are as follows:

> RQ1: How are innovation metrics perceived and used (in practice) by organizational members involved in innovation in changing strategic context?
>
> RQ2: How can action research be used to study and develop innovation metrics in changing strategic context?

Paper II and III show the perception and use of innovation metrics by organizational members involved in innovation and provide findings related to RQ1. Paper II looks at how innovation metrics are used in combination with complementary data such as reading-between-the-lines information. Paper III takes a closer look at the occurrence of room for organizational errors when organizational members use innovation metrics.

RQ2 is related to the use of action research to develop innovation metrics. In Paper I, the state of the art of innovation measurement research field is given and the definitions of innovation measurement are studied. This state of the art is in turn related to the current and future opportunities of action research in innovation measurement. Paper IV gives an understanding of how innovation metrics are developed in using a form of action research, participatory action design research, in an organization.

# How are innovation metrics perceived and used by organizational members involved in innovation in changing strategic context?

The findings of this thesis illustrate that innovation metrics are perceived and used in many ways by organizational members. Innovation metrics intended to be perceived and used on Paper (captured by the official innovation metrics/KPIs) were observed as well as innovation metrics perceived and used in practice by organizational members. In effect, different levels of understanding the phenomenon, innovation metrics, and measurement, as displayed in Figure 1, can be applied to analyze these findings.

Study B uses an interpretative approach to analyze the perceptions and use of innovation metrics by members of the organization. In the frame of reference, it was explained that innovation measurement mainly uses contingency theory to describe and explain metrics in practice (Chenhall, Hall, & Smith, 2013; Chenhall & Moers, 2015; Moll, 2015; Otley, 2016). Thus, innovation metrics have mostly been studied in a functional, normative, and positivistic manner (Birchall et al., 2011; Moll, 2015). In the functional view on innovation metrics and measurement, there is a focus on finding the right and fitting metrics in a strategy-as-planning process (Edmondson and Verdin, 2018). Study B with an interpretative perspective on innovation metrics focuses on how innovation metrics are part of a strategy-as-learning process (Edmondson & Verdin, 2018; Harris & Tayler, 2019; Richtnér et al., 2017). This interpretative approach enables us to analyze what is promised to be measured in innovation and what is delivered and measured in innovation (Mouritsen & Kreiner, 2016). In Study B, it is observed how organizational members understand competing interpretations, prioritize them and incorporate them into their organizational practices (Laine, Korhonen, & Martinsuo, 2016). By observing the perception and use of innovation metrics by organization members at multiple levels of the organization, it is possible to observe that the formal innovation metrics might not give the accounting information necessary to make sense out of the complexity of organizational life (Chapman et al. 1997), and this forces organizational members to use additional informal sources of information, i.e., reading-between-the-lines information. The results in Paper II explores this discrepancy between the innovation metrics designed and used in practice (expected vs. actual use). In the case study reported in Paper II it becomes clear that organizational members perceive and use innovation metrics in many ways. Each individual has his/her interpretation of what innovation is and how it is measured, illustrated by the following quotes:

*Before we start controlling and measuring innovation, we first need to define what we mean by innovation[…]I do not think we have come much further right now in defining innovation and discuss what we mean by innovation in total? What do we mean by innovation in each of our business areas? That is in some way the basis for how we want to measure and control this [innovation] […] innovation can be so many things […]it can be technical innovation, but also logistics […] innovation can be so incredibly difficult.* - Business controller

*Innovation at this company is complex. It is much more complex than where I worked before. From what I have seen up to now it is important for innovation to create products and applications that are going from commodities to high-end specialty productions.* – Senior Innovation Officer

The above excerpts from Paper II illustrate that innovation metrics are interpreted and used in many ways, e.g., here varying with organizational units and function in the organization. In this case, each individual has his/her perception and interpretation of what innovation is and how it should be measured. It seems that innovation metrics established in 2014, in practice in 2017 required reading-between-the-lines information to be understood by organizational members.

Paper I indicates that there are several definitions of innovation in the research field of innovation. Thus agreed-upon definitions and interpretations of innovation are not established among scholars (Davila et al., 2012; Edison et al., 2013). In practice, in Paper II and III, ambiguity on how innovation is defined is reflected in the answers by the organizational members, where it can be seen that innovation can be defined as a "product", "process", "project" or "organization". A way of organizing these diverse perceptions and definitions of innovation can be done by combining the conceptual models presented by Davila et al. (2012) and Edison et al. (2013).

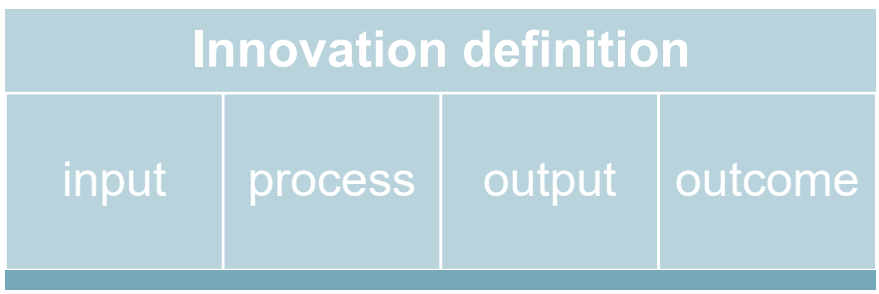


**Figure 11.** Four dimensions of innovation according to Davila et al. (2012) and Edison et al. (2013).

By organizing how each of the organizational members defines and perceives innovation shows that diverse interpretations of the object of measurement "innovation" and the tool for measurement "metric" are possible and how to categorize it. The following passage from Paper II highlights how to several interpretations of innovation:

*Mostly they [innovation staff] work in* ***new innovation projects, new products*** *that they develop. I do not work with this in my project, but this with processes, development projects, and existing products […]. Right now I am working with* ***innovation and new processes*** *and we are trying to duplicate our facilities from one site to another. Three geographical locations are involved in this process. All locations have different prerequisites to test in the lab, so I need to assign it where the capacity is* – Project leader

In this answer, innovation is perceived as "projects", "products" and "processes" by this organizational member. By using the organizing scheme in Figure 11, it can be seen that innovation for this organizational member can be an outcome "new project", but it can also be a "new innovation project" which is classified as innovation as process execution (Davila et al., 2012).

Other organizational members focused more on the input definition of innovation. The following illustrates this:

*I think [innovation is] about taking care of the* ***ideas that exist*** *and ensuring that we can develop and improve things and come up with new things. We need to handle it both in the short term and in the long-term – senior innovation staff*

Top management appears to perceive innovation as output and outcome, as evidenced by the following:

*The definition [of innovation] is to create profitable growth and at the same time be technical support in the relationship with customers. Provide technical support for our production and being involved in investment projects covering the long-term technical parts of investment projects.* – Director business

Both Paper II and III address the consequences of the co-existence of several definitions and perceptions of innovation as a source of "incongruence", and label it "misfit" and "organizational error". According to the literature, there is no ideal definition of innovation, much less a perfect innovation metric, that can capture all of these various conceptions and perspectives of organizational members (Fried, 2017; Fried et al., 2017). The process of finding the "perfect one", representing the perfect innovation metric, or package of innovation metrics, might be ongoing as the definition of innovation is a dynamic one (Busco & Quattrone, 2017), partly in reflection of changing strategic context for the companies, its organizational members and the researchers studying them.

In line with the frame of reference and Paper I, the perceptions of innovation, reported in the case study, seems to have shifted from innovation as a department that develops new products towards innovation including many processes, participants at multiple organizational levels from idea generation to execution, and value capture (Adams et al., 2006; Davila et al., 2012).

As reported in Paper III, several perceptions of innovation may be related, in part, to the occurrence of organizational errors when innovation metrics are used (see Figure 10). Previous literature indicates, that most metrics, such as innovation metrics, are imperfect on some level, and thus should be regarded as flawed proxies (Harris & Tayler, 2019). Innovation and learning in changing strategic context are associated with an increased risk of making errors (Putz, Schilling, Kluge, & Stangenberg, 2013). The interpretation and perception of innovation, innovation measurement, its metrics, and changing strategic context seem to be unique to each organizational member. The following quote from Paper III illustrates this:

*I have worked a few decades for this company, in the innovation department. In the beginning, we just were just a department at one location. Nowadays, innovation is conducted in several departments, locations, and organizational levels in the company.* – Senior innovation consultant

Here, what seems relevant to measure and follow up with innovation metrics, depends on the negotiation (bargaining process) between individual and collective perception (construction) on what is relevant in innovation in changing strategic context (Karlsson, Kurkkio, & Hersinger, 2019; Westelius & Lind, 2020). The label "organizational error" is used in Paper III to make sense of the room in between the "official" innovation metrics designed by participants at strategic levels and the innovation metrics reported by participants at operational levels in the organization. Each organizational member in this process tries to paint a convincing picture of what they perceive as a "relevant" innovation metric in changing strategic context (Westelius & Lind, 2020). Prompted by changing strategic context, Paper III provides insight into the mechanisms behind organizational errors when organizational members use and perceive innovation metrics. In extension to previous understanding of organizational errors(Lei et al., 2016), these mechanisms can be seen as precursors for learning, adaptation and dialogue when organizational members use innovation metrics.

In Paper II, reading-between-the-lines information was identified as a practice utilized by organizational members for the disparity between the innovation metrics designed and used in practice. The findings show that official innovation metrics (KPIs) were used in combination with other supplementing or complementing information from other systems, and not in isolation (Bedford, Malmi, & Sandelin, 2016; Grabner & Moers, 2013). This observation, that reading-between-the-lines information exists can be seen as a contribution to the previous literature that

addresses incompleteness of accounting representations (Davila & Ditillo, 2017; Jordan & Messner, 2012; Wouters & Wilderom, 2008). These incomplete metrics can be viewed as "lagging" performance indicators, however, it seems unclear why companies maintain them (Melnyk et al., 2014). The literature on innovation measurement does explain that metrics fail (Neely & Bourne, 2000; Nudurupati et al., 2011) but it does not explain when innovation metrics are sustained as incomplete representations with reading-between-the-lines information. The observation, that the reading-between-the-lines information exists, therefore, can be considered a contribution to the literature dealing with the interaction between supplementing or complementing systems and innovation metrics (Bedford, 2015; Bedford et al., 2016). It is possible that sustained incomplete innovation metrics supplemented with reading-between-the-lines practices reflect a coping strategy used by organizational members to cope with and adapt to a complex and uncertain strategic innovation context. However, this needs to be studied in future studies.

Paper III documents multiple ontological levels of innovation metrics and measurement (Figure 1). Figure 10 illustrates how multilevel antecedents interact (individual perceptions/use vs. collective perceptions/use, strategic vs. operational) to create conflicting and synergistic interpretations of innovation metrics by organizational members. The room for organizational errors can be facilitated or inhibited by each one of these multilevel antecedents (Lei et al., 2016). To date, research on innovation metrics shows little about the organizational errors associated with these proxies, and their strategic and operational consequences are not often considered (Edmondson & Verdin, 2018; Frese & Keith, 2015; Harris & Tayler, 2019). Paper III provides insights into why the official innovation metrics, even though they were proxies with room for organizational error still were sustained by organizational members. Organizational errors do not necessarily lead to negative organizational consequences (Frese and Keith, 2015, Edmondson and Verdin, 2018). It is the response of the organization and its organizational members that influence whether organizational errors result in undesired or desired organizational outcomes (Lei et al., 2016; Weick, 2012). The room for organizational error can thus create a learning and adaptive opportunity in changing strategic context, essential to positive organizational outcomes in innovation (Goodman et al., 2011, Edmondson and Verdin, 2018, Weick, 2012, Frese and Keith, 2015). Brattström et al. (2018) explain that an innovation metric is not in itself a hindrance or crutch for innovation, but that the way that it is used within the organization (to learn, control, or question, for instance), interpreted (diagnostically or interactively) and understood (as a leading or lagging indicator) will determine the innovation and organization outcome. So, the use, interpretation, and understanding of the innovation metrics as "misfits" and with room for organizational errors is determinant for whether or not processes such as organizational learning takes place. Thus, innovation metrics used in dialogue,

socially(interconnected) and interactively may better enable organizational members to cope with changing strategic context and learn, than those used individually and diagnostically to control (Karlsson et al., 2019; Nilsson, Petri, & Westelius, 2016).

## How can action research be used to study and develop innovation metrics in changing strategic context?

The findings of this thesis describe how action research, more specifically, participatory action design, can be used to study and develop innovation metrics. In conjunction with the case company, this approach was chosen to assure the participation and involvement of different stakeholders to develop innovation metrics. Based on Study A and C, the potential for action research in innovation measurement was explored, researched, and documented. Study A was a systematic literature review on the research field of innovation measurement which was related to action research. Study Cs is a participatory action design study at the case company and documents how innovation metrics can be studied and developed using action research.

Study A, reported in Paper I presents the results of a systematic literature review and relates the developments in the research field to the potential of action research. Study C, reported in Paper IV, zooms into how innovation metrics can be studied and developed using action research. Paper IV describes how innovation metrics are developed using a participatory action design (PAD) and how this has enabled and enlarged the possibilities to study the development process of a new innovation metric in action.

Study A was performed to make an overview of the research field of innovation measurement and the role that action research plays in this field. In Paper I a systematic literature review is used to organize these constructs in innovation measurement (Bisbe et al., 2007; Kerssens-van Drongelen, 1999; Lee, Son, & Lee, 1996; Moll, 2015). The research field of innovation measurement portrays a lack of synthesis and agreement of theoretical constructs of innovation measurement. This lack of synthesis and agreement increases the risk that different operationalizations of the same effect will produce conflicting findings and that theoretical advances become lost in the different terminologies that resist the accumulation of knowledge (Adams et al., 2006; Edison et al., 2013; Haldma et al., 2012; Micheli & Mari, 2014). The challenge in innovation measurement is isolating the theoretical constructs of measurement and innovation and in turn determining causality, modeling, and theorizing of these constructs (Luft & Shields, 2003, 2006). The increasing number of publications and publication outlets on innovation

measurement shows that the research field is expanding making it even more important to have clear conceptualization and systemize research findings.

To date, the state of the art of the research field, as presented in Paper I, shows that innovation metrics are mainly measuring organizational, output, and financial parts of innovation. Paper I confirms the results of Adams et al. (2006) and Edison et al. (2013) The state of the art of the research field shows that innovation metrics are mainly measuring organizational, output, and financial parts of innovation. Financial metrics account for 84 % of all innovation metrics used. A mere 11 % of all innovation metrics target the non-financial part of innovation. As the innovation metrics predominantly can be categorized as financial the future challenges in innovation, such as service innovation, radical and open innovation might stay largely unnoticed (Aas & Pedersen, 2011; Kristiansen & Ritala, 2018). The quantification issues regarding innovation are likely to compound in light of the innovation challenges ahead, that is the more radical, open, and service-orientated innovation will get, due to a changing strategic innovation context, the less quantifiable it might get (Birchall et al., 2011; Frishammar et al., 2018). The findings reported in Paper I confirm the failure of adopting metrics targeting other aspects, such as input, process, group, non-financial aspects, of innovation. Measurement, of these types of innovation, is even more complex because there is no single or main trend to assess the extent of innovation, plus the information regarding the concept is highly subjective and uncertain (Alfaro García, Gil-Lafuente, & Alfaro Calderon, 2015). This mimics the results found in the reluctance of the adoption and diffusion of the Balanced Scorecard in innovation practice (Ax & Bjørnenak, 2005). In part, this might be explained by the embedded nature of the innovation metrics in the financial accounting systems that are in place (Alfaro García et al., 2015; Hartmann, 2000).

Studying innovation measurement with quantitative research methods will not capture the complexity and relationality of innovation measurement and metrics on all levels (Ollila & Yström, 2020). Generally, there are simultaneous development of products, processes, and services involved in innovation activities at various organizational units and functions and more permanent cooperation between research at all organizational levels (Gustavsen, 2005). the findings in Paper I show that only a minority of the metrics in the research field of innovation measurement focuses on the group and individual levels. These individual or teams levels of analysis seem to be neglected by applying solely quantitative methods (Ollila & Yström, 2020). Action research, on the other hand, enables researchers to explore these individual and team levels of analysis, by being involved in the organizational setting (Ollila & Yström, 2020).

Due to the socio-technical complexity and novelty of innovation, innovation management and measurement face a high level of uncertainty (Guertler et al., 2019;

Okwir et al., 2018). Action research (AR) is surprisingly underutilized in innovation management and measurement (Guertler et al., 2019; Ollila & Yström, 2020). This creates a space in which action research can play a prominent role (Ollila & Yström, 2020; Scaratti, Hersted, Vince, & Cunliffe). The flexibility and adaptability of action research make it possible to navigate the complexity in innovation measurement. The interdisciplinary character of action research helps to overcome established discipline structures and silos often present in innovation measurement (Guertler et al., 2019). In Paper I it is shown how AR is specially equipped to navigate innovation measurement as it is adaptable to situations of complexity and change in organizational contexts which are characterized by instability, turbulence, and uncertainty (Scaratti et al., 2017). It is argued that action research enables a continued exploration of current issues in innovation measurement such as new organizing forms, changing managerial and governance structures (Ollila & Yström, 2020). The tools used in action research enable researchers to shift focus from the "right" design in theory to develop metrics that are used in practice (Richtnér et al., 2017; Melnyk et al., 2014; Kirsner, 2015; de Waal and Kourtit, 2013).

As could be seen in the frame of reference, the complexity of contemporary innovation measurement systems implies that multiple stakeholders are involved both in the design and use of an innovation metric (Okwir et al., 2018; Schrage & Kiron, 2018). Paper IV reports on a study to involve multiple stakeholders in the company in the development of innovation metrics. Most development of innovation metrics is done by a selected group of stakeholders, such as only the top management team and/or the management control function. In previous studies, two tools are proposed to involve a selected group of stakeholders in the development of innovation metrics the theory of self-determination and employee participation (Groen et al., 2012, 2017). However, none of these tools seem to facilitate and mediate in developing innovation metrics with several stakeholders. Employee participation in KPIs makes employees more positive about the developed metrics (Groen et al., 2012). Employee participation has many benefits such as; employees will perceive the innovation metric credible resource; and make employees more likely to accept their output and use innovation metrics to improve their work (Groen et al., 2012). Paper IV illustrates that a PAD makes stakeholders more committed to the solution and job contentment and output (Lu, 2011; McIntyre, 2008; Reason & Bradbury, 2008; Swantz, 2008; Wong-On-Wing, Guo, & Lui, 2010). Even though research shows benefits using employee participation, action research is chosen to facilitate and offer a more integrated approach that bridges the gap between ethnography and action-taking or design (Bilandzic & Venable, 2011; Coghlan, 2019).

In the development of innovation metrics, there is an active collaboration between the researcher and the stakeholders (Guertler et al., 2019, 2020; Ollila and Yström, 2020). Action research, here a PAD study, enables the researcher to develop metrics

in innovation involving multiple stakeholders (Bilandzic & Venable, 2011; Scaratti et al., 2017). A distinguishing feature of a PAD study is that the power and control over the process rest with the participants themselves (Chevalier & Buckles, 2019). In a PAD study, a researcher is assigned a "complete" member role (Coghlan, 2019). This complete member role allows the researcher to acquire "understanding in use" rather than "reconstructed understanding" (Coghlan, 2019). An example can be found in Paper IV, where the senior consultant states that

"It [the KPI] is not going to be an exact measure because this is going to be very difficult. We have such complexity behind it. We will spend more time measuring and it's gonna be more expensive than the benefit from the actual information we are getting to follow up".

This quote shows that the PAD study uncovered understanding that an innovation metric is complex, and gives information about the process, the trade-off between exact measure versus the time spent measuring. Here, a PAD study makes it possible to uncover tacit knowledge normally hidden from the researcher and perhaps also from the practitioners themselves. This underlines one of the benefits of using a PAD study in the research of innovation metrics; it enables the researchers to shift focus from understanding the "right" design in theory to understanding construct metrics that are used in practice (Melnyk et al., 2014; Richtnér et al., 2017). Previous understanding of innovation metrics development has focused mainly on the design or implementation of innovation metrics separately, a PAD study on the other hand enables simultaneous development, use, test, and research on innovation metrics (Bourne, Mills, Wilcox, Neely, & Platts, 2000; Brattström et al., 2018; Braz, Scavarda, & Martins, 2011).

Paper IV documents a PAD study for innovation metrics where the facilitation between researchers and stakeholders at the innovation department is central. For researchers, each stage of a PAD study has its challenges. Early in the PAD study process, researchers and stakeholders found it difficult to identify customers in the innovation department which created some confusion. According to the workshop plan, identifying the customers of the innovation department and understanding the problem was considered the starting point of the PAD study process. In practice, Paper IV shows that the stakeholders found neither a shared view of the customer nor an elaborate understanding of the problem. This starting point of the PAD study can be viewed as a messy human situation, where different needs, priorities, and judgments of stakeholders need to be understood, organized, and negotiated (Bilandzic and Venable, 2011).

In a PAD study, different stakeholders in the company at various levels and units, are involved in the development of the innovation metric (McIntyre, 2008; Reason & Bradbury, 2008; Swantz, 2008). Paper IV describes the dynamics between stakeholders at different organizational levels holding different hierarchical ranking,

referred to as interlevel dynamics (Coghlan, 2019: 99). This interlevel dynamics could be seen when the stakeholders described the customer, as it involved several levels of the organization. In the findings reported in Paper IV, it can be seen that the stake of the stakeholders' changes in each part of the development of innovation metrics, e.g. some stakeholders wanted to explain what service the customers received more elaborately than others. The changing stake of employees does not do not seem to have been noticed in previous studies on employee participation (Lu, 2011; Wong-On-Wing et al., 2010). The multidisciplinary and multi-stakeholder nature of a PAD study helps to overcome the established "silos" that often arise when researching and solving innovation measurement problems (Brattström et al., 2018; Guertler et al., 2019). As an example from Paper IV, three stakeholders (innovation personnel, R&D manager, and senior innovation consultant), at three hierarchical levels, decided to collaborate on developing the emerging innovation metric solution, i.e. one point of entry for customer service requests. This illustratres that PAD studies does not only promote dialogue and knowledge sharing, but also promotes collaboration, which shows that the actions and design parts of PAD are performed simultaneously on three levels.

The group dynamics associated with the development of innovation metrics are also uncovered in Paper IV. It could be seen that there was increased collaboration between PAD workshops. The collaboration between innovation personnel, the Sales and Technical Support, and the R&D manager was very limited before the PAD workshops. During and after workshop one, these stakeholders started to take ownership of the problem at hand and collaborate to collect customer information at different locations, emails were sent and separate meetings were planned to speed up the emerging solution. This collaboration on customer service and support was an indicator of a stronger relational platform, which is a competence that can be used in future projects and processes (Coghlan, 2019; Guertler et al., 2019). Hence, PAD studies may create a deeper understanding of group dynamics and their effects on innovation metric development outcomes (Guertler et al., 2019).

In the construction of innovation metrics, there is an information asymmetry between the stakeholders that compose the innovation metric and the ones that will use it to measure and follow up innovation and its performance. Paper IV reports that PAD workshops enable stakeholders to address information asymmetry among stakeholders. An explanation is that the PAD study used in this study allowed for knowledge sharing which dissolves asymmetries by building consensus among the stakeholders (McIntyre, 2008; Reason & Bradbury, 2008; Swantz, 2008). In a PAD workshop, stakeholders interpret the forces for change and form their subsequent judgment as to what choices they have, which is an important political dynamics (Coghlan, 2019: 80). The suggested solution was collectively found and committed to by all the stakeholders. In employee participation, on the other hand, a common understanding of the issue and solution is not part of the process (Groen et al., 2017;

Lu, 2011; Wong-On-Wing et al., 2010). Another benefit that the use of PAD studies provides is that bottom-up information can be obtained from all stakeholders during and between the PAD processes. In a functional top-down process, this bottom-up information usually is not acquired. This benefit is similar to the one associated with employee participation (Groen et al., 2017; Lu, 2011; Wong-On-Wing et al., 2010).

The development of innovation metrics are known to be a challenging task, far too often the design and implementation of an innovation metric fails and the innovation metrics do not meet the expectations (Bourne, Neely, Mills, & Platts, 2003; Neely & Bourne, 2000; Stormi, Laine, & Korhonen, 2019). The lessons learned from using a PAD study can be related to how the researcher has handled its related challenges. In the development of innovation metrics, three types of challenges occurred; challenges related to the PAD process, the role of the researcher, and the outcome of the PAD process.

One of these challenges relates to the PAD process that involves the combining and bridging of the gaps between ethnography, participative involvement, and empowerment of the stakeholders of concern, action-taking (solving the problem), and design-orientation (Bilandzic & Venable, 2011). Insights regarding these challenges concerned that there existed, a different perception in the need for development (change) of the existing innovation metrics, there could have existed different judgments about urgency and scope, a lack of deep commitment and ambivalence arising from conversations (Coghlan, 2019; Pasmore, 2011). This combining and bridging put specific demands on how a researcher handles preunderstanding, role duality, and organizational politics (Coghlan, 2019). “Pre-understanding” is the prior knowledge an action researcher has about the studied organization (Coughlan & Coghlan, 2002; Kumar, 2013). “Role duality” means the researcher has to constantly juggle between being a researcher and a participant which may call for mutually conflicting behavior (Kumar, 2013). Similarly, a researcher has to constantly balance “organizational politics” with the research objectives (Coughlan & Coghlan, 2002; Kumar, 2013).

The second challenge is related to the PAD process. Ollila and Yström (2020) identify a clear challenge in this between the reflective and progressive research part in a PAD process. This reflective part of the PAD process includes knowledge generation, pending between inquiry and action, and should take time to strengthen the authenticity of the process (Coghlan, 2019). Paper IV reports that the reflective part of this research was subordinate to the progressive part of the research process. Other explanations can be related to a lack of authentic participation and alignment and commitment across the various levels of leadership (Coghlan, 2019; Pasmore, 2011). Here Coghlan (2019) proposes a quest for authenticity, that is: to struggle to engage in being attentive, intelligent, reasonable, and responsible in confronting the challenges of preunderstanding, role duality, and organizational politics.

Another challenge is related to the role of the researcher in a PAD study. In a PAD study, there is a close cooperative relationship between researchers and practitioners (McNiff, 2013; Postholm & Skrøvset, 2013). This type of relationship can blur boundaries between the traditional roles of researchers and the researched (Arieli, Friedman, & Agbaria, 2009; Snoeren, Niessen, & Abma, 2012). While close cooperation between a researcher and a practitioner can be challenging for the researcher, it also creates possibilities and provides rich insights (Ollila & Yström, 2020; Postholm & Skrøvset, 2013). However, without clarity about the researcher or facilitators' role, a PAD study can create a participation paradox, like a lack of authentic participation, alignment, and commitment across the various levels of leadership (Arieli et al., 2009; Coghlan, 2019). There are a lot of causes for a participation paradox, some of these causes can be related to the location for practitioners or the prerequisites for practitioners (Eady, Drew, & Smith, 2015). The emotional, social, and intellectual capabilities of the researcher accompanied by clarity of the role of the researcher is thus essential but challenging (Postholm & Skrøvset, 2013).

Lastly, there is a challenge is related to the outcome of the PAD study. The challenge with the PAD study outcome can be explained by the difference between the reflective and progressive research part in a PAD process, as elaborated on before. The time and political pressure to deliver a result, the progressive part of the PAD study, could sometimes force stakeholders into the ladder of interference (Coghlan, 2019: 31). Naturally, the research outcome of a PAD study is, to a large extent, dependent on the researcher's competence, skills, and understanding of the approach requirements (Ollila & Yström, 2020). As the switch from knowledge generation (inquiry) to using problem-solving skills (action) is unpredictable and random in the PAD process. The action researcher must have organization and management consultancy skills, which comprise the action research toolbox, alongside research method skills (Eden & Huxham, 1996; Huxham & Vangen, 2003; Ollila & Yström, 2020).

The contribution of each one of the stakeholders in the PAD process can be seen as a strategy-as-learning process, instead of a strategy-as-planning process (Edmondson and Verdin, 2018). In addition, using a PAD study for innovation metrics enables multiple stakeholders to review, update and reflect on the innovation metrics in place, without taking a green-field approach (Braz et al., 2011; Lohman, Fortuin, & Wouters, 2004; Nilsson et al., 2016; Westelius & Lind, 2020). The importance of innovation metrics as learning tools has been mentioned, but often not considered, in developing innovation metrics (Davila et al., 2012). Participatory action design studies for innovation metrics are thus a unique means to connect knowing, learning, and changing involving multiple stakeholders (Scaratti et al., 2017). Paper IV shows that researchers and practitioners, in a PAD study facilitate the inquire from the inside, and therewith uncovers not only explicit

knowledge of managing and organizing innovation in collaborative contexts but also tacit knowledge that is embedded in the skills, practices, ideas, and experiences of people (Ollila and Yström, 2020). A participatory action design is thus a way to encourage more conversational and aspirational innovation metrics instead of diagnostic innovation metrics (Brattström et al., 2018; Davila et al., 2012).

*To sum up, the findings in this introductory essay have described and explained how innovation metrics are perceived and used (in practice) by organizational members involved in innovation. From a more interpretative perspective, an understanding is given of how innovation metrics are perceived and used. It showed a discrepancy between how innovation metrics are intended to be perceived and used (captured by the "official innovation metrics/KPIs) differs from how innovation metrics are perceived and used in practice. The understanding presented in this essay demonstrates that innovation metrics are used in conjunction with reading-between-the-lines information and related to the incompleteness of accounting information and the use of complementary and supplementary systems. To further explain this phenomenon this thesis has zoomed into the existence of room for organizational error in innovation metrics. This introductory essay furthermore has described and showed how action research can be used to study and develop innovation metrics. The involvement of the stakeholders using a PAD in developing innovation metrics allows for a unique way to navigate this process. This PAD approach, as part of action research, enables the researcher and multiple stakeholders to not only be engaged and involved but also co-construct an innovation metric.*

# Research contributions and implications

*This chapter gives the research implications and limitations of this research, followed by its empirical and methodological implications. Lastly, recommendations for future research are given, these are based on the findings and contributions of the research presented in this dissertation.*

## Research implications

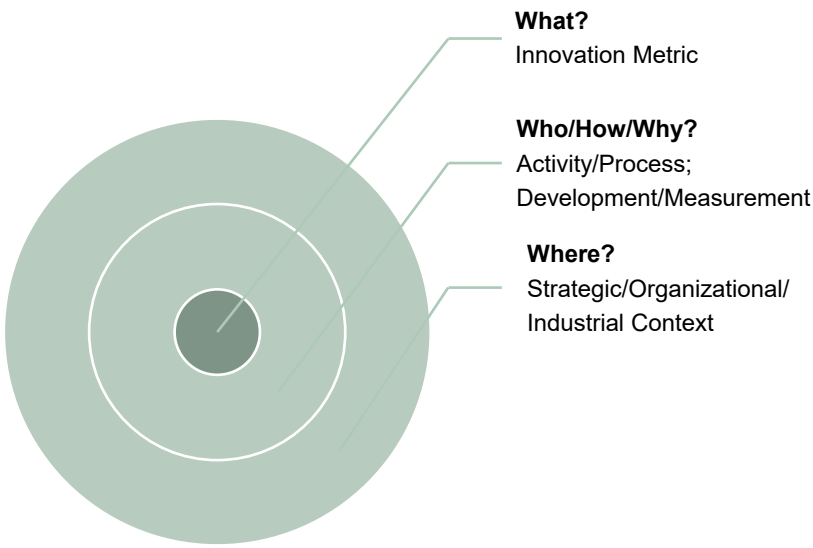


**Figure 1** Levels of understanding of innovation metrics and measurement

This thesis has several implications for research on innovation metrics and measurement and has added new knowledge on several ontological levels (see Figure 1). The added knowledge and understanding here can be seen as a theoretical and conceptual contribution to the existing body of knowledge on innovation metrics and measurement. Different research perspectives and theoretical frameworks have been combined here to understand innovation metrics as a dynamic phenomenon, as explained earlier (Näslund et al., 2010). Based on the analysis, of each level and the dynamics, it is described how innovation metrics are perceived, used, and developed by organizational members involved in innovation and what role each of these stakeholders plays in it. In the beginning, it is shown "what" innovation metrics are used and developed. In the research field, innovation metrics were found that were organizational, financial, and output-oriented (see Paper I). Relating these to "what" innovation metrics in Paper II and III, show that innovation metrics in practice, are perceived and (mis)interpreted differently, where reading-between-the-lines information and organizational errors could be observed on multiple levels. Here, the second level of understanding starts to become apparent, the "who/how/why" level. Innovation metrics, in a process of innovation measurement, are perceived and interpreted by a "who", the organizational members involved in innovation. "How" innovation metrics measure innovation, is captured in this level, from the point of view of each organization member. Innovation measurement, on this level, involves the "what", the innovation metric, as well as the "who/how/why" level combined, uncovering as a dynamic. In addition, the reason "why" innovation metrics are used and developed is analyzed. This level of understanding (re)presents why innovation metrics and measurement can be associated with reading-between-the-lines information and organizational errors. Finally, the context, the strategic context of innovation, represents a layer of understanding. Again, the interaction with this level and the previous levels gives a unique view of innovation metrics and measurement.

In this introductory essay, a knowledge foundation is established through a literature review in Paper I (on innovation measurement and action research) and frame of reference in this essay. In relation to earlier studies Edison et al. (2013) and Adams et al. (2006), in part confirms earlier findings and extends areas of research on innovation metrics and measurement. Recent contributions by Brattström et al. (2018); Frishammar, Richtnér, Brattström, Magnusson, and Björk (2019) indicate that the findings in the research field have provided a representative overview of the research field of innovation metrics and measurement [1]. Furthermore, this research shows the importance of challenging the assumptions of the research field of innovation measurement (Alvesson & Sandberg, 2014b). The complementary role of action research is suggested to question the established research, where

[1] The author has been mentioned as a source of valuable research input in a recent research project (see foreword – Frishammar et al 2019)

innovation measurement has mostly been studied from a strategic, top-level, green-field approach (Goshu & Kitaw, 2017; Lohman et al., 2004). This strategic, top-level, green-field approach does not take into consideration all ontological levels of innovation metrics as explained in Figure 1. This dissertation shows that more pragmatic stances, such as action research and design research, are fruitful research avenues to develop theory and practice and be an engaged scholar (Avison, Davison, & Malaurent, 2018; Goldkuhl, 2012; Ollila & Yström, 2020). This research implies that by adding layers of understanding of innovation measurement and metrics in analyzing and implementing systems, tools, and practices together with practitioners in action research, the gap between academic perception and practical reality regarding how organizations should measure innovation may be bridged (Naslund & Norrman, 2019). It shifts the focus from the design of metrics to the actual use of metrics in innovation (Bititci et al., 2018; Bourne et al., 2018).

Suffice to mention, the value of the systematic literature review conducted in 2014 (Paper 1) has weakened due to the rapid advancement of technology and its subsequent diffusion in industry. However, a recent search and publications in the research field reveal that the results in Paper I still are valid and representative of the current developments in the research field (Haar, 2018; Melendez, Dávila, & Melgar, 2019). In previous reviews e.g. Edison et al. (2013); Saunila (2017); Munir, Wnuk, and Runeson (2016) no specific attention has been paid to the research methods used in the research field. In contrast to using contingency and functional theory to study innovation measurement and metrics (Chenhall & Moers, 2015; Otley, 2016), this thesis adds a more interpretative approach to the subject and phenomenon at hand (Birchall et al., 2011; Moll, 2015; Mouritsen & Kreiner, 2016). This can be seen as a more bottom-up approach to innovation metrics focusing on the symbolic and interpretative value of innovation metrics, where an innovation metric is seen as an "accounting inscription" (in Paper II) (Busco & Quattrone, 2018; Hopwood, 1972). By capturing perceptions of innovation metrics by organizational members in changing strategic context, this essay and Paper II and III represent a paradigmatic change in studying innovation metrics towards more interpretative research (Näslund et al., 2010).

Another research implication is related to the changing strategic context. Understanding what innovation is, how it is measured, perceived to be measured, and followed up and what role changing strategic context plays in it, has been highlighted in this research. Paper I illustrate that the influence of the changing strategic context is rarely mentioned in the existing knowledge base of the research field. Furthermore, a linear causality is assumed between innovation, its metrics and measurement, and the changing strategic context (Gericke & Blessing, 2012). In line with other researchers, this implies that the assumptions on what is relevant in innovation are, who is responsible for it, how is it perceived by organizational members, and what it takes to align these views is better captured by dynamic and

emergent/fluid views on "relevant" organizations (Westelius & Lind, 2020: 31). The mechanisms that are triggered in changing strategic context such as complexity and interdependence, are grasped in Paper II, by the phenomenon "reading-between-the-lines", and in Paper III, "organizational errors".

The phenomenon of reading-between-the-lines information (Paper II) highlights that innovation metrics when used in changing strategic context, are not stand-alone metrics as usually is assumed in strategic, top-level, green-field approaches (Goshu & Kitaw, 2017; Lohman et al., 2004). Previous literature seems to explain why metrics fail, not why innovation metrics are sustained as incomplete accounting representations with reading-between-the-lines information (Bourne et al., 2000; Bourne, Neely, Mills, & Platts, 1999; Neely & Bourne, 2000). Therefore, this research adds to previous literature on the incompleteness of accounting representations and the literature dealing with the interaction between supplementing or complementing systems and innovation metrics (Bedford, 2015; Bedford et al., 2016; Davila & Ditillo, 2017; Jordan & Messner, 2012; Wouters & Wilderom, 2008). Sustained incomplete innovation metrics supplemented with reading-between-the-lines explored in this dissertation might be a coping strategy used by organizational members to adapt to a complex and uncertain strategic innovation context. The use, interpretation, and understanding of innovation metrics with reading-between-the-lines information by organizational members, could be seen as part of the coordination and conversational approach (Brattström et al., 2018). This approach implies that researchers should pay attention to not only the choice of innovation metrics (directional, mixed, or conversational) but also how these metrics are matched with the existing management control systems, as integrated not stand-alone metrics (Brattström et al., 2018).

The phenomenon of organizational errors when using metrics, and specifically, innovation metrics, illustrates the aspects of what is "right" and "wrong" in the use of innovation metrics in changing strategic context. As a first, this dissertation proposes learning and organizational errors at the heart of the interaction between strategy, structure, and metrics which is a novel way of analyzing the effect and side-effect of innovation metrics in use at multiple organizational levels (Goodman et al., 2011). To consider organizational errors associated with innovation metrics in actual use and their strategic and operational consequences could be a key to understanding the functional and dysfunctional effects of innovation metrics (Edmondson & Verdin, 2018; Frese & Keith, 2015; Harris & Tayler, 2019). In future research, it could therefore be suggested to see innovation metrics in the light of organizational error, learning, and resilience – in between control and creativity (Lei et al., 2016; Lövstål & Jontoft, 2017).

Finally, the use of action research in Paper I and IV can be seen as a theoretical contribution, as well as a methodological one, and has implications for current research and future research. Introducing action research as a theoretical lens in

innovation measurement enables conceptually to take into account the complexity and non-linearity of innovation on several organizational levels (Coghlan, 2019; Gustavsen, 2005). Action research, and more specifically, PAD, facilitates that more stakeholders and ecological systems are involved in the framework of value (co-) creation, innovation, and innovation metrics (Yang & Sung, 2016). The PAD study enables simultaneous participation and action of multiple stakeholders in the development of innovation metrics (Bilandzic & Venable, 2011; Braz et al., 2011). The research implications of using PAD study in innovation measurement are that researchers and multiple stakeholders collaboratively construct both theory and practice (Coghlan, 2019), however, certain conditions should be met, as highlighted in Paper IV. In the future, the context and concept of innovation are likely to include primarily intangible and unmeasurable parts, implying that when studying innovation metrics these need to be captured. Here, action research can be a way of capturing these intangible and unmeasurable parts in layers of understanding of innovation metrics and contributing to methodological diversity(Elsahn et al., 2020).

# Practical implications

As in related fields, in innovation measurement, there is a gap between academic perception and practical reality when it comes to innovation metrics (Naslund & Norrman, 2019). Over the years, academic authors have provided several models and frameworks on how to measure innovation and what metrics to use (Adams et al., 2006; Davila et al., 2012; Edison et al., 2013; Richtnér et al., 2017). Yet, the empirical evidence of their applications is often less well described (Naslund & Norrman, 2019). This research gives a practical understanding of how innovation metrics are perceived, used, and developed by organizational members. This understanding can be used in innovation management, project management, operational management, or other related professions (Brattström et al., 2018). This research can give practitioners insight into the developments in the field of innovation measurement as well as in how to use and develop innovation metrics. For these practitioners, the complexity of innovation, the cost of innovation metrics, and the balance between creativity and control should be part of their agenda (Henri & Wouters, 2019; Henri & Wouters, 2017).

An important practical implication of this research is that designing and implementing innovation metrics is influenced by how innovation is defined and perceived by organizational members. The interpretation of the metrics, as (accounting) inscriptions, by not only organizational members but also other stakeholders (sometimes unknown stakeholders), is an implication that deserves

attention (Westelius & Lind, 2020). Practitioners should be aware that innovation metrics, seen as accounting facts, are human creations and socially constructed (Karlsson et al., 2019; Nørreklit, Nørreklit, & Mitchell, 2010). When multiple stakeholders are involved in the use and development of innovation metrics, these processes of use and development should be viewed as a social process. Here, the individual efforts to create construct causalities that are interconnected have to be aligned into a complex set of functioning construct causalities (Karlsson et al., 2019). Going back to Figure 1, practitioners could benefit from understanding innovation metrics and measurement on the 1) what, 2) how/who/why, and 3) where level.

Other implications can be connected to 1) the dynamic and complex nature of changing strategic context, which will necessitate a design, use, update, and implementation of innovation metrics with care, (2) the incompleteness of innovation metrics and the associated organizational errors and reading-between-the-lines information which practitioners should be aware of (3) action research ( participatory action design) which can facilitate practitioners in the development of innovation metrics with stakeholders inside and outside the "relevant" innovation organization under certain condition (Westelius & Lind, 2020).

Moreover, it will assist managers in developing ideas to handle reading-between-the-lines information and the occurrence of organizational errors in the use of innovation metrics. The findings in this dissertation can make practitioners reflect on how the innovation metrics facilitate learning while executing the planned strategy. Innovation metrics should thus not be regarded as static instruments but dynamic and contemporary tools for an innovation orchestrator (Börjesson & Elmquist, 2011). Innovation measurement and the use of innovation metrics require the continuous task of fine-tuning the "control" panel for innovation by practitioners in organizations.

# Methodological implications

This dissertation has a few methodological implications. The problems and issues in innovation measurement can be understood differently by applying two types of qualitative research. This thesis combines both finding an *explanation* of the why, as well as an *understanding* of the how and mixes different types of qualitative research (Stake, 2000). Qualitative methods gave the researcher the ability to zoom into specific issues in innovation measurement. The methodological lenses chosen in this research were exploratory and explanatory case studies and participatory action design. Thus, the methodological implications of this dissertation have been a unique combining and mixing of different methodologies across different research

fields providing insight into an undertheorized intersectional field such as innovation measurement. This will enable us to uncover the complexity of the undertheorized fields that are studied, by using the zoom-in and zoom-out functions of methodological lenses, in this dissertation case study techniques are complemented by action research. This diversity of methodological lenses chosen in this study are a way to cultivate methodological diversity (Bansal & Corley, 2011; Bansal et al., 2018; Elsahn et al., 2020).

# Limitations and suggestions for further research

This dissertation has aimed to increase the theoretical and practical understanding of innovation measurement and metrics in changing strategic context and thereby augment the possibilities for improved practices and performance in organizations. This research question is quite broad. To tackle such a broad research question two qualitative methods were used. Further research and different combinations of research methods would be recommended avenues of research.

One limitation of this dissertation can be connected to the data collection method of this thesis. Each of the data collection methods asked for a specific skill set, e.g. a systematic literature review, case study, or participatory action design, requires skills to collect, process, and triangulate the data correctly. The combination of research methods also requires specific skill sets. To mitigate this limitation the researcher has exposed herself to continual feedback from academic networks and conferences, colleagues, and supervisors.

Another limitation is the research material used in the systematic literature review of this study. Even though it seems outdated, covering the period until 2012, recent snowball searches show that the sample still is representative of the recent developments of the research field “innovation measurement”. Curation techniques like forward snowballing were used to keep the data in the literature review current(Felizardo, Mendes, Kalinowski, Souza, & Vijaykumar, 2016; Mendes, Wohlin, Felizardo, & Kalinowski, 2020; Wohlin, 2016).

Part of this thesis is based on a case study and a participatory action design study that has been conducted in a single company. This raises concerns with sample size and how representable or generalizable the findings of the sample are. The findings of these studies, Study B and C, are limited in their generalizability but could be transferrable. Future studies could thus focus on transferring the findings to other contexts, business sectors, and types of firms. This would enrich and elaborate Study B and C in specific.

The field of innovation measurement is still growing and maturing, thus creating numerous opportunities for future research. First, researchers could further investigate innovation measurement as a research and practice field. The influence of performance measurement and innovation management on the intersectional field of innovation measurement could also be a fruitful avenue of further research. In innovation measurement, practice drives theoretical development, however, these developments over the years have not been in focus (Bourne et al., 2018; Dodgson et al., 2014). The multidisciplinary nature of the innovation measurement field suggests that researchers from different disciplines bring their theoretical lenses, however, can hinder further theory-building (Bititci et al., 2018: 655). Additional research and theorizing in the research field of innovation measurement would be beneficial. To contrast functional theory in the research field of innovation measurement, the researcher would encourage and welcome contributions from an interpretative perspective and apply methodologies such as action research.

Future research opportunities lie also in the innovation metrics in place and use (Bourne et al., 2018: 2011; Richtnér et al., 2017). Recent studies address the issue of how to keep (innovation) measurement systems up to date and there is a need to develop theory around the continuing use and emergent development of these systems (Braz et al., 2011; Franco-Santos et al., 2012). The presence of existing metrics and parallel innovation measurement initiatives may quite fundamentally change the development from a "design approach" to a "coordination approach" or "orchestration approach" focused on aligning innovation measurement with existing performance measures and parallel initiatives outside the innovation function (Börjesson & Elmquist, 2011).

There is a need to develop theory and more empirical studies on the incompleteness of accounting information (Busco & Quattrone, 2017; Jordan & Messner, 2012). The findings of this dissertation identified reading-between-the-lines information when innovation metrics are in use. This raises an array of research opportunities related to the use of supplementary or complementary information in innovation measurement (Rowe, Shields, & Birnberg, 2012) and how innovation metrics are interpreted, perceived, and translated by organizational members (Mouritsen, Hansen, & Hansen, 2009; Mouritsen & Kreiner, 2016).

An avenue for future research could be to see whether or not the room for organizational error creates a learning and adaptive opportunity. Following Brattström et al. (2018) an innovation metric in itself does not need to be a hindrance or crutch for innovation. How innovation metrics are used within the organization (to learn, control, or question, for instance), interpreted (diagnostically or interactively), and understood (as a leading or lagging indicator), will determine the functioning or dysfunctioning of innovation metrics. In the future, the use, interpretation, and understanding of the innovation metrics as "misfits" and with

room for organizational errors could be studied further and related to whether or not processes such as organizational learning takes place.

The broader aspects of organizational errors in innovation measurement could also be addressed in future research (Goodman et al., 2011). The risks and opportunities of organizational errors associated with using innovation metrics should be further elaborated and enriched (Harris & Tayler, 2019; Lei et al., 2016). Here, researchers could look at processes connected to individual and organizational error, failure, and error management in concurrence with innovation metrics.

More action research, field experiments, and studies for stakeholders' involvement in developing innovation metrics are necessary, as has been suggested in related fields (Alfaro-Tanco et al., 2021). Further theorizing is necessary to understand how the involvement of stakeholders affects the embeddedness of innovation metrics within the organization as a whole (Lawton, McKevitt, & Millar, 2000; Yang & Sung, 2016). These studies could complement the recent studies on employee participation and self-determination (Groen et al., 2012, 2017).

*“You may get to the very top of the ladder, and then find it has not been leaning against the right wall.”—Allen Raine.*

*Whenever there is fear, you will get wrong figures.- W. Edwards Deming*

# References


Aas, T. H., & Pedersen, P. E. 2011. The impact of service innovation on firm-level financial performance. ***The Service Industries Journal***, 31(13): 2071-2090.

Adams, R., Bessant, J., & Phelps, R. 2006. Innovation management measurement: A review. ***International Journal of Management Reviews***, 8(1): 21-47.

Adler, P. S., & Borys, B. 1996. Two types of bureaucracy: Enabling and coercive. ***Administrative science quarterly***: 61-89.

Ahrens, T., & Chapman, C. S. 2006. Doing qualitative field research in management accounting: Positioning data to contribute to theory. ***Accounting, Organizations and Society***, 31(8): 819-841.

Alawattage, C., & Wickramasinghe, D. 2012. ***Management accounting change: approaches and perspectives***: Routledge.

Alfaro-Tanco, J. A., Avella, L., Moscoso, P., & Näslund, D. 2021. An Evaluation Framework for the Dual Contribution of Action Research: Opportunities and Challenges in the Field of Operations Management. ***International Journal of Qualitative Methods***, 20: 16094069211017636.

Alfaro García, V. G., Gil-Lafuente, A. M., & Alfaro Calderon, G. 2015. A fuzzy logic approach towards innovation measurement. ***Global Journal of Business Research***, 9(3): 53-71.

Alvesson, M. 2003. Beyond neopositivists, romantics, and localists: A reflexive approach to interviews in organizational research. ***Academy of management review***, 28(1): 13-33.

Alvesson, M. 2010. ***Interpreting interviews***: Sage.

Alvesson, M., & Sandberg, J. 2011. Generating research questions through problematization. ***Academy of management review***, 36(2): 247-271.

Alvesson, M., & Sandberg, J. 2014a. Habitat and habitus: Boxed-in versus box-breaking research. ***Organization Studies***, 35(7): 967-987.

Alvesson, M., & Sandberg, J. 2014b. Problematization meets mystery creation: generating new ideas and findings through assumption challenging research. ***Critical management research: Reflections from the field***: 23-41.

Arias Aranda, D., & Molina-Fernández, L. M. 2002. Determinants of innovation through a knowledge-based theory lens. ***Industrial Management & Data Systems***, 102(5): 289-296.

Arieli, D., Friedman, V. J., & Agbaria, K. 2009. The paradox of participation in action research. ***Action research***, 7(3): 263-290.

Auguste, B. G., Harmon, E. P., & Pandit, V. 2006. The right service strategies for product companies. ***McKinsey Quarterly***, 1: 40.

Avison, D. E., Davison, R. M., & Malaurent, J. 2018. Information systems action research: Debunking myths and overcoming barriers. ***Information & Management***, 55(2): 177-187.

Ax, C., & Bjørnenak, T. 2005. Bundling and diffusion of management accounting innovations—the case of the balanced scorecard in Sweden. ***Management Accounting Research***, 16(1): 1-20.

Bansal, P., & Corley, K. 2011. The coming of age for qualitative research: Embracing the diversity of qualitative methods: Academy of Management Briarcliff Manor, NY.

Bansal, P., Smith, W. K., & Vaara, E. 2018. New ways of seeing through qualitative research: Academy of Management Briarcliff Manor, NY.

Baregheh, A., Rowley, J., & Sambrook, S. 2009. Towards a multidisciplinary definition of innovation. ***Management decision***, 47(8): 1323-1339.

Barros, R. S., & da Costa, A. M. D. S. 2019. Bridging management control systems and innovation. ***Qualitative Research in Accounting & Management***.

Bedford, D. S. 2015. Management control systems across different modes of innovation: Implications for firm performance. ***Management Accounting Research***, 28: 12-30.

Bedford, D. S., Malmi, T., & Sandelin, M. 2016. Management control effectiveness and strategy: An empirical analysis of packages and systems. ***Accounting, Organizations and Society***, 51: 12-28.

Bilandzic, M., & Venable, J. 2011. Towards participatory action design research: adapting action research and design science research methods for urban informatics. ***Journal of Community Informatics***, 7(3).

Birchall, D., Chanaron, J.-J., Tovstiga, G., & Hillenbrand, C. 2011. Innovation performance measurement: current practices, issues and management challenges. ***International Journal of Technology Management***, 56(1): 1-20.

Bisbe, J., Batista-Foguet, J.-M., & Chenhall, R. 2007. Defining management accounting constructs: A methodological note on the risks of conceptual misspecification. ***Accounting, organizations and society***, 32(7): 789-820.

Bititci, U., Garengo, P., Dörfler, V., & Nudurupati, S. 2012. Performance Measurement: Challenges for Tomorrow*. ***International Journal of Management Reviews***, 14(3): 305-327.

Bititci, U. S., Bourne, M., Cross, J. A., Nudurupati, S. S., & Sang, K. 2018. Towards a theoretical foundation for performance measurement and management. ***International Journal of Management Reviews***, 20(3): 653-660.

Bititci, U. S., Garengo, P., Ates, A., & Nudurupati, S. S. 2015. Value of maturity models in performance measurement. ***International journal of production research***, 53(10): 3062-3085.

Blichfeldt, B. S., & Andersen, J. R. 2006. Creating a wider audience for action research: Learning from case-study research. ***Journal of Research Practice***, 2(1): D2-D2.

Bloomberg, L. D., & Volpe, M. 2018. ***Completing your qualitative dissertation: A road map from beginning to end***. CA: Sage.

Bornemark, J. 2018. ***Det omätbaras renässans: En uppgörelse med pedanternas världsherravälde***: Volante.

Bourne, M., Franco-Santos, M., Micheli, P., & Pavlov, A. 2017. Performance measurement and management: a system of systems perspective. ***International Journal of Production Research***: 1-12.

Bourne, M., Melnyk, S., & Bititci, U. S. 2018. Performance measurement and management: theory and practice. ***International Journal of Operations & Production Management***, 28: 2010–2021.

Bourne, M., Melnyk, S. A., Bititci, U., Platts, K., & Andersen, B. 2014. Emerging issues in performance measurement. ***Management Accounting Research***, 2(25): 117-118.

Bourne, M., Mills, J., Wilcox, M., Neely, A., & Platts, K. 2000. Designing, implementing and updating performance measurement systems. ***International journal of operations & production management***, 20(7): 754-771.

Bourne, M., Neely, A., Mills, J., & Platts, K. 1999. ***Performance measurement system implementation: an investigation of failures***. Paper presented at the Managing Operations Networks: 6th International EuroMA Conference.

Bourne, M., Neely, A., Mills, J., & Platts, K. 2003. Implementing performance measurement systems: a literature review. ***International Journal of Business Performance Management***, 5(1): 1-24.

Bradbury, H. 2015. Introduction: How to situate and define action research. ***The SAGE handbook of action research. London: Sage***: 1-9.

Brattström, A., Frishammar, J., Richtnér, A., & Pflueger, D. 2018. Can innovation be measured? A framework of how measurement of innovation engages attention in firms. ***Journal of Engineering and Technology Management***.

Brattström, A., Frishammar, J., Richtnér, A. D., Bjork, J., & Magnusson, M. 2016. ***Boxing-In and Box-Breaking of Attention: a Process Model of Innovation Measurement***. Paper presented at the Academy of Management Proceedings.

Braz, R. G. F., Scavarda, L. F., & Martins, R. A. 2011. Reviewing and improving performance measurement systems: An action research. ***International Journal of Production Economics***, 133(2): 751-760.

Brem, A., & Viardot, E. 2013. ***Evolution of innovation management: trends in an international context***: Springer.

Brickley, J. A., Smith, C. W., Zimmerman, J. L., Zhang, Z., & Wang, C. 2004. ***Managerial economics and organizational architecture***: McGraw-Hill/Irwin Boston et. al.

Brinkmann, S., & Kvale, S. 2015. Conducting an interview. ***Interviews. Learning the craft of qualitative research Interviewing***: 149-166.

Bromwich, M., & Scapens, R. W. 2016. Management accounting research: 25 years on. ***Management Accounting Research***, 31: 1-9.

Brydon-Miller, M., Greenwood, D., & Maguire, P. 2003. Why action research?: Sage Publications.

Bryman, A., & Bell, E. 2015. ***Business research methods***: Oxford University Press, USA.

Burchell, S., Clubb, C., Hopwood, A., Hughes, J., & Nahapiet, J. 1980. The roles of accounting in organizations and society. ***Accounting, organizations and society***, 5(1): 5-27.

Busco, C., & Quattrone, P. 2017. In Search of the "Perfect One": How accounting as a maieutic machine sustains inventions through generative 'in-tensions'. ***Management Accounting Research***.

Busco, C., & Quattrone, P. 2018. Performing business and social innovation through accounting inscriptions: An introduction. ***Accounting, Organizations and Society***, 67: 15-19.

Börjesson, S., & Elmquist, M. 2011. Developing innovation capabilities: a longitudinal study of a project at Volvo Cars. ***Creativity and Innovation Management***, 20(3): 171-184.

Carayannis, E. G., Goletsis, Y., & Grigoroudis, E. 2018. Composite innovation metrics: MCDA and the Quadruple Innovation Helix framework. ***Technological Forecasting and Social Change***, 131: 4-17.

Chenhall, R. H. 2009. Theorizing Contingencies in Management Control Systems Research. ***Handbook of Management Accounting Research Volume***, 3: 163.

Chenhall, R. H., Hall, M., & Smith, D. 2013. Performance measurement, modes of evaluation and the development of compromising accounts. ***Accounting, Organizations and Society***, 38(4): 268-287.

Chenhall, R. H., & Langfield-Smith, K. 2007. Multiple perspectives of performance measures. ***European Management Journal***, 25(4): 266-282.

Chenhall, R. H., & Moers, F. 2015. The role of innovation in the evolution of management accounting and its integration into management control. ***Accounting, Organizations and Society***, 47: 1-13.

Chevalier, J. M., & Buckles, D. J. 2019. ***Participatory action research: Theory and methods for engaged inquiry***: Routledge.

Christensen, C. M., Kaufman, S. P., & Shih, W. C. 2010. ***Innovation killers: how financial tools destroy your capacity to do new things***: Harvard Business Review Press.

Clark, V. L. P., & Ivankova, N. V. 2015. ***Mixed methods research: A guide to the field***: Sage publications.

Coghlan, D. 2019. ***Doing action research in your own organization***: SAGE Publications Limited.

Cooper, R. G., & Kleinschmidt, E. J. 1995. Benchmarking the firm's critical success factors in new product development. ***Journal of product innovation management***, 12(5): 374-391.

Coughlan, P., & Coghlan, D. 2002. Action research for operations management. ***International journal of operations & production management***, 22(2): 220-240.

Creswell, J. W., & Creswell, J. D. 2017. ***Research design: Qualitative, quantitative, and mixed methods approaches***: Sage publications.

Crossan, M. M., & Apaydin, M. 2010. A multi-dimensional framework of organizational innovation: A systematic review of the literature. ***Journal of management studies***, 47(6): 1154-1191.

Daiberl, C. F., Oks, S. J., Roth, A., Möslein, K. M., & Alter, S. 2019. Design principles for establishing a multi-sided open innovation platform: lessons learned from an action research study in the medical technology industry. ***Electronic Markets***, 29(4): 711-728.

Damanpour, F., & Wischnevsky, J. D. 2006. Research on innovation in organizations: Distinguishing innovation-generating from innovation-adopting organizations. ***Journal of engineering and technology management***, 23(4): 269-291.

Davila, A. 2012. New trends in performance measurement and management control, ***Performance Measurement and Management Control: Global Issues***: 65-87. Bingley: Emerald Group Publishing Limited.

Davila, A., & Ditillo, A. 2017. Management Control Systems for Creative Teams: Managing Stylistic Creativity in Fashion Companies. ***Journal of Management Accounting Research***, 29(3): 27-47.

Davila, A., Foster, G., & Oyon, D. 2009. Accounting and control, entrepreneurship and innovation: Venturing into new research opportunities. ***European Accounting Review***, 18(2): 281-311.

Davila, A., & Oyon, D. 2009. Introduction to the special section on accounting, innovation and entrepreneurship. ***European Accounting Review***, 18(2): 277-280.

Davila, T. 2000. An empirical study on the drivers of management control systems' design in new product development. ***Accounting, organizations and society***, 25(4): 383-409.

Davila, T., Epstein, M., & Shelton, R. 2012. ***Making innovation work: How to manage it, measure it, and profit from it***. New Jersey, US: FT press.

De Vaus, D. A., & de Vaus, D. 2001. ***Research design in social research***: Sage.

Denzin, N. K., & Lincoln, Y. 2000. Qualitative research. ***Thousand Oaks ua***: 413-427.

Dewangan, V., & Godse, M. 2014. Towards a holistic enterprise innovation performance measurement system. ***Technovation***, 34(9): 536-545.

Dodgson, M., Gann, D. M., & Phillips, N. 2014. Perspectives on innovation management. ***The Oxford handbook of innovation management***: 3-25.

Dosi, G. 1982. Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change. ***Research policy***, 11(3): 147-162.

Dosi, G. 1988. Sources, procedures, and microeconomic effects of innovation. ***Journal of economic literature***: 1120-1171.

Drucker, P. F. 1998. The discipline of innovation. ***Harvard business review***, 76(6): 149-157.

Dziallas, M., & Blind, K. 2019. Innovation indicators throughout the innovation process: An extensive literature analysis. ***Technovation***, 80: 3-29.

Eady, S., Drew, V., & Smith, A. 2015. Doing action research in organizations: Using communicative spaces to facilitate (transformative) professional learning. ***Action Research***, 13(2): 105-122.

Eden, C., & Huxham, C. 1996. Action research for management research. ***British Journal of management***, 7(1): 75-86.

Edison, H., Bin Ali, N., & Torkar, R. 2013. Towards innovation measurement in the software industry. ***Journal of Systems and Software***, 86(5): 1390-1407.

Edmondson, A. C., & Nembhard, I. M. 2009. Product development and learning in project teams: The challenges are the benefits. ***Journal of product innovation management***, 26(2): 123-138.

Edmondson, A. C., & Verdin, P. J. 2018. The Strategic Imperative of Psychological Safety and Organizational Error Management, ***How Could This Happen?***: 81-104: Springer.

Eisenhardt, K. M., & Graebner, M. E. 2007. Theory building from cases: Opportunities and challenges. ***Academy of management journal***, 50(1): 25-32.

Eisenhardt, K. M., Graebner, M. E., & Sonenshein, S. 2016. Grand challenges and inductive methods: Rigor without rigor mortis: Academy of Management Briarcliff Manor, NY.

Elsahn, Z., Callagher, L., Husted, K., Korber, S., & Siedlok, F. 2020. Are rigor and transparency enough? Review and future directions for case studies in technology and innovation Management. ***R&D Management***, 50(3): 309-328.

Eurostat, O. 2018. Oslo manual 2018: guidelines for colleting, reporting and using data on innovation: Luxembourg: OECD publishing.

Eveleens, C. 2010. Innovation management; a literature review of innovation process models and their implications. ***Science***, 800(2010): 900.

Fagerberg, J. 2004. ***Innovation: a guide to the literature***.

Fagerberg, J., Fosaas, M., & Sapprasert, K. 2012. Innovation: Exploring the knowledge base. ***Research policy***, 41(7): 1132-1153.

Fagerberg, J., Mowery, D. C., & Nelson, R. R. 2005. ***The Oxford handbook of innovation***: Oxford university press.

Fagerlin, W. P., & Lövstål, E. 2020. Top managers' formal and informal control practices in product innovation processes. ***Qualitative Research in Accounting & Management***.

Felizardo, K. R., Mendes, E., Kalinowski, M., Souza, É. F., & Vijaykumar, N. L. 2016. ***Using forward snowballing to update systematic reviews in software engineering***. Paper presented at the Proceedings of the 10th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement.

Flyvbjerg, B. 2006. Five misunderstandings about case-study research. ***Qualitative inquiry***, 12(2): 219-245.

Folan, P., & Browne, J. 2005. A review of performance measurement: Towards performance management. ***Computers in industry***, 56(7): 663-680.

Franco-Santos, M., Kennerley, M., Micheli, P., Martinez, V., Mason, S., Marr, B., Gray, D., & Neely, A. 2007. Towards a definition of a business performance measurement

system. ***International Journal of Operations & Production Management***, 27(8): 784-801.

Franco-Santos, M., Lucianetti, L., & Bourne, M. 2012. Contemporary performance measurement systems: A review of their consequences and a framework for research. ***Management accounting research***, 23(2): 79-119.

Frese, M., & Keith, N. 2015. Action errors, error management, and learning in organizations. ***Annual review of psychology***, 66: 661-687.

Fried, A. 2017. Terminological distinctions of 'control': a review of the implications for management control research in the context of innovation. ***Journal of Management Control***, 28(1): 5-40.

Fried, A., Götze, U., Möller, K., & Pecas, P. 2017. Innovation and management control. ***Journal of Management Control***, 28(1): 1-4.

Frishammar, J., Richtnér, A., Brattström, A., Magnusson, M., & Björk, J. 2018. Opportunities and challenges in the new innovation landscape: Implications for innovation auditing and innovation management. ***European Management Journal***.

Frishammar, J., Richtnér, A., Brattström, A., Magnusson, M., & Björk, J. 2019. Opportunities and challenges in the new innovation landscape: Implications for innovation auditing and innovation management. ***European Management Journal***, 37(2): 151-164.

Garcia, R., Wigger, K., & Hermann, R. R. 2019. Challenges of creating and capturing value in open eco-innovation: Evidence from the maritime industry in Denmark. ***Journal of Cleaner Production***, 220: 642-654.

Gehman, J., Glaser, V. L., Eisenhardt, K. M., Gioia, D., Langley, A., & Corley, K. G. 2018. Finding theory–method fit: A comparison of three qualitative approaches to theory building. ***Journal of Management Inquiry***, 27(3): 284-300.

Gericke, K., & Blessing, L. 2012. ***An analysis of design process models across disciplines***. Paper presented at the DS 70: Proceedings of DESIGN 2012, the 12th International Design Conference, Dubrovnik, Croatia.

Gerring, J. 2004. What is a case study and what is it good for? ***American political science review***, 98(2): 341-354.

Gerring, J. 2006. ***Case study research: Principles and practices***: Cambridge University Press.

Gibbert, M., Ruigrok, W., & Wicki, B. 2008. What passes as a rigorous case study? ***Strategic management journal***, 29(13): 1465-1474.

Goffin, K., Beznosov, A., & Seiler, M. 2021. Countering Commoditization Through InnovationChallenges for European B2B Companies: B2B companies can use a Commoditization-Innovativeness Matrix to identify actions to counteract the pervasive threat of commoditization that exists in many B2B markets. ***Research-Technology Management***, 64(4): 20-28.

Goldkuhl, G. 2012. Pragmatism vs interpretivism in qualitative information systems research. ***European journal of information systems***, 21(2): 135-146.

Goodman, P. S., Ramanujam, R., Carroll, J. S., Edmondson, A. C., Hofmann, D. A., & Sutcliffe, K. M. 2011. Organizational errors: Directions for future research. ***Research in Organizational Behavior***, 31: 151-176.

Goshu, Y. Y., & Kitaw, D. 2017. Performance measurement and its recent challenge: a literature review. ***International Journal of Business Performance Management***, 18(4): 381-402.

Grabner, I., & Moers, F. 2013. Management control as a system or a package? Conceptual and empirical issues. ***Accounting, Organizations and Society***, 38(6-7): 407-419.

Graebner, M. E., Martin, J. A., & Roundy, P. T. 2012. Qualitative data: Cooking without a recipe. ***Strategic Organization***, 10(3): 276-284.

Groen, B. A., Wouters, M. J., & Wilderom, C. P. 2012. Why do employees take more initiatives to improve their performance after co-developing performance measures? A field study. ***Management Accounting Research***, 23(2): 120-141.

Groen, B. A., Wouters, M. J., & Wilderom, C. P. 2017. Employee participation, performance metrics, and job performance: A survey study based on self-determination theory. ***Management accounting research***, 36: 51-66.

Guertler, M., Sick, N., & Kriz, A. 2019. A Discipline-Spanning Overview of Action Research and Its Implications for Technology and Innovation Management. ***Technology Innovation Management Review***, 9(4).

Guertler, M. R., Kriz, A., & Sick, N. 2020. Encouraging and enabling action research in innovation management. ***R&D Management***.

Gustavsen, B. 2005. Innovation and action research. ***International Journal of Action Research***, 1(3): 267-289.

Haar, P. t. 2018. Measuring innovation: A state of the science review of existing approaches. ***Intangible Capital***, 14(3): 409-428.

Haldma, T., Nasi, S., & Grossi, G. 2012. Background and scope of the special issue on innovations in accounting, performance measurement and management: international trends. ***Baltic Journal of Management***, 7(4).

Hansen, M. T., & Birkinshaw, J. 2007. The innovation value chain. ***Harvard business review***, 85(6): 121.

Harris, M., & Tayler, B. 2019. Don't Let Metrics Undermine Your Business. ***Harvard business review***, 97(5): 63-69.

Hartmann, F. G. 2000. The appropriateness of RAPM: toward the further development of theory. ***Accounting, Organizations and Society***, 25(4-5): 451-482.

Heller, F. 2004. Action research and research action: a family of methods. ***Essential Guide to Qualitative Methods in Organisational Research. London: Sage Publications***.

Henri, J.-F., & Wouters, M. 2019. Interdependence of management control practices for product innovation: The influence of environmental unpredictability. ***Accounting, Organizations and Society***: 101073.

Henri, J.-F., & Wouters, M. J. 2017. Coexistence of Management Control Practices and Successful Product Innovation, ***2017 Canadian Academic Accounting Association (CAAA) Annual Conference***.

Henttonen, K., Ojanen, V., & Puumalainen, K. 2016. Searching for appropriate performance measures for innovation and development projects. ***R&D Management***, 46(5): 914-927.

Hirth-Goebel, T. F., & Weißenberger, B. E. 2019. Management accountants and ethical dilemmas: How to promote ethical intention? ***Journal of Management Control***, 30(3): 287-322.

Hofmann, D. A., & Frese, M. 2011. Errors, error taxonomies, error prevention, and error management: Laying the groundwork for discussing errors in organizations. ***Errors in organizations***, 1: 44.

Hopwood, A. G. 1972. An empirical study of the role of accounting data in performance evaluation. ***Journal of accounting research***: 156-182.

Huizingh, E. K. 2011. Open innovation: State of the art and future perspectives. ***Technovation***, 31(1): 2-9.

Huxham, C., & Vangen, S. 2003. Researching organizational practice through action research: Case studies and design choices. ***Organizational Research Methods***, 6(3): 383-403.

Ittner, C. D., & Larcker, D. F. 2003. Coming up short on nonfinancial performance measurement. ***Harvard business review***, 81(11): 88-95.

Jannesson, E., Nilsson, F., & Rapp, B. 2014. Introduction to the Cases: Theories, Concepts and Models, ***Strategy, Control and Competitive Advantage***: 1-26: Springer.

Janssen, S., Moeller, K., & Schlaefke, M. 2011. Using performance measures conceptually in innovation control. ***Journal of Management Control***, 22(1): 107.

Johnson, H. T., & Kaplan, R. S. 1991. ***Relevance lost: the rise and fall of management accounting***: Harvard Business Press.

Jordan, S., & Messner, M. 2012. Enabling control and the problem of incomplete performance indicators. ***Accounting, Organizations and Society***, 37(8): 544-564.

Jørgensen, B., & Messner, M. 2009. Management control in new product development: The dynamics of managing flexibility and efficiency. ***Journal of Management Accounting Research***, 21(1): 99-124.

Jørgensen, B., & Messner, M. 2010. Accounting and strategising: A case study from new product development. ***Accounting, Organizations and Society***, 35(2): 184-204.

Kanter, R. M. 1983. The change masters: Innovation and productivity in American corporations. ***New York***.

Kaplan, R. S. 1998. Innovation action research: creating new management theory and practice. ***Journal of management accounting research***, 10: 89.

Kaplan, R. S., & Norton, D. P. 1996a. ***The balanced scorecard: translating strategy into action***: Harvard Business Press.

Kaplan, R. S., & Norton, D. P. 1996b. Using the balanced scorecard as a strategic management system: Harvard business review Boston.

Karlsson, B., Kurkkio, M., & Hersinger, A. 2019. The role of the controller in strategic capital investment projects: bridging the gap of multiple topoi. ***Journal of Management and Governance***, 23(3): 813-838.

Kashani, K. 2006. Fighting commoditization strategies for creating novel customer values. ***Perspectives for Managers***(137): 1.

Kemmis, S., & McTaggart, R. 2005. ***Participatory action research: Communicative action and the public sphere***: Sage Publications Ltd.

Kennerley, M., & Neely, A. 2002. A framework of the factors affecting the evolution of performance measurement systems. ***International journal of operations & production management***, 22(11): 1222-1245.

Kent, C. A., Sexton, D. L., & Vesper, K. H. 1982. Encyclopedia of entrepreneurship.

Keong Choong, K. 2014. The fundamentals of performance measurement systems: A systematic approach to theory and a research agenda. ***International Journal of Productivity and Performance Management***, 63(7): 879-922.

Keupp, M. M., Palmié, M., & Gassmann, O. 2012. The strategic management of innovation: A systematic review and paths for future research. ***International Journal of Management Reviews***, 14(4): 367-390.

Kim, W. C., & Mauborgne, R. 2005. How to create uncontested market space and make the competition irrelevant. ***Harvard Business Review***, 4(13): 1-2.

Kirsner, S. 2015. What Big companies get wrong about innovation metrics. ***Harvard Business Review***.

Kitchenham, B., Brereton, O. P., Budgen, D., Turner, M., Bailey, J., & Linkman, S. 2009. Systematic literature reviews in software engineering–a systematic literature review. ***Information and software technology***, 51(1): 7-15.

Kotler, P. 1984. ***Marketing essentials***: Prentice Hall.

Koufteros, X., Verghese, A. J., & Lucianetti, L. 2014. The effect of performance measurement systems on firm performance: A cross-sectional and a longitudinal study. ***Journal of Operations Management***, 32(6): 313-336.

Kowalkowski, C., Gebauer, H., & Oliva, R. 2017. Service growth in product firms: Past, present, and future. ***Industrial marketing management***, 60: 82-88.

Kowalkowski, C., Windahl, C., Kindström, D., & Gebauer, H. 2015. What service transition? Rethinking established assumptions about manufacturers' service-led growth strategies. ***Industrial marketing management***, 45: 59-69.

Kristiansen, J. N., & Ritala, P. 2018. Measuring radical innovation project success: typical metrics don't work. ***Journal of Business Strategy***, 39(4): 34-41.

Kuhn, T. S. 1970. ***The Structure of Scientific Revolutions, 2nd enl. ed***: University of Chicago Press.

Kumar, M. R. 2013. Insider action research: premises and promises. ***Journal of Organizational Change Management***.

Kuratko, D. F., Covin, J. G., & Hornsby, J. S. 2014. Why implementing corporate innovation is so difficult. ***Business Horizons***, 57(5): 647-655.

Kvale, S. 1994. ***Interviews: An introduction to qualitative research interviewing***: Sage Publications, Inc.

Laine, T., Korhonen, T., & Martinsuo, M. 2016. Managing program impacts in new product development: An exploratory case study on overcoming uncertainties. ***International Journal of Project Management***, 34(4): 717-733.

Latour, B. 1983. Give me a laboratory and I will raise the world. ***Science observed: Perspectives on the social study of science***: 141-170.

Lawton, A., McKevitt, D., & Millar, M. 2000. Developments: Coping with ambiguity: Reconciling external legitimacy and organizational implementation in performance measurement. ***Public Money and Management***, 20(3): 13-20.

Lei, Z., Naveh, E., & Novikov, Z. 2016. Errors in organizations: An integrative review via level of analysis, temporal dynamism, and priority lenses. ***Journal of Management***, 42(5): 1315-1343.

Lohman, C., Fortuin, L., & Wouters, M. 2004. Designing a performance measurement system: A case study. ***European Journal of Operational Research***, 156(2): 267-286.

Lu, Y. 2011. Individual engagement to collective participation: The dynamics of participation pattern in performance budgeting. ***Public Budgeting & Finance***, 31(2): 79-98.

Luft, J., & Shields, M. D. 2003. Mapping management accounting: graphics and guidelines for theory-consistent empirical research. ***Accounting, organizations and society***, 28(2): 169-249.

Lukka, K., & Vinnari, E. 2014. Domain theory and method theory in management accounting research. ***Accounting, Auditing & Accountability Journal***.

Lövstål, E., & Jontoft, A.-M. 2017. Tensions at the intersection of management control and innovation: a literature review. ***Journal of Management Control***, 28(1): 41-79.

Mackenzie, J., Tan, P.-L., Hoverman, S., & Baldwin, C. 2012. The value and limitations of participatory action research methodology. ***Journal of hydrology***, 474: 11-21.

Markóczy, L., & Deeds, D. L. 2009. Theory building at the intersection: recipe for impact or road to nowhere? ***Journal of Management Studies***, 46(6): 1076-1088.

Matthyssens, P., & Vandenbempt, K. 2008. Moving from basic offerings to value-added solutions: Strategies, barriers and alignment. ***Industrial Marketing Management***, 37(3): 316-328.

McIntyre, A. 2008. Qualitative Research Methods Series, vol. 52: Thousand Oaks: Sage Publications.

McKinnon, J. 1988. Reliability and validity in field research: some strategies and tactics. ***Accounting, Auditing & Accountability Journal***, 1(1): 34-54.

McNiff, J. 2013. ***Action research: Principles and practice***: Routledge.

Melendez, K., Dávila, A., & Melgar, A. 2019. Literature Review of the Measurement in the Innovation Management. ***Journal of technology management & innovation***, 14(2): 81-87.

Melnyk, S. A., Bititci, U., Platts, K., Tobias, J., & Andersen, B. 2014. Is performance measurement and management fit for the future? ***Management Accounting Research***, 25(2): 173-186.

Mendes, E., Wohlin, C., Felizardo, K., & Kalinowski, M. 2020. When to update systematic literature reviews in software engineering. ***Journal of Systems and Software***, 167: 110607.

Messner, M. 2016. Does industry matter? How industry context shapes management accounting practice. ***Management Accounting Research***, 31: 103-111.

Micheli, P., & Mari, L. 2014. The theory and practice of performance measurement. ***Management accounting research***, 25(2): 147-156.

Miller, R., & Olleros, X. 2008. To manage innovation, learn the architecture. ***Research-Technology Management***, 51(3): 17-27.

Moll, J. 2015. Special issue on innovation and product development. ***Management Accounting Research***(28): 2-11.

Mortensen, P. S., & Bloch, C. W. 2005. ***Oslo Manual-Guidelines for Collecting and Interpreting Innovation Data: Proposed Guidelines for Collecting and Interpreting Innovation Data***: Organisation for Economic Cooporation and Development, OECD.

Moss Kanter, R. 1989. When giants learn to dance. ***Touchstone, NY***.

Mouritsen, J., Hansen, A., & Hansen, C. Ø. 2009. Short and long translations: Management accounting calculations and innovation management. ***Accounting, Organizations and Society***, 34(6): 738-754.

Mouritsen, J., & Kreiner, K. 2016. Accounting, decisions and promises. ***Accounting, Organizations and Society***, 49: 21-31.

Muller, A., Välikangas, L., & Merlyn, P. 2005. Metrics for innovation: guidelines for developing a customized suite of innovation metrics. ***Strategy & Leadership***, 33(1): 37-45.

Munir, H., Wnuk, K., & Runeson, P. 2016. Open innovation in software engineering: a systematic mapping study. ***Empirical Software Engineering***, 21(2): 684-723.

Naslund, D., & Norrman, A. 2019. A performance measurement system for change initiatives: An action research study from design to evaluation. ***Business Process Management Journal***.

Neely, A. 1999. The performance measurement revolution: why now and what next? ***International journal of operations & production management***, 19(2): 205-228.

Neely, A. 2005. The evolution of performance measurement research: developments in the last decade and a research agenda for the next. ***International Journal of Operations & Production Management***, 25(12): 1264-1277.

Neely, A., & Bourne, M. 2000. Why measurement initiatives fail. ***Measuring business excellence***, 4(4): 3-7.

Neely, A., Gregory, M., & Platts, K. 1995. Performance measurement system design: a literature review and research agenda. ***International journal of operations & production management***, 15(4): 80-116.

Neely, A., Gregory, M., & Platts, K. 2005. Performance measurement system design: A literature review and research agenda. ***International journal of operations & production management***, 25(12): 1228-1263.

Nilsson, F., Petri, C.-J., & Westelius, A. 2016. ***Strategisk ekonomistyrning: med dialog i fokus***: Studentlitteratur AB.

Nixon, B., & Burns, J. 2012. The paradox of strategic management accounting. ***Management Accounting Research***, 23(4): 229-244.

Nudurupati, S. S., Bititci, U. S., Kumar, V., & Chan, F. T. 2011. State of the art literature review on performance measurement. ***Computers & Industrial Engineering***, 60(2): 279-290.

Nyström, H. 1979. ***Creativity and innovation***: John Wiley & Sons Inc.

Nyström, H. 1990. ***Technological and market innovation: Strategies for product and company development***: John Wiley & Sons.

Näslund, D., Kale, R., & Paulraj, A. 2010. Action research in supply chain management—a framework for relevant and rigorous research. ***Journal of Business Logistics***, 31(2): 331-355.

Nørreklit, H., Nørreklit, L., & Mitchell, F. 2010. Towards a paradigmatic foundation for accounting practice. ***Accounting, Auditing & Accountability Journal***.

Okwir, S., Nudurupati, S. S., Ginieis, M., & Angelis, J. 2018. Performance measurement and management systems: A perspective from complexity theory. ***International Journal of Management Reviews***, 20(3): 731-754.

Ollila, S., & Yström, A. 2020. Action research for innovation management: three benefits, three challenges, and three spaces. ***R&D Management***.

Olsen, E. O., Zhou, H., Lee, D. M., Ng, Y.-E., Chewn Chong, C., & Padunchwit, P. 2007. Performance measurement system and relationships with performance results: A case analysis of a continuous improvement approach to PMS design. ***International Journal of Productivity and Performance Management***, 56(7): 559-582.

Otley, D. 2016. The contingency theory of management accounting and control: 1980–2014. ***Management accounting research***, 31: 45-62.

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. 2015. Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. ***Administration and Policy in Mental Health and Mental Health Services Research***, 42(5): 533-544.

Pasmore, W. A. 2011. Tipping the balance: Overcoming persistent problems in organizational change. ***Research in organizational change and development***, 19(2): 259-292.

Pinchot III, G. 1985. Intrapreneuring: Why you don't have to leave the corporation to become an entrepreneur.

Porter, M. E. 1990. The competitive advantage of nations. ***Competitive Intelligence Review***, 1(1): 14-14.

Postholm, M. B., & Skrøvset, S. 2013. The researcher reflecting on her own role during action research. ***Educational Action Research***, 21(4): 506-518.

Putz, D., Schilling, J., Kluge, A., & Stangenberg, C. 2013. Measuring organizational learning from errors: Development and validation of an integrated model and questionnaire. ***Management learning***, 44(5): 511-536.

Qu, S. Q., & Dumay, J. 2011. The qualitative research interview. ***Qualitative research in accounting & management***.

Raelin, J., Dickens, L., Watkins, K., Park, P., Marsick, V. J., O'Neil, J., Putnam, R., Torbert, W., & Reason, P. 1999. The action dimension in management: diverse approaches to research, teaching, and development. ***Learning***, 30(2).

Reason, P., & Bradbury, H. 2008. ***Handbook of action research: Participative inquiry and practice***: Sage.

Reilly, T. M., & Jones III, R. 2017. Mixed methodology in family business research: Past accomplishments and perspectives for the future. ***Journal of Family Business Strategy***, 8(3): 185-195.

Reimann, M., Schilke, O., & Thomas, J. S. 2010. Toward an understanding of industry commoditization: Its nature and role in evolving marketing competition. ***International Journal of Research in Marketing***, 27(2): 188-197.

Richtnér, A., Brattström, A., Frishammar, J., Björk, J., & Magnusson, M. 2017. Creating Better Innovation Measurement Practices. ***MIT Sloan Management Review***, 59(1): 45.

Robson, K., & Bottausci, C. 2018. The sociology of translation and accounting inscriptions: Reflections on Latour and Accounting Research. ***Critical Perspectives on Accounting***, 54: 60-75.

Rowe, C., Shields, M. D., & Birnberg, J. G. 2012. Hardening soft accounting information: Games for planning organizational change. ***Accounting, Organizations and Society***, 37(4): 260-279.

Rumelt, R. P., Schendel, D. E., & Teece, D. J. 1994. Fundamental Issues in Strategy: A Research Agenda: Harvard Business School Press. ***Boston, MA***.

Runeson, P., Host, M., Rainer, A., & Regnell, B. 2012. ***Case study research in software engineering: Guidelines and examples***: John Wiley & Sons.

Salloum, M. 2013. Explaining the Evolution of Performance Measures-A Dual Case-Study Approach. ***Journal of Engineering, Project, and Production Management***, 3(2): 99.

Salter, A., & Alexy, O. 2014. The nature of innovation. ***The Oxford handbook of innovation management***: 26-49.

Saunila, M. 2017. ***Innovation Performance Measurement: A Quantitative Systematic Literature Review***. Paper presented at the European Conference on Innovation and Entrepreneurship.

Scaratti, G., Gorli, M., Galuppo, L., & Ripamonti, S. 2017. Action research: Knowing and changing (in) organizational contexts. ***The SAGE Handbook of Qualitative Business and Management Research Methods: History and Traditions***: 286.

Scaratti, G., Hersted, L., Vince, R., & Cunliffe, A. L. Opening a Window on Action Research.

Schrage, M., & Kiron, D. 2018. Leading with next-generation key performance indicators. ***MITSloan Management Review and Google June***: 1-2.

Schreier, M. 2012. ***Qualitative content analysis in practice***: Sage publications.

Schumpeter, J. A. 1934. The theory of economic development. Cambridge. ***MA: Harvard***.

Seawright, J., & Gerring, J. 2008. Case selection techniques in case study research: A menu of qualitative and quantitative options. ***Political research quarterly***, 61(2): 294-308.

Siedlok, F., & Hibbert, P. 2014. The organization of interdisciplinary research: modes, drivers and barriers. ***International Journal of Management Reviews***, 16(2): 194-210.

Simons, R. 1994. ***Levers of control: How managers use innovative control systems to drive strategic renewal***: Harvard Business Press.

Smith, N. 2020. Emerging from the swamp: an autoethnography on the legitimacy of action research. ***International Journal of Managing Projects in Business***.

Snoeren, M. M., Niessen, T. J., & Abma, T. A. 2012. Engagement enacted: Essentials of initiating an action research project. ***Action Research***, 10(2): 189-204.

Speklé, R. F., van Elten, H. J., & Widener, S. K. 2017. Creativity and Control: A Paradox—Evidence from the Levers of Control Framework. ***Behavioral Research in Accounting***, 29(2): 73-96.

Srimai, S., Radford, J., & Wright, C. 2011. Evolutionary paths of performance measurement: an overview of its recent development. ***International Journal of Productivity and Performance Management***, 60(7): 662-687.

Stake, R. E. 2000. Case Studies In: Denzin N. and Lincoln, Y.(Ed.). Handbook of qualitative research (pp. 435-455): Sage Publications: California.

Stebbins, R. A. 2001. ***Exploratory research in the social sciences***: Sage.

Stormi, K. T., Laine, T., & Korhonen, T. 2019. Agile performance measurement system development: an answer to the need for adaptability? ***Journal of Accounting & Organizational Change***.

Swantz, M. L. 2008. Participatory action research as practice. ***The SAGE handbook of action research: Participative inquiry and practice***: 31-48.

Tan, K. H., & Zhan, Y. 2017. Improving new product development using big data: a case study of an electronics company. ***R&D Management***, 47(4): 570-582.

Taticchi, P., Balachandran, K., & Tonelli, F. 2012. Performance measurement and management systems: state of the art, guidelines for design and challenges. ***Measuring Business Excellence***, 16(2): 41-54.

Teece, D. J. 1987. ***The competitive challenge: Strategies for industrial innovation and renewal***: Ballinger Pub. Co.

Weick, K. E. 1995. What theory is not, theorizing is. ***Administrative Science Quarterly***, 40(3): 385-390.

Weick, K. E. 2012. David A. Hofmann and Michael Frese, eds.: Errors in Organizations: Sage Publications Sage CA: Los Angeles, CA.

Vendrell-Herrero, F., Bustinza, O. F., Parry, G., & Georgantzis, N. 2017. Servitization, digitization and supply chain interdependency. ***Industrial Marketing Management***, 60: 69-81.

Westelius, A., & Lind, J. 2020. Painting the Relevant Organisation. In F. Nilsson, C.-J. Petri, & A. Westelius (Eds.), ***Strategic Management Control: Successful Strategies Based on Dialogue and Collaboration***: 31-43. Cham: Springer International Publishing.

Wilderom, C. P., Wouters, M. J., & van Brussel, J. 2007. ***Balance Leadership, Professionalism, and Team Trust predict positive attitudes towards performance measurement***. Paper presented at the Academy of Management Proceedings.

Wohlin, C. 2016. ***Second-generation systematic literature studies using snowballing***. Paper presented at the Proceedings of the 20th International Conference on Evaluation and Assessment in Software Engineering.

Wong-On-Wing, B., Guo, L., & Lui, G. 2010. Intrinsic and extrinsic motivation and participation in budgeting: Antecedents and consequences. ***Behavioral Research in Accounting***, 22(2): 133-153.

Wouters, M., & Wilderom, C. 2008. Developing performance-measurement systems as enabling formalization: A longitudinal field study of a logistics department. ***Accounting, Organizations and Society***, 33(4): 488-516.

Yang, C.-F., & Sung, T.-J. 2016. Service design for social innovation through participatory action research. ***International Journal of Design***, 10(1).

Yin, R. K. 2014. ***Case study research: Design and methods*** (5th edition ed.). Thousand Oaks, CA: Sage publications.

Zahra, S. A., & Newey, L. R. 2009. Maximizing the Impact of Organization Science: Theory-Building at the Intersection of Disciplines and/or Fields. ***Journal of Management Studies***, 46(6): 1059-1075.

# The Swedish Research School of Management and Information Technology MIT

The *Swedish Research School of Management and Information Technology* (MIT) is one of 16 national research schools supported by the Swedish Government. MIT is jointly operated by the following institutions: Blekinge Institute of Technology, Chalmers University of Technology, University of Gothenburg, Jönköping International Business School, Karlstad University, Linköping University, Linnaeus University Växjö, Lund University, Mälardalen University College, Stockholm University, Umeå University, Örebro University, and Uppsala University, host to the research school. At the Swedish Research School of Management and Information Technology (MIT), research is conducted, and doctoral education provided, in three fields: management information systems, business administration, and informatics.

## DISSERTATIONS FROM THE SWEDISH RESEARCH SCHOOL OF MANAGEMENT AND INFORMATION TECHNOLOGY

### Doctoral theses (2003- )

1. **Baraldi, Enrico (2003),** *When Information Technology Faces Resource Interaction: Using IT Tools to Handle Products at IKEA and Edsbyn.* Department of Business Studies, Uppsala University, Doctoral Thesis.

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3. **Ekman, Peter (2006),** *Enterprise Systems & Business Relationships: The Utilization of IT in the Business with Customers and Suppliers*. School of Business, Mälardalen University, Doctoral Dissertation.

4. **Lindh, Cecilia (2006),** *Business Relationships and Integration of Information Technology*. School of Business, Mälardalen University, Doctoral Dissertation.

5. **Frimanson, Lars (2006),** *Management Accounting and Business Relationships from a Supplier Perspective.* Department of Business Studies, Uppsala University, Doctoral Thesis.

6. **Johansson, Niklas (2007),** *Self-Service Recovery*. Information Systems, Faculty of Economic Sciences, Communication and IT, Karlstad University, Doctoral Thesis.

7. **Sonesson, Olle (2007),** *Tjänsteutveckling med personal medverkan: En studie av banktjänster.* Företagsekonomi, Fakulteten för ekonomi, kommunikation och IT, Karlstads universitet, Doktorsavhandling.

8. **Maaninen-Olsson, Eva (2007),** *Projekt i tid och rum: Kunskapsintegrering mellan projektet och dess historiska och organisatoriska kontext.* Företagsekonomiska institutionen, Uppsala universitet, Doctoral Thesis.

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20. **Henningsson, Stefan (2008),** *Managing Information Systems Integration in Corporate Mergers & Acquisitions*. Institute of Economic Research, Lund Studies in Economics and Management, Doctoral Thesis.

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