

DOCTORAL THESIS IN MACHINE DESIGN  
STOCKHOLM, SWEDEN 2015

# **Making innovation everyone's business**

Using routines and controls

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Doctoral thesis no. 3, 2015  
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Making innovation everyone's business – using routines and controls

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TRITA MMK 2015:03

ISSN 1400-1179

ISRN/KTH/MMK/R-15/03-SE

ISBN 978-91-7595-549-0

Printed by: US-AB, Stockholm, Sweden

Academic thesis, which with the approval of Kungliga Tekniska Högskolan, will be presented for public review in fulfillment of the requirements for a Doctorate of Engineering in Machine Design. The public review will be held at Kungliga Tekniska Högskolan, Kollegiesalen, Brinellvägen 8, at 10.00 on the 20<sup>th</sup> of May, 2015.



## Abstract

Contemporary high-technology companies are under pressure to deliver short-term profits *and* to serve the market demands for future innovative solutions. An increased interest for alternative innovations such as new services or business models to be recognized in parallel to new technologies results in that companies are increasingly attempting to engage all their employees in innovation. This requires attention to what ways of working need to be changed in order to better support employees in pursuing both induced and autonomous initiatives i.e. to realize ideas that are aligned to and those that deviate from a company's existing strategy and operational models. A key challenge is related to understanding how to develop organizational routines; how to make use of management controls to support both types of initiatives despite their different needs and, make the changes in routines and controls become accepted throughout the organization. Surprisingly few studies deal with understanding how managers or assigned employees in companies go about to address these issues.

The overall purpose of this thesis is to increase knowledge on how innovation capabilities are built when involving a broad base of employees in innovation in large and mature organizations. More specifically, this thesis seeks to understand what characterizes organizational routines and what are the consequences from using different types of management controls supporting employees in pursuing both induced and autonomous initiatives. The thesis is made up of four qualitative studies that explore how a planned effort to deliberately involve a broad base of employees in innovation is performed and experienced by actors representing different hierarchical levels and functions in two large and world-leading high-technology companies.

The research shows how involving employees in innovation can be made possible through a conscious and creative design and usage of routines and controls. The thesis shows that an upper management call for an increased number of induced and autonomous initiatives results in the use of diverse approaches to achieve this goal even within the same organization due to personal beliefs and experiences of what innovation needs and due to a bias towards either personnel or action management controls. Further, a strong focus on developing organizational routines to initiate innovation was observed at the expense of routines for selection and development of new initiatives. The studies show also that the outcome is dominated by incremental process improvements and the underlying reason to this result is discussed in this thesis.

Four characteristics were identified that distinguish organizational routines used in settings successfully supporting employees in pursuing both induced and autonomous initiatives : i) routines targeting selection, development and retention in an innovation process, ii) routines were frequently used and were somewhat linked to other routines, iii) routines to support resource owners and/or customers to come in direct contact with innovators to evaluate and develop new ideas in an atmosphere characterized by a mix of playfulness and seriousness were developed and finally iv) a combination of personnel and actions controls were used. Implications for innovation management, organizational routine and management control research are discussed.

Finally, a re-thinking and re-design of the performance management is suggested, taking into consideration the potential in using measurement and goal setting to provide effective means to support both induced and autonomous initiatives. The studies showed that the use of performance measurement can act as a trigger for managers to take actions. In addition, the thesis identified the value in improving the understanding of how result controls, specifically goals, can be formulated and used to stimulate different types of innovative behaviors.

## Sammanfattning

Dagens högteknologiska företag är pressade att både leverera kortsiktiga vinster och skapa framtida innovativa lösningar. Ett ökat intresse för att åstadkomma alternativa innovationer såsom nya tjänster eller affärsmodeller parallellt med traditionell teknikutveckling gör att dessa företag i allt större utsträckning försöker engagera alla sina anställda i innovationsarbetet. Detta kräver ökat fokus på vilka arbetssätt som behöver förändras för att bättre stödja anställda att driva både inducerade och autonoma initiativ d.v.s. att förverkliga idéer som är i linje med och de som väsentligt avviker från ett företags befintliga strategier och arbetssätt. En utmaning är att förstå hur man kan utveckla arbetsrutiner och ledningsverktyg för att stödja båda typerna av initiativ, de olika behov de skapar och att dessutom få de förändringar som görs i rutiner och verktyg att bli accepterade i hela organisationen. Förvånansvärt få studier fokuserar på att förstå hur chefer och anställda i företagen går tillväga för att hantera detta.

Det övergripande syftet med denna avhandling är att öka kunskapen om hur innovationsförmåga byggs upp när ett företag involverar en stor del av sina anställda i innovation i stora etablerade organisationer. Mer specifikt, syftar anhandlingen till att förstå konsekvenserna när olika typer av ledningskontroller används för att stödja anställda att genomföra både inducerade och autonoma initiativ. Avhandlingen består av fyra kvalitativa studier som undersöker hur en planerad insats för att medvetet engagera en stor del av de anställda i innovation utförs och upplevs av aktörer som representerar olika hierarkiska nivåer och funktioner i två globala och världsledande högteknologiska företag.

Forskningen visar hur medarbetare kan engageras i innovation genom en medveten och kreativ utformning och användning av rutiner och kontrollmekanismer. Avhandlingen visar att högsta ledningens uppmaning till ett ökat antal inducerade och autonoma initiativ leder till vitt skilda angreppssätt för att uppnå samma mål och ett starkt fokus på att utveckla rutiner för att initiera innovation i kombination med antingen kultur- eller processkontroller. Studierna visar också att det främst skapas inkrementella innovationer som relaterar till interna processer och orsaker till detta resultat diskuteras i avhandlingen.

Studierna visar på fyra olika karaktäristika som särskiljer organisatoriska rutiner i miljöer där medarbetare på ett lyckosamt sätt involverats för att driva både inducerade och autonoma initiativ: i) rutiner för val, utveckling och diffusion av olika initiativ används, ii) rutiner används frekvent och har vissa kopplingar till andra rutiner, iii) rutiner som skapar möjlighet för resursägare och/eller kunder att träffas och aktivt utvärdera nya idéer finns på plats och slutligen iv) en kombination av kontrollmekanismer används. Avhandlingen diskuterar implikationer för tre forskningsområden; innovationsledning, ledningskontroll samt organisatoriska rutiner.

Slutligen, med utgångspunkt från studierna, föreslås ett nytänkande kring hur mätning och målstyrning kan utformas för att bättre stödja både inducerade och autonoma initiativ i organisationer. Avhandlingen visar hur innovationsmätning kan skapa engagerade ledare och på värdet av att utveckla förståelsen för hur resultatkontroller, särskilt mål, kan utformas och användas för att stimulera olika typer av innovativa beteenden.

## Acknowledgements

This thesis investigates how organizational routines and management controls are used to support employees in pursuing both induced and autonomous initiatives in two large high-technology companies. The research studies began with doubts that I had while I was working with technology development and innovation management in practice as to whether traditional management tools and routines can provide valuable support for innovation. Based on the studies presented in this thesis, I do believe they can. In fact, I think these tools and routines can have an important role to play if we critically and creatively re-think and re-design them.

The writing of this thesis would never have been possible without support from a large number of people. First of all, I owe my deepest gratitude to my supervisor, Sofia Ritzén. Thank you for suggesting and encouraging me to start a journey that turned out to be a much more radical shift in my professional life than I ever thought possible. Thank you for being such an inspiring and clear-sighted guide and eminent intellectual partner. Also, thanks for not fully “taming” me – the confidence you have shown me has been invaluable to my learning process.

I also want to provide a big thanks to my former managers Magnus Öhman and Torbjörn Andersson who made it possible for me to become an industrial PhD student in the MedTech company. Thank you also to all of you in the MedTech company who have contributed with your time and input in my studies. The same is true for all of the research participants in the TeleCom company; thank you so much for your generosity.

I am privileged to be part of a truly stimulating academic setting at IPU, the Integrated Product Development department at KTH. Working is pure pleasure when you are surrounded by so many passionate and knowledgeable colleagues. Thanks to all of you!

A special thanks to my co-supervisor, Magnus Karlsson for your excellent advices, positive attitude, and ability to pinpoint exactly where I need to clarify my thoughts and cut my “German” sentences. Professor Mats Magnusson, thank you for always generously sharing your knowledge and your constructive ideas (not the least for the kappa in this thesis) and for patiently teaching me what it means to be in the “business of words”. Professor Margareta Norell Bergendahl, thanks for providing me with great opportunities to learn what it means to work in academia in a broader sense and for sharing your outstanding experiences and visions of how academia can create true impacts in our society. Ingrid Kihlander, thank you for continuous mentoring in “doktorerandet”. Thank you to my closest colleagues by physical proximity, Katarina Lund Stetler and Carl Wadell – you have been a tremendous support to me over the years. Also, thank you Gunilla Hugosson, Daniel Sellgren, and Björn Finér for great administrative assistance.

Being part of the Product Innovation and Engineering research program financed by Vinnova has enabled me to discuss, and write together with many great colleagues all over Sweden. In particular I would like to thank Malin Olander Røese for being such an insightful and invigorative colleague and friend – we have just started our journey together. In addition, a special thanks to Maria Elmqvist and Peter Kesting for sharing valuable comments on earlier versions of this thesis.

I am lucky to also have a life outside academia and work (although many of you might have doubted this in the last few years). I want to express my deepest appreciation to my closest and extended family, and all my friends, neighbors, former colleagues and classmates, very old and very new friends, Swedish and American.

A special thanks to some of you who have supported me with extra mental and physical support during the writing of this thesis: Ingrid Alveteg for sharing your uncanny insights in our fascinating and infinite dialogues, the constantly updated futurist Patrik Malmberg for supporting me in my second study, Joakim Bergström for serving me with excellent contemporary music, Ruth and Jan Lidin for great proofreading and coaching (even at unholy hours!), and Lena Thelander with her family for reminding me when it is time for bubbly or for tough workouts. And many thanks to my extra-ordinary female relatives who are supporting me each in her own unique way; my grandmother Karin, my mother Rita, my mother-in-law Anita, and my sisters Annelie and Sandra.

Finally, this thesis would not have been possible without the backing of my nearest and dearest Tomas, Gustaf, and Stella, my biggest supporters and my harshest critics. Thanks to you I have developed not only as a researcher but as a person. Love you.

Susanne Nilsson

Stockholm, April, 2015

## List of appended papers

**Paper I:** Nilsson, S. (2012) Exploring problem finding in a medical device company, *Measuring Business Excellence*, Vol. 16. No. 4, pp. 66-78.

**Paper II:** Nilsson, S. and Ritzén, S. (2014) Exploring the use of innovation performance measurement to build innovation capability in a medical device company, *Creativity and Innovation Management*, Vol. 23, No. 2, pp. 183-198.

**Paper III:** Ritzén, S., Nilsson, S. and Karlsson, M. P. (2012) Innovation in teams – inducing action by defining challenges and indicators, *Proceedings of the 19<sup>th</sup> International Product Development, Management Conference*, 17-19 June, Manchester, United Kingdom.

**Paper IV:** Nilsson, S., Öhlund-Sandström, G., Karlsson, M.P. and Ritzén, S. (2014) Innovating everyday – making innovation everyone's business, in review for *Technovation*. A previous version was published in the proceedings of the 15<sup>th</sup> International CINet Conference, 7-9 September, 2014, Budapest, Hungary.

**Paper V:** Nilsson, S. and Ritzén S. (2014) Selecting and developing organizational routines to support innovation, in review for *International Journal of Innovation Management*. A previous version was published in the proceedings of the 15<sup>th</sup> International CINet Conference, 7-9 September, 2014, Budapest, Hungary.



## List of additional publications

In addition to the appended papers, Susanne Nilsson has been the author or co-author of the publications below. The publications appear in chronological order.

Ritzén, S., Nilsson, S. (2009) Innovative Teams: Identification of new opportunities. Chapter in Organising for innovation and growth: Experiences and efforts in ten companies, Editor: Marianne Döös, Lena Wilhelmson, Vinnova report VR 2009:22, ISBN: 978-91-85959-76-1 pp. 67-78.

Kihlander, I., Nilsson, S., Lund, K., Ritzén, S., and Norell Bergendahl, M. (2011) Planning Industrial PHD Projects In Practice: Speaking Both 'Academia' and 'Practitionese', Proceedings of the 18<sup>th</sup> International Conference on Engineering Design, August 15-18, Copenhagen, Denmark.

Nilsson, S., Wallin, J., Benaim, A., Annosi, M.C., Berntsson, R., Ritzén, S. and Magnusson, M. (2012) Re-thinking innovation measurement to manage innovation-related dichotomies in practice, Proceedings of the 13<sup>th</sup> International CINet Conference, September 17-18, Rome, Italy.

Ritzén, S. and Nilsson, S. (2013) Designing and implementing a method to build innovation capability in product development teams, Proceedings of the 19<sup>th</sup> International Conference on Engineering Design, August 19-22, Seoul, Korea.

Ritzén, S. and Nilsson, S. (2013) Research Based Experimentation for Increasing Innovation Capability, Proceedings of the 14<sup>th</sup> International CINet Conference, September 8-11, Nijmegen, The Netherlands.

Schenkl, S.A., Elser, H., Nilsson, S., Ölundh-Sandström, G., Mörtl, M., Srinivasan, V. (2014) A method for assessing the innovativeness of product-service systems, Proceedings of the 13<sup>th</sup> International Design Conference, May 19-22, Dubrovnik, Croatia.

Schmidt, D.M., Schenkl, S.A., Munkhart, E., Nilsson, S. and Moertl, M. (2014) Interview Study: Decisions and Decision Criteria for Development in Industry, Proceedings of the International Conference on Industrial Engineering and Engineering, December 9-12, Kuala Lumpur, Malaysia.

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## Introduction

Rapidly changing technologies and competition have put increased pressure on all functions in high-technology companies. Not the least, their R&D organizations are forced to ensure that the company can deliver short-term profits *and* at the same time serve the market demands for innovative solutions that create increased value (Tushman, Anderson, and O'Reilly, 1997; Boer and Gertsen, 2003; Mc Grath, 2012). The need to be able to come up with a never-ending stream of innovations to rapidly meet customers' needs requires increased attention to deploy work practices that will support and facilitate the innovation process. The focus on reducing R&D expenditures through general cost savings and by taking actions to increase efficiency, while at the same time retaining flexibility in the product development process, has been a top priority in the past several decades (Howells, 2008). In addition, the implementation of flatter and more distributed structures to expand R&D capabilities over wider geographical areas has required strenuous coordination efforts and high levels of management attention.

As a consequence, the time and energy to also engage in creating conditions conducive to innovation has often been severely limited. This is particularly the case for currently successful companies where product plans are often set in terms of what improvements in existing products and market offerings are needed in the coming years. Thus, despite the awareness of its importance and the access to an abundance of information and knowledge from popular literature and academic sources on how to make it happen, building innovation capabilities tends to in many cases end up as an afterthought in the daily work of both managers and engineers.

Despite the shortcomings described above, being able to create conditions to ensure a continuous stream of both radical and incremental innovations is far from a neglected part of the top management agenda in most companies. In survey after survey (e.g. Wagner et al., 2014; Jaruzelski et al., 2011) innovation has remained among the top priorities and has been identified by their CEOs as crucial for companies' long-term survival. The most successful companies are found to be characterized by more systematic approaches to innovation and by being able to support employees to continuously pursue *both induced and autonomous initiatives* i.e. initiatives that are aligned and those not aligned to existing strategy and established operational models respectively as defined by Burgelman (1983). These companies have succeeded in creating sustained conditions conducive to innovation. In other words, they have built innovation capabilities, or routinized innovation considering that capabilities can be described as being composed of a bundle of organizational routines (Nelson and Winter, 1982).

New services and business models as well as organizational and managerial innovations (i.e. the implementation of changes to the organizational structures or ways to manage the organization's resources) have received increased attention as economically viable "alternative" innovation paths for firms to pursue (Birkenshaw et al., 2011). This challenges the "ownership" of innovation in a company, and the R&D organization is typically no longer considered the single internal source for innovation. As a result, many companies have implemented a strategy to involve more and more people in the innovation process (Björk et al., 2010) by taking employee-driven (Kesting and Ulhoy, 2010) and high-involvement approaches i.e. every employee is invited and even expected to drive ideas in any area and of any magnitude of change (Bessant, 2003).

The underlying assumption when companies increasingly go beyond the R&D department and recognize a broader range of sources for innovation is that knowledge is distributed in formal as well as in informal networks (Tsoukas, 1996). By systematically making use of as many of these sources as possible the likelihood of new knowledge to be recognized or created and ultimately transformed to valuable innovations increases (Nonaka and Takeuchi, 1995; Argyris, 2004). The approach to involve a broad base

of employees in innovation is in itself not a new strategy. However, the intensity and the degree of systematics that it is applied with and the emphasis to involve employees to also drive more strategy-deviating initiatives can be considered a more recent phenomenon. As a consequence innovation is seen to increasingly become subject to a larger degree of professionalization and in many companies the management of innovation begins to form an expert function in itself.

Building the capability for broader involvement in the innovation process in contemporary companies requires thus getting as many employees as possible to become willing to pursue both induced and autonomous initiatives with limited time and resources. Making innovation everyone's business undoubtedly put increased demands on companies' ability to recognize and develop supportive work practices. How companies address this challenge is not well understood from a research perspective. Innovation management research shows that building innovation capability entails the implementation of new ways of working which many times largely deviate from the work the majority of employees normally do (van de Ven et al., 1989; Francis and Bessant, 2005). Traditional management steering and controls hence need to be adapted or even replaced.

Induced and autonomous initiatives are also shown to require different types of support as a consequence from the former being able to rely on existing ways of working in contrast to the latter that by definition concern ideas that deviate from existing strategies or established operational models (Burgelman, 1983; 1991). Literature on corporate entrepreneurship shows that companies aiming for an increased number of autonomous initiatives to take place need to explore how to build capabilities and re-design its structural context while ensuring that these changes become accepted throughout the organization (Dess et al., 2003; Kelley, 2009). A fundamental challenge for organizations with an ambition to increase the number of both induced and autonomous initiatives is thus to managing the tensions arising from this conflict and to ensure that the routines and controls used are compatible to support both types of initiatives despite their different needs. However, surprisingly few studies deal with understanding how actors in companies go about to develop appropriate organizational routines and management controls.

This thesis targets this gap in literature. By focusing on actions taken on an intra-organizational level this thesis aims apart from addressing the need in research to generate actionable knowledge for managers and other actors who have taken the mission voluntarily or as a result from a chain of command to create conditions within their organization that are conducive to innovation

## Purpose and scope

The overall purpose of this thesis is to increase knowledge on how innovation capabilities are built when involving a broad base of employees in innovation in large and mature organizations. More specifically, this thesis seeks to understand what characterizes organizational routines and what are the consequences from using different types of management controls supporting employees in pursuing both induced and autonomous initiatives.

The thesis is made up of four studies that explore how the work to support employees pursuing both induced and autonomous initiatives is performed and experienced by actors representing different hierarchical levels and functions in two large and mature high-technology companies, one in the telecommunication industry (in the thesis referred to as the TeleCom company) and one in the medical technology industry (in the thesis referred to as the MedTech company). Both companies operate in markets characterized by a high level of cost pressure, globalization, and demand for innovations. In both of these companies, managers or assigned employees are expected – with limited resources and on a part-time basis – to involve as many of the organizations' employees as possible in innovation activities. Thus the companies were selected because they represent the context that is of interest for the purpose of this thesis.

The ongoing efforts in the two companies to create conditions conducive to innovation has facilitated the identification on what deliberate actions have been taken and particularly what changes in ways of working has been made to support employees in pursuing both induced and autonomous initiatives. Under more stable organizational conditions, it is harder to identify the conflicts associated to the implementation of new work practices than during a planned change when people are struggling to establish stable patterns for their actions and interactions. In these companies, each unit is mandated to create conditions conducive to innovation to ensure that ways of working are adapted to specific needs. This means that managers or employees responsible for this mission in each unit can decide for themselves what activities to spur, how much time to devote to this work, whom to involve, etc.

Since the researcher was an Industrial PhD student in the MedTech company, a detailed understanding of the challenges associated to developing organizational routines and the consequences from using management controls also over time was allowed for in this company. Studies in the TeleCom company provided opportunities to search for similar and different patterns in the deliberate actions taken across many different units. It also made a careful comparison possible of what characterizes the use of routines in units that are more successful in involving a broad base of their employees in innovation to what characterizes those that are less successful.

This thesis takes the stance that all organizations are more or less innovative, i.e. no clear definition or objective measure of a successful innovative company exists, and organizations can be found on a scale from more innovative to less innovative (Dougherty, 1992). Different units in each company are sometimes referred to as more or less successful in their effort to support innovation. The assessment of what is considered successful or an effective way of working and the evaluation criteria used are outlined in relation to each study.

The main focus of the investigations in this thesis is on collective and recurrent work activities i.e. the organizational routines or routinized elements of work activities that are implemented at the operational level in the R&D organizations to support employees in the pursuing of both induced and autonomous initiatives. The reason for focusing on the R&D organizations is because these are still subject to the most intensive efforts to create conditions conducive to innovation in high-technology companies. Thus the probability of identifying issues of interest to the purpose of the thesis was increased. Actions taken in

other parts of the companies were also studied to increase the understanding of the consequences from involving employees in innovation outside an R&D organization and to contrast the approaches to those of the R&D organizations.

## Previous research

How companies are building capabilities to support employees in pursuing both induced and autonomous initiatives is a complex area that involves many research fields. Several literature streams are thus relevant to the purpose of this thesis.

Firstly, understanding the differences between supporting induced and autonomous initiatives is crucial and not the least the implications when involving a broad base of employees to take initiatives in any area and any magnitude of change.

Secondly, the literature on organizational routines provides important knowledge related to capabilities below the strategic level that much of the capability literature deals with. This stream of literature is consulted to identify what characterizes organizational routines and how these are developed. The not entirely straightforward relationship between innovation and routines when taking an intra-organizational perspective of innovation is highlighted as research literature tends to place routine in contrast to innovation rather than focus on understanding how innovation can become routinized.

Finally, the role of management controls in relation to innovation is discussed and problematized. In a similar vein to organizational routines, management controls and innovation have a complicated relationship due to the long history of management controls as traditional tools for constraining and regulating employee behavior rather than supporting autonomy and experimentation understood as key features in an innovation process. This single-sided perspective of management controls and innovation is however being undermined by more recent studies offering a more nuanced picture of their association.

Based in the exposition of literature, a number of areas where more research is needed emerge that have guided the identification of the research questions in focus for this thesis.

## Innovation process, capabilities and outcomes

An *innovation process* is described in van de Ven's (1986, p. 590) seminal paper as "the development and implementation of new ideas by people who over time engage in transactions with others within an institutional context". His definition readily captures the idea that innovation is foremost a social system process, i.e. people collectively create innovations by developing new ideas within certain boundaries. In product innovation studies (e.g. van de Ven et al., 1989; Dougherty and Hardy, 1996; McCarthy et al., 2006), the development of new business units (Burgelman, 1983) in critical studies of technology and product development (Latour, 1986; Jones and Stevens, 1999) and in literature on knowledge and innovation (Murray and Blackman, 2006; Carlile, 2002; Nonaka et al., 2000; Nonaka, 1994) the innovation process is shown to be nonlinear and multidimensional and to involve complex and dynamic interactions between actors, organizations, and social environments in order to enable learning and the accumulation and creation of knowledge. The activities or phases in the innovation process are seen to occur in parallel, to be integrated rather than to occur sequentially. Issues relating to management's attention and willingness to support innovation, and different actors' ability to understand their role in relation to the complex innovation process, are considered critical factors that need to be managed also

supported by leadership and organizational science studies (Mumford et al., 2002; Mumford and Licuanan, 2004; Amabile, 2004).

Based in these studies, it has become clear that the innovation process depends on a large number of interactions and events and that this makes it hard to predict or plan for a very specific outcome. Being able to develop sustained innovation i.e. to generate multiple new innovations, as strategically necessary over time, with a reasonable rate of commercial success (Dougherty and Hardy, 1996) require attention to many aspects and interactions between diverse elements in an organizations structure, processes and resources. Research show how building capabilities for sustained innovation needs to consider simultaneously changes in existing structure, management and culture of an organization in order to stimulate the learning and the knowledge creation and exploitation required (Kogut and Zander, 1992; Nonaka and Takeuchi, 1995). This put demands on the actors who have taken the mission to create conditions within their organization that are conducive to innovation to identify and develop new ways of working. Ways of working that ultimately can form *innovation capabilities*. Fulfilling such mission has been found to be connected to a number of challenges, not the least when a company considers both incremental and more radical innovation outcomes as strategically desirable (Francis and Bessant, 2005; O'Connor, 2008). The underlying reason is that the trigger and subsequent development of innovations of diverse novelty degrees differ as shown in literature on radical innovation (O'Connor and De Martino, 2006) and in the organizational learning literature related to exploration and exploitation (Tushman and O'Reilly, 1996; March, 1991). Also, since capabilities can be described as being composed of a bundle of organizational routines (Nelson and Winter, 1982) the new ways of working developed needs to be routinized. It is important to notice that activities performed in an organization are not dichotomized as either routines or not, but rather they are routinized to different levels (Nelson and Winter, 1982).

*Innovations as outcomes* are by definition novel in relation to something that already exists (e.g. an existing product or process). In the literature, the degree of novelty is often discussed as a scale from incremental to radical, which describes the perceived magnitude of change and knowledge content in the innovation (Dewar and Dutton, 1986). For the most radical innovations, this change is not just a matter of degree of variation but represent a complete deviation from existing structures or a clear departure from existing practices (Ettlie, 1983) or a company's strategies (Burgelman, 1983; 1991), value chains (Christensen, 1997) or business models (Berghman, 2013). Most incremental innovations, on the other hand, are simple improvements or adjustments to existing products or processes. The more novel an idea is or how much an idea deviates from existing structures and behaviors, the harder it becomes to predict the outcome of the innovation process. Thus people who are involved in the pursuit of innovations need to be prepared to deal with the unknown and "groping in the dark" for extended periods of time (Latour, 1996).

### **Variation-selection-development-retention of induced and autonomous initiatives**

Nevertheless, research has shown that some companies have been more successful in creating conditions that enable both a steady stream of improvements to existing products and services to ensure short-term success *and* the ability to make large-scale strategy transformations in order to adapt and survive in the long run. Burgelman (1983) showed that the reason behind Intel's successful adaption and long-term survival was related to its ability to nurture both *induced and autonomous* strategic intra-organizational behavior.

The latter involves initiatives that are outside of an organization's current strategy or established operational models that are taken by an employee or group of employees. These initiatives are significantly different from induced ones when it comes, for instance, to the technology involved and to which customer



needs or customer groups are targeted. Autonomous initiatives most often originate when front-line managers are directly in contact with new technology development or markets, and they are often triggered by opportunities that are external to the organization. They are made possible by individuals or small groups that are able to make new combinations of skills and capabilities that at that particular point in time are not recognized as distinctive or central to the organization. Autonomous initiatives are found to be critical to the evolution of an organization because these create new competences that might be combined in unique ways with existing resources and competences. The innovations resulting from an autonomous initiative might trigger changes or even transformations of a company's strategy and thus contribute to necessary adaptations. Strategic transformation or renewal only occurs, however, if the autonomous initiatives have a successful outcome and become integrated into the company strategy (Burgelman, 1991; 2002).

Induced initiatives are those individuals or group of individuals take that fit with a company's current strategy and typically involve advances in core technologies, new product development, or marketing and manufacturing approaches of existing product families. These initiatives include the generation and implementation of ideas in already pre-defined areas or improvement of existing products and processes.

Whether or not an autonomous or induced initiative will lead to a radical or an incremental innovation, or to any innovation at all, cannot be foreseen because radical and incremental innovations are outcomes and thus can only be identified in retrospect. Research on radical innovation shows that opportunities for radical innovation typically emerge from employee engagements and initiatives, including skunk works (Peters 1997), intrapreneurs (Menzel et al, 2007), and bottom-up approaches (Birkinshaw et al 2011; Smeds and Haho, 2003) where incremental innovation typically is a result of more traditional control and planning exercises, top down or "naturally" cumulative changes (Bessant et al., 2005; Tushman and O'Reilly, 1996). Induced strategic initiatives aim to implement the objectives and means that are communicated in the strategic concept, and thus more incremental outcomes are expected. However, a strategic concept might trigger inconsistent behaviors or behaviors that are in opposition to the intention of a certain strategy and induced initiatives may form a radical outcome (Burgelman, 1983). In a similar vein, even though an autonomous initiative is not triggered by a company's strategy and is exploring novel opportunities, it is not self-evident that such an initiative will result in a radical output. Internal variations in behaviors that are simultaneously distributed among several groups and at multiple levels of management in large organizations and the high rate of failures associated to realizing strategy-deviating ideas may lead to a less radical outcome. Research has however shown that autonomous initiatives are more likely to form strategically renewing outcomes i.e. more radical innovations (Burgelman, 1983; 1991).

Organizations are restricted in terms of how many of their initiatives can be supported financially and resource-wise why the selection of which initiatives will be supported and which will not be is a critical step in an innovation process. Because induced and autonomous initiatives have very different characteristics, the selection mechanisms can be expected to be different as well. Burgelman (1983) showed the importance of internal selection mechanisms for induced initiatives being strongly coupled to the company's espoused strategy and vision *and* to the selective pressures of the environment if they are to be effective. This means that companies select induced initiatives both with help from a formulated strategy and by listening to current customer and market needs.

Selection of autonomous initiatives typically involves few rules. Instead, iterative and substantive interactions between managers and the idea generator or champion of an initiative are used to manage the highly equivocal inputs that characterize these initiatives. These initiatives are selected without an ex ante vision in place, and this is why viability of the initiative (both in its internal and external environment) needs to be shown not only during its initiation and end, but also at each intermediate stage. Over time as

an autonomous initiative is further developed and more information becomes available, top management is able to better evaluate its potential for the organization. “From an evolutionary point of view, only after [top management] has become reasonably certain that an autonomous initiative is viable can it legitimately become part of the organizational strategy” (Burgelman, 1991, p. 247). Helping managers to understand and value autonomous initiatives is thus a true challenge.

The retention process, i.e. the translation, internal diffusion, and learning from autonomous initiatives, is more or less intertwined with the selection process as it emerges over time. This is in contrast to induced initiatives where the selection process can be more easily separated from the retention process because these initiatives have a “template” in the form of an existing strategy or vision to lean on when learning from their development.

The variation-selection-retention resemblance critical phases or activities in an innovation process as shown in longitudinal studies such as van de Ven et al., (1998) and Dougherty and Hardy (1996). These studies provide a nuanced picture of the difficulties that actors involved in innovation work face during different phases in innovation processes and what challenges this puts on the management of these processes. Providing “shocks” by enabling potential innovators to come in close contact with the problems they are expected to solve is found to effectively initiate an innovation process. In addition, there is a critical need to manage the different perspective on what is considered creating future value held by the many stakeholders involved in the process over time. Also, to handle the many set-backs and surprises that emerges in the complex idea development phase. These studies show clearly the large effort required to ensure that an innovation is understood, valued, and accepted in an organization.

What is clear from the literature is that pursuing autonomous initiatives means going beyond existing strategies and ways of working, and this requires individuals who are willing to take risks and who has the drive to realize new ideas despite internal resistance or managers’ inability to understand or value these initiatives in extended periods of time.

## **The intra-organizational ecology model as a framework for this thesis**

Burgelman (1991) intra-organizational model understanding organizations as an “ecology of initiatives” constitutes a relevant framework for the study of companies that have an explicit ambition to involve a broad base of their employees to realize new ideas. The path to strategic renewal in this model is through the exploitation of autonomous initiatives generated by employees (in the original model it was front-line managers who were considered to have the most relevant knowledge). Having the innovation strategy to broadening the base of employees to drive ideas in any area and of any magnitude of change can thus be viewed as top management desire to increase the number and sources of both induced and autonomous initiatives in the organization as a way to improve the opportunities for both short-term profit and strategic renewal.

It is important to notice that Burgelman’s intra-organizational model differs in relation to other more commonly discussed evolutionary models in literature (e.g. Nelson and Winter, 1982); the variations created in the intra-organizational model are not something that is completely random or a result from adaption of external forces as assumed in the classical evolutionary models. The actors in a company are considered taking a much more active role. Hence, the intra organizational model is applicable when studying what actors do to deliberately support employees in pursuing both induced and autonomous initiatives in practice. Burgelman (1983; 1991) view a company’s strategy as an emergent process shaped by many actors whose actions are enabled and constrained by a process of variation-selection-retention and by modifying the *company’s internal capabilities* and *structural context*. While Burgelman (1983, 1991) is rather detailed about what is defining the structural context in a company and its role in his intra-

organizational model, he is far less outspoken about the role of capabilities and how these are modified to support different types of initiatives. Literature on corporate entrepreneurship highlights that companies aiming for an increased number of autonomous initiatives to survive need to explore how to build capabilities ensuring that these changes become accepted throughout the organization (Dess et al., 2003). When a company has the ambition to involve a broad base of employees to pursue both induced and autonomous initiatives, this undoubtedly requires an organization to pay attention to the development of new ways of organizing and working intra-organizationally. Ultimately, some of these new ways of working will form bundle of organizational routines that will build valuable innovation capabilities. What actions are taken and the consequences from different approaches to reach this ambition is yet scarcely empirically investigated.

### **Characteristics and development of organizational routines**

Creating and implementing new ways of working is one approach to changing organizations. If organizational members repeatedly engage in their practices, then more stable work processes such as organizational routines – i.e. repetitive, recognizable patterns of interdependent actions carried out by multiple actors as defined by Feldman and Pentland (2003) – can be developed. This means that routines are collective phenomena in contrast to skills or habits that can be used to describe recurrent activities performed by single individuals (Hodgson and Knudsen, 2003). Over time, this leads to the new work practices becoming embedded within the organization, and ultimately the acquisition of these routines leads to strategically important capabilities for a company (Nelson and Winter, 1982). These capabilities are important for a company because they constitute a competitive advantage by being more difficult to copy and to transfer across contexts (Grant, 1991). Routines are attractive as these make better use of humans' limited attention capacity because people tend to focus on non-routine events and to only focus semi-consciously on recurring events. Routines also store knowledge, particularly aspects of tacit and collectively held knowledge (Nelson and Winter, 1982; Zollo and Winter, 2002; Teece et al., 1997). This makes companies less dependent on single individuals because these routines enable new organizational members to learn more quickly what activities or rules are more successful than others in certain situations (Grant, 1991; March, 1991).

Three dimensions of routines have emerged as critical in empirical studies: the frequency of repetition, the regularity of the frequency, and time pressure. A higher frequency of recurrence supports the routinization of activities, and for routines that have recently been acquired repetition prevents them from decaying or falling apart (Weick, 1993). A greater number of interruptions in a process will encourage a search for, or an adoption of, a routine from external rather than internal sources (Zellmer-Bruhn, 2003), and increased time pressure increases the likelihood of routines being used even if they had previously been considered inadequate in a certain situation (Garapin and Hollard, 1999; Betsch et al, 1998). It has been shown that it is not necessarily the tacitness of the routines that allows firms to capture value from them, but rather the *ongoing use* of them (Becker, 2004).

Routines are specific to a particular context and are not easily transferred between contexts because essential parts of a routine might not be easily separated from more peripheral parts (Winter and Szulanski, 2001; Teece et al., 1997) and because there are often a large number of tacit components (Nonaka and Takeuchi, 1995) or inarticulate procedural knowledge (Cohen and Bacdayan, 1994) involved. There can thus only exist *local* "best practices". As a consequence, routines need to, and will always be, incompletely specified and open to interpretations, and this will lead to heterogeneity of work practices across time and space within an organization (Narduzzo et al. 2000). Routines are interlinked with other structures – such as technology, culture (Howard-Grenville, 2005), patterns of coordination, relationships between groups (Feldman, 2000), and artifacts (Hales and Tidd, 2009; D'Addario, 2008). This can lead

to change (Feldman, 2000), but these structures can also become barriers and make it difficult for the actors to alter them (Howard-Grenville, 2005). Organizational routines can thus act as a vehicle for change and development in a company and are thus a suitable subject for researchers with an interest in change management and how companies build up new capabilities.

Actors' aspiration levels, i.e. the particular performance levels an actor perceives as adequate and hopes to achieve, have been shown to be an important trigger or initiator for a routine (Levinthal and March, 1981). External cues like other routines and feedback, especially negative feedback, are powerful triggers of routines (Betch et al., 1998). The development of routines is dependent on their history, and routines change in a path-dependent (Nelson and Winter, 1982; Teece et al., 1997) and often incremental (Feldman, 2000, 2003) manner. Also, it is often difficult to trace the underlying reason for why a certain routine exists because "the experiential lessons of history are captured by routines in a way that makes the lessons but not the history accessible to organizations and organizational members who have not themselves experienced the history" (Levitt and March, 1988;320). In empirical studies, routines are often found to be developed "as a result of participant's reflections on and reactions to various outcomes of previous iterations of the routine" (Feldman, 2000). Routines are thus found to be developed when people make use of the routine in practice *and* reflect about its usefulness (Feldman, 2000).

A number of artifacts are also typically involved in the course of a routine, including guidelines, templates, IT tools, maps, objects, etc. The artifacts associated with a routine can play a more or less important role in motivating and guiding actors when carrying out a routine either as proxies for the cognitive aspect of the routine or as embodiments of certain views of preferred ways of working (Pentland and Feldman, 2005; D'Adderio, 2008). However, the roles of artifacts in routines are not well understood (Labatut et al., 2012). A thorough mapping of routines would thus include the documents and other artifacts.

## **Routinizing innovation**

The literature on routines makes a distinction between *operating* routines – or first-order routines – that involve the execution of known procedures that have the purpose of generating revenue and *search* – or second-order routines - that aim to make changes in the operating routines with the purpose of creating future profits (Nelson and Winter, 1982). Search routines to generate new opportunities can involve, for example, scanning and interpreting the environment, making use of customers and other external actors, and making use of employees' creativity; activities that can also be found in an innovation process. Second-order routines form the basis for the firm's dynamic capabilities (Teece et al., 1997; Eisenhardt and Martin, 2000; Zollo and Winter, 2002) i.e. the managerial and organizational capabilities that change and renew the stock of resources and capabilities in companies to adopt to or even change its external environment over time. Innovation capabilities may hence be argued to constitute capabilities that also can form important dynamic capabilities. Not the least organizational routines where search and recognition or creation of new opportunities is in focus (Teece, 2007).

Routines are often strongly associated with stability and inflexibility or even with causing organizational inertness, and thus they are often understood as in conflict with the ability to be innovative, i.e. the need for dynamicity, flexibility, and creativity. Also, innovation research literature has to a large extent been focused on investigating how company's normal operations routines with its focus on increasing efficiency in existing processes create barriers to innovation and has sought to understand how innovation can thrive in spite of a company's organizational routines (Dougherty, 1992; Tushman and O'Reilly, 1996). Innovation activities or exploration is understood as being in direct conflict with efficiency activities or exploitation referring to the organizational learning literature (March, 1991). The implication is that organizational routines need to be overcome in order for innovation to flourish. This is typically suggested

to be dealt with through the use of different ambidextrous solutions where Tushman and O'Reilly (1996) structural separation (i.e. separation of explorative from exploitative tasks by organizational design) is one of the most common concept discussed in literature. In this thesis the conflict between innovation and efficiency routines is however not in focus. The target for investigation is instead to understand how to routinize innovation in order to build valuable innovation capabilities. Building innovation capabilities, is understood as the development of a bundle of organizational routines to support employees in pursuing both induced and autonomous innovation. Innovation in the organizational routine literature (e.g. Nelson and Winter, 1982; Zollo and Winter, 2002) has traditionally been treated as a high-level second order routine (mostly innovation has been equating R&D or product development) and seldom as a more nuanced operational routine e.g. as a bunch of different routines targeting variation- selection- development -retention on an operational level as in this thesis. This approach is thus considered to complement previous research and to have the potential to generate some new insights of the challenges facing actors who have taken on the mission to create conditions conducive to innovation in an organization.

Routines are in everyday talk understood as stable work process patterns with the purpose of doing the same thing in the same way over and over again. Routines are thus intuitively not expected to deliberately support the creation of variations in the outcome. Also, in practice people are much more accustomed to associate routines with aim for targets such as increased quality and streamlining or standardizing of processes (e.g. decreased variations) rather than innovativeness and the creation of work routines enabling increased variations. Organizational routines are nevertheless in more recent and empirical-based research considered as having both a stable and a changing character; "they come about only through being performed by actors and they hold the seeds to their own continuity or change" (Feldman and Pentland, 2003). Research has shown that routines are rather conscious accomplishments which are often changeable, dynamic, generative, and open to variations, thus there will naturally be differences when participants carry out the routine in practice or choose to alter it (Feldman and Pentland, 2003). Routines are not just followed or reproduced, and both the stable and changing character of routines can act as a vehicle for change and development in a company. The studies performed in this field have however targeted administrative first-order routines (Feldman, 2000). The question thus arises if the models developed in this literature are valid also for second-order routines.

Nonaka and Toyama (2002) and Nonaka et al. (2006) concept of "creative routines", based in their studies of successful Japanese high-technology companies, suggest that it is possible to routinize innovation in a way so that the routines in use take advantage of recurrent and more stable work patterns without sacrificing the ability to continue to produce outcome variations. These routines are able to synthesize the efficiency of "traditional" routines with creativity to ensure continuous knowledge creation. Creative routines" involves the use of a knowledge vision, the development of spaces in organizations where certain types of dialogues are nurtured along with the development of more systematic knowledge management processes (Nonaka and Toyama, 2002). Knowledge creation is guided through the synthesis of contradictions which is achieved using dialogues where people openly share their opinions and beliefs and feedback from actions taken are incorporated in the discussions. This research indicates that it is possible to deliberately design routines that are supportive also for autonomous initiatives. Research also shows, that taking actions to stimulate deliberate learning (Zollo and Winter, 2002) is more effective than semi-automatic experience accumulation (Zollo and Singh, 2004) even when companies are managing new territories or striving to radically change strategies (Lenox and King, 2004). Deliberate learning focuses on the cognitive and conscious aspects of the process in order to understand the causalities between practices and outcomes and uses interventions such as experiments or training (Arthur and Huntley, 2005; Nembhard et al., 2014).

## **Creating a structural context supporting both induced and autonomous initiatives**

Besides bringing up the importance in paying attention to internal capabilities, however, without specifying what these implies, Burgelman (1983; 1991) showed how the evolution of induced and autonomous initiatives is shaped and determined by the *structural and strategic context* in an organization. The structural context shapes the communication in the organization and involves “various organizational and administrative mechanisms such as organizational architecture, information and measurements systems, and reward and punishing systems” (Noda and Bower, 1996: 160) and is influenced by values, beliefs, goals, and how top management understand current concept of corporate strategy (Noda and Bower, 1996). Middle managers play a crucial role in forming the structural context by them negotiating with top managers on what specific mechanisms to be used.

The strategic context is described as a sociopolitical or micro-political process through which middle managers attempt to convince or persuade top management about the value of certain (strategy-deviating) autonomous initiatives and why the current strategy needs to be changed (Noda and Bower, 1996). The strategic context involves few rules and many informal interactions (Burgelman, 1983; 1991) and even though top management cannot directly steer this context it can indirectly influence it by creating conditions allowing for the development of autonomous initiatives.

The various organizational and administrative mechanisms defining the structural context as defined by Noda and Bower (1996) are in this thesis proposed to equating an organizations bundle or combination of management controls. The use of organizational structures, measurement, rewards systems and goals are all examples of formal management control systems while influencing through values and norms are examples of informal management controls. Management controls are managers most commonly used tools to influence people’s minds and behaviors in order to achieve organizational objectives, and ensuring that company strategies are implemented as intended (Anthony, 1988; Ouchi, 1977). Following Malmi and Brown (2008), management controls are “those systems, rules, practices, values and other activities that management put in place in order to direct employee behavior”. The structural context can hence be described as require a re-designing of management controls when an organization has the ambition to involve a broad base of employees to pursue both autonomous and induced initiatives.

## **The role of management controls in innovation**

Managers in practice make use of management controls for coordinative and traditional steering purposes alone and tend to be reluctant in using these in relation to innovation (Henri, 2006). By steering and following-up on people’s behavior, management controls can lead to more coordinated actions in an organization that help to minimize the risks failure and maximize the efficiency in reaching the organization’s goals. This is seen to act as a barrier for the increased risk-taking and experimental attitude that is needed to support innovation. In addition, research is dominated by studies of management controls with a more traditional coercively control purpose (Malmi and Brown, 2008). Only using controls coercively rather than as a way to empower employees, is found to restrict their potential to enable innovative behaviors (Ahrens and Chapman, 2004; Henri, 2006). Based on the search for understanding how managers balance innovation and control, Simons (1995) developed an understanding of innovation as having a need for a larger degree of flexibility compared to more administrative processes. Simons (1995) showed that control systems need to be adaptable both to the company’s strategies as well as to strategies emerging from experimentations and initiatives by employees. This is in line with the Burgelman (1983) model where both employees’ initiatives and experimentation (e.g. autonomous initiatives) and top managers’ strategies (e.g. induced initiatives) need to be managed simultaneously. Simons (1995) also embraces the idea that management is the art of integrating conflicting demands or tensions, for instance, between freedom and constraint or between experimentation and efficiency that are

always present within organizations. The design of control systems needs to take these tensions into consideration as the basis for creating organizational capabilities.

Interestingly, more recent research shows that management controls increasingly can be used not only for constraining purposes but also to enable the innovative behaviors of creativity and experimentation (e.g. Davila and Oyon, 2009; Adler and Chen, 2011). The role of management controls in relation to creating variations has in more recent studies become a target of more systematic analysis. These studies indicate that management controls might be sufficiently flexible and dynamic to be able to adapt to the surprises created by innovation (Davila et al., 2006). Adler and Chang (2011) showed how the use of rational controls was able to provide a dynamic and flexible framework for people involved in creative large-scale product innovation teamwork. When successfully combined, the use of constraining and enabling controls has been shown to be able to create dynamic tensions that can produce unique capabilities and competitive advantages (Henri, 2006; Widener, 2007). In addition to the design, how management controls are used is as important to consider. An interactive use of controls, i.e. where managers involve themselves together with employees in the interpretation of data, has been found to have the potential to create unique and important capabilities if properly managed (Simons, 1995). Such use, however, has also been shown to be particularly problematic to implement and to manage (Mundy, 2010).

### **Social actions and social constraints in innovation management**

Another reason to the reluctance of using management controls in relation to innovation in practice may be due to the infelicitous division in different researchers' preferences between *social actions* and *social constraints* (Giddens, 1982) in the innovation management literature (Dougherty, 2008). Social-constraint approaches emphasize direct managerial actions such as boundaries and reward mechanisms because these approaches take as their basis that people have limited cognitive abilities within a bounded rationality (March and Simon, 1958) and that structures built into organizations and society further constrain possible actions. Thus vigorous actions are required to enable social action (Leonard, 1998). Social action approaches, on the other hand, theorize that people have immense social competence that makes coordination less needed and less costly (Giddens, 1982). Improvisation rather than authority drives behavior and organizational designs based on social action theory, and thus there is an emphasis on indirect managerial actions and concepts such as emergence, freedom, and self-fulfillment. Dougherty (2008) proposed that the different views on what innovation is in need of creates conflicting advice when it comes to the managerial implications suggested in the literature, and this might be one important underlying cause for why companies are seen to struggle to become innovative despite the vast amount of knowledge available on what is required.

Dougherty (2008) argues for the need to make use of both direct and indirect actions to successfully support innovation. The reason for this is that social action and constraint are mutually constitutive; social action produces and reproduces social constraints while constraints enable action (Giddens 1982; Barley 1986; Orlikowski 1992). Dougherty (2008) suggests alternate organizational "construction principles" when building innovative organizations that take both social constraint and action into consideration and that reflect the fact that people's bounded rationality and social competence are situationally enacted, i.e. they are context dependent. Both social action and constraint are needed. This is in line with research concerned with understanding the role of structure in organizations. Studies show that high performing organizations are using a moderate amount of structure to support innovation (Brown and Eisenhardt, 1997) and improvisation (Weick, 1998; Feldman and Pentland, 2003). Too many rules constrain innovation and improvisation but too few rules lead to chaos in product innovation (Brown and Eisenhardt, 1997). Understanding the role of management control in enabling both social action and social

constraints emerge as a crucial when developing a structural context supporting employees in pursuing both induced and autonomous initiatives.

### **Personnel/cultural, action and result management controls**

There are several ways to categorize different types of management controls. Distinguishing between input, behavior, and output is one of the most traditional ways to discuss management controls (Ouchi, 1977). Merchant (1985) developed Ouchi's categorization further and re-named the controls according to the target for the control in use; personnel/cultural, action and result control respectively. These categories are also used in this thesis. Management control research has shown that the target of controls and how tight it is designed (i.e. the degree of specificity), will have an impact.

*Personnel/cultural controls* aim to influence conditions to enable a certain desired behavior and are controls that build on employees natural tendencies to control or motivate themselves (Merchant, 1985). For example, in an R&D department this might be related to creating the right environment by building the knowledge, skills, and attitudes that are desired (Mintzberg, 1983). Under conditions of high uncertainty, experiential learning such as on the job training, job rotation, and mentoring becomes a crucial part of the personnel controls in use (Ouchi 1979; Cardinal 2001). Facilitate the use of diverse knowledge (Snell and Youndt, 1995; Cardinal, 2001) and allowing sharing and distribution of information about company strategies and customer and market needs (Kanter, 1983) are important characteristics of an environment that is supportive of innovation or when task uncertainty is high. Stimulating the tacit dimension of knowledge i.e. knowledge that is not easily expressed or documented (Polanski, 1967) is found to be particularly supportive for innovation. This is found to be facilitated through face-to-face meetings where dialogues are encouraged and basic assumptions are challenged (von Krogh et al., 2000), by using strategic plays (Roos and Statler, 2004) or strategic dialogues (Dougherty and Hardy, 1996) or by creating conditions of creative chaos, redundancy of information, and requisite variety referring to Nonaka (1994). Enabling a creative climate characterized by a high level of trust (Ekvall, 1996), encouraging new ideas (Damanpour, 1991), and accepting risk taking and conflicts (Ekvall, 1996; King, 1992; West and Anderson, 1992) have been shown in a large number of studies to support innovation. Other important factors involve a focus on employee's tasks and intrinsic motivation and expertise development (Amabile, 1988), creating conditions for experimentation and collaboration (Damanpour, 1991; Thomke, 2001; Burgelman and Sayles, 1986) as well as tolerance of failed ideas (Madjar et al., 2002). Finally, making sure time and money dedicated to innovation is enabled has been shown to be crucial (Mumford and Licuanan, 2004). Organizational science innovation research makes a strong association between innovation and creativity (e.g. Amabile, 1996; Mumford, 2002) and tend to prescribes the use of indirect managerial actions or personnel rather than direct.

*Action control* is a direct control of people's behaviors through the use of different guiding or monitoring devices (Eisenhardt, 1985; Ouchi, 1979). Controls that target a direct regulation of activities usually in the form of procedures and step-by-step instructions have been the type of management control subject to the most intense research (Barker, 1993). Despite the number of studies on action controls influence on innovation, the results are far from consistent (Damanour, 1991). Formal procedures have for instance been shown to support radical innovation in high-technology settings (Jelinek and Schoonhoven, 1990; Adler and Borys, 1996) People in these organizations *perceive* structures and processes as "tools" rather than as fixed frames or as ways for managers to directly control behavior. Damanpour's (1991) meta-analytic review demonstrates that formalization is positively related to product innovation (although no separation was made between radical and incremental innovation). On the other hand, formalization is in other studies found to restrict experimentation (March and Simon 1958), people's deviation from established behavioral patterns (Weick, 1979), and radical innovation (Dewar and Dutton 1986). For more



incremental innovation, formalization can improve information-processing efficiency, and thus the realization of the innovation. Increased regulation enhances the implementation of innovation but hampers the generation of new ideas and the creativity stages of innovation (Amabile, 1998). Using action controls has also been found to have a neutral role in projects aiming for strategic renewal (Poskela and Martinsuo, 2009).

*Result controls* are made by defining and setting the dimensions of expected results and by monitoring the alignment of the output with the set standards as well as by providing incentives (Merchant, 1985). Identifying and communicating targets, goals, and visions are typical results controls. Instead of directly controlling behaviors, it strives to communicate and capture a pre-defined desired result within a certain time period. The use of result controls is, and in a similar vein as action controls, found to show conflicting results in relation to innovation. It is also the least investigated type of management controls in relation to innovation (Cardinal, 2001). By making use of result controls, employees receive a considerable amount of freedom and autonomy in achieving the goals and this is expected to facilitate creativity and novelty (Zollo and Winter, 2002). The use of so-called “creativity goals” (goals that encourage creative behavior) have been found to have a positive effect on creative behavior (Shalley, 1991) and Cardinal (2001) showed that the use of result controls resulted in an enhancement of both radical and incremental innovation. A shared vision has been shown to significantly influence both radical and incremental innovations in teams as organizations with a high level of shared vision, tend to make individuals more likely to contribute with their ideas and knowledge (Tsai and Ghoshal, 1998). One common approach in top innovating companies studied was their use of a few broad challenging goals using a few indicators related to timing, cost, and performance (Quinn, 1985). Over time the goals become more specific although still allowing many different options to be evaluated. Pursuing goals that are seemingly impossible so called stretch goals might stimulate radically new approaches but may also lead to less desirable behaviors (Sitkin et al., 2011). The clarity of organizational goals has been found to be an effective antecedent to innovation outcomes (Patterson et al., 2005). In contrast, Nonaka (1994) and Nonaka and Toyama (2002) highlighted the use of an ambiguous vision involving contradictory elements as crucial for creating new knowledge. Companies that emphasize quantifiable outputs and more narrow and specific goals tend to support only incremental and short-term initiatives with more predictable outcomes and faster returns (Ouchi 1977; Merchant, 1985). Also, frequent monitoring will make people in an organization avoid making mistakes and encourage them to “play it safe” and to focus on small improvements rather than pursuing more autonomous initiatives (Burgelman and Sayles 1986, Sitkin 1992), and it might discourage experimentation in order to “look good” (Merchant 1985). This makes the design of appropriate result controls a true challenge in a complex and dynamic innovation process.

More often than not, management controls are studied isolated rather than in combination. Particularly, few studies investigate the combination of personnel/cultural controls and action or result controls (Alvesson and Kärreman, 2004; Malmi and Borown, 2008). The studies that have investigated the combination of these types of controls indicate the potential in further understanding their impact. Alvesson and Kärreman (2004) showed how such combination of controls build on each other rather than simply compensate each other. Because a specific interest of this thesis is to provide knowledge about the consequences from using management controls or create the structural context referring to Burgelman (1983, 1991) to better support employees in pursuing both induced and autonomous initiatives, investigating different types of management controls emerge as vital.

### **The special case of performance measurement**

One of the most common management control systems in use in contemporary companies is performance measurement. Performance measurement consists of a set of metrics used to quantify both the efficiency and effectiveness of actions (Neely et al., 2000). The function of performance measurement is two-fold. First, it provides feedback on the outcome of actions to support learning. Second, it uses and

communicates selected performance metrics as a way of implementing a strategy or a preferred behavior within the organization, i.e. it is a feed-forward process. The metrics or indicators selected can thus be of very different kinds depending on the purpose of the measurement. For example, such metrics might include key success factors as a way to communicate “best practices”, metrics for detection of deviations from a performance goal, or metrics to modify or learn from actions within a process (Lebas, 1995). A performance measurement system can hence be considered involve both action and result controls. Since the use of performance measurement formed a central part of the deliberate effort to build innovation capabilities in the MedTech company studied in this thesis, an in-depth study of the consequences from using action and result controls to support of employees to pursue both induced and autonomous initiatives was enabled.

Using measurement on a continuous basis is a familiar approach in industry and has been shown to both reinforce existing ways of working and to signal a need to challenge the status quo and inform goal setting within an organization (Widener, 2007; Grafton et al., 2010; Kaplan and Norton, 1996). Furthermore, the use of performance measurement has been found to stimulate the generation and implementation of creative ideas, to motivate and inspire new behaviors (Simons, 1990; Simons, 1995; Kaplan and Norton, 1982), to support team autonomy (Atkinson, 1999), and to affect managerial decision-making and to influence perceptions of the positioning of the organization in its competitive environment (Simons, 1990). Such measurements have also been found to help managers develop a mental representation of the business and to provide goal and process clarity as well as to encourage extensive scanning behavior (Gimbert et al., 2010).

The use of performance measurement needs careful attention because despite its potential to facilitate learning and change, measurement is a problematic area for companies and its influence on performance has shown contradictory results (Neely, 2006; Bourne, 2002; Micheli and Manzoni, 2010). One reason for such contradictions put forward in research is the close linkage of performance measurement to a number of contextual and environmental factors such as a company’s culture, reward system, and leadership (Henri, 2006). Simply implementing new metrics is not sufficient, and several other areas need to be taken into consideration. Also, companies do, in general, tend to become set in their ways of measurement once a system has been implemented, so even if new metrics are supplemented, the old ones are not discarded and this can lead to an overload of metrics (Neely, 2005).

Measuring in the context of innovation is considered particularly challenging because the innovation process is complex, multidimensional, and unpredictable; the many functions and stakeholders involved will make the set-up of clear goals and the identification of relevant indicators a true challenge (Adams et al., 2006; Smith, 2005). Furthermore, the difficulties of analyzing the impact of innovations due to the time lag between an innovation and its impact (a lag of several years or even decades) are an additional issue. Moreover, many of the key parameters for understanding innovation are intangibles and thus not easily observed. This means that the collection of data needs to be performed using many different means, including rather advanced and time-consuming analyses that do not readily support the practical needs of more easily performed measurement procedures (Smith, 2005). As a result, it has been found that companies, despite the potential of measurement, seldom track the information required to evaluate and assess innovation in a systematic way (Adams et al., 2006; Tidd, 2001). In addition, using measurement has been shown to be particularly problematic in R&D settings due to the long tradition of measurement as a device to control costs and processes rather than to support learning and motivation (Henri, 2006). R&D personnel are known to be sensitive to the use of control tools in general and to prefer more normative and social controls such as building their practices on certain values and norms (Tushman and O'Reilly, 1996). These values have often been found to be based on their profession rather than on the company’s values.

This challenging situation has, however, not stopped researchers in the operational, management, and accounting fields from proposing and developing a large number of conceptual models for R&D and innovation performance management. The majority of these models focus on describing the most important areas to consider and provide suggestions on metrics, including the process for analyzing and using the measures with the aim of improving performance, managing R&D (Brown and Svenson, 1998; Kerssens-van Drongelen and Bilderbeek, 1999; Ojanen and Vuola, 2006; Cooper and Kleinschmidt, 1986), general innovation management (Tidd, 2001; Adams et al., 2006; Tang, 1998)) and innovation audits (Chiesa, Coughlan and Voss, 1996; Hallgren, 2009).

Compared to the large number of conceptual innovation performance measurement models, the number of empirical studies on the use of innovation measurement is quite small. This is particularly the case for the role that measurement plays in the work to create conditions to support innovation. The majority of empirical studies on innovation measurement have investigated the practical use of diagnostic innovation audits (e.g. Chiesa et al., 1996; Hallgren, 2009) and not the impact from using innovation measurement to continuously evaluate and measure innovation activities in practice. This is despite an understanding of the value of using measurement to support daily work and learning and to determine whether certain actions lead to improvements or not.

## Research questions

There is a pressing need in contemporary organizations to understand how to deliberately build innovation capabilities to involve a broad base of employees in innovation. In addition, there is a need in research to increase knowledge on how organizational capabilities to support employees in pursuing both induced and autonomous initiatives are built on an operational level and the role of management controls in this effort. Given the identified needs in practice and research the following research questions are addressed in order to be able to fulfill the purpose of this thesis:

**RQ1:** What characterizes the use of organizational routines to support employees in pursuing both induced and autonomous initiatives?

**RQ2:** What are the consequences from making use of different types of management controls to support employees in pursuing both induced and autonomous initiatives?

**RQ3:** How are organizational routines in settings that successfully support employees in pursuing both induced and autonomous initiatives different from organizational routines in settings where such support is not found?

## Empirical settings

The studies in this thesis were performed in two companies. Both companies are part of what can be considered to be high-technology or knowledge-intensive industries, namely advanced medical technology and telecommunications. These industries have many similarities, but the studied companies are subject to different demands. Innovations in both companies have traditionally been based on new technologies, and their products have over the years become increasingly complex and are typically composed of electronic, mechanical, and software components. Software components are particularly important and are responsible for adding much of the new functionality available in complex products (Broy, 2005). The service content is also rapidly increasing, and the value in identifying strategic collaborations and partnerships between customers and other actors is significant. In addition, the global distribution of different functions in the companies in order to come closer to targeted markets and to facilitate the access to qualified personnel has resulted in high levels of organizational complexity. This reflects a general trend in these industries (Howells, 2008).

Despite innovation being at the heart of the strategies in these industries, there is also a strong focus on keeping costs down. The medical technology industry is increasingly becoming more focused on costs savings because it must organize and manage for less generous revenues as a consequence of health providers' tighter cost controls and increasing reluctance to pay for more novel and, therefore, more expensive technologies. Because clinical efficacy and patient safety is and will remain crucial, and because the ability to make accurate efficiency calculations within health care is severely limited, understanding how to develop the business strategies in medical device companies is far from straightforward. In parallel, the fear of new entrants with disruptive technologies keeps the mature companies on their toes. Increased regulatory scrutiny has, however, made it increasingly difficult for any actor in the market to receive product approval, and this has resulted in the need to identify alternative ways of working. Therefore, the product cycles (even for "simple" software updates) are far longer compared to the telecommunication industry.

The telecommunication business with its deregulated market has for longer periods of time compared to the medical technology industry been strongly focused on cost and efficiency. It faces fierce competition not only from within but also from the computer industry, and this makes innovation a necessity. This competition is combined with a market characterized by many and small-sized customers that demand high performance and low prices, and this requires increasingly shorter life cycles and a highly flexible development process. New work practices are thus required for companies in both industries, and these provide an opportunity for competitiveness.

Regarding their innovation strategies, both companies make use of a similar approach when aiming to enhance and build new capabilities to innovate, and they both strive to involve a broad base of their employees in the innovation effort. The companies' organizations are described in detail below.

### The TeleCom company

The company has a long history (100+ years) and is a world leader in the telecommunications industry. It develops and provides equipment, software, and services to mobile and fixed network operators. Its customers as well as its more than 100,000 employees are found in 180 countries. The company's headquarters are located in Stockholm, Sweden, as are its R&D head offices. The company is divided into three main Business Units, ten Regions, and a number of Group Functions. Each Business Unit has its own marketing, support, and development organization, and these are further divided into a large number of units or sites that are distributed worldwide. The company is characterized by highly structured and

rather open processes, including strategy development and human resource management. The annual strategy cycle includes situation analysis, defining strategic choices and focus, and identifying strategic and capability issues and key priorities, including their targets and KPIs (Key Performance Indexes), down to unit levels. Individuals are responsible for defining part of their own goals in communication with their managers, and these are documented and regularly followed up on.

#### *Product innovation organization*

The organizational design of most high-technology firms is that of a functional design. In practice, this means a specialization within the company between, for instance, technology specialists and people with business-oriented competences, and this company is no exception to this. The development organization is divided into three different product system areas that all have software development as their core business, although hardware development is included as well. The majority of people in each unit work in a development group, and each development group is specialized around the responsibility to realize new features and products. Many of these groups are organized into teams of about 20 persons. The majority of these teams are organized according to agile principles, i.e. the team works in well-defined blocks of time, it has the competencies to develop a new feature from start to end, and it follows principles promoting autonomy, flexibility, and learning.

Another important organizational function is the advanced technology groups that consist of senior engineers and experts with the aim of exploring and developing new technologies, preferably into prototypes. People in these groups have a deep knowledge of the product systems. Together with their separate budgets dedicated to the development of new technologies, they have, in contrast to the majority of developers in the company, the opportunity to explore rather radical and complex ideas. Furthermore, people in these groups manage many different interfaces (research, product management, customers, and development) making them important in translating different needs and requirements in the product innovation process.

Two other functions, the research and the product-management organizations, are closely connected to the development units and thus deserve some short descriptions. The research organization serves the development organization with new knowledge, ideas, and concepts in diverse technology areas. The product-management organization is responsible for developing strategic plans, and it defines and prioritizes specific product-development initiatives. This requires people working in this organization to be skilled both in technology and business. The latter is especially critical because this organization is responsible for bringing the business aspect to the selection and evaluation of new technologies and of new product and service ideas and concepts. Their external focus makes them valuable knowledge sources for the development organization when it comes to interpreting customer and market needs.

#### *Organizing to create conditions that are conducive to innovation*

The company started a work plan to accelerate its innovation capability in 2009/2010. Innovation in the overall strategy is broadly defined as realizing and creating value for different kinds of ideas such as new technologies, products, services, business models, internal processes, and ways of working. The major driver is the exponentially increasing number of smart phones and connected devices in the market that has pushed the limits on existing communication solutions and network capabilities. End customers are demanding increased speed and connectivity coverage, however, they are not willing to pay more than before. Thus, the company must pay attention to both developing advanced technical solutions and to controlling costs. Communication services and machine-to-machine solutions are gaining momentum, and the company is continuously seeking new partnerships with, for instance, automobile manufacturers, health care providers, and financial service companies to create new opportunities with the aim of forming service and business model innovations. The key challenge is to find a balance between the company's

well-established culture of technology focus, engineering practices, and operational efficiency and a culture that empowers everyone in the company to innovate. The purpose of this is to become more market and insight driven, more collaborative, and more engaging with employees, customers, and partners.

Internally, the strategic emphasis on innovation involves all employees who are expected to contribute to the innovation efforts. Measures taken to create conditions to support innovation include actions dedicated to broadly sourcing ideas both internally and externally, the implementation of new IT technologies to support the sharing of information and ideas, the set-up of a group-level incubator for potentially valuable opportunities that have a hard time finding a “home” in the organization, and the establishing of a network of innovation coaches. Tools and information to support the fostering of innovation are gathered on the company’s intranet. In addition, information on initiatives taken in different parts of the company is regularly shared. The strategic emphasis on creating an innovative spirit is supported by the overall mission statement and values where innovating to empower people, business, and society is emphasized, including an urging to innovate on a daily basis.

## **The MedTech company**

The medical technology industry is characterized by a wide range of products varying in technological complexity, from plasters and catheters to advanced neuro-stimulators and robotic surgery systems. The company studied in this thesis is a manufacturer of products in the more technically complex end of the spectrum with a focus on active and implantable products <sup>1</sup> that seek to manage a range of diseases and medical conditions. The company has a history of 50+ years of bringing a number of pioneering technologies and products to the market, and it is a market leader in several of its product areas. The company has its headquarters in the US and consists of five divisions with approximately 15,000 employees worldwide. In the same manner as for the telecommunications company, these divisions are further divided into sites or units that are distributed globally, and the company is represented in 100+ countries. The R&D units are located only in the US and Sweden. In contrast to the telecommunications company, this company is characterized by rather top-down and closed strategy development processes that are performed every other year rather than annually, and this is reflective of a less rapid product cycle. The KPIs are, in a similar manner, broken down to reflect goals on an individual level that are documented and regularly followed up on in an annual or biannual cycle.

The site that is the subject of the research studies in this thesis is located in Sweden and is part of the largest division of the company. It has about 600 employees, of which about 200 work in the R&D department. In contrast to the headquarters, the site management encourages a bottom-up approach and strives to involve a broad base of its employees in the strategy development and innovation processes.

### *Product innovation organization*

Like in the TeleCom company, the organization is functionally designed around specific competences. The R&D organization is divided into four different technological platforms targeting different diseases or medical conditions. The majority of people work in a development group. Because the product systems

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<sup>1</sup> An active implantable medical device is any device that relies on a source of electrical energy or source of power other than that which is directly generated by the human body or gravity. In addition, it is intended to be totally or partially introduced into the human body and is intended to remain after the initial medical procedure. (This is an abbreviation of the definition in Medical Device Directive 93/42/EEC.)<sup>1</sup>

that are developed have a larger tangible output component compared to the output in the TeleCom company, the hardware part of the development department is not insignificant. The R&D organization is divided according to technical competences serving the different platforms, including hardware, mechanics, electronics, software, etc., rather than according to product features or functions. Many of the technology projects and most product development projects make use of cross-functional teams. The projects make use of well-defined stages and gates to a small extent in the advanced technology phases and to a large extent in the new product development phases. A less formal process characterizes the earlier “front-end” phase. The software development is similar to that in the TeleCom company and is organized and works according to agile principles where smaller teams are responsible for delivering specific features.

The different roles of advanced technology, research, and product management are the same as described for the TeleCom company. Because the products are defined as safety critical, the involvement of specialists in design assurance and clinical and system engineering is crucial. These specialists are involved in technology and product development projects from identifying and translating customer requirements to testing and verifying product systems.

#### *Organizing to create conditions that are conducive to innovation*

As for the TeleCom company, the focus on innovation has always been a critical factor for success. In addition, minimizing patient risks and improving patient outcomes while reducing costs is emphasized. Today, innovation requires not only the development of new technologies but also an understanding of how complex relations between different medical conditions, technologies, and actors in the health care supply chain need to be managed in order to develop new products and product service systems. This has had an impact on the organization and management of innovation, and, as a consequence, the company has an explicit strategic objective to develop its innovation capabilities to meet these demands.

A more dedicated effort to support innovation in the Swedish unit was initiated in 2006. This effort focused on improving the early phases of product development along with an encouragement of new ideas from all employees. Specific innovation areas to direct idea generation were identified together with the development of processes and tools to support unsolicited ideas. New work practices were experimented with, including temporary cross-functional innovation teams, collaborative environmental scouting, hiring clinicians on a part-time basis, and organized brainstorming using systematic creative problem solving techniques (TRIZ). The introduction of “Innovation Fridays” and “Innovation Days” were other types of activities that had the aim of allocating time to generating and exploring more innovative ideas within the whole organization. The innovation work was coordinated by an “innovation board” composed of the heads of different departments within R&D and appointed individuals with the responsibility of managing innovation-related work within each department. The communication from the head office related to innovation and its importance was considered rather weak in comparison to that in the telecommunications TeleCom company. Nevertheless, innovation was considered a core value, and an idea-management tool and process was implemented in 2007 to enable the gathering of ideas from all employees. The system was closed, meaning that only dedicated individuals were allowed to take part in the ideas gathered by the system. As a result of a corporate decision to consolidate all R&D in the US and all manufacturing in Malaysia, the Swedish site of the company that was the subject of the studies in this thesis was closed down in 2012.

## **Research approach, design, and methods**

### **Research approach**

Investigating what people in companies do to involve a broad base of their employees in innovation is a complex area that is insufficiently investigated, and this is why an exploratory approach was chosen for this thesis. To some extent, the research is also explanatory in that it aims to provide possible explanations for why certain ways of organizing for innovation seem more feasible for its intended purpose than others. The selection of an exploratory research approach means that the research strives foremost to systematically describe the situation or phenomenon being studied as well as the attitudes towards what is considered prevalent with respect to the target of the study (Kumar, 2011). Descriptive or exploratory studies tend to be inductive and to ask “what” questions with the purpose of exploring people’s experiences and their views or perspectives of these experiences. Explanatory studies make use of “why” and “how” questions and aim to explain a phenomenon or situation. The studies performed in this thesis have thus dealt with and made use of all three types of questions.

This thesis took a constructivist view. This means that the world is interpreted as socially constructed and that the way the world is perceived depends, in part, on our beliefs and expectations, and this is why complete truth is inevitably difficult to ascertain (Bunge, 1993). This also implies that context needs to be taken into consideration. However, it is important to be aware that social phenomena do not exist only in our minds and reasonably stable relationships exist between social phenomena and the objective world (Miles and Huberman, 1994).

Because human activity is under investigation in this thesis, the interpretation of information will play a key role in drawing conclusions (Corley and Gioia, 2011). Knowledge about the issues in focus for this thesis is considered to best be generated through a qualitative approach to the examination and interpretation of the data. Humans construct their own meaning in different ways, and thus multiple contradictory, but equally valid, accounts of the same phenomenon can exist. Thus, both managers and non-managerial employees were approached, and employees representing different roles and functions were sought when this has been possible. To actively search for different views and perspectives in the collection and analysis of the empirical material has been an important guiding principle. Even though interviews were used as the main source and individuals’ experiences were in focus, the ‘site’ or context was considered important as well. Thus, it was valuable to have had the opportunity to have longer visits at the companies than only during the interviews. In addition, having access to the companies’ intranets enabled a better understanding of the virtual environment within the companies. This has been considered valuable because it has not only provided additional contextual knowledge (considering how much of people’s daily working hours are spent in the virtual environment), but it also provided access to internal documents describing the processes and work practices brought up by the respondents during the interviews.

### **Collaboration between researchers and practitioners**

This thesis aims to generate knowledge that can serve both research and practice. This thesis is the result of an industrial PhD project between the Swedish subsidiary of a medical device company (hereafter referred to as the MedTech company) and the Integrated Product Development (IPU) group at the Swedish Royal Institute of Technology. An industrial PhD project aims to advance knowledge that is beneficial to both the company and academia, and the student in such a project conducts part-time or full-time studies at the request of the employing company and is affiliated with and supported by academic supervisors in a department in a university (Kihlander et al., 2011). The first two studies (Studies 1 and 2,



see Table 1) were performed in the MedTech company where the researcher was an industrial PhD student and was familiar with the organization. This is in contrast to Studies 3 and 4 (see Table 1) that were performed in the TeleCom company where the researcher did not have any pre-understanding or affiliation.

In the MedTech company, the researcher was actively involved in the innovation-related activities as a coordinator in the implementation of the work practices being studied. As a coordinator, the researcher scheduled and facilitated formal meetings, suggested improvements, collected and shared data, and wrote protocols. This allowed for an exploration of how new work practices evolved over time, while in the TeleCom company the researcher had no active role.

In Studies 1 and 2, the implementation of new work practices was made in close collaboration with the practitioners, and the effects on outcomes and learning were followed up and analyzed through interviews and document analysis. Interactions with practitioners were an essential part in these studies. Practitioners have been involved in different roles, e.g. as discussion partners in prioritizing the design, implementation, and use of new work practices, as testers and evaluators of new work practices, as subjects of observations, and as respondents in interviews. In both studies, both R&D managers and engineers in the organization participated. This practice-oriented approach was inspired by action research (Coghlan, 2003) and collaborative research (Shani and Coghlan, 2014). These research streams aim to contribute to both research and practice by systematically initiating, supporting, and studying changes in the researched organization (Gummesson, 2000).

## **Principles for serving both research and practice**

The debate concerning rigor and relevance in management research has been on-going for some time. Two main camps have developed, one that claims that existing management research need to become more relevant for practice and the other that claims that rigorous research cannot also be relevant (Gulati, 2007). Several scholars have attempted to develop approaches and to define principles for research studies where rigor and relevance are not considered being polarities (e.g. Van de Ven and Johnsson, 2006; Tushman et al., 2007; Gualti, 2007). These principles are also considered as being in alignment to suggestions made in design research (e.g. Blessing and Chakrabarti, 2009), which is a research field stemming from the engineering schools that also aim to target the practices of managers and engineers. This thesis accepts the view that it is possible to perform research that is both relevant and rigorous. The following four principles have been important for how the research was performed in this thesis.

*– Researchers should interact closely with practitioners in order to reveal problems that motivate research studies*

This is not the same as simply asking practitioners what their problems are. Managers and engineers are not always fully aware of or are not able to explicitly articulate critical issues (similar to customers or consumers in the product-development process). Identifying what problem to focus on is rather an interactive process that can be facilitated through different means but which ultimately is about having productive dialogues (Silverman, 2011). As a response to this principle, several dialogues with practitioners who are responsible for organizing for innovation in organizations outside the companies studied have been held. In addition, the dialogues with senior researchers in academia have been crucial in the development of fruitful research questions.

*– Researchers should strive to ground their ideas in existing theories and should be distinct and transparent when articulating new theories*

This will make the contributions to the body of management or design knowledge clearer. In this thesis, the Theoretical Frame of Reference section aims to explain what streams of literature have been used and the underlying assumptions made in their selection. In addition, Table 1 illustrates how the literature was used in the different studies.

*– Researchers should appreciate the existing dialectic between theory and the phenomenon or practice to which it relates*

“Theory forces one to examine phenomena from a novel or more integrated standpoint, whereas observable behavior or outcomes allow one to define, refine, or discard theory” (Gulati, 2007, pp.). The different studies in this thesis have made use of different theoretical lenses when interpreting the empirical material at hand. The access to empirical data in two different settings has provided the ability to challenge some of the existing theories or assumptions. Table 1 aims to make the research process clearer to the reader when it comes to the dialectic between theory and practice.

*– The role of the researcher as a translator needs to be embraced*

The researcher’s role resembles that of a translator who must interpret the world of practitioners and be able to share research findings with them in an intelligible manner (Mohrman et al., 2001). Such translation does not necessarily need to result in a new method or process, but as Silverman (2011) put it, it can, for example, mean participating in debates about how organizations function, providing different options for people to make their own choices, or simply offering a new perspective. This thesis embraces the wide range of available options on how to translate academic research. In agreement with Weick (2001), this thesis also embraced the idea that the present gap between what is produced in academic research and what is applied and used in practice does not lie only in the ways that researchers work. It is “as much a product of practitioners wedded to gurus and fads as it is of academics wedded to abstractions and fundamentals” Weick (2001). It takes two to tango. Or rather three if the numerous consultants in the field of innovation management are included.

## **Research design**

This thesis builds on four empirical studies. The first two studies were performed in the MedTech company between 2009 and 2011. The investigations were performed by zooming in on two particular routines that the company had implemented as a result of its ambition to become more innovative. By following the implementation of these new ways of working, the studies generated insights into what it means to design and implement new routines and guided the search for relevant theory. These studies served as the basis for the design of the studies performed in the TeleCom company.

The third study was performed in the TeleCom company in the spring of 2013 and in the spring of 2014. It investigated what leaders scoring the highest in terms of an innovative environment in an internal employee survey do to involve a broad base of their employees in driving both radical and incremental innovation. Finally, the fourth study was initiated in the TeleCom company in September 2013 and ended in February 2014. This study identified and compared new ways of working in four different globally distributed R&D units within the company.

The research process has included several iterations between the collection and analysis of empirical material and consulting the literature. In Table 1, the research design is summarized and the different steps in the research process are illustrated.

**Table 1 Summary of research design**

<b>Time period for data collection &amp; company</b>	<b>Rationale for the study</b>	<b>Method used to collect empirical material</b>	<b>Method and literature used to analyze the empirical material</b>	<b>Paper included in this thesis</b>	<b>Main findings &amp; contributions to research</b>
Aug 2010-Oct 2010 MedTech	<b>STUDY 1</b> Performed to investigate the use of innovation measurement on a continuous basis.  Questions were related to people's definition of innovation and their experience from the ongoing innovation work, and particularly the consequences from using innovation measurement.	19 interviews with 10 managers and 9 engineers  Participant observations  Document analysis	The researcher facilitated the implementation of the innovation measurement using a research-based framework.  The researcher actively participated in innovation steering-board meetings.  Collection and analysis of innovation measurement.  Notes were taken and meeting protocols were used to describe how the implementation was performed, and these were compared with the experiences from respondents in the interviews.  Categorization, clustering, and comparison between different respondents representing two levels (engineers and managers) and different departments.	Paper II	Addressed a research gap in studies on the use of innovation measurement on a continuous basis in contrast to an existing focus on conceptually advanced diagnostic audit tools. Also, contributing by investigating the role of performance measurement in relation to innovation organizational routines.  Increased understanding of the roles of performance measurement in relation to innovation and the identification of consequences from using innovation measurement over time.
			Clustering and comparison of the field material using Pavlov and Bourne's (2011) conceptual model and the general performance and innovation management literature.  Analysis made use of the data from the interviews related to attitudes and experiences from using innovation	Paper III	Addressed a research gap on studies that can shed light on the implementation of a

			<p>measurement in the MedTech company, and these were compared with the experiences from the development and use of the research-based framework in the TeleCom company.</p> <p>Analysis made use of general organizational learning literature.</p>		<p>research-based support tool and not just its design.</p> <p>Identified design criteria for a tool based on the use of measurement to support groups/teams to initiate their own change work to become innovative and to sustain innovation.</p>
<p>Aug 2009 - June 2011</p> <p>MedTech</p>	<p><b>STUDY 2</b> Performed to investigate how a new work practice over time (collaborative environmental scanning).</p> <p>Questions were related to how people use and perceive the work practice that was implemented, what elements are considered most and least useful, and the learning and innovation outcomes generated.</p>	<p>11 interviews with 3 managers and 8 engineers</p> <p>Participant observation</p> <p>Document analysis</p>	<p>The researcher coordinated the implementation of the new work practice.</p> <p>Notes were taken and meeting protocols were used to describe how the implementation was performed, and these were compared with the experiences from respondents in the interviews.</p> <p>Categorization, clustering, and comparison between different respondents representing two levels (engineers and managers).</p> <p>Clustering and comparison of the field material using the knowledge and innovation management literature.</p>	Paper I	<p>Addressed a research gap in studies that focus on how companies go about changing their work practices to enable both incremental and radical innovation over time.</p> <p>Increased understanding on issues related to implementing innovation work practices that aim to stimulate knowledge creation and innovation.</p>
<p>March 2013– June 2013</p> <p>+</p> <p>March 2014– May 2014</p> <p>TeleCom</p>	<p><b>STUDY 3</b> Performed to investigate what formal leaders scoring the highest in terms of an innovative environment in an internal employee survey do to involve a broad base of their employees in driving both incremental and radical innovation.</p> <p>Questions related to contextual factors, innovation definition and outputs, reason for scoring high, deliberate actions</p>	<p>31 interviews with managers</p>	<p>The sampling was based on scores on an internal survey that assessed to what extent employees considered their own organization to be open to new ways of thinking and to be good at transforming market insights into new products and offerings and if the person answering the survey felt encouraged to come up with new and better ways of doing things.</p> <p>Categorization, clustering, and comparison of experiences and attitudes between managers and in relation to the different functions they represent.</p>	Paper IV	<p>Addressed a research gap on what actions people in an organization take to broaden the involvement of employees in innovation, and particularly to what extent they take into consideration the needs for both incremental and more radical innovation.</p> <p>Identified types of deliberate actions that are considered to be important to enable an innovative environment and identified and highlighted issues when involving a broad base of</p>

	taken with the purpose of support innovation, and leadership principles.		Clustering and comparison of the field material using the innovation management literature and the literature that distinguishes between radical and incremental innovation management.		employees in innovation.
Sept 2013 –Feb 2014  TeleCom	<p><b>STUDY 4</b> Performed to investigate the approaches and organizational routines to support innovation that were used in four different units in the R&amp;D organization.</p> <p>Questions related to the definition of innovation; how innovation-work is planned, coordinated, and evaluated; what formal work practices they have implemented; and the experiences, learning, and outputs of these and the on-going innovation work.</p>	<p>24 interviews w. managers (8), innovation managers/coaches (10) and developers (6)</p> <p>Non-participant observations (in total about 80 hours)</p> <p>Document analysis</p>	<p>Categorization, clustering, and comparison of experiences and attitudes between people in different roles involved in the development of organizational support for innovation and between different units in the company.</p> <p>Documents describing the work and the organizational support that was implemented were compared with the experiences from the respondents in the interviews.</p> <p>Clustering of the material using a framework for categorizing organizational support for innovation based on the following three theoretical concepts: autonomous and induced initiatives (Burgelman, 1991); the social constraint-action concept for product innovation (Dougherty, 2008), and the organizational routine literature (e.g. Feldman, 2000; Feldman and Pentland, 2003)</p>	Paper V	<p>Addressed a research gap on what actions people in an organization take to involve a broad base of employees in both induced and autonomous initiatives.</p> <p>Made a link between organizational routines and Burgelman’s intra-organizational innovation model as a way to analyze different approaches to support innovation.</p> <p>Identified similarities between approaches that create a higher level of engagement and those that create a lower level of engagement.</p> <p>Identified the need to manage specific types of conflicts that arise in a planned effort to support innovation.</p>

## Research methods

Interviews, participant and non-participant observations, and document analysis were used in the studies of this thesis (see Table 1). These research methods were selected based on the research approach and were used to build knowledge as well as for methodological triangulation (Denzin and Lincoln, 2000). Data collection was undertaken in partnership with a senior academic researcher in Study 1, and several researchers were involved in Study 3. The analysis of the empirical material in all studies was undertaken by the researcher and was complemented by additional and iterative analyses in collaboration with one or more senior academic researchers. The detailed methods for data collection and the analyses of the empirical material are found in the appended papers. It is important to note that in qualitative fieldwork the analysis of the material is not a distinct stage of the research process. In many respects it begins when the researcher contemplates potential research problems before they go into the field and it continues as the researcher writes articles, books, and research reports after their return from the field (Silverman, 2011).

### *Interviews*

A total of 80 interviews were conducted, and these lasted 45–90 minutes each. The number of interviews performed in the different studies and the guiding questions are shown in Table 1. The interviews were used to create knowledge on what actions are undertaken to stimulate innovation and to collect different experiences and possible conflicting views on how efforts for innovation are organized in the company. Thus the interviews allowed data to be collected from people in different positions with different functions as well as in two different companies in order to include as many perspectives as possible and to provide a more nuanced understanding of how innovation is approached (Beitin, 2012). The interviews also acted as a way to identify important issues that require further investigation.

Interviews can best be characterized as open conversations (Kvale, 1996) and are a research method suitable for exploratory and descriptive research studies because they can produce detailed, precise, valid, and adequate responses (Kvale and Brinkmann, 2009). A competence that was crucial to develop in this project was reflexivity. As Fog (1994) points out, the researcher needs to be aware of the hidden manipulative and seductive aspects of an interviewing situation. An interview is not simply a conversation between equals because the researcher is the one in power who can accept or condemn what the interviewee is saying. Because interviews construct knowledge through the interaction between the interviewer and the interviewee(s), attention needs to be paid both to what is happening during the actual interview situation and in subsequent analysis (Alvesson and Skoldberg, 2000).

The interviews were recorded except when individuals preferred that they not be. In these cases, notes were taken during the interviews and summarized after the interviews. The recorded interviews were transcribed and re-read. Categorization of the transcribed material was made both in relation to what was said and answered, and in a second step these categories were analyzed with respect to established theories (see Table 1).

### *Observations*

Direct observation can be divided into participant and non-participant observation. The main difference is that participant observation describes the situation when the researcher is performing the same tasks as the people whom she or he is observing (Czarniawska, 2014).

In the first two studies, participant observation was made possible because the researcher was involved as a coordinator in the innovation work in the organization that was being studied. The observations were systematically performed during formal meetings. In Study 1, notes were taken during regular meetings with the innovation board of the company. In Study 2, notes were taken during the regular meetings

between the engineers in their roles as environmental scouts and during the regular meetings between the engineers and the managers in the company. Specific attention was paid to issues raised by the attendees in the meetings as being problematic or particularly valuable. Also, less systematic observations were made during casual conversations in the researcher's daily work within the company.

In the fourth study, non-participant observations were performed during formal innovation events that were organized by people in different units in the TeleCom company. The researcher was invited to participate in formal events in all four of the sites studied and participated in a total of five full-day events at three of the sites. Also, less systematic observations were made possible during casual conversations during regular company visits (in total 80 hours).

The notes taken acted as guidance in the development of interview questions, were used to compare the respondents' answers in the interviews and to identify what and how documents and other innovation-related artifacts were used in the companies.

### *Document analysis*

Documents related to the planned effort to stimulate innovation in both companies were gathered through access to the companies' business management systems. Table 2. lists type of document used in the analysis. The analysis of the documents fulfilled an important role both as a way to triangulate methods and to develop an understanding of how the work to stimulate innovation was performed over time. The researcher was employed by the MedTech company and thus had unlimited access to information from the company's internal system. In the TeleCom company, temporary access during the study was generously granted in order to facilitate the archival search for relevant material and to facilitate the scheduling of interviews and other meetings. The documents were used to support an understanding of how the work practices were implemented and communicated as well as an understanding of the outcomes from the work practices.

**Table 2. List of documents analyzed.**

This table lists the type of documents that have been analyzed.

<b>Document</b>
Vision and value statements (company and unit level)
Balanced Score Cards (unit level)
Innovation vision and/or objectives (company and unit level)
Information on intranet innovation sites (company and unit level)
Announcements/newsletters related to innovation
Innovation power point presentations related to actions and outcomes (unit level)
Innovation posters
Innovation gadgets (used in conjunction to Innovation days and Idea contests in the Telecom Company)
Innovation process and organization descriptions
Innovation planning and target documents
Innovation performance measurement data (MedTech Company)
Internal regular yearly innovation survey (Telecom Company)//single survey (MedTech Company)
Innovation methods training material
Summary of innovation workshop/seminar outputs (MedTech Company)
Innovation idea management system
Idea evaluation excel sheets (unit level)

Innovation board meeting agendas and meeting notes (MedTech Company)
Environmental scanning reports (MedTech Company)
Environmental scanning meeting agendas and meeting notes (MedTech Company)

## **Reflection on validity, reliability, and generalizability**

By selecting a real-life situation that possesses all the elements that the research questions seek to address, the data can be considered highly relevant in relation to the research question. This is considered to be a critical factor for data validity (Bryman and Bell, 2007). Furthermore, qualitative research has an advantage in how it can address and match the reality it seeks to represent. This is especially the case if the research involves prolonged participation over time as was the case in the Med tech company. Also, in an interview situation there is the opportunity to follow-up and ask questions to clarify any ambiguities. In the studies performed for this thesis, the researcher always asked for permission to come back to ask additional questions and occasionally did so. The presentation of the findings from the different studies to the practitioners in the respective companies has also been used to further strengthen the validity of the studies.

The respondents were selected based on their levels of experience and their involvement in the issues at hand, as recommended by Bryman and Bell (2007). Because this thesis sought to obtain a broad perspective on the practices in question, the respondents represented different roles, functions, genders, and geographical locations. This does not mean that all possible perspectives have been collected, but the diversity of respondents can at least be considered to contribute to a more nuanced picture of the practices in question. Also, the fact that the respondents were promised total anonymity is viewed to have contributed to less biased or prettifying answers.

### *Studying your own business*

The researcher was employed in, and thus familiar with, the Med Tech company in contrast to the TeleCom company. A pre-understanding can be considered an advantage because it provides the researcher with knowledge of many aspects of the everyday life of the organization being studied. This means, for instance, that it enables an understanding of critical events and what they mean within the organization (Coghlan, 2003). It also provides an understanding of legitimate and taboo phenomena in the organization and what might be hidden beyond the “window-dressing” (Gummesson, 2001). However, the disadvantage in being close to the data is the risk that the insider assumes too much, which can lead to less deep probing than if he or she were an outsider or did not know so much about the situation within the company. Furthermore, it might be hard for the researcher to stand back from the organization in order to objectively assess and criticize it (Coghlan, 2003; Coghlan and Shani, 2008). This is where the senior academic researchers, as well as the discussions and interviews with individuals from the organization, have played a crucial role in the studies performed in the Medtech company. By asking different questions and reflecting differently on the data, the “outsider” researchers and individuals outside the research project provided a kind of alternative framing (Coghlan, 2003).

In the initial part of the research project in the Med Tech company, the data collection was performed together with external researchers to reduce biases and conflicts. In addition, both purposive and chain-of-referral samplings were used when selecting respondents to facilitate different perspectives on the same phenomenon. These measures are argued to have contributed to the development of the reflexivity competence as called for by Brannick and Coghlan (2007). They emphasize that it is important in insider-research projects for the researcher to engage in a process of reflexivity to make them aware of the strengths and limits of their pre-understanding so that they can use their experience and knowledge to



reframe their understanding of situations to which they are close. By being open to conflicting views, the research findings in this thesis have been challenged and this has led to additional rounds of analysis of the field material. Another important measure in supporting the development of a more reflective capacity was the researcher's access to two offices during the studies. The office at the university was particularly valuable when there was a need to take a step back and look at the field material that had been gathered without the noise from the subject of analysis; the physical distance truly supported the mental distance that was needed.

The use of an action research-inspired design in Studies 1 and 2 enabled an understanding of how changes in work practices evolve over time and the possible outcomes of these changes. The researchers' involvement in these changes can be argued to bias the analysis of the outcomes due to an unexpressed desire for these changes to be "successful". The use of several methods, and especially the study of documented results in these studies, can be argued to have contributed to a less biased view. Furthermore, the involvement of other researchers and individuals in the data collection and analysis has been crucial in providing an outside perspective.

The risk for the respondents not daring to disapprove or to be critical of the changes that were implemented in the companies also needs to be taken seriously. The researcher's role in the organization and the researcher's frequent contacts with its management might have made respondents provide answers that were more politically correct. However, considering how open and how mixed the attitudes were towards the innovation-related changes, such bias is considered to have been less common than what might have been expected. The same openness and mixed critical attitudes were also seen among the respondents in the TeleCom company.

It would be naive to ignore potential conflicts of interests that can arise because companies, even if they are genuinely interested in learning about their own organization, have an interest in being described in positive terms in any kind of public documents. The companies studied have, however, shown respect for academic quality and freedom and have not at any time rejected a publication even though the data could at times be considered less than flattering. In the MedTech company, the understanding that a PhD student's role is to critically study their own organization in order to provide learning opportunities was explicitly expressed by the innovation management board. This allowed the researcher to openly express criticism towards the organization and towards its management when the results supported taking such a stand.

### *Selection of respondents*

The use of an internal survey in the selection of respondents for the studies performed in the TeleCom company deserves some reflection. The survey, which is briefly described in Table 1 (under Study 3) was designed and conducted internally within the company. In general, the use of a research-based survey would have been preferable as a tool to select the different units. For instance, in Study 3 a survey design that would have made it possible to more clearly separate between units producing more or less radical innovations would have been preferable. This would have made it possible to analyze specific features of these units and would have enabled a comparison between these and the top-scoring units. Another possible improvement would have been if the managers who were interviewed would have been unaware of having been selected as top performers because such knowledge might have led to bias in their answers. However, because the majority of managers were very humble in relation to their results and because they highlighted actions that they were not involved with, it appears that such bias was not prevalent in their answers.

In Study 4, it would also have been preferred if managers representing the least well-performing units had also been systematically selected from the survey. This was, however, not possible due to ethical reasons.

The selection of the R&D units in Study 4 that were not represented in the top-performing list was done in dialogue with an innovation manager in the company. During the interviews at the different sites, the differences in the level of engagement and output as depicted by the innovation manager were confirmed.

*From the specific to the general*

The studies were performed in two companies during a limited time period, and the possibility to draw general conclusions from the research is limited (Bryman and Bell, 2011). The contexts that were studied and the issues that were identified can, however, be considered to be rather common in many large technology-based companies. When results and issues from these studies have been presented to practitioners working in similar settings, the recognition factor has been high. This indicates that even though it is not possible to make any claims about generalizability, the findings might prove valuable in other settings. It is impossible to fully replicate the studies because they were performed in a dynamic social setting, but by providing detailed information about the empirical settings and by being transparent with how the studies were performed – in addition to keeping the raw data that were collected – the studies provide as much guidance as possible for how similar studies could be performed. Although the issues were not investigated in a way that ensures high generalizability, the systematic approach in the study design and data analysis was intended to increase the validity and the relevance for both researchers and practitioners.

## Summary of appended papers

This section summarizes the five appended papers and their contributions to the thesis.

Papers I and II are based on studies performed in the MedTech company. Paper I describes the development of an organizational routine to support a collaborative environmental scanning and the challenges associated with this development over time. Paper II presents how innovation performance measurement is designed and used to support employees in pursuing both induced and autonomous initiatives and the consequences from using it in the company. The results from these two papers generated insights on the overall design of and the challenges associated to a planned effort to support employees in pursuing both induced and autonomous initiatives. These papers formed the basis for the studies performed in the TeleCom company that are presented in paper IV and V.

Paper III describes and compares the design and use of innovation measurement as a way to support the building of innovation capabilities in the MedTech and TeleCom companies. This paper deepens the understanding of what needs to be considered when designing and using innovation measurement to support employees in pursuing both induced and autonomous initiatives presented in Paper II.

Papers IV and V are based on studies performed in the TeleCom company. Paper IV search for similar and different patterns in the deliberate actions taken to support employees in pursuing both induced and autonomous initiatives across many different units in the company. Paper V presents a fine-grained analysis of what characterizes the routines used in units that are more successful in involving a broad base of their employees in innovation compared to what characterizes those units that are less successful. An overview of the papers and the distribution of work between the authors can be found in Table 3.

**Table 3. Distribution of work among the authors of the appended papers**

<b>Paper</b>	<b>First author</b>	<b>Co-author(s)</b>	<b>Distribution of work between authors</b>
I	Susanne Nilsson		Planning of the study was carried out by Nilsson under supervision of Ritzén. Interviews were conducted and analyzed by Nilsson who wrote the paper.
II	Susanne Nilsson	Sofia Ritzén	Planning of the study was carried out by Nilsson under supervision of Ritzén. The interviews were conducted and analyzed and the article written by Nilsson and Ritzén in collaboration.
III	Sofia Ritzén	Susanne Nilsson, Magnus P. Karlsson	Data were collected in two organizations by Ritzén, Nilsson and Karlsson. The analysis was performed and article was written in collaboration between Ritzén, Nilsson and Karlsson.
IV	Susanne Nilsson	Gunilla Ölundh-Sandström, Magnus P. Karlsson, Sofia Ritzén	Planning of the study was performed by Nilsson, Karlsson and Ritzén in collaboration. Interviews were conducted by Nilsson (16), students (15) under close supervision by Ritzén and Nilsson. Analysis was performed in collaboration between Nilsson, Ölundh-Sandström and Ritzén. The article was co-authored with Nilsson as the main contributor.
V	Susanne Nilsson	Sofia Ritzén	Planning of the study and the data were collected and analyzed by Nilsson. The article was co-authored with Nilsson as the main contributor.

**Paper I:** Nilsson, S. (2012) Exploring problem finding in a medical device company, *Measuring Business Excellence*, Vol. 16. No. 4, pp. 66-78.

Paper I explores the design, implementation, and use of a systematic and collaborative way of working for environmental scanning in the Med Tech company to improve the company's ability to identify both incremental and radical innovation opportunities. The paper presents how the new way of working evolved over a period of three years and what types of management controls were used. In addition, challenges that were raised and the resulting innovation and learning outcomes are also described and analyzed. This paper contributes to the thesis by highlighting what needs to be taken into consideration if an organizational routines (in the paper a collaborative and systematic innovation routine) is to be implemented as a means to encourage both induced and autonomous initiatives and by showing which control mechanisms are combined and are considered more useful or less useful.

The paper reveals that the workshops where the result from the environmental scanning were shared and discussed between engineers and managers were considered the most stimulating part for both parties. The workshops were found to create a forum that was largely missing in the organization and provided an occasion where experts and managers had the opportunity to discuss company strategies and to share their thoughts about the present and future state within a broad field of areas. The workshops also caused frustration among the experts when it came to resistance from management to the more radical opportunities that were not seen as being in alignment with existing strategies.

The paper also highlights challenging areas that are considered critical to pay attention to when aiming to develop new routines to support innovation. The issues identified in the study differed between the engineers and the managers. It was found to be difficult for the engineers to select relevant information or to screen out information, not the least when it came to more immature areas such as novel technologies or disease management areas. The study showed that training in formulating a search question was a key managerial approach. Furthermore, it took time and effort to achieve the right amount and quality of information that was automatically retrieved using the IT-based tool, and for many of the areas the tool was never able to unburden the expert to the extent that it was meant to. Issues were also related to interpersonal matters such as the scouts feeling insecure in their selection of relevant material to publish, especially when searching in novel areas. One of the key issues highlighted by the managers was to understand how to break down the high-level strategies communicated within the company for identifying more specific problems or areas that could support the search for information and spur creative ideas among the scouts.

The level of specificity of the managerial controls that were used is addressed in the paper as a key issue when developing routines for both induced and autonomous initiatives. The paper shows that the use of simple templates and guidelines and the follow-up on time spent on scanning were perceived as supportive measures for introducing deadlines for deliverables. The direction of search areas and the report format that was used showed mixed results, and the implementation and use of the IT tool was the least appreciated support that was implemented. Despite the abundance of conflicting views and strong emotions present in the analysis workshops, the face to face meetings were considered far more productive than sharing information using the IT tool due to the tool's inability to provide quick feedback.

**Paper II:** Nilsson, S. and Ritzén, S. (2014) Exploring the use of innovation performance measurement to build innovation capability in a medical device company, *Creativity and Innovation Management*, Vol. 23, No.2, pp. 183-198.

In this paper, the implementation and use of performance measurement to support the ongoing effort to create conditions that are conducive to innovation are described and analyzed in detail. The paper illustrates the diverse views on innovation that exist within an organization and the issues related to this. Innovation management and measurement theory are combined with empirical investigations of experiences of using measurement as a support for the development of innovation capability in practice. This paper contributes to the thesis by providing increased knowledge on the role of measurement in developing organizational routines to support employees pursuing both induced and autonomous initiatives.

The paper shows that the level of involvement by different departments in the company's R&D organization differed markedly in the company's ongoing effort to build innovation capability – from being heavily involved (referred to as innovation leaders) to attentiveness from a distance (referred to as innovation laggards and progress evaluators). This is argued to reflect the diverse views of what constitutes innovation and what role the department's members consider it to play in innovation. The diverse views on innovation are also reflected in what types of measures are in use. For example, the research department measures the number of patentable ideas and research projects while the project office makes use of project-process efficiency metrics. The innovation leaders are seen to experiment with the implementation of new measures with the aim of triggering new routines, which is in contrast to the laggards who only make use of traditional metrics.

The result from the use of measurement in the company showed that new ideas were not something that would naturally occur within the organization despite dedicating time and resources to it and that triggers and guided actions were required. The visualization of the innovation measurement pattern gave rise to an increased understanding among the managers of how important it was to continuously manage innovation and to act accordingly.

Measuring time spent on innovation-related work was found to play an important role in spurring discussions on priorities, and measuring the number of ideas that were generated gave rise to extensive debates that revealed the different views on innovation that dominated in different parts of the organization. The paper suggests that if a measurement is to support different type of ideas, it needs to take into consideration that patentable ideas have the strongest status in an R&D organization and that organizational process-related ideas are easier to track, communicate, and implement than measures for ideas that do not fit within these categories such as new services, business models, etc. While using measurement acted as a trigger for management, the same response was not seen among the developers. The paper reveals the potential roles for measurement in supporting the development of organizational routines to support innovation. However, the paper shows that the role of measurement as a trigger or guide for the development of new routines is far from straightforward.

**Paper III:** Ritzén, S., Nilsson, S. and Karlsson, M. P. (2012) Innovation in teams – inducing action by defining challenges and indicators, Proceedings of the 19<sup>th</sup> International Product Development, Management Conference, 17-19 June, Manchester, United Kingdom.

Paper III continues to explore the design and implementation of support based on performance measurement that enables the creation of conditions that are conducive to innovation. In the paper, the development of an innovation measurement framework with the aim of supporting teams in becoming more innovative in the two companies are described and analyzed. The designs and re-designs that were made, why they were made, and the learning outcomes that resulted from these designs are presented. The

paper also describes the overall planned effort in each company when it comes to how to enable the building of innovation capabilities and how the measurement framework was used in these different contexts. Both the similarities and differences between the companies give rise to a number of important observations during the deployment of the innovation measurement framework. The paper is based on a collaborative research setting between academia and industry, and in this paper the three authors reflect upon the observations they have made over the years when designing and implementing the framework in the companies. This paper contributes to the thesis by shedding light on what needs to be taken into consideration when designing and implementing performance measurements to support innovation.

Team members in both case study companies found measuring innovation easy to relate to and easy to anchor in their organizations because using indicators is a familiar approach in many processes and systems in their companies. Participants from the teams in both companies expressed their enthusiasm that the workshop and the inspiration from the lists of indicators had broadened their view on innovation. The contribution of innovation measurement framework to a measurement system in the MedTech company was considered to signal to employees that the focus on innovation is an equally important focus for the organization as other priorities. In the TeleCom company, the ambition to spread the concept on a global level, to *all* teams, provided a clear signal of the urgency to work with innovation in the company.

Regarding the differences between the companies in deploying the framework, the paper concludes that the framework in the TeleCom company enables clearer support for the teams in their change work. Furthermore, the indicators in the TeleCom company were used for team learning and were not used by management as a control or evaluation tool. This was in contrast to the Med Tech company where the deployment of the framework contributed to an existing measurement system, which entailed the risk of the framework becoming less motivational because measurement is associated with the traditional use of measurement as a control rather than a learning device. In addition, the support in developing concrete action plans and the adaption of the framework to the language of the Telecom company was considered a beneficial improvement because it provided firmer guidance and anchored the support within the company context.

**Paper IV:** Nilsson, S., Öhlund-Sandström, G., Karlsson, M.P. and Ritzén, S. (2014) Innovating everyday – making innovation everyone’s business, in review for Technovation. A previous version was published in the proceedings of the 15<sup>th</sup> International CINet Conference, 7-9 September, 2014, Budapest, Hungary.

The study presented in paper IV was based on interviews with thirty-one managers working in different globally distributed units in the TeleCom company. The managers were identified as top performers on innovation in a yearly employee survey conducted within the organization. The paper outlined and analyzed the actions taken by the managers to involve a broad base of their employees in innovation in their respective units. In addition, the paper investigated how, and to what extent, managers organized for and initiated work practices that support both radical and incremental innovation. The paper contributes to the thesis with knowledge on what actions people in organizations with the ambition to support employees pursuing both induced and autonomous take. The paper also provides insights on the implications from the effort to increase the level of participation in innovation in parts of a company beyond the R&D organization, which is the traditional “owner” of innovation in industrial firms.

The paper showed that several units scoring high in the internal survey in the company were non-R&D units and were primarily internal process and customer-related support units. The paper identified the use of four categories of actions: actions to stimulate and motivate people to innovate; actions aiming to induce knowledge sharing and creation; actions to provide time, money, and other resources; and actions

to create structures and processes. In the analysis of the empirical data, some common patterns among the top innovation managers emerged. The dominating approaches in use focused on creating an innovative environment rather than managing innovation in the sense of controlling or steering it, which is emphasized by how the managers define innovation. Culture and attitudes were seen as ongoing processes rather than results, and managers did not separate their strategies, processes, or organizational structures with regard to induced and autonomous initiatives. In addition, the majority of the ideas generated and realized were rather incremental in their nature. Most of the managers perceived that the dominance of incremental ideas is natural in a large organization where the end-product is a highly complex technology product, although some of the managers admitted that they would like to see more ideas that identify radical innovation opportunities. Few of the leaders brought up external collaborations as the key to why they are top performers, but rather they referred to individual and team performance and motivation. The results show that customer-related support units were naturally able to include customers in problem solving, although when customers were included this tended to have a rather reactive nature such as solving immediate customer problems or issues. In most units, the problem solving and idea management activities were mainly performed by employees.

The freeing up of people's time and the need to stimulate people's mindsets were found to be a critical leadership philosophy, and many of the managers, regardless of their level within the company, were found to involve themselves personally with the exchange of market and business information and the evaluation of ideas from their employees. The organizational structure and formalization level of the innovation work differed markedly among the units. Adopting a high level of participation in innovation does not require managers to step away from their guiding and steering roles, and the paper shows that doing so might even be considered a threat to radical innovation. The study also provides examples of units where mechanisms for proactively stimulating and guiding innovation are used, for example, when implementing a systematic approach in goal setting or developing processes to evaluate and develop innovative ideas.

**Paper V:** Nilsson, S. and Ritzén S. (2014) Selecting and developing organizational routines to support innovation, in review for International Journal of Innovation Management. A previous version was published in the proceedings of the 15<sup>th</sup> International CINet Conference, 7-9 September, 2014, Budapest, Hungary.

Paper V addresses how organizational routines are deployed so as to involve a broad base of employees in pursuing both autonomous and induced initiatives. The paper investigates the similarities and differences of the organizational routines that were identified in the four different units in the R&D organization of the TeleCom company, and it analyses the underlying reasoning and consequences of these differences. The paper contributes to the thesis with an understanding of how approaches that might appear very different on the surface can be equally successful in supporting innovation if some underlying principles are shared between the approaches.

This study shows that the routines created to support employees in the pursuit of both induced and autonomous initiatives in large, mature companies are manifold and diverse. Which routines are selected is largely dependent on personal views on what an innovation process is in need of rather than on internal or external environmental contingencies, and the lack of consensus on how to support innovation within the innovation management community is found to be reflected in actions in practice. This study also shows that accepting diverse opinions on what innovation is in need of can create a valuable source of tension that can stimulate innovation in an organization.

Some combinations of organizational routines emerge as more effective and some as less effective in supporting employees in pursuing both autonomous and induced initiatives. Based on the analysis in this paper, it is concluded that the actors who are responsible for creating the conditions that are conducive to innovation in an organization need to select routines to target the selection, development, and retention of innovation initiatives. It is also important not to fall into the trap of associating innovation too closely with creativity and idea generation, and thus it is important to consider routines that not only provide the resources needed to generate new ideas, but also the routines that educate people and provide them with the necessary skills to participate in an innovation process. In addition, the innovation routines were shown to need to be neither too strongly nor too weakly integrated into normal operations, and it is also important to understand how to properly “dress” innovation routines, i.e. how to design the artifacts that are in use. Both overdressing and underdressing are ineffective because innovation routines need to be perceived as both familiar and deviant at the same time.

This paper emphasizes the importance of using structures or social constraints i.e. not only make use of social actions by providing resources and stimuli and the “hope for innovation to happen”. However, too strong of a focus on structures and procedures is also shown to be problematic, and in line with Dougherty’s (2008) conceptual model this study illustrates the importance on considering both social actions and social constraints when deliberately building innovation capabilities in practice. By embracing the idea that innovation is a process with different phases with different needs depending on whether it concerns induced and autonomous initiatives, the study creates an understanding of when and how to effectively combine social constraints and social actions in practice. Finally, and in line with much of the existing literature, the study shows the importance of engaged leaders when an organization seeks to involve a broad base of employees in pursuing both induced and autonomous initiatives.

## **Analysis and discussion of key contributions from the appended papers**

In this section, key contributions from the five appended papers are analyzed and discussed to answer the three research questions and to highlight the central findings of this thesis.

This section starts by discussing the observation that the majority of actions taken in both companies studied target the initiation of innovation with the purpose to stimulate the generation of new ideas. The reasons for and the consequences stemming from the ambition to involve a broad base of employees as means to increase the number of both induced and autonomous initiatives pursued in a company is problematized.

Following is a discussion of the results that displays the diversity of approaches to involve a broad base of employees in pursuing both induced and autonomous initiatives that is in use within the same organization. A detailed comparison of what characterizes the routines in units that are more successful in involving a broad base of their employees in innovation compared to those units that are less successful reveals similar and different patterns. Two diverse approaches or bundle of routines emerge as particular interesting for handling the selection and development of autonomous initiatives and their key characteristics is further elaborated on.



Subsequently, an analysis of the consequences from using different types of management controls to support employees in pursuing both induced and autonomous initiatives is presented. The analysis is taking its basis in the study of how performance measurement is designed and used in the MedTech company. In addition, an analysis of the consequences from using different types of management controls in both companies studied is performed and reflected upon. The analysis reveals that units that are more successful in involving a broad base of their employees in innovation shows similar patterns in how management controls are used compared to those units that are less successful. Of particular interest is the difference in how the conflict related to the selection of management controls is handled and its implications on the building of innovation capabilities.

Finally, the analysis of the appended papers reveals some interesting patterns when it comes to the use of different types of result controls in the companies studied and the potential in skillfully using goal setting to provide effective means to support both induced and autonomous initiatives in an organization is discussed.

### **The focus on initiating new initiatives**

The studies in this thesis revealed a strong focus on creating conditions aiming to support employees in initiating both induced and autonomous initiatives. Paper IV showed that recognizing and creating opportunities and ideas for innovation were highlighted as essential and were described by many managers as the very essence of innovation. In addition to this observation it was also shown that the dominant outcome when deliberate actions to involve a broad base of employees in innovation was taken, is incremental process improvements.

The focus on triggering employees to take initiatives was by many respondents assumed to be the most logical way to also initiate a planned effort to create conditions conducive to innovation. The managers who were identified in Paper IV as being successful in involving a broad base of employees in innovation engaged in deliberate actions to motivate and make people start to pay attention to innovation and to search for new opportunities or novel solutions. Actions that encouraged people to speak up or to communicate their ideas, that communicated the value of innovation and that created arenas for people to more informally share information and knowledge were highlighted in this paper. Also, in the R&D units in the TeleCom company characterized by a “gaming and inspiring” approach and in the MedTech company, the initiation or variation creation of the innovation process were in focus as illustrated in Papers I, II and V. Paper I, showed that a main focus in the MedTech company was on identifying new ways to enable people to recognize and collaboratively create new opportunities.

As highlighted by van de Ven (1986), managing human attention in relation to innovation is defined as one of the key problems in innovation management because mature organizations are “largely designed to focus on, harvest, and protect existing practices rather than pay attention to developing new ideas” (van de Ven, 1986, p.591). A strong focus on supporting the initiation of innovation can hence be expected. However, the amount of time and resources that is spent on trying to succeed in creating attention to innovation is, however, quite surprising. The majority of managers does not question their organization’s strong focus on initiation or idea generation but assumes that this is a necessity when aiming to become more innovative. Particularly when involving employees that are not familiar with generating new ideas. Organizational science studies also tend to make a strong association between innovation and creativity and thus studies tend to focus on understanding how to create conditions supporting innovation equating understanding how to support creativity and idea generation (e.g. Amabile, 1988; Mumford, 2000; Mumford and Licuanan, 2004; Ekvall, 1996). Also, in companies aiming to build radical innovation capabilities, providing support to the initiation of an innovation process or the discovery phase is in

focus (O'Connor and De Martino, 2006) as in companies aiming to build a capability for discontinuous innovations (Bessant, 2008).

Studies on how innovation is initiated have shown that in order for new ideas to become realized, specific actions are needed that can enable people to not only generate new ideas but to take actions to develop these ideas further. Empirically based research has shown the importance of enabling actors to directly confront the problem they are set to solve described (van de Ven et al., 1989) or involving customers and external collaborators (von Hippel, 1986) and of avoiding making tasks too abstract (Dougherty, 1992). Even if there is a willingness to take the risks associated to realizing autonomous initiatives it is not easily done due to the lack of adequate technical and managerial knowledge and due to people's inability to overcome pre-judgement, basic assumptions and obsolete and traditional mental models and identify new opportunities. Both basic assumptions of what the organization exist for as the values underlying for instance its decision making and ways of organizing need to be challenged to facilitate breaking of people's mental models i.e. second order learning (Argyris and Schön, 1978). External "shocks" seems to be the most common way to trigger such learning in organisations (Sinkula, 2002; Nonaka, 1994) or through stimulating dialogues and by developing alternative future scenarios (Argyris, 1994). Paper IV showed that few deliberate actions were undertaken that sought to directly confront employees with external customer problems or directly support the creation of variations and generation of new ideas. The majority of actions was indirectly supportive and aimed to create an enabling environment.

In addition, only few of the managers were found to have developed support for the selection and development of new ideas i.e. there is a limited understanding of innovation as a process that requires equal (if not more) attention to subsequent activities. The majority of the organizational science studies on innovation also tend to neglect taking into consideration how an organization needs to be designed or what routines need to be developed in order to build the capability to support idea selection and development (e.g. Amabile, 1998; Mumford, 2000). Further this stream of literature tend to focus on creating an environment that is conducive to innovation without taking in consideration how the "structural context", referring to Burgelman (1991), needs to be adapted to support induced and autonomous initiatives respectively.

Burgelman (1991) and the corporate entrepreneurship literature in general (Dess et al., 2003), is in contrast paying much more attention to the selection-development-retention phases. Creating mechanisms that are supportive for the development autonomous initiatives is considered crucial in these models. Attention on creating variation or idea generation is neglected since autonomous initiatives are assumed to arise spontaneously in an organization. In the original model, autonomous initiatives are triggered when "front-line" managers seizes new opportunities in the external environment (Burgelman, 1991). In the companies studied, involving all employees in seizing new opportunities regardless of whether these employees are located at the front or not is emphasized.

The studies hence show that having the ambition to involve "everyone" in the innovation process requires extensive time and resources in order to create the attention required. The great effort in companies on the initiation of innovation without developing routines to expose employees to external stakeholder problems and without developing routines for the selection and development of autonomous initiatives emerge as a less effective innovation strategy taking in consideration that incremental process improvements is the dominating outcome. At least if a company has the ambition to enable a continuous stream of both radical and incremental innovations

## **Searching for selection, development and retention routines**

Paper IV showed thus that most managers did not create support for the selection, development and retention of autonomous initiatives. The lack of development routines is less of a concern when it concerns minor changes to internal processes as these can many times be made with little effort. In addition, for induced initiatives concerning existing products and technologies, the internal development processes and routines are already in place in the form of new product development processes. However, developing mechanisms to support the selection and development of initiatives that deviate from existing strategies and operational models is a necessity if autonomous initiatives targeting for instance new business models or services are to be realized (Burgelman, 1991).

Paper V showed that in two of the R&D units that were less successful in involving a broad base of employees in innovation, the lack of routines to enable the development of ideas made people demotivated when very few of their ideas were further developed. The lack of attention to selection and development was raised as an important barrier for innovation in these units. This is similar to findings in studies of how mature companies build radical innovation capabilities. O'Connor and DeMartino (2006) showed how most mature companies are successful in creating a good “discovery” phase but fail to build up and sustain subsequent phases to support the development and implementation of radical ideas. Research has shown how bottom-up initiatives need the support from managers to survive (Day, 1994), and the literature provides much advice for supporting elements for the development and experimentation phase, including the use of a separate budget (Mumford and Licuanan, 2004) and a separate management team that is responsible for determining the value of novel ideas (O'Connor and DeMartino, 2006), the use of a high-weight team (Eisenhardt) or designing a separate organization (Tushman and O'Reilly, 1996).

The result from the comparison of different R&D units in paper V reveals that units more successful in involving employees in pursuing both induced and autonomous initiatives, have selection and development routines in place in contrast to the units less successful. The studies presented in this thesis shed light on the alternative mechanisms that are used to select among autonomous initiatives and to enable their development. Examples from Papers II, IV, and V include the dedication of time and resources for one week of experimentation, formalized skunk work, prototype contests in conjunction to “idea” contests, the use of an internal “Dragon’s Den” where the senior management team frequently evaluates new ideas from any employee, the use of innovation coaches who help “find a home” for ideas, or the use of special temporary “innovation” teams.

If the routines to initiate innovation and encourage people to engage in innovation were considered time-consuming, the development of routines to make novel concepts accepted and to integrate them into the product strategies in the companies were seen to require the most energy. These were also the routines that were the most difficult to identify in the companies. In paper V, retention routines were identified in the two units that were able to successfully support employees in both induced and autonomous initiatives. These routines aimed to develop a shared mental model of what a new concept is and its place in existing or upcoming product-development programs. Even though both companies studied make use of formal processes to support new concepts in becoming accepted in product development (for instance through detailed business opportunity plans), these routines were described as requiring support from a broad range of less formal processes based on intense dialogues and networking. Paper V showed that several retention routines were present in the two units that were most successful in involving a broad base of their employees in innovation (e.g. the use of innovation coaches as translators of new ideas, the use of an innovation management board, people having part-time assignments in both research and development groups, and special recruitment rules with a maximum number of years for working in one group). In the MedTech company, Papers II presented a routine aiming to support the retention of new ideas, namely the use of an innovation management board. The use of an innovation management board (or the active involvement of a senior management board as identified in one of the units in the TeleCom

company) is – in a similar line as O'Connor and DeMartino (2006) – suggested as an example of how to ensure that autonomous initiatives receive adequate support *and* of how to evaluate which routines will be supportive and which will be hindering. Multiple research studies show how hard it is for mature companies to accept and value and to learn from more radical or disruptive opportunities due to their deviant characters and because they occur so seldom and take such a long time before they reach the market (if they do) that few individuals in a company are involved the whole journey (Berghman et al., 2013). Interestingly, it is in this thesis shown that rules or routines for retention are identified and even deliberately developed. The combination of making use of a group of people responsible for following up on initiatives taken for more autonomous initiatives and the use of mechanisms to link employees with resource allocators is found to characterize both units found to be successful in involving their employees in innovation.

### **Diverse approaches based on different perspectives on innovation**

Because the upper management in the companies studied in this thesis allows each unit in their organizations to decide for themselves how to go about building innovation capabilities, somewhat different approaches to reach the same outcome can be expected due to adaptations to different needs in different units. However, the differences were found to be very diverse despite the units belonging to the same internal organization as shown in Papers II and V.

In Paper II, revealed how different views of what constitutes innovation led to different levels of involvement in the deliberate effort to build innovation capabilities. In Paper V, it was shown that despite the fact that all four units studied belong to the same R&D organizations within the same company and are targeting the same end-products and markets, three distinct approaches were identified. It was clear in the studies that the main reason for the distinction in approach used in the different units was different personal views on what innovation is and what it requires among the responsible managers and the innovation managers/coaches. The approaches identified in the empirical material of Paper V are seen to correspond to different perspectives on innovation as found in previous research. The “gaming and inspiring” approach makes use of dedicated roles to support innovation, yearly contests, and organized activities supported by IT –based idea management tools to inspire people in the organization to generate new and creative ideas, and it associates innovation with *creative problem solving* (Amabile, 1998). The “learning and norming” approach defines innovation as an outcome of productive *knowledge sharing and learning* in accordance with organizational learning research (e.g. March, 1991), and in such an approach measures are taken that focus on creating a learning environment. Finally, the “framing and fighting” approach focuses on the *socio-political aspects of innovation* (Dougherty and Hardy, 1996; Jones and Stevens, 1999), and emphasis is on creating opportunities for employees to directly confront internal and external stakeholders. The approach used in the MedTech company is similar to the “gaming and inspiring” approach even though the gaming elements are somewhat downplayed and innovation is treated as a more or less systematic creative problem-solving process. Each approach can hence be viewed as following existing innovation management logics. The studies show that when all units are allowed to decide for themselves what actions to take to create innovation capabilities, the resulting approach will be highly dependent on personal experiences and beliefs on what this means. The diverse range of approaches argued for in research is hence found to be represented in practice. The acceptance of a broad and inclusive definition of innovation as communicated in both companies, is suggested to contribute to the very diverse interpretations on what actions to take and what routines to develop.

Having access to a broad range of approaches might even be productive for an organization because innovation is known to be nurtured by differences in perspectives as well as differences in processes and routines. However, for an organization to truly benefit from such diversity it is crucial to learn from the experiences and outcomes in different units (Pentland and Feldman, 2005). Not the least because Paper V

showed that some approaches result in the development of routines that are less effective in supporting employees in pursuing both induced and autonomous initiatives, which will be elaborated on in the next section.

### **Comparing the characteristics of organizational routines**

Paper V shows that units using very different approaches might succeed in involving a broad base of employees in innovation. Also, the opposite is true; approaches that appear to be very similar are making use of routines that have very different characteristics when performing a more fine-grained analysis. When performing a cross-unit analysis of what routines are used in the R&D units in the TeleCom company that are more successful in involving a broad base of employees in pursuing both induced and autonomous initiatives, some interesting patterns emerge as shown in Paper V. The comparison shows that despite the fact that the two more innovative units make use of rather diverse approaches (i.e. gaming and inspiring vs. framing and fighting), more similarities arise when performing a detailed analysis of the characteristics of the routines in use. The same is true for the less innovative units.

The two successful units were found to be cautious in considering all phases in an innovation process, i.e. variation, selection, development, and retention, and to *pay more attention to the latter phases* compared to the units that were less successful. In addition, the routines in both units can be described as *semi-embedded* where the innovation routines are *used frequently*, are *intertwined* with each other and to some extent also with normal operations, although they are *distinct* from the latter through their labeling and the artifacts they use. In other words, the routines are considered both familiar and deviant at the same time. The connectedness to the organization, as described by Kelley (2009) as being important for a radical technology innovation program to become sustainable, might be described as having identified the right level of embeddedness when looking at the organizational routine literature. Activities are not dichotomized as either routines or not, but rather they are routinized to a certain level (Nelson and Winter, 1982).

As a consequence, the risk of innovation becoming too closely associated to an event or campaign if these are not linked to other routines in an organization is for the innovation routines to never become accepted as an important routine in the organization. An interesting finding presented in Paper V is thus that the “innovation as normal operations” was found to be as problematic as “innovation as an event”. This highlights a key issue related to the use of innovation routines; these need to be perceived as both familiar and deviant at the same time in order to become effective.

As Paper V points out, the type of artifacts created to support innovation requires careful management. The usage of strongly deviating artifacts such as colorful t-shirts and gadgets were found to be partly responsible for creating reluctance to innovation activities. This reluctance was particularly visible among more senior engineers and business aspect representatives. This was considered problematic especially when aiming to create effective routines to support the development of new ideas because both business and technology aspects are critical particularly for autonomous initiative. Communicating innovation as being more fun than normal work risks having the opposite effect, and innovation can become viewed as less serious.

Further support for the importance of designing the routines according to the principles discussed above is provided when analyzing the units that are less able to involve a broad base of employees in innovation. In neither of these units were the routines in use targeting issues in all phases of the innovation process, and the routines were either well embedded or weakly embedded, which stands in contrast to the semi-embedded routines characterizing the more innovative units that were studied.

The Dragons Den routine used in one of the R&D units that is successfully supporting employees in pursuing both induced and autonomous initiatives deserves some extra attention. The Dragons Den routine may come about as trivial. It is a simple routine inspired by a familiar TV program. Still, it contains element that are considered crucial in terms of supporting both induced and autonomous initiatives. It encourages employees to not only presenting a solution but framing the underlying problem or opportunity. In addition, the routine is designed as a face-to-face meeting in front of a senior management board who discusses and evaluates the idea and take decisions to allocate resources to those ideas that are considered having most potential. The managers will never say no to any idea and everyone is offered to visit the management board for re-evaluations. Everyone who is willing to keep on working on their ideas will have the opportunity to do so. By naming the routine after a TV-show it creates room for role plays and at the same time it is a real situation.

Such an approach is supported by research embracing the value of creating simple routines when dealing with high levels of complexity (Brown and Eisenhardt, 1997). This routine also exemplifies the importance in considering both playful and serious elements in the routines supporting innovation. Contrary, to what is many times assumed when discussing playfulness, playing is found to not be perceived as fun in the sense of being characterized by only involving positive emotions. Playing means being exposed also to a broad range of negative emotions as it many times involves elements of being challenged and being exposed to surprises and tension (like when playing sports or games) as Mainemelis and Ronson (2006) show in their extensive review of the literature linking play and creativity in organizations. Play do however enable a safe environment for the expression of a wide range of emotions and this has shown to stimulate intrinsic motivation and creativity (Amabile et al., 2005) as well as risk taking and learning from errors (Glynn, 1994). Thus communicating that innovation is more fun than other tasks as was found to be common in the units labelled as “gaming and inspiring” risks thus not only creating reluctance in many potential innovators not defining the listening to external presenters or participating in an idea contest as fun. It may even create false expectations. Also, research has shown that if more playful work routines are introduced without any possibilities for employees to make use of the outcomes from these in their daily work, it has a negative impact on performance (Mainemelis and Ronson (2006).

The routine is also characterized by its reliance on frequent face-to-face meetings that stimulate the sharing of tacit elements of knowledge known to support knowledge creation and innovation (Nonaka and Takeuchi, 1995). Interestingly, Paper I also shows that semi-structured face-to-face meetings where engineers and management exchanged their ideas both on what the future might look like and how to cope with different possible scenarios (the “vernissage”) was seen to despite the many conflicting perspectives and disagreements that were present, be perceived as the most valuable routine for both managers and engineers in the environmental scanning process developed in the MedTech company. This routine hence has elements similar to the Dragons Den routine (e.g. being simple, partly structured face-to-face meetings involving the challenging of different perspective and opinions between resource holders and potential innovators and its naming “vernissage” signals, like the “Dragons Den”, an allowance for some role-playing). An organizations ability to develop routines involving these elements may, based in the studies performed, be considered an important skill or even an innovation capability in itself. This is further supported by literature showing how the use of strategic dialogues (Dougherty and Hardy, 1996) or strategic play (Roos and Statler, 2004) are found to support innovation in mature companies. The type of dialogues supported by the “Dragons Den” and “vernissage” routines also resembles the dialogues brought forwards as crucial in the “creative routines” (Nonaka et al., 2006; Nonaka and Toyama, 2002); dialogues where contradictions are synthesized and people openly share their opinions and beliefs and feedback from actions taken are incorporated in the discussions.

When it comes to the number of routines, their longevity, and their complexity, the two units that were most successful in supporting employees in pursuing both induced and autonomous initiatives have two

completely different approaches. One of the units makes use of few and simple routines. In the other unit, new and many times rather complicated routines are frequently tried out and exchanged. From an organizational routine perspective, the unit's lack of long-lived routines to foster innovation can be viewed as a failure in building capabilities (Nelson and Winter, 1982; Grant, 1991). However, it can also be that such an approach enables the high level of dynamics, flexibility, and routine-breaking that has been shown to be beneficial to innovation (Nonaka and Toyama, 2002). An important innovation routine identified in this unit can be described as continuously designing, using, and learning from a wide range of routines. The goal is thus not to identify the "best practice" but rather to develop the capability to master a multitude of innovation routines. As a support for the innovation routine portfolio management, the use of innovation performance measurement was used. Ideas were continuously ranked against certain criteria and the linking of new ideas to the use of a certain routine was discussed in a dedicated group of innovation coaches. The regular meetings created thus an effective routine for deciding what methods or work practices to make further use of and when to implement a new one. Organizational routine literature (Feldman, 2000; Feldman and Pentland, 2003) as is the literature related to "creative routines" (Nonaka et al., 2006) shows the importance of reflecting upon the usefulness of a routine in order for it to act as a vehicle for change and development in an organization.

This is an approach that is also followed in the MedTech company. Paper II shows how the implementation and use of innovation performance measurements is a valuable complementary routine when experimenting with new ways of working to support employees in pursuing both autonomous and induced initiatives. In addition, Pavlov and Bourne (2011) suggest in a conceptual paper that the use of performance measurements might have several important roles in relation to organizational routines. In the next section, the roles of performance measurement are analyzed and problematized based on the results from Papers II and III.

## **Using innovation performance measurement on a continuous basis**

Paper II showed how managerial actions were triggered by metrics related to the output that was generated in terms of new ideas, prototypes, and new conceptual projects in the organization. The same was true when it came to measuring the amount of time spent on innovation-related activities. The visualization of a dissatisfying trend in innovation-related output and time usage fueled discussions within the management board and led to an understanding that action to support innovation was needed. This role of spurring debates about what determines good performance is in line with previous studies of how measurement impacts performance outside the innovation management field and is particularly prominent when intangibles are measured (e.g. Mouritsen, 1998; Askim, 2004). Thus Paper II shows thus that the value in using measurement lies in the fact that it stimulates a search for drivers of organizational performance rather than its encouragement of a desired behavior. Börjesson and Elmquist (2011) pointed to a need for a more engaged and less passive 'management capability' in established companies that are seeking to improve their capability to innovate. Mumford et al. (2000) also showed the importance of active management in order for innovation to happen, and O'Connor et al. (2006) showed a similar importance for such management practices when it comes to building a capability for radical innovations in mature companies. The use of innovation performance measurements as observed in the studies in this thesis is suggested to be able to act as a stimulus for building a more active and engaged management by supporting the reflection that stimulates the search for alternative actions to support innovation.

Paper II also illustrates how sensitive the use of action or result management controls in an R&D setting is. The implementation and communication of new metrics made values and norms already present in the organization more visible and triggered rather strong emotional responses from non-managerial employees. This is well illustrated by the implementation of the metrics encouraging cross-functional

collaboration. This metric was considered by some of the engineers to be highly provocative because it implicitly denied that the single inventor was an important source for high-quality ideas; however, for others it was considered a relief because it was viewed to balance the traditional focus on individual inventors. Engineers prefer relying on subtle ways of control such as establishing desired values and norms i.e. personnel/cultural controls. It is preferable, however, for these values and norms to be based in their professional community rather than on the company's management policies (Bart 1991; Ouchi 1979). Making measurement support learning and motivation to change behaviours appears to be difficult particularly in R&D organizations, as shown in previous studies (Chiesa et al., 2009). However, if many of the managers expressed a skepticism against the value in using performance measurement (not only in relation to innovation), the engineers were eager to suggest how to improve both the design and use of it. More qualitative measures were requested by the engineers and particularly a linking between activities and what new knowledge it created indicating the importance of identifying metrics beyond result or output.

Another finding from the study was that the continuous use of measurement over time revealed that innovation requires continuous stimulation, otherwise other activities and issues related to ongoing projects or manufacturing "take over" people's attention and time. This finding was supported by the outcomes from the investigations of one of the units in the TeleCom company that was less successful in supporting employees in pursuing both induced and autonomous initiatives. This unit did not make use of any direct managerial actions but dedicating time for innovation as presented in Paper V. This thesis thus shows that it is not enough to "only" allow time for innovation. Additional actions are required.

Paper II highlights the importance of making use of metrics that measure other types of ideas beyond those that are patentable (i.e. technology based) and those that only lead to small improvements. In other words, the metrics should focus on more resource-demanding and non-patentable ideas such as new services or business models if such ideas are desirable in an organization. The underlying reason for this is that the historically strong link between patents and ideas in high-tech companies and the routines and status associated with these tend to lead to an attention bias within the company. From an organizational routine perspective, these ideas are backed up by well-embedded routines in these companies (Nelson and Winter, 1982). This is especially obvious in the recognition and reward systems that are closely associated with producing patents. In addition, measuring improvements in a company's internal processes creates a bias because these are the most easy to implement, track, and communicate, which was further illustrated in Paper IV. This means that there is a bias for coming up with patentable solutions and process improvements, and this bias is strengthened when only "new ideas" are measured without any specification as to the types of ideas that are desired. Because the generation and realization of other types of ideas require new organizational routines to be developed, it can be expected that other actions need to be taken to support the influence that is desired from implementing new output metrics.

Another finding in the studies in this thesis is the value that is gained from measuring time spent on innovation-related activities. Paper I found that this value legitimized spending time on these activities, and Paper II revealed how innovation was valued and prioritized in different parts of the company and gave rise to extensive discussions on the value of innovation-related activities. The degree of specificity in how time for innovation should preferably be used, differed significantly between different units within both companies. Innovation-related activities ranged from being expected to be performed as subversive side activities – i.e. no time is explicitly dedicated to innovation – to being communicated as using a defined number of man hours. In its most specified form, there are rules regarding when innovation activities are expected to take place (i.e. certain innovation days as in two of the units in the TeleCom company and in two of the units in the MedTech company). In addition, time spent on innovation is sometimes monitored (as in the MedTech company) or not (as in the Telecom company). In the Telecom company, time is measured but in the system in use it is not possible to register how much time is



dedicated to innovation-related activities. Instead this time becomes part is recorded as time dedicated to continuous improvement. Dedicated time for innovation has been shown to be an important organizational support for innovation (e.g. Amabile, 1996), and many companies are inspired by the famous Google “time rule” that emphasizes a certain percentage of man hours to be spent on innovation (Steiber and Arlänge, 2012). However, the consequences from degree of specificity of these time rules and whether the use of a follow-up on how time is spent has an impact, has not been highlighted in previous research. The result from the studies in this thesis suggests that paying attention to degree of specificity when designing time rules is crucial; either too tight or too loose time rules was in Paper V suggested to contribute to be less supportive. In addition, the studies in Paper I and Paper II suggest that measuring time spent on innovation activities seem to have several positive effects.

### **Designing a support for change involving innovation measurement**

Paper III describes the design of an innovation measurement system specifically dedicated to serving teams that desire to become more innovative. The results from this study indicate that in order for an innovation performance measurement to be supportive of changes in internal work routines, it is important to consider both its design and implementation. The role for using indicators in the TeleCom company is to promote learning, and the system is designed to be closely connected to goals and actions. Earlier research has clearly shown that if measurement is to become motivating and to provide learning opportunities, then groups and teams need to identify for themselves what to measure (Meyer, 1994). In this way, measurement has a greater chance of becoming the learning device it is meant to be and less of the coercive control tool it has long been seen as (Neely and Najar, 2006). The extensive list of indicators was developed to broaden the view on what innovation can mean in the Telecom company. In combination with examples from what actions other organizations and companies have taken to become more innovative, the triggering and guiding role of how innovation performance measurement was enhanced compared to how it was deployed in the MedTech company.

In the TeleCom company, innovation performance measurement is adapted and used to support the needs of specific teams. By allowing each team to select what to measure and what targets to aim for might risk creating behaviors that are not aligned to current strategy (or to other teams). Previous research has shown that if measurement is to have an impact on company performance it needs to be aligned to the company’s strategy (Micheli and Manzoni, 2010). However, because the encouragement of autonomous initiatives is intended to support strategy-deviating behaviors, a strategy unlinking and team-oriented approach might be exactly what is needed in a company with the ambition to pursue both induced and autonomous initiatives. This is especially the case in an R&D organization where organizational routines for induced initiatives are already in place. Paper II revealed how different groups in the MedTech company’s R&D organization either made use of measurement as way to legitimize existing ways of working or as a way to trigger changes in behaviors depending on the level of ambition to create conditions to support innovation. This result emphasizes that the predominant values and norms related to innovation in a group will have a strong impact on how measurement is used despite such measurement being connected to a common strategy. Earlier studies have also shown that implementing new measures risks simply becoming a device to support the present state within an organization (Melnik et al., 2010). Once again, only implementing new metrics will not change anything.

The close linking of performance measurement to a company’s values and norms has been shown in earlier studies to be important to consider when implementing performance measurements (e.g. Henri, 2006). This thesis also shows that when it comes to innovation, both how innovation is defined in the organization and the personal beliefs of the people responsible for creating conditions conducive to innovation need to be taken into consideration. This is where the linking of the selection of indicators to

the discussion of what innovation means and how it can be supported is needed. If innovation performance measurement is to be used as a device to trigger and guide the organizational routines for autonomous and induced initiatives in a team, the measurement needs to involve the team in the discussion and selection of indicators, it needs to be unlinked from the company's reward/compensation system, and it needs to be closely linked to a team's long-term and short-term planning. Furthermore, implementing an innovation performance measurement system needs to be prepared to challenge existing values and norms related to innovation, if changes in behaviors are desired.

### **Combining management controls to develop organizational routines**

The studies showed how performance measurement, which is one of the most commonly used management controls in use in contemporary companies, may act as a support in developing routines to support innovation if its design and usage is carefully considered. It also showed that its usage is far from common in the TeleCom R&D units studied and that many managers are reluctant in using it in relation to innovation. Burgelman (1983, 1991) showed the importance of paying attention to the design of the structural context in an organization that is aiming to support employees in pursuing both autonomous and induced initiatives. Defining this context as a combination of management controls as suggested in this thesis provides yet another way of viewing the results from the studies performed in this work. By turning to the management control literature, a deeper understanding of the challenges related to building innovation capabilities by involving a broad base of employees in innovation is created.

In the studies, it was observed that extensive effort was made to try to support people to become creative and to realize new ideas, i.e. building innovation capabilities was seen to be closely associated with creativity as discussed earlier. Managers in many of the units in the TeleCom company put great effort into creating the right environment by communicating the value of innovation to the business, what innovation is, and what innovation needs by gathering employees and sometimes also external stakeholders to discuss problems and generate ideas and by allowing time to pursue both autonomous and induced initiatives. Referring to the management control literature, personnel or cultural management controls is dominating. In paper V, one of the units less successful in involving a broad base of employees in innovation only make use of personnel/cultural controls while the other three units mixes these controls with action and result controls. The other unit less successful in involving a broad base of employees in innovation is found to only make use of rather complicated and structured routines involving a lot of actions controls (procedures for a yearly idea contest, structured innovation days). Also the MedTech company seem to have a preference towards the use of action controls and Paper I shows how the use of actions controls increased over time.

Based on the study comparing the different R&D units in the TeleCom company in Paper V, combining both personnel management and action or result-management controls emerges as crucial to consider when aiming to involve a broad base of employees in both autonomous and induced initiatives. This is also in line with Dougherty (2008) who proposes that companies are still seen to struggle to become more innovative because innovation management researchers have a bias towards either social action or social constraints. She highlights the importance of considering both social action and social constraint when designing an innovation process. In Paper V, the different units were analyzed according to whether the organizational routines developed were based on social actions or constraints. The units that were found to be the most successful in involving a broad base of employees in innovation were found to make use of a mix rather than be biased towards either side.

## **Conflicts related to using personnel and action controls when re-designing the structural context**

A conflict related to people's preferences when it comes to social action versus social constraint in relation to innovation is revealed. Paper V shows that there is an ongoing debate among actors dedicated to improving conditions to support innovation (e.g. innovation managers, coaches, drivers, etc.) related to what should be the target for innovation management or for the re-design of the structural context. This gives rise to a conflict between what is referred to as "process-and-tools" versus more "people-oriented" actors. The process-and-tool actors have a predilection for the implementation of lists, decision criteria, structured methods, and tools, thus they tend to have a preference for action control (Merchant, 1998). The people-oriented actors focus on empowering people by changing their thinking, and they enable the generation of creative ideas and new ways of thinking by creating occasions for people to meet, i.e. they tend to have a preference for personnel controls. It is argued in this thesis that such conflicting views might not necessarily be a bad thing but rather might be supportive in the development of the structural context in an organization. Research has shown the importance in using a moderate amount of structure to support innovation (Brown and Eisenhardt, 1997) and improvisation (Weick, 1998; Feldman and Pentland, 2003). The processes and tools might serve as cognitive frames when dealing with high levels of uncertainty and complexity (Adler and Chen, 2011). This is in alignment to what Jelinek and Schohooven (1990) brought up as a view of structure as a flexible frames or tools rather than constraints found to characterize people working in innovative companies. Also, the change-management literature has shown that so long as conflicts concerning how to make changes do not devolve into personal attacks, different opinions about the design and implementation of changes might actually be facilitating (REF). Tensions, not the least in the context of innovation, are seen as a necessity, and it is how this tension is handled that will determine whether it will support or hinder innovation (Ekvall, 1996). The conflict is handled differently in the units studied in Paper V. Of particular interest is how a bias towards action controls in one of the units in Paper V led to the development of a rather forceful "underground" movement of people with a strong people-oriented or personnel control preference. The conflict was seen to give rise to rather strong tensions among different actors that hampered rather than stimulated the innovation-related activities because the conflict became more personal rather than focusing on the task at hand. In the unit considered more successful in its mission to involve a broad base of employees in innovation, this conflict instead led to the creation of a portfolio of productive innovation routines. The conflicting views were accommodated by allowing the people who were active in creating conditions conducive to innovation to develop a diverse range of routines. This portfolio of routines was seen to be managed using systematic planning and measurement in order to stimulate learning from the different actions that were taken. This way of solving the conflict present is closely in alignment to how Nonaka et al., (2006) and Nonaka and Toyama (2002) describes how knowledge creation is achieved by synthesizing rather than dissolving contradictions. The management of a portfolio of routines can hence, in a similar vein as the Dragons Den and the "vernissage", be described as having key elements of a creative routine.

Research on conflicts related to creating conditions conducive to innovation tends to focus on dealing with conflicts that arise between innovation and what can be referred to as normal operations, and this conflict is often referred to as a conflict between efficiency and innovation (March, 1991). However, in this thesis it is argued that the conflict related to combining management controls in innovation deserves increased attention. The reason for this is that the studies in this thesis show that this conflict can be as much of a barrier for companies to become more innovative as the conflict between what is considered business as usual and the innovation-related activities. This is especially the case because it was shown in paper V that combining management controls rather than relying on one type is more effective in involving a broad base of employees in innovation-related activities. Considering that management controls can be used to influence behavior by different means, the management control literature that embraces management control systems as packages of controls (e.g. Malmi and Brown, 2008) offers a perspective that allows

organizations to go beyond a dichotomist way of thinking. There does not have to be a conflict between using “structure and tool” approaches and “people-oriented” approaches, nor between having a preference for social actions and a preference for constraint. Understanding that influencing people’s behaviors can be done by targeting personnel/culture, actions, and/or results a broader perspective on what it means to control emerges along with the many design options it brings with it.

## **Goals as triggers and guides**

Based on the empirical findings in this thesis, there appears to be a bias in practice towards the use of personnel controls (such as communicating values and norms) on the one hand and action controls on the other (such as designing procedures and organizational structures). The literature associating innovation with creativity also has a bias towards using personnel controls, i.e. it is about creating the right climate and relationship along with resources and time (Amabile, 2004; Mumford and Licuanan, 2004). The literature associating innovation to a more or less rational business process has a bias towards using action controls, i.e. it is about defining the crucial steps and providing the structure and tools to support the realization of new ideas (e.g. Goffin and Mitchell, 2005; Bessant, 2003). Much less research is dedicated to the role of result controls (Cardinal, 2001).

Result controls communicate a desired future (Merchant, 1985) and can do so with different degrees of specificity ranging from making use of very clear and measureable targets in the near future to more expressive and less achievable visions of an undefined future. The former belongs to a rational rhetoric and is closer to action controls, while the latter is a way to influence people’s emotions and mindsets and thus can be viewed as a type of personnel control. Making use of result metrics is considered a useful approach when managing more complex and uncertain operations because such metrics do not specify how to do things and only provide guidance by stating a desired result or output (Poskela and Martinsuo, 2009). However, as was evident from the review of previous research, the research results show conflicting results when it comes to the value of using result controls in relation to innovation.

The studies on how the companies in this thesis use goals to support innovation provide some interesting insights. As seen in Papers II, IV, and V, the different units and departments in both companies have various preferences for how to set up and make use of innovation-related goals at the unit, team, and/or individual level. Three of the units in the TeleCom company specifically communicated a vision that includes innovation. However, only in one unit were specific targets and goals set up to support the innovation work. Many of the managers were found to be skeptical of using goals as a tool to create conditions to support innovation because they did not find them to be important drivers for innovation. In a similar manner as measurements, goals are related to putting pressure on individuals and are associated with a top down approach, which is considered to have a negative effect on innovation. These experiences were, however, only valid for the use of innovation output goals. Fulfilling innovation goals in the yearly performance review was shown in Paper II to be seen by management as a bonus rather than as something that was important or necessary. Among the engineers interviewed for the paper, this view of innovation as a less important activity to pursue was seen to make people less prone to take time to manage new ideas compared to focusing on ongoing projects despite having allocated time to managing new ideas. Managers found it hard to value activities that were only in focus for a small percentage of people’s time as is the case when working with innovation. This attitude is argued to be problematic because it leads to the paradoxical situation in which innovation is prioritized but because it is constrained in terms of time and resources and because it constitutes such a small part of the working hours it is less valued.

In contrast to the negative experiences from using innovation output goals, the formulation of specially designed goals as a way to trigger new thinking and more novel ideas is used in some units as described in

Paper IV. Such stretch goals (Sitkins et al., 2011) were argued to both help people understand where the company or unit needs to go and to challenge existing solutions. Other managers as was shown in Paper IV were found to make use of goals to support people's dual roles in an employee-driven innovation strategy where every employee is expected to generate, explain, and fight for their own ideas *and* to comment, encourage, and help others with theirs. The breaking down of the company's overall vision to be able to communicate direction was found by some to be a useful approach in guiding innovation activities. Also, as shown in Paper V, making use of clear performance goals for novel features that are developed in collaboration with technology and business specialists and external customers is also considered valuable in providing a shared understanding of what to try to achieve in a specific situation.

Existing goal-setting research and practice has been dominated by the set-up of performance or result-oriented goals, and the majority of studies performed have not distinguished between situations where people can use existing knowledge and when there is a need to acquire new knowledge, i.e. in situations characterized by a high level of uncertainty (Seitjs et al., 2004; Locke and Latham, 2006). In recent studies, it was discovered that when a specific and challenging performance goal was set up in a situation where new knowledge is required, it had a negative effect on individual/team performance. The reason behind this is that our limited attention is distracted and the focus will be on becoming successful in achieving the end result rather than learning what is needed to achieve the end-result. The use of specific and challenging learning goals shows promising results in such situations. Learning goals are focused on the exploration of strategies, ways of working, or methods to increase the effectiveness/efficiency of individuals and teams. The purpose with using learning goals is to have individuals/teams systematically search for new ideas, to stimulate reflection capability, and to experiment and test new ways to do things. In other words, they encourage people to leave their "comfort zone". When an individual/team masters a new way of working and has acquired the new knowledge required, the use of performance goals is applicable and preferable. The few studies that have investigated the use of learning goals have been performed in experimental settings in schools, and there is a need to investigate the use of these goals in real life settings (Locke and Latham, 2006). As proposed in Paper II, the set-up of learning goals might provide a potential and promising organizational routine for companies because studies indicate that such goals, rather than traditional performance or results goals, will support the experimentation and reflection capability that is required when developing new ideas. <sup>2</sup>

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<sup>2</sup> This suggestion is supported by the presentation of the concept of learning goals in two organizations (in the Telecom Company and in a financial firm) by the researcher. Three groups of 10–15 managers were tasked with formulating learning versus performance goals for their own teams, and the concept received positive response and has continued to created interest also in other organizations.

## Concluding discussion and implications for research

The focus on an active and ongoing effort to deliberately create conditions conducive to innovation in two companies has generated insights regarding the development of organizational routines and how management controls are used to involve a broad base of employees in innovation. The analysis shows that engaging employees in innovation can be made possible through a conscious and creative design and through the use of routines and controls. Routinizing innovation is possible in the sense that companies are found to develop collective and recurrent ways of working that support employees in pursuing both autonomous and induced initiatives. How such routinization is made differs depending on what phases or activities in an innovation process these routines target. Furthermore, it has been shown that understanding the implications from designing and combining management controls is a crucial competence when an organization aims to build innovation capabilities to involve a broad base of employees in innovation.

This thesis has several implications for research. The first implications are related to *the building of innovation capabilities* to support employees in pursuing both induced and autonomous initiatives. In this thesis the organizational routine literature has been used as an analytical lens to generate knowledge on how companies are building capabilities to innovate. Organizational routine research provides important knowledge related to capabilities below the strategic level that much of the capability literature deals with (Becker, 2004). This stream of literature was consulted to identify what characterizes organizational routines and how routines are developed and enabled a fine-grained analysis of how innovation capabilities are built in practice when involving a broad base of employees in innovation. The insights generated from the studies presented in this thesis can be considered to complement existing research on how capabilities are built by creating attention to what characteristics of organizational routines that emerges as essential to consider for companies with an ambition to involve a broad base of their employees in innovation. Existing literature tend to highlight the importance of certain management practices or ways to organize (Bessant, 2003). What characterizes those collective practices that become recurrent or routinized is however far less investigated as is how organizational routines in settings that successfully support employees in pursuing both induced and autonomous initiatives differ from organizational routines in settings where such support is not found. It is not only “what” routines target (e.g. like involving customers or setting goals) that needs to be taken in consideration. Paying attention to details “how” this is performed i.e. details in both the design and use of the routines emerges as equally crucial (e.g. like usage frequency, linking to other routines, design of artifacts in use, the handling of playfulness and seriousness in face-to-face meetings etc.). Making use of the more recent and empirically based organizational routine literature when studying how actors in companies go about to build innovation capabilities when broaden the involvement in innovation is hence suggested to provide a fruitful path for further research. Some contextual factors are, based in the studies suggested to be interesting for further studies. For instance, whether or not there are any advantages or disadvantages from an innovation perspective for an organization to be located outside the head office of a company as is only briefly touched upon in paper V. Is it a coincidence that the two units successful in supporting employees in pursuing both induced and autonomous initiatives are units located outside the head office? Is a remote location enabling for more strategy-deviating initiatives to be taken? It would also be particularly interesting to study if it is more or less effective for a business unit to have access to many different product areas or for it to be responsible for a single product area when it comes to pursuing autonomous initiatives.

The research performed hence has implications also for Burgelmans *intra-organizational ecology model*. The specific innovation capabilities studied in this thesis can be related to what in literature is referred to as elements in a corporate entrepreneurship strategy (Sharma and Chrisman, 1999). Burgelmans intra-

organizational ecology model (1991) which was selected as an analytical framework for the studies performed in this thesis is an example of model within this stream of literature. A key challenge associated to implementing a corporate entrepreneurship strategy has been identified to be related to achieving acceptance for the routines that need to be deployed to support also autonomous initiatives (Dess et al., 2003). This challenge also proved to be one that the actors in the companies studied were busy with. Some insights complementing existing research on why acceptance of these routines is a challenge and how acceptance may be overcome is generated in the research performed. Existing innovation management literature tends to focus on how efficiency-focused normal operations routines or exploitation routines act as barriers or make the implementation and use of more explorative activities and routines more difficult (March, 1991). In corporate entrepreneurship literature, issues in focus are more related to resource allocation and management power. Not being able to handle the conflict between the “process-and-tools” versus “people-oriented” actors was in this thesis identified as an additional reason previously less highlighted to why acceptance of these routines becomes problematic. Actors responsible for implementing new ways of working were found to have different preferences to social actions and social constraints or personnel and action/result controls which were found to potentially become hindering for new routines to become accepted. The failing of designing organizational routines that are perceived as both familiar and deviant is yet another reason that was identified in the studies and that is less explored in previous research. This thesis provides hence some insights related to the hitherto neglected role of capabilities in Burgelman's (1991) intra-organizational ecology model.

By focusing on the topic of innovation in the more recent empirically based organizational routine literature (Feldman, 2000; Pentland and Feldman, 2005), this thesis also has *implications for the organizational routine literature*. The research based models in this stream of literature are based on studies of administrative and first-order routines (Feldman, 2000; Pentland and Feldman, 2003). Hence, it was based in the review of the literature, questioned whether the models of Feldman (2000) and Pentland and Feldman (2003) are also valid when studying routines not aiming to reduce variety, or to stream-line or standardize processes but instead seek to increase variety and make decisions under a high degree of uncertainty. In the review of previous research Nonaka and Toyama (2002) concepts of “creative routines” was brought up as an indication on that these models are valid also for second-order routines. Creative routines are those routines that are able to synthesize the efficiency of “traditional” routines with creativity to ensure continuous knowledge creation. Creative routines are guided through the synthesis of contradictions which is achieved using dialogues where people openly share their opinions and beliefs and feedback from actions are incorporated (Nonaka et al., 2006). In this thesis some examples of what can be referred to as “creative routines” have been identified. The “vernissage” and Dragons Den routine has several elements as the routine of managing a portfolio of innovation routines. Although these routines have very different characteristics, they are based on dialogues where very different beliefs and opinions are openly addressed and feedback from actions is incorporated, key characteristics of creative routines (Nonaka et al., 2006). Based in the result from the studies in this thesis it is suggested that a search for how creative routines are developed in practice would be an interesting field for further research within the field of organizational routines.

Implications on the *innovation management control* literature are also stressed. Specifically, this thesis is able to shed light on the role of performance measurement as a tool to build capabilities to innovate. This thesis complements the traditional literature on innovation performance measurement that has been rather conceptual and has tended to develop tools for advanced audits rather than understanding how the use of performance measurement can be designed and used to enable innovation on a continuous basis (Adams et al., 2006). This thesis shows how the use of innovation measurement on a regular basis has an indirect impact on performance by displaying the differences in values and norms and spurring debates among managers that leads to them taking actions. The use of measurement is suggested to potentially form an important element in an active management capability that was earlier called for when companies

have the ambition to build innovation capabilities (Börjesson and Elmqvist, 2012). The analysis of the studies shows that monitoring time spent on innovation related activities is perceived as supportive in those organizations that engage in such monitoring. Inspired by the Google-way of dedicating certain man-hours to innovation (Steiber and Arlänge, 2012) many companies have sought to make use of similar time rules. In this thesis it was shown that only allowing or ensuring time for innovation will not be enough. Additional actions are needed.

The use of performance measurement also highlights the importance of developing routines that support autonomous initiatives that can compete with existing routines supporting induced initiatives. It was shown that not only efficiency-focused operational routines, but existing “innovation routines” that can be a hindrance when aiming to create new innovation routines aiming to support autonomous initiatives. The existing patent process in high technology companies and the rather straight forward continuous improvement routines will be preferred paths when an organization is seeking more new ideas. Thus it is necessary to develop routines and to implement metrics for alternative types of ideas that cannot easily be patented or be considered improvements of existing products and processes.

Besides the implications on innovation performance measurement literature, this thesis shows the potential in making a conscious use of management controls in relation to innovation as called for in more recent literature (Davila and Oyon, 2009). The analysis in this thesis revealed the tendency in organizations to either become overly structured and thus to make use of more and more action controls over time or to only make use of personnel/cultural controls when aiming to stimulate induced and autonomous initiatives. The latter approach is suggested to be a reflection of how mature companies attempt to imitate young entrepreneurial companies when having an ambition to become more innovative by supporting a broad base of employees in pursuing both induced and autonomous initiatives. The focus on personnel controls is also supported by much of the organizational science literature devoted to innovation that strongly associate innovation with creativity. An increased usage of action controls can be considered to reflect contemporary company’s ambition to make innovation management more systematic and manageable (or professionalized). Such tendency is supported by studies evaluating the emergence of management controls in entrepreneurial companies (Davila, 2005). It has also been proposed to signal a higher level of maturity of a high-involvement innovation in companies (Bessant, 2003). Both approaches turned out to be less effective compared to using a mix of controls. The analysis in this thesis made use of Dougherty (2008) model that emphasizes the need to consider both social constraints and social actions when creating conditions conducive to innovation. Social constraints bias is proposed to be related to an action control preference and social actions to personnel controls. The result from the analysis performed brought attention to the need to make actors involved in designing the structural context to support employees in pursuing both induced and autonomous initiatives (Burgelman, 1991) become aware of their personal preference when it comes to using personnel controls and actions controls.

Finally based on the results in this thesis, the potential in using result controls to support both induced and autonomous initiatives was identified. Several ways of using goals were identified in the studies presented in this thesis. From using stretch goals to stimulate more novel ideas, to the use of goals on an individual level to guide employees in their dual roles to both generate and develop ideas, the use of result metrics, to the use of clear performance goals in order to create a shared understanding among different shareholders on what to achieve during the development of a new idea. Goals hence serve different purposes or have different impacts depending on how they are formulated. The research in this thesis highlights that conscious and creative goal setting might in a similar vein as the use of performance measurement form a valuable organizational routine to support employees in pursuing both induced and autonomous initiatives. An interesting path for further research in innovation management control suggested in this thesis is hence studies on the role of different types of result controls to support



employees in pursuing both induced and autonomous initiatives. This is further backed up by more recent goal-setting research that has called for the need to understand how goals need to be formulated to be supportive in situations characterized by a high degree of uncertainties (Locke and Latham, 2006).

## Conclusions and implications for practice

### Conclusions

Building the capabilities to involve a broad base of employees to drive ideas in any area and of any magnitude of change in contemporary companies is a true challenge. Especially because it entails the implementation of new ways of working that often deviate significantly from the work the majority of employees normally do. In addition, as is shown in this thesis, using organizational routines to support both induced and autonomous initiatives requires careful considerations both when it comes to the design of the routines and how to combine different types of management controls.

Three research questions were addressed in this thesis. *The first question* investigated what characterizes the use of organizational routines to support employees in pursuing both induced and autonomous initiatives. The research identified *four general characteristics*. First, the responsible actors tend to focus on the initiation of innovation rather than on developing routines for selection, development, and retention, i.e. for the latter phases in an innovation process. This indicates that either induced or autonomous initiatives are seldom triggered spontaneously as assumed in the Burgelman model (1991). By using an intrapreneurial lens that focuses more on the scarcity of resources for developing initiatives rather than a lack of creativity – as much of the organizational innovation literature does – this thesis questions the disproportionately large effort spent on encouraging employees to initiate new initiatives while neglecting the development of organizational routines for their selection and development. This was further underlined by the presence of routines for the latter phases in settings found to be successful in supporting their employees in both induced and autonomous initiatives compared to those settings where such support was not found.

Second, it is seldom taken into account whether the routines developed are supportive for induced or autonomous initiatives or both. Responsible actors tend to assume that innovation is nurtured by the same actions despite the degree of novelty of the ideas. This assumption is also nurtured by dominant innovation management research literature that rarely investigates or presents models on how to support innovation or ideas of different degrees of novelty. This thesis stresses that the close link between innovation and creativity in much of the literature ignores the need to better understand how to provide support for the less divergent selection, development, and retention phases of the innovation process.

Third, the majority of actions taken in the studied companies focused on managing relations rather than structures. This means that the implementation and design of face-to-face meetings where people from a group or from a unit meet and share information and knowledge is the most common type of organizational routine used. It was found that outside stakeholders are rarely involved in such meetings. If outside stakeholders are invited, the focus is usually on more immediate problem solving or information sharing through tech-talks and presentations. The importance for innovation on creating conditions that are conducive for people to share and create knowledge is well supported in the literature. The significant amount of attention paid to knowledge sharing with very few external influences being actively involved in creating future solutions is suggested to be one of the reasons for the dominance of process improvement outcomes.

Fourth, the conflicting views on how to best manage and organize for innovation that are present in the research literature were also found to be present within the studied companies. leads to diversity in what actions are taken in different unit or groups in the companies. The reason is due to different levels of ambition when it comes to making changes in ways of working and due to different actors understandings and experiences of what is required for innovation to be successful. Having access to a broad range of approaches might be productive for an organization because innovation is known to be nurtured by

differences in perspectives as well as differences in processes and routines. However, for an organization to truly benefit from such diversity it is crucial to learn from the experiences and outcomes in different settings. Not the least because studies comparing different approaches result in the development of routines that are found to be less effective in supporting employees in pursuing both induced and autonomous initiatives.

*The second research question* dealt with the consequences from using different types of management controls when supporting employees in pursuing both induced and autonomous initiatives. *Three important observations* were made in the studies in this thesis. The first two concern the use of different types of management controls, and the third concerns how performance measurement is used.

The first observation made is that personnel and actions controls dominate. The former is emphasized in a higher degree than the latter in the Teletech company compared to the MedTech company reflecting different biases towards social actions and social constraints of the actors involved in the development of organizational routines for innovation in each organization. An overuse of actions controls that seems to be more at risk when organizational routines develop over time, is considered de-motivating. However, an overuse of personnel controls is found to be equally in-effective in supporting employees in pursuing both induced and autonomous initiatives.

The second observation made is that the use of result controls to support employees in pursuing both induced and autonomous initiatives is manifold. The use of result controls ranged from not being used at all, being used although not considered being supportive, forming a crucial part of the evaluation of both ideas and actions taken, to being used as a means to generate more creative solutions. Taking in consideration the more recent literature in goal setting, it is in this thesis suggested that investigating the influence from using different types of goals provides a productive path for future research.

The third observation relates to the consequences from using performance measurement. This thesis shows that using performance measurements can potentially support the learning and reflection needed to enable the development of routines. The research shows that the use of specific result metrics is less valuable when it comes to influencing employee behavior, but they are useful as indirect triggers for managerial actions. This is particularly true if time spent on innovation activities is frequently monitored and interactively analyzed. The use of performance measurement revealed that it is not enough to “only” allow time for innovation. Additional actions are required. Using measurement also made it clear that asking for (by measuring) “new ideas” risks leading to a dominance of small process improvement ideas and patentable ideas. If other types of ideas are desired, the metrics implemented should specify these. Furthermore, the research showed that the innovation performance measurement system should not be too closely linked to other performance measurement systems or reward systems in an organization. To support its implementation, measurement should also preferably be closely connected to the particular needs of the team that seeks to benefit from it.

*The final and third question* in this thesis concerned the characteristics of the organizational routines that are used in settings that are able to support and those that are not able to support employees pursuing both induced and autonomous initiatives. The organizational routines that support employees pursuing both induced and autonomous initiatives were found to have *four common characteristics*. The first characteristic relates to what activities in the innovation process are targeted. The results of this thesis stress the need to develop routines for selection, development, and retention and thus go beyond creating support for the initiation or variation creation phase alone. The results from the studies show how such routines can be developed to support more autonomous initiatives.

The second characteristic concerns the level of embeddedness, which in this thesis is defined in terms of how frequently a routine is used, how it links to other routines, and to what extent the artifacts in use are able to handle the level of familiarity required. The research shows that it is crucial to achieve semi-embeddedness i.e. the routines need to be somewhat, but not too strongly, linked to each other and to other routines in the organization and need to be used frequently and be designed so that they can be distinguished from people's everyday activities however not deviate too much from normal routines so as to avoid deterring important participants.

The third characteristic concerns the importance of making use of both personnel/cultural and action management controls instead of being biased to one type in order to support employees in pursuing both induced and autonomous initiatives.

Finally, creating face-to-face meeting routines that put resource owners and/or customers in direct contact with innovators to evaluate and develop new ideas was found to be a crucial characteristic. These routines provide opportunities for debates and discussions on strategic, business, and technology issues and enable new ideas to not only be evaluated but also to be further developed. The research in this thesis also showed that such routines are considered valuable despite how emotionally challenging many actors experience these meetings to be, and this is supported by the emerging literature on the role of play in innovation.

This thesis shows how the use of two very different approaches is able to take these four characteristics into consideration. In one of the units, a very simple routine for selecting new ideas involving the senior management and potential innovators was combined with the use of a small team of engineers working closely with customers to develop more novel prototypes. In another unit, the use of a team of innovation coaches systematically developed and learned from a portfolio of routines targeting the variation and development of induced and autonomous initiatives. In addition, these coaches connected potential innovators with resource holders to ensure that good ideas were understood and valued in the organization.

## **Implications for practice**

The research presented in this thesis has been conducted with the dual purpose of serving both theory and practice. This means that the research performed also aims to produce actionable knowledge, i.e. knowledge useful for those individuals who are tasked with making things happen in practice. The studies in this thesis show that despite the ambition to support both induced and autonomous initiatives, the dominant outcome in most organizations is incremental process improvements. In large high-technology companies support for induced initiatives is available. Routines for supporting any employee in pursuing more autonomous initiatives are less common, thus the development of such routines is suggested to be an important target. Implications for practice in this thesis focus on what actions can be taken by managers, assigned employees or consultants who are responsible for defining actions to be taken to build innovation capabilities when involving a broad base of employees to drive ideas in any area and of any magnitude of change in large mature organizations.

First of all, this thesis stresses that making innovation everyone's business requires the actors responsible for such task to critically and creatively re-think what routines and management controls are, and can be, in order to truly support employees in pursuing both induced and autonomous initiatives. *It is crucial to accept that routines and management controls are not necessarily harmful for innovation.* Routinizing innovation means deliberately ensuring that ways of working to support innovation become well established within the organization yet are able to continue to support the creation of variations. In more recent literature, routines have been shown to be the vehicle for both change and development, and viewing routines only as a hindrance to innovation has become less accepted. Organizational routines are

the basic elements of organizational capabilities. If an organization wishes to build innovation capabilities that support employees pursuing both induced and autonomous initiatives, it needs to understand how to develop useful innovation routines.

In a similar vein, management controls are shown to have very different roles and to influence routines through different mechanisms. Management controls are far from being the constraints that they have traditionally been viewed as. Understanding that management controls can influence behavior as an antecedent or trigger (i.e. personnel control), by providing guidance (i.e. action control), or by setting expectations (i.e. result control) is essential. By adopting a more comprehensive view of the different types of management controls that are available, controls can be designed and combined to more effectively support employees in pursuing both induced and autonomous initiatives.

Second, in addition to re-thinking routines and management controls in relation to innovation, this thesis suggests *that the key characteristics of the routines* identified in settings that are able to support their employees in pursuing both induced and autonomous initiatives provide useful support for practitioners. These characteristics can be viewed as basic design requirements to be used by actors when aiming to develop organizational routines supporting employees in pursuing both induced and autonomous initiatives. By starting with these requirements when designing the routines, the resulting routines are suggested to have a greater chance of becoming truly supportive:

To be successful, the routines that are developed to support innovation need to target the selection, development, and retention phases of an innovation process. Furthermore, the routines need to be somewhat, but not too strongly, linked to each other and to other routines in the organization and need to be used frequently. The routines need to be designed so that they can be distinguished from people's everyday activities and thus create the attention required for people to engage themselves in innovation. However, they must not deviate too much from normal routines so as to avoid deterring important participants. In addition, routines that provide space for resource holders and/or customers to meet with potential innovators to actively evaluate and develop new ideas need to be considered. Involving elements of play in these routines is suggested to provide additional support. Finally, the studies in this thesis highlighted the importance of making use of both personnel or indirect managerial actions and action controls, i.e. more direct managerial actions. Hence, it is as essential for the actors who are responsible for supporting employees in pursuing both induced and autonomous initiatives to become aware of their personal bias towards either personnel or action controls in order to ensure a mix of controls are used.

In this thesis, two very different approaches and uses of routines were identified, and both were found to successfully support employees in pursuing both induced and autonomous initiatives. A more fine-grained analysis of the similarities between these routines showed that routines can look very different on the surface but share similar characteristics and design requirements. This thesis emphasizes that taking into consideration the design requirements discussed above provides room for creativity on how to design routines and use management controls to support innovation. Taking a design perspective on the building of innovation capabilities hence provides organizations with the tools to develop unique and hard-to-imitate capabilities.

Finally, this thesis also has implications for practice when it comes to the design of the commonly used management control systems of performance measurement and planning. Based on the research performed in this thesis, it is suggested that if performance measurement is to be used to support employees pursuing both induced and autonomous initiatives it requires consideration of both *what to measure* and *how to implement it*. Making use of innovation performance measurements can act as a valuable tool to support the development of a portfolio of innovation routines in an organization. This thesis shows that using performance measurements can support the learning and reflection needed to

enable the development and variation of routines. Thus, performance measurement can potentially become a useful organizational routine in itself to support both induced and autonomous initiatives. Measuring time spent on innovation activities was found to act as a legitimizer for spending time on these activities and was found to be the metric that spurred the most discussions among the management board and thus indirectly acted as a trigger for managerial actions. Also, measuring the number of ideas beyond those that are patentable or those only concerned small improvements is suggested to support autonomous initiatives.

When it comes to planning, the investigations performed in this thesis suggested that practitioners should *experiment with using different types of goals*. Depending on how goals are formulated, they are able to stimulate different types of behaviors in different phases of an innovation process (from triggering the generation of novel ideas to supporting the development as well as the retention of autonomous initiatives). Of particular interest is to understand how to make use of so-called learning goals that are found to support experimenting and the learning of new strategies as a complement to the use of performance goals that strive to constrain actions toward a specific outcome. Taking into consideration that the development of autonomous initiatives undoubtedly requires people to be “groping in the dark” for prolonged periods of times, the use of learning goals might make such experiences more bearable. Or even fun, depending on what makes you tick.

## References

- Adams, R., Bessant, J. and Phelps, R. (2006) Innovation management measurement: A review. *International Journal of Management Reviews*, 8 (1), 21-47.
- Adler, P. S. and Chen, C. X. (2011) Combining creativity and control: Understanding individual motivation in large-scale collaborative creativity. *Accounting, Organizations and Society*, 36, 63-85.
- Adler, P. S. and Borys, B. (1996) Two Types of Bureaucracy: Enabling and Coercive. *Administrative Science Quarterly*, 41 (1), 61-89.
- Ahrens, T. and Chapman, C. S. (2004) Management accounting as practice. *Accounting, Organizations and Society*, 32, 1-27.
- Alvesson, M. and Kärreman, D. (2004) Interfaces of control. Technocratic and socio-ideological control in a global management consultancy firm. *Accounting, Organizations and Society*, 29 (3-4), 423-444.
- Alvesson, M. and Sköldberg, K. (2000) *Reflexive Methodology: New Vistas for Qualitative Research*. London: Sage.
- Amabile, T. M. (1998) How to Kill Creativity. *Harvard Business Review*, 5, 77-87.
- Amabile, T. M. (1988) A Model of Creativity and Innovation in Organizations. *Research in Organizational Behavior*, 10, 123-16.
- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., Herron, M. (1996) Assessing the work environment for creativity. *Academy of Management Journal*, 39 (5), 1154-1184.
- Amabile, T. M., Schatzel, E. A., Moneta, G. B. and Kramer, S. J. (2004) Leader behaviors and the work environment for creativity: Perceived leader support. *The Leadership Quarterly*, 15 (1), 5-32.
- Amabile, T. M., Barsade, S. G., Mueller, J. S., and Staw, B. M. (2005) Affect and creativity at work, *Administrative Science Quarterly*, 50, 367-403.
- Anthony, R.N. (1988) The management control function. Boston, MA: Harvard Business School Press.
- Anthony, S. Eyring, M. Gibson, L. (2006) Mapping your Innovation Strategy. *Harvard Business Review*. 84 (5), 104-113. Är denna kvar???
- Argyris, C. (2004) Reasons and Rationalizations: The Limits to Organizational Knowledge. Oxford: Oxford University Press.
- Argyris, C. (1977) Organizational learning and management information systems. *Accounting, Organizations and Society*, 2, 113-123.
- Arthur, J.B., Huntley, C.L. (2005) Ramping up the organizational learning curve: assessing the impact of deliberate learning on organizational performance under gainsharing. *Academy of Management Journal* 48 (6), 1159-1170.
- Askim, J. (2004) Performance management and organizational intelligence: adapting the balanced scorecard in Larvik municipality. *International Public Management Journal*, 7 (3), 415-438.
- Atkinson, R. (1999) Project Management: Cost, Time and Quality, Two Best Guesses and a Phenomenon, Its Time to Accept Other Success Criteria. *International Journal of Project Management*, 17 (6), 337-342.

- Atuahene-Gima, K. (1995) An exploratory analysis of the impact of market orientation on new product performance. *Journal of Product Innovation Management*, 12 (4), 275-293.
- Baker, W. and Sinkula, J. (2002) Market Orientation, Learning Orientation and Product Innovation: Delving into the Organization's Black Box. *Journal of Market Focused Management*, 5 (1), 5-23.
- Basadur, M.S., Graen, G.B. and Green, S.G. (1982) Training in creative problem solving: Effects on ideation and problem finding in an applied research organization. *Organizational Behavior and Human Performance*, 30, 41-70.
- Barley, Stephen (1986) Technology as an occasion for structuring. *Administrative Science Quarterly*, 31 (1), 78-109.
- Bart, C. (1991) Controlling New Products in Large Diversified Firms: A Presidential Perspective. *Journal of Product Innovation Management*, 8 (1), 4-17.
- Becker, M. C. (2004) Organizational routines: a review of the literature. *Industrial and Corporate Change*, 13 (4), 643-678.
- Beitin, B.K. in chapter 16, *The SAGE Handbook of Interview Research: The Complexity of the Craft*. SAGE Publications, Inc, Thousand Oaks, CA.
- Berghman, L., Matthyssens, P., Streukens, S., and Vandenbempt, K. (2013) Deliberate learning mechanisms for stimulating strategic innovation capacity, *Long Range Planning*, 46 (1), 39-71.
- Bessant, J.R., Lamming, R.C., Noke, H. and Phillips, W.E. (2005) Managing innovation beyond the steady state, *Technovation*, 25 (12), 1366 – 1376.
- Bessant, J. (2008) Dealing with discontinuous innovation: the European experience. *International Journal of Technology Management*, 42 (1-2), 36-50.
- Bessant, J. and Caffyn, S. (1997) High-involvement innovation through continuous improvement. *International Journal of Technology Management*, 14 (1), 7-28.
- Bessant, J., Stramm, B. V. and Moeselein, K. M. (2011) Selection strategies for discontinuous innovation. *International Journal of Technology Management*, 55 (1-2), 156-170.
- Betsch, T., Fiedler, K. and Brinkmann, J. (1998) Behavioral routines in decision making: the effects of novelty in task presentation and time pressure on routine maintenance and deviation, *European Journal of Psychology*, 28, 861-878.
- Birkinshaw, J., Bouquet, C. and Barsoux, J-L. (2011) The 5 Myths of Innovation. *MIT Sloan Management Review*, 52, 43-50.
- Björk, J., Boccardelli, P. and Magnusson, M. (2010) Ideation Capabilities for Continuous Innovation. *Creativity and Innovation Management*, 19 (4), 385-396.
- Blessing L.T.M. and Chakrabarti A. *DRM, a Design Research Methodology*, 2009 (Springer, London).
- Boer, H. and Gertsen, F. (2003) From continuous improvement to continuous innovation: a (retro)(per)spective. *International Journal of Technology Management*, 26 (8), 805-827.
- Bourne, M., Neely, A., Mills, J. and Platts, K. (2003) Implementing performance measurement systems; a literature review. *International Journal of Business Performance Management*, 5 (1), 1-24.
- Brannick, T. and Coghlan, D. (2007) In Defense of Being “Native”: The Case for Insider Academic Research. *Organizational Research Methods*, 10 (1), 59-74.



- Brown, J. and Duguid, P. (1998) Organizing knowledge. *California Management Review*, 40 (3), 90-111.
- Brown, S. L., and Eisenhardt, K.M. (1997) The Art of Continuous Change: Linking Complexity Theory and Time-paced Evolution in Relentlessly Shifting Organizations. *Administrative Science Quarterly*, 42, (1), 1-34.
- Brown, M.G. and Svenson, R.A. (1998) Measuring R&D Productivity. *Research-Technology Management*, 41, 30-35.
- Broy, M. Automotive software and systems engineering. Formal Methods and Models for Co-Design, 2005. MEMOCODE '05. Proceedings. Third ACM and IEEE International Conference on, 11-14 July 2005 2005. 143-149.
- Bryman, A. and Bell, E., Business Research Methods revised edition (Oxford University Press, 2007)
- Bunge, M. (1993) Realism and Antirealism in Social Science. *Theory and Decision*, 35 (3), 207-235.
- Burgelman, R. A. (1983) A Process Model of Internal Corporate Venturing in the Diversified Major Firm. *Administrative Science Quarterly*, 28 (2), 223-244.
- Burgelman, R. A. (1991) Intraorganizational Ecology of Strategy Making and Organizational Adaptation: Theory and Field Research. *Organization Science*, 2 (3), 239-262.
- Burgelman, R.A. (2002) Strategy as vector and the inertia of coevolutionary lock-in, *Administrative Science Quarterly*, 47 (2), 325-57.
- Burgelman, R. A., and Sayles, L. R. (1986) Inside corporate innovation: Strategy, structure, and management skills. New York, NY: Free Press.
- Börjesson, S. and Elmqvist, M. (2011) Building innovation capabilities: A longitudinal study of a project at Volvo cars. *Creativity and innovation management*. 20 (3), 171-184.
- Cardinal, L. (2001) Technological Innovation in the Pharmaceutical Industry: The Use of Organizational Control in Managing Research and Development. *Organization Science*, 12(1), 19-36.
- Carlile, P.R. (2002) A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development. *Organization Science*, 13 (4), 442-455.
- Chiesa, V., Coughlan, P. and Voss, C.A. (1996) Development of a Technical Innovation Audit. *Journal of Product Innovation Management*, 13 (2), 105-136.
- Christensen, (1997), The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Boston: Harvard Business School Press.
- Coghlan, D. (2003) Practitioner Research for Organizational Knowledge: Mechanistic- and Organistic-Oriented Approaches to Insider Action Research. *Management Learning*, 34, 451-63.
- Cohen, M. and Bacdayan, P. (1994) Organisational routines are stored as procedural memory: evidence from a laboratory study. *Organization Science*, 5, 554-568.
- Cooper, R. G. and E. J. Kleinschmidt (1986) An investigation into the new product process - steps, deficiencies, and impact. *Journal of Product Innovation Management*, 3, (2), 71-85.

- Corley, K. and Gioia, D. (2011) Building theory about theory building: What constitutes a theoretical contribution? *Academy of Management Review*, 36 (1), 12-32.
- Crossan, M. M. and Apaydin, M. (2010) A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature. *Journal of Management Studies*, 47, 1154-1191.
- Czarniawska, B. (2014) *Social Science Research: From Field to Desk*, Sage Publications Ltd.
- D'Adderio, L. (2008) The performativity of routines: theorising the influence of artefacts and distributed agencies on routines dynamics. *Research Policy*, 37 (5), 769–789.
- Damanpour, F. (1991) Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, 34 (3). 555-590.
- Davila, T. (2000) An empirical study on the drivers of management control systems design in new product development, *Accounting, Organizations and Society*, 25 (4-5), 383-409.
- Davila, T. (2005) An exploratory study on the emergence of management control systems: formalizing human resources in small growing firms. *Accounting, Organizations and Society*, 30, 223-248.
- Davila, T., Epstein, M.J., Shelton, R. (2006) *Making innovation work: How to manage it, measure it and profit from it*. Pennsylvania, NJ: Wharton School Publishing.
- Davila, T., Foster, G. and Oyon, D. 2009. Accounting and Control, Entrepreneurship and Innovation: Venturing into New Research Opportunities. *European Accounting Review*, 18, 281-311.
- Day, D. (1994) Raising Radicals: Different Processes for Championing Innovative Corporate Ventures. *Organization Science*. 5 (2), 148-172.
- Denzin, N., & Lincoln Y. (Eds.) (2000). *Handbook of Qualitative Research*. London: Sage Publication Inc.
- Dewar, R.D. and Dutton, J.E. (1986) The Adoption of Radical and Incremental Innovations: An Empirical Analysis. *Management Science*, 32 (11), 1422-1433.
- Dess, G. G., Ireland, R. D., Zahra, S. A., Floyd, S. W., Janney, J. J. and Lane, P. J. (2003) Emerging Issues in Corporate Entrepreneurship. *Journal of Management*, 29 (3), 351-378.
- Dougherty, D. and Hardy, C. (1996) Sustained product innovation in large, mature organizations: overcoming innovation-to-organization problems. *Academy of Management Journal*, 39 (5), 1120-1153.
- Dougherty, D. (1992) Interpretive Barriers to Successful Product Innovation in Large Firms. *Organization Science*, 3 (2), 179-202.
- Dougherty, D. (2008) Bridging Social Constraint and Social Action to Design Organizations for Innovation. *Organization Studies*. 29 (3), 415-434.
- Duncan, R.B. (1976) The ambidextrous organization: Designing dual structures for innovation. In R.H. Kilmann, L.R. Pondy and D. Slevin (eds.): *The Management of Organization*, 1, 167-188, New York: North-Holland.
- Eisenhardt, K.M. and Tabrizi, B. (1995) Accelerating adaptive processes: Product innovation in the global computer industry, *Administrative Science Quarterly*, 40 (1), 84-110.
- 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., and Martin, J. A. (2000) Dynamic capabilities: What are they? *Strategic Management Journal*, 21 (10-11), 1105–1121.
- Ekvall, G. (1996) Organizational climate for creativity and innovation. *European Journal of Work and Organizational Psychology*, 5, 105–123.
- Ettlie, J. E. (1983) Policy implications of the innovation process in the U.S. food sector. *Research Policy*, 12, 239-267.
- Feldman, M. S., and Pentland, B. T. (2003) Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*, 48 (1), 94–118.
- Feldman, M. S. (2000) Organizational routines as a source of continuous change. *Organization Science*, 11 (6), 611–629.
- Fog, J. (1994) *Med samtalen som utgangspunkt. Det kvalitative forskningsinterview*. København: Akademiske Forlag A/S
- Francis, D. and Bessant, J. (2005) Targeting innovation and implications for capability development. *Technovation*, 25 (3), 171-183.
- Garapin, A. and Hollard, A (1999) Routines and incentives in group tasks, *Journal of evolutionary economics*, 9 (4), 465-486.
- Giddens, A. (1982) *Profiles and critiques in social theory*. Berkeley, CA: University of California Press.
- Gimbert, X., Bisbe, J. and Mendoza, X. (2010) The role of performance measurement systems in strategy formulation processes, *Long Range Planning*, 43 (4), 477-497.
- Glynn, M. A. (1994) Effects of work task cues and play task cues on information processing, judgment, and motivation, *Journal of Applied Psychology*, 79, 34–45.
- Goffin, K. and Mitchell, R. (2005) *Innovation Management: Strategy and Implementation Using the Pentathlon Framework*. Palgrave Macmillan, New York.
- Grafton, J., Lillis, A.K. and Widener, S.K. (2010) The Role of Performance Measurement and Evaluation in Building Organizational Capabilities and Performance. *Accounting, Organizations and Society*, 35, 689–706.
- Grant, R. M. (1991) The resource-based theory of competitive advantage: Implications for strategy formulation. *California Management Review*, 33 (3), 114–135.
- Gulati, R. (2007) Tent-Poles, Tribalism, and Boundary Spanning: The Rigor-Relevance Debate in Management Research. *Academy of Management Journal*, 50 (4), 775–782.
- Gummesson, E. (2000) *Qualitative Methods in Management Research*, 2nd edn. Thousand Oaks, CA: Sage.
- Hales, M. and Tidd, J. (2009) The practice of routines and representations in design and development. *Industrial and Corporate Change*, 18 (4), 551-574.
- Hallgren, E. W. (2009) How to Use an Innovation Audit as a Learning Tool: A Case Study of Enhancing High-Involvement Innovation. *Creativity and Innovation Management*, 18 (1), 48-58.

- Henri, J. (2006) Organizational Culture and Performance Measurement Systems. *Accounting, Organizations and Society*, 31 (1), 77–103.
- Hodgson, G. M., and Knudsen, T. (2004) The firm as an interactor: Firms as vehicles for habits and routines. *Journal of Evolutionary Economics*, 14 (3), 281–307.
- Howard-Grenville, J.A. (2005) The Persistence of Flexible Organizational Routines: The Role of Agency and Organizational Context. *Organization Science*, 16 (6), 618–636.
- Howells, J. (2008) New directions in R&D: current and prospective challenges. *R&D Management*, 38 (3), 241–252.
- Jaruzelski, B., Loehr, J., Holman, R. (2011), The Global Innovation 1000: Why Culture is Key, in strategy+business, 65 et al., 2011
- Jelinek, M. and Schoonhoven, C. (1990) The Innovation Marathon: Lessons From High Technology Firms, Oxford: Basil Blackwell.
- Jones, O. and Stevens, G. (1999) Evaluating failure in the innovation process: the micropolitics of new product development. *R&D Management*, 29 (2), 167–178.
- Kanter, R.M. (1983) When a thousand flowers bloom: structural, collective, and social conditions for innovation in organizations', in Staw, B.M. and Cummings, L.L. (Eds), Research in Organizational Behavior, JAI Press, Greenwich, CT, pp. 169–211.
- Kaplan, R.S. and Norton, D.P. (1996) *The Balanced Scorecard*. Harvard Business School Press, Boston.
- Kelley, D. (2009) Adaptation and Organizational Connectedness in Corporate Radical Innovation Programs. *Journal of Product Innovation Management*, 26 (5), 487–501.
- Kerssens-van Drongelen, I.C. and Bilderbeek, J. (1999) R&D Performance Measurement: More than Choosing a Set of Metrics. *R&D Management*, 29 (1), 35–46.
- Kesting, P. and Ulhøi, J.P. (2010) Employee-driven innovation: extending the license to foster innovation. *Management Decision*, 48. (1), 65 – 84.
- Kihlander, I., Nilsson, S., Lund, K., Ritzén, S., and Norell Bergendahl, M. (2011) Planning Industrial PHD Projects In Practice: Speaking Both 'Academia' and 'Practitionese', Proceedings of the 18<sup>th</sup> International Conference on Engineering Design, August 15–18, Copenhagen, Denmark.
- King, N. (1992) Modelling the innovation process: An empirical comparison of approaches. *Journal of Occupational and Organizational Psychology*, 65 (2), 89–100.
- Kogut, B., and Zander, U. (1992) Knowledge of the firm, combinative capabilities and the replication of technology. *Organization Science*, 3 (3), 383–397.
- Kumar, R. (2011). *Research methodology: A step-by-step guide for beginners* (3rd ed.). Thousand Oaks, CA: Sage Publications Inc.
- Kvale, S. (1996) *Interviews: An Introduction to Qualitative Research Interviewing*. Sage, Thousand Oaks, CA.
- Kvale, S. and Brinkmann, S. (2009) *Interviews: Learning the Craft of Qualitative Research Interviewing*, Los Angeles, Calif., Sage.

- Labatut, J., Aggeri, F., and Girard, N. (2012) New Practice Creation Discipline and Change: How Technologies and Organizational Routines Interact in New Practice Creation. *Organization Studies*, 33 (1), 39-69.
- Latour, B. (1996), *Aramis or the love of technology*, Harvard University Press, 1996, US.
- Lebas, M.J. (1995) Performance Measurement and Performance Management. *International Journal of Production Economics*, 41 (1-3), 23–35.
- Leenders, R. T. A. J., van Engelen, J. M. L. and Kratzer, J. (2007) Systematic Design Methods and the Creative Performance of New Product Teams: Do They Contradict or Complement Each Other? *Journal of Product Innovation Management*, 24, 166-179.
- Lenox, M. and King, A. (2004) Prospects for Developing Absorptive Capacity through Internal Information Provision. *Strategic Management Journal*, 25, 331-345.
- Leonard, D. and Sensiper, S. (1998) The role of tacit knowledge in group innovation. *California Management Review*, 40 (3), 112-132.
- Leonard-Barton, D. 1992. Core capabilities and core rigidities - a paradox in managing new product development. *Strategic Management Journal*, 13, 111-125.
- Levinthal, D. A. and March, J.G. (1993) The myopia of learning. *Strategic Management Journal*, 14, 95–112.
- Locke, E.A., and Latham, G.P. (1990) *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice-Hall.
- Locke, E. A. and Latham, G. P. 2006. New Directions in Goal-Setting Theory. *Current Directions in Psychological Science*, 15 (5), 265-268.
- Madjar, N., Greenberg, E. and Chen, Z. (2011) Factors for Radical Creativity, Incremental Creativity, and Routine, Noncreative Performance. *Journal of Applied Psychology*, 96 (4), 730-743.
- Mainemelis, C. and Ronson, S. (2006) Ideas are born in fields of play: towards a theory of play and creativity in organizational settings. *Research in Organizational Behavior*, 27, 81–131
- Malmi T. and Brown, D. A. (2008) Management control systems as a package—Opportunities, challenges and research directions. *Management Accounting Research*, 19, 287-300.
- March, J.G. (1991) Exploration and Exploitation in Organizational Learning, *Organization Science*, 2 (1), 71-87.
- March, James G. and Herbert A. Simon (1958), *Organizations*. New York: John Wiley & Sons, Inc.
- Maute, M. F. and Locander, W. B. (1994) Innovation as a socio-political process: An empirical analysis of influence behavior among new product managers. *Journal of Business Research*, 30 (2), 161-174.
- McCarthy, I. P., Tsinopoulos, C., Allen, P., Rose-Anderssen, C. (2006) New Product Development as a Complex Adaptive System of Decisions. *Journal of Product Innovation Management*, 23 (19), 437-456.
- McGrath, R. 2012. How the Growth Outliers Do It. *Harvard Business Review*, 90, 110-116.
- Melnyk, S. A., Hanson, J.D. and Calantone, R.J. (2010) Hitting the Target...but Missing the Point: Resolving the Paradox of Strategic Transition. *Long Range Planning*, 43 (4), 555-574.

- Menzel, H.C., Aaltio, I. and Ulijn, J. (2007). On the way to creativity: Engineers as intrapreneurs in organizations. *Technovation*, 27 (12), 732-743.
- Merchant, K. A. (1985) Organizational Controls and Discretionary Program Decision Making: A Field Study. *Accounting Organizations and Society*, 10 (1), 67 – 85.
- Meyer, C. (1994) How the Right Measures Help Teams Excel. *Harvard Business Review*, 72, 95–103.
- Micheli, P. and J.-F. Manzoni (2010) Strategic Performance Measurement: Benefits, Limitations and Paradoxes. *Long Range Planning*, 43 (4), 465-476.
- Miles, M.B. and Huberman, A.M. (1994), *Qualitative Data Analysis*, 2nd ed., Sage, Beverly Hills, CA.
- Mintzberg, H., Quinn, J.B and Goshal, S. (1998) *The strategy process: concepts, contexts and cases*, Englewood Cliffs, NJ: Prentice Hall.
- Mohrman, S.A, Gibson, C.B. and Mohrman, A.M., Jr. (2001) Doing research that is useful to practice. *Academy of Management Journal*, 44(2), 347-375.
- Mouritsen, J., (1998) Driving Growth: Economic Value Added versus Intellectual Capital, *Management Accounting Research* vol. 9, pp.461-482.
- Mumford, M. D., Scott, G. M., Gaddis, B., and Strange, J. M. (2002) Leading creative people: Orchestrating expertise and relationships. *The Leadership Quarterly*, 13(6), 705–730.
- Mumford, M. D. and Licuanan, B. (2004) Leading for innovation: Conclusions, issues, and directions. *The Leadership Quarterly*, 15, 163-171.
- Mumford, M.D. (2000) Managing creative people: strategies and tactics for innovation. *Human Resource Management Review*, 10(3), 313-351.
- Mundy, J. (2010) Creating dynamic tensions through a balanced use of management control systems. *Accounting, Organizations and Society*, 35 (5), 499-523.
- Murray, P. and Blackman, D. (2006) Managing innovation through social architecture, learning, and competencies: a new conceptual approach. *Knowledge and Process Management*, 13 (3), 132-143.
- Narduzzo, A., Rocco, E. and Warglien, M. (2000) Talking about routines in the field, in Dosi, G., Nelson, R and Winter, S. (eds), *The Nature and Dynamics of Organizational Capabilities*, pp., 27-50, Oxford University Press, Oxford.
- Neely, A., Mills, J., Platts, K., Richards, H., Gregory, M., Bourne, M. and Kennerly, M. (2000) Performance measurement system design: developing and testing a process-based approach. *International Journal of Operations & Production Management*, 20 (10), 1119-1145.
- Neely, A. and Al Najjar, M. (2006) Management Learning Not Management Control: The True Role of Performance Measurement. *California Management Review*, 48 (3), 101–14.
- Nembhard, I. M., Cherian, P. and Bradley, E. H. (2014) Deliberate Learning in Health Care: The Effect of Importing Best Practices and Creative Problem Solving on Hospital Performance Improvement. *Medical Care Research and Review*, 71 (5), 450-471.
- Nelson, R. R., and Winter, S. G. (1982) *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press.
- Nijssen, E.J., Hillebrand, B., Vermeulen, P. and Kemp, R. (2006) Exploring Product and Service Innovation Similarities and Differences. *International Journal of Research in Marketing*, 23 (3), 241–251.

- Noda, T. and Bower, J. L. (1996) Strategy Making as Iterated Processes of Resource Allocation. *Strategic Management Journal*, 17, 159-192.
- Nonaka, I. (1991) The knowledge-creating company. *Harvard Business Review*, 69 (6), 96-104.
- Nonaka, I. (1994), A dynamic theory of organizational knowledge creation. *Organization Science*, 5 (1), 14-37.
- Nonaka, I. and Takeuchi, H. (1995) *The Knowledge-Creating Company*, New York: Oxford University Press.
- Nonaka, I., Toyama, R. and Konno, N. (2000) SECI, Ba and Leadership: a Unified Model of Dynamic Knowledge Creation. *Long Range Planning*, 33 (1), 5-34.
- Nonaka, I. and Toyama, R. (2002) A firm as a dialectic being: towards a dynamic theory of a firm, *Industrial and Corporate Change*, 11 (5), 995-1009.
- Nonaka, I., von Krogh, G. and Voelpel, S. (2006) Organizational knowledge creation theory: Evolutionary paths and future advances, *Organization Studies*, 27(8), 1179-1208.
- O'Connor, G. C. and DeMartino, R. (2006) Organizing for Radical Innovation: An Exploratory Study of the Structural Aspects of RI Management Systems in Large Established Firms. *Journal of Product Innovation Management*, 23 (6), 475-497.
- O'Connor, G. C. (2008) Major Innovation as a Dynamic Capability: A Systems Approach, *Journal of Product Innovation Management*, 25 (4), 313-330.
- Ojanen, V. and Vuola, O. (2006) Coping with the Multiple Dimensions of R&D Performance Analysis. *International Journal of Technology Management*, 33(2-3), 279-290.
- Orlikowski, W.J. (2000) Using Technology and Constituting Structures. *Organization Science*. 11 (4), 404-428
- Ouchi, W. G. (1979) A conceptual framework for the design of organizational control mechanisms. *Management Science*, 25(9), 833- 848.
- Patterson, M.G., West, M.A., Shackleton, V.J., Dawson, J.F., Lawthom, R., Maitlis, S., Robinson, D.L., and Wallace, A.M. (2005) Validating the organizational climate measure: links to managerial practices, productivity and innovation. *Journal of Organizational Behaviour*, 26 (4), 379-408.
- Pavlov, A. and Bourne, M. (2011) Explaining the Effects of Performance Measurement on Performance: An Organizational Routines Perspective. *International Journal of Operations and Production Management*, 31(1), 101-22.
- Pentland, B. T. and Feldman, M. (2005) Organizational routines as a unit of analysis. *Industrial and Corporate Change*, 14 (5), 793-815.
- Peters, T. (1997) A skunkworks tale. In: R. Katz, ed. 1997. *The Human Side of Managing Technological Innovation*. New York: Oxford University Press.
- Poskela, J. and Martinsuo, M. (2009) Management Control and Strategic Renewal in the Front End of Innovation. *Journal of Product Innovation Management*, 26 (6), 671-684.

- Quinn, J. (1985) Managing Innovation: Controlled Chaos: Big companies stay innovative by behaving like small entrepreneurial ventures, *Harvard Business Review*, 63 (3) , 73–84.
- Roos, J., Victor, B., and Statler, M. (2004) Playing Seriously with Strategy. *Long-Range Planning*, 37(6), 549-568.
- Seitjs, G. H., Latham, G. P., Tasa, K. and Brandon, W. L. (2004) Goal Setting and Goal Orientation: An Integration of Two Different Yet Related Literatures. *The Academy of Management Journal*, 47(2), 227-239.
- Sherer, S. A., Kohli, R. and Baron, A. (2003) Complementary Investment in Change Management and IT Investment Payoff. *Information Systems Frontiers*, 5(3), 321-333.
- Schneier, C.E (1995) Capitalizing on performance management, recognition and rewards systems. Performance measurement, management and appraisal sourcebook. Ed. By Shaw, D.G, Schneier, E..C., Beatty, R.W., Lloyd, S.B., publ. Human Resource Development Press, Inc. Amherst, MA.
- Shalley, C.E. (1991) Effects of productivity goals, creativity goals and personal discretion on individual creativity, *Journal of Applied Psychology*, 76, 179-185.
- Shani, A. B. and Coghlan, D. (2014) Collaborate With Practitioners: An Alternative Perspective A Rejoinder to Kieser and Leiner (2012). *Journal of Management Inquiry*, 23, 433-437.
- Silverman, D. (2011) *Interpreting Qualitative Data*, 4th ed. London: Sage.
- Simons, R. (1990) The Role of Management Control Systems in Creating Competitive Advantage: New Perspectives. *Accounting, Organizations and Society*, 15 (1-2), 127–143
- Simons, R. (1995) *Levers of Control: How Managers Use Innovative Control Systems to Drive Strategic Renewal*. Harvard Business School Press, Boston, MA.
- Sitkin, S.B. (1992) Reconceptualizing the determinants of risk behavior. *Academy of Management Review*, 17 (1-2), 9-38.
- Sitkin, S. B., See, K. E., Miller, C. C., Lawless, M. W. and Carton, A. M. (2011) The Paradox of Stretch Goals: Organizations in Pursuit of the Seemingly Impossible. *Academy of Management Review*, 36 (3), 544-566.
- Sitkin, S.B. and Roth, N.R. (1993) Explaining the limited effectiveness of legalistic “remedies” for trust/distrust. *Organization Science*, 4 (3), 367-392.
- Snell, S. A. and Youndt, M. A. (1995) Human resource management and firm performance: Testing a contingency model of executive controls. *Journal of Management*, 21 (4), 711-737.
- Smeds, R. and Haho, P. (2003) Bottom-up or top-down? Evolutionary change management in NPD processes. *International Journal of Technology Management*. 26 (8), 887-902.
- Smith, K.M. (2005) Measuring Innovation. In Fagerberg, J., Mowery, D.C. and Nelson, R.R. (eds.), *The Oxford Handbook of Innovation*. Oxford University Press, New York, pp. 148–717



- Steiber, A. and Alänge, S. (2013). A corporate system for continuous innovation: The case of Google Inc., *European Journal of Innovation Management*, 15 (2), 243-264.
- Tang, H. K. (1998) An integrative model of innovation in organizations. *Technovation*, 18 (5), 297-309
- Teece, D., Pisano, G. and Shuen, A. (1997) Dynamic capabilities and strategic management. *Strategic Management Journal*, 18 (7), 509-533.
- Teece, D. J. (2007) Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal*. 28(13), 1319-1350.
- Thomke, S. (2001) Enlightened experimentation: The new imperative for innovation, *Harvard Business Review*, 79 (2), 67-75.
- Tidd, J. (2001) Innovation Management in Context: Environment, Organization and Performance. *International Journal of Management Reviews*, 3(3), 169–83.
- Tsai, W. and Ghoshal, S. (1998) Social Capital and Value Creation: The Role of Intrafirm Networks. *The Academy of Management Journal*, 41(4), 464-476.
- Tsoukas, H. (1996) The Firm as a Distributed Knowledge System: A Constructionist Approach. *Strategic Management Journal*. 17, 11–25.
- Tushman, M.L. and O'Reilly, C.A. (1996) Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change. *California Management Review*. 38 (4), 8-30.
- Tushman, M.L., P.C. Anderson, and C. O'Reilly (1997) Technology cycles, innovation streams, and ambidextrous organizations: organizational renewal through innovation streams and strategic change, in: Tushman, M.L., and P. Anderson (eds.) *Managing Strategic Innovation and Change, A Collection of Readings*, Oxford University Press: New York: 3-23.
- Tushman, M and Nadler, D (1986) Organising for innovation, *California Management Review*, 28 (3), 74–88.
- Tushman, Michael L., Smith, Wendy K., Wood, Robert C., Westerman, George and O'Reilly, Charles A. (2007). Organizational designs and innovation streams. Harvard Business School Working Paper, 2007.
- van de Ven, A. (1986) Central Problems in the Management of Innovation. *Management Science*. 32 (5), 590-607.
- Van de Ven, A., Angle, H. and Poole, S.M. (eds.) (1989) "Research on the Management of Innovation: The Minnesota Studies", New York: Ballinger Publishing/Harper and Row.
- Van de Ven, A. H., and Johnson. P. E. (2006) Knowledge for science and practice. *Academy of Management Review* 31 (4), 802–21.
- von Hippel, E. (1986) Lead users: a source of novel product concepts. *Management science*, 32 (7), 791-805.
- von Krogh, G., K. Ichijo, et al. (2000). Enabling Knowledge Creation. New York, Oxford University Press.
- Nonaka, I., von Krogh, G. and Voelpel, S. (2006) Organizational Knowledge Creation Theory: Evolutionary Paths and Future Advances. *Organization Studies*, 27(8), 1179-1208.

- Wagner, K., Taylor, A., Zablit, H. and Foo, E. (2014) The most innovative companies 2014: Breaking through is hard to do, Boston Consulting Group.
- Weick, K. E. (1993) The collapse of sensemaking in organizations: The Mann Gulch disaster. *Administrative Science Quarterly*, 38, 628–652.
- Weick, K. E. (1998) Improvisation as a Mindset. *Organization Science*, 9(5) 543-555.
- Weick, K.E. (1979) *Sensemaking in organizations*. Thousand Oaks, CA: Sage.
- Weick, K. E. (2001) *Making sense of the organization*. Oxford: Blackwell.
- West, M. A., and Anderson, N. (1992) Innovation, cultural values and the management of change in British hospitals. *Work and Stress*. 6 (3), 293–310
- Widener, S-K. (2007) An Empirical Analysis of the Levers of Control Framework. *Accounting, Organizations and Society*, 32 (7-8), 757–88.
- Winter, S.G. and Szulanski, G. (2001), Replication as strategy. *Organization Science*. 12(6), 730-743.
- Zellmer-Bruhn, M.E., (2003) Interruptive events and team knowledge acquisition. *Management Science*, 49 (4), 514-528.
- Zollo, M. and Winter, S.G. (2002) Deliberate learning and the evolution of dynamic capabilities, *Organization Science*, 13(3), 339-353.
- Zollo, M. and Singh, H. (2004) Deliberate learning in corporate acquisitions: post-acquisition strategies and integration capability in US bank mergers. *Strategic Management Journal*, 25(13), 1233-1256.

# Appendix

## Interview guides

All interviews were initiated with a short description of the purpose of the study, the overall structure of the interview and information about how interview data will be handled in terms of confidentiality. All interviews ended with an invitation to the interviewee to bring up additional information of relevance to the study along with making a request for further contact if the interviewee or the researcher(s) would have any supplementary questions in the future.

## Study 1.

1. What is the function of your organization?
2. What is success for your organization?
  - a. Can you give examples on when your organization has been successful?
3. What do you perceive are the most important success factors for your organization?
4. How do you know if your organization is successful?
5. Describe how you are making use of performance measurement?
  - a. What is measured? Who is measuring? How frequent?
6. What is the purpose of measuring performance?
  - a. Does it differ depending on the metrics in use?
7. Who collects, analyzes and communicates the measurement data?
  - a. Does it differ between the metrics in use?
8. Who requests the result from the performance measurement analysis? Why?
9. What metric(s) is most important? Why?
10. What would you like to measure? Why?
  - a. What is hindering you from measuring this today?
11. What support would you like to have related to performance measurement?
12. What is innovation for you?
13. How important is innovation for your organization?
  - a. Can you provide examples when innovation has played an important role?
14. How do you carry out your innovation work?
15. What works good and what would you like to improve in your innovation work?
16. What is your innovation work expected to generate?
17. Who evaluates your organization's innovation work?
  - a. Who requests its outcomes?
18. Is your organization measured according to how innovative you are?
  - a. If yes, what is measured?
  - b. Who requests the result from these measurements?
19. Describe how you are making use of innovation measurement?
  - a. What is measured? Who is measuring? How frequent?
20. What is the purpose of measuring innovation?
  - a. Does it differ depending on the metrics in use?
21. Who collects, analyzes and communicates the measurement data?
  - a. Does it differ between the metrics in use?

22. Who requests the result from the innovation measurement analysis? Why?
23. What metric(s) is most important? Why?
24. What would you like to measure? Why?
  - a. What is hindering your from measuring this today?
25. What support would you like to have related to innovation measurement?
26. Can you provide examples when measuring innovation has played a role?
27. How are individuals evaluated related to innovation in your organization?
28. What incentives are in use for individuals in relation to innovation in your organization?
29. What is (your, if manager) managers role in the innovation work?
  - a. What are the most important functions of managers in the innovation work?
  - b. Can you give examples on when (you, if manager) managers have played a role in the innovation work?
30. In what way are you collaborating with others in your or in other organizations within the company in innovation?
  - a. What works good and what would you like to change in this collaboration?
31. Describe the other innovation roles in your innovation work.
32. What are other employee's roles in innovation?
33. What support in relation to innovation do you perceive that your organization is in most need of?

## Study 2.

1. Describe how you are performing environmental scanning.
  - a. When, how often, what activities, with whom?
  - b. How do you perform environmental scanning in your group/team?
2. Please, share your personal experiences related to the environmental scanning activities and tools.
  - a. Please, provide examples on activities/tools that you find stimulating.
  - b. Please, provide examples on activities/tools that you find frustrating.
3. How have you developed as an environmental scout (*alt. as a user of environmental information if a manager*)?
  - a. Have you gradually developed or in relation to certain occasion? Please, give examples.
  - b. What steps have you taken in order to develop as an environmental scout (*alt. as a user of environmental information if a manager*)?
  - c. What new insights on how you work or need to perform as an environmental scout have you gained?
4. What are the reasons or motivation for you to work as an environmental scout? (*alt. making use of environmental scanning information if a manager*)
5. How important do you consider the environmental scanning work is?
6. In what way has the environmental scanning supported you in your role as a developer or manager? (Ex. legitimizes spending time on learning, stimulating idea generation, increased knowledge, new relationship, career etc.)
7. What in the environmental scanning process do you consider has been most useful? (personally, for your group, for the organization etc.)
  - a. In what way?
8. What in the environmental scanning process do you consider has been least useful? (personally, for your group, for the organization etc.)
  - a. In what way?

9. How does environmental scanning differ from other ways to build knowledge that you use?
  - a. What kind of knowledge is created?
10. In what way do you consider the environmental scanning process and tool respectively act as a support for learning and innovation? Please, give examples.
11. In what way do you consider the environmental scanning process and tool respectively act as a barrier for learning and innovation? Please, give examples.
12. What new knowledge or new insights have you gained from being part of the environmental scanning process? (In relation to your scanning area, other areas, the company and its strategies, the industry etc.)
  - a. Do you have any examples on specific occasions when you achieved new knowledge or new insights? Please, give examples.
13. What activities in the environmental process have contributed to increased understanding for the company and its strategies? *(For managers: in what way has the environmental scanning information meant a support for your strategy work?)*
  - a. Has the environmental scanning provided some direct effect in your work? If so, what effects? (ex. new ideas, solved problems in ongoing projects, new colleagues, structure, motivator for newthinking, support in the development of strategies)
14. In what way has the environmental scanning changed your way of working?
15. Has it given you any new ideas on how you think about problem solving, work methods, new ideas, how to collaborate, strategy work, creativity, structure?)
16. What and how often have you received feedback on your environmental scanning results?
  - a. From who?
  - b. How did you experience this feedback?
17. In what way is your role as an environmental scout reflected in your performance evaluation? (For managers; how do you evaluate your employees as an environmental scout? In what way are you evaluated as a manager considering your ability in bringing relevant environmental scanning information?)
18. How would you like to change the environmental scanning process? Why?

### Study 3.

1. Which organization do you represent?
2. What is your role in your organization?
3. What are the deliverables of your organization?
4. What are the key characteristics of your organization (background of the people working, size, working closely together or not, agile teams etc.?)
5. What is innovation in your organization?
6. What are the reasons behind that your organization is found to score high in Innovation Index?
  - a. What actions have you taken to be innovative?
  - b. How is your innovation work organized?
7. What kind of results have come out of your innovation work? Give examples.
8. The innovation index is constituted of three issues concerning your organization i) Openness to new ways of thinking; ii) Transforming market insights into new offerings; iii) Encouragement to come up with improved ways of doing things.

- a. Please, reflect on specific actions that you have or your organization has taken, to secure these issues? Reflect on each one.
  - b. What would you advice others to do?
- 9. What in your culture do you think is of particular importance to support innovation? Please, give examples.
- 10. What of your working processes do you think is of particular importance to support innovation? Please, give examples.
- 11. What in your ways of managing resources do you think is of particular importance to support innovation? Please, give examples.
- 12. Do you have any personal guiding principle that you think have contributed to your innovation performance?

#### **Study 4.**

- 1. Describe your organization and your role in the organization.
- 2. What is innovation to you?
- 3. Describe how you carry out innovation work in your organization.
  - a. What activities are performed?
  - b. By who, when, how?
  - c. Have there been any changes the last two years?
  - d. If yes, what has changed? Why?
  - e. What actions or activities do you consider to have been most important? Why?
- 4. How do innovation activities differ from other R&D activities performed in your organization?
- 5. Describe how your innovation work is organized.
  - a. Specific roles, board, days, amount of time, collaborations etc.?
  - b. Have there been any changes the last two years?
  - c. If yes, what has changed? Why?
- 6. What are the reasons to why your organization is working with innovation?
  - a. How is the reason for why innovating communicated in the organization?
  - b. What documents are available to support this?
  - c. How has this documentation been developed and communicated?
  - d. By who, when, how?
  - e. Have these reasons or the way it is communicated changed during the last two years?
  - f. If yes, what has changed? Why?
- 7. What outcome is your innovation work expected to generate?
  - a. How do you find out what your organization is expected to generate?
  - b. What documents are available to support this?
  - c. How has this documentation been developed and communicated?
  - d. By who, when, how?
  - e. Has this changed during the last two years?
  - f. If yes, what has changed? Why?
- 8. How do you identify what actions to take?
  - a. What documents are available?
  - b. How has this documentation been developed and communicated?
  - c. By who, when, how?

- d. Has this changed during the last two years?
  - e. If yes, what has changed? Why?
- 9. How do you identify how much time and resources you need to achieve what you are expected to generate?
  - a. What documents are available?
  - b. How has this documentation been developed and communicated?
  - c. By who, when, how?
  - d. Has this changed during the last two years?
  - e. If yes, what has changed? Why?
- 10. How do you find out what your organization has achieved?
  - a. What documents are available?
  - b. How has this documentation been developed and communicated?
  - c. By who, when, how?
  - d. Has this changed during the last two years?
  - e. If yes, what has changed? Why?
- 11. Describe what your organization has achieved with your innovation work and what actions are related to a certain outcome (if possible).
- 12. Do you classify or categorize your outcomes in any way? For instance whether ideas generated are more or less novel, whether you have identified new solutions or identified new needs, what capabilities you have built/improved etc..
  - a. By who, when, how?
  - b. Has this changed during the last two years?
  - c. If yes, what has changed? Why?
- 13. What in your innovation work is well-functioning?
  - a. What are the reasons behind?
  - b. Has this changed the last two years?
  - c. If yes, what has changed? Why?
  - d. Does this differ in different parts of the organization?
  - e. If yes, please give examples.
- 14. What in your innovation work is not well-functioning?
  - a. What are the reasons behind?
  - b. Has this changed the last two years?
  - c. If yes, what has changed? Why?
  - d. Does this differ in different parts of the organization?
  - e. If yes, please give examples.

## **Appended papers**



