

EMRE KARALI

# Investigating Routines and Dynamic Capabilities for Change and Innovation





## **Investigating Routines and Dynamic Capabilities for Change and Innovation**



# **Investigating Routines and Dynamic Capabilities for Change and Innovation**

Een onderzoek naar de rol van routines en dynamische vaardigheden in verandering en innovatie

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## **PREFACE**

The PhD trajectory has been one to never forget. Choosing for a career in academia was not easy. I still think that by having chosen for academia, I have not economized on anything else in the sense that I am able to teach, conduct research and be in touch with business life. This way, I think that I can keep doing what I desire most, which is being of value to society to the best of my abilities. As I can contribute to the education and development of a generation that will shape the future and can translate my findings to organizations, as an academic I can directly contribute to two of the most important pillars of society. Whereas I am certain that I made the right career choice, 4.5 years ago I was not as sure as I am now. Luckily, I have been surrounded by great people, who have greatly supported me in my decision process and throughout the PhD trajectory.

I am first of all invaluablely grateful to my family and particularly my parents. They have supported me, in any possible way, regardless of which trajectory in life I would embark on. I was not the easiest the child to raise, nor was I the least expensive. Still, my parents managed to provide me with what I think the best they could do and I will always be grateful for this. They have especially been very supportive of my choice for pursuing a PhD, knowing the good that can be done to society through teaching and research. As much as I hope to have been able to write a great dissertation, I simply hope they are proud of my achievement, so that I have been able to repay them a tiny bit for all they have granted me with. I will continue trying to make you proud throughout the rest of my life and be a son that you deserve. Anne, baba, herşey için teşekkür ederim, iyi ki varsınız. Sizin içinde olmadığınız bir hayatı, hattâ içinde olmadığınız bir çerçeveyi dahî düşünemiyorum. Umarım benimle gurur duyuyorsunuzdur.

During the PhD I met my wife, Rabia. How could I not mention her in this section? She witnessed and also shared the long nights that I had to go through from time to time to be able to deliver the high standards that are demanded from those pursuing a PhD. I am lucky to have her, as she has always stood by me no matter how frustrating things could become. Know please that I notice it all. I promise to always stand beside you too. You are my ever-lasting sunshine, breaking through clouds no matter how thick and enlighting my life, no matter how dark certain periods might become. I am not going write something in Turkish to you, because you speak English too!

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Family and supervisors have been important, but so have been my friends. Erasmus University Rotterdam has provided me with great friendships over the course of nine years, which started all the way back in 2008, when I pursued a Bachelor's degree in Economics and Business Economics. Firstly, Saskia (by now, Sascha) Krijger and dr. Murat Tarakci (Murat abi) for the great talks that we have had on what academia entails and whether I should pursue being an academic. As they might recall, they have been amazingly important in me making my decision, as they were my coaches throughout the ESE Research Traineeship. I am happy to say that those talks do still continue and that I keep benefitting from their rich views on academia and life.

I would like to dedicate a small section of this section to my fellow colleagues to which I have been the closest throughout this journey, perhaps because we simply shared an office, and built great relationships. Guus, Krishnan, Lance, Renee and Saedeh, you have been amazing friends. Ones to never forget. Thank you for coloring my PhD-trajectory and for the great discussions and talks that we have had, often covering very important topics,



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# Chapter 1. General Introduction

## 1.1 Research Topic: Investigating Routines and Dynamic Capabilities for Innovation

For years, scholars have sought to unravel how it is that some organizations are able to continuously innovate and consequently, acquire sustainable competitive advantage, whereas others are not. Every year, many organizations go bankrupt, while at the same time, other organizations are able to stick around for longer periods of time and even fewer are able to consistently surprise customers and competitors with their innovations. The question of why some organizations are innovative whereas others are not is a persistent question that has bothered many since the start of research on organizations. As a result, some scholars have researched the effect of the external environment on innovativeness and the necessity of good positioning within such an environment (Porter, 1996). Others have tried to explain innovativeness based on the internal resource base of organizations, by many known as the Resource-Based View (Barney, 1991; Mahoney and Pandian, 1992; Peteraf, 1993; Priem and Butler, 2001; Wernerfelt, 1994). In this regard, many have suggested that as the environment would keep changing, routines, as important intangible resources (Volberda and Karali, 2015), would reinforce themselves and hence turn inert.

Thus, in an increasingly dynamic environment, scholars advocated the need for a concept that would capture how organizations could continuously and successfully reconfigure themselves (Teece et al., 1997). Consequently, over the past twenty years, dynamic capabilities as the ability of an organization to purposefully alter the way in which it makes its living by the orchestration of routines, has been embraced as an important means of inquiry regarding organizational performance and resource alteration (Teece et al., 1997; Eisenhardt and Martin, 2000; Teece, 2007; Helfat et al., 2007; Helfat and Peteraf, 2009; Drnevich and Kriauciunas, 2011; Peteraf et al., 2013; Helfat and Martin, 2014; Schilke, 2014; Schilke et al., 2017).

Shortly after the dynamic capabilities concept was introduced, some scholars have closely researched the extent to which routines would inhibit organizational change and innovation. More specifically, scholars have delved into the question of whether routines are static structures, or can be dynamic systems. In what became to be known as the routine dynamics research stream, Feldman (2000) uncovered that routines can indeed be static and change endogenously as agents may act upon imperfections that they may encounter as routines' performances recur. Subsequently, in a series of articles, scholars have found that routines can lead to organizational change (Rerup and Feldman, 2011) and novelty (Sonenshein, 2016) without needing to be altered exogenously.

Whereas both the dynamic capabilities and routine dynamics research streams have covered many important topics, this dissertation builds on the notion that there is still much left to learn on how organizations change and innovate. Not much research has focused on how dynamic capabilities and routines actually relate to innovation, which has led to a commentary article by Teece (2012) not too long ago. Also, the dynamic capabilities and routines concepts themselves are still far from perfectly understood (Schilke et al., 2018). Scholars have invited research on how different organizational dynamic capabilities are from managerial dynamic capabilities in bringing about innovation (Helfat and Peteraf, 2015). Also, scholars have explicitly debated the extent to which such capabilities are different from routines that can change themselves as the people within such routines act upon imperfections (Feldman and Pentland, 2003; Teece, 2012). In addition, we have yet to understand how individual characteristics can affect routine dynamism and hence, how such knowledge can be acted upon. Thus, the focus of this dissertation is as follows:

*How do routines and dynamic capabilities relate to change and innovation?*

## 1.2 Conceptual approach

The size of the question required an at least equally sizable approach of inquiry. Hence, I try to deal with this question in a variety of ways. In the first study, I start by reviewing the current state of the dynamic capabilities and routine dynamics literatures in

relation to innovation. Then, as a continuation of past conversations on the divide between routines and dynamic capabilities scholars (Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011), I examine the extent to which routines and dynamic capabilities scholars converse with each other and describe the implications of the current level of conversation on the development of knowledge regarding change and innovation within organizations. As I find a major gap between both research streams, I share six possible drawbacks that might flow from such a divide. Broadly speaking, focusing too much on dynamic capabilities only results in the lack of nuance regarding the suitability of dynamic capabilities and their evolution as their building blocks, routines, change endogenously. On the other hand, focusing too much on routine dynamics limits our understanding regarding what type of innovations can be contributed to by routines and to what extent.

In the second study, I review, reconcile and interlink the dynamic capabilities and routine dynamics research streams in a conceptual manner, by means of an overarching framework. To do this, I draw from the problem-complexity and problem-solving literatures (e.g. Simon, 1962; Nickerson and Zenger, 2004; Foss et al., 2016), implying that I treat organizations as entities that try to solve problems of varying complexities. Then, I build on the notion that organizations rarely come across one type of problem and hence, need to master different approaches to be able to solve different problems. I argue that such approaches can vary in the degree to which they are routinized and that these are inversely related to problem complexity. I argue that highly complex situations require highly managerial and ad hoc approaches (Simon, 1987; Winter, 2003) that do not draw from past paths or experiences, but are novel in order to be able address such problems. On the other hand, the least complex problems can be solved in highly routine ways via operational capabilities (Zollo and Winter, 2002; Helfat and Winter, 2011), as they do not require much managerial interference and discretion, because they are predictable and can be dealt with by extrapolating past insights (Daft and Lengel, 1982; Gilbert, 2005). Dynamic capabilities then are suitable in moderately complex occasion, in which it makes sense to draw from the past as the encountered problem is sufficiently predictable. Managerial-level dynamic capabilities that draw from simple routines are favored compared to organization-level dynamic capabilities that draw from complex routines, whenever problems are very hard to decompose and hence require more managerial discretion.

Thirdly, I look at the relationship between dynamic capabilities and innovation to uncover to what extent both are interrelated and in what way. I look particularly at exploratory innovations, which are innovations that stem from new knowledge sources and address new customers and markets (Jansen et al., 2006). As these innovations tend to be radical and at the same time require organizations to break substantially from their past paths, exploratory innovation is a good proxy for measuring the extent to which dynamic capabilities can contribute to innovations that are distinctive and substantial. At the same time, it allows me to tease out to what extent the routines that are part of dynamic capabilities can contribute to such newness and what the importance of routine orchestration is aside from the benefits that stem from the internal dynamics of these routines. I find that organizational routines are contributing to organizational innovativeness, but that the managerial act of routine orchestration is decisive for achievement of such innovations.

Finally, I look at the antecedents of routine dynamism and the outcomes of such dynamism, which I can compare to the effects that dynamic capability deployment<sup>1</sup> can have. In a setting that is characterized by a variety of constraints, I explore the dynamic patterns that routines display and find, in line with the literature, that routines are immensely flexible in responding to pressures, because the people that enact such routines act upon the imperfections they encounter (Feldman and Pentland, 2003; Feldman et al., 2016). I find that professional identities are very important in sparking such dynamism (Fagermoen, 1997; Ibarra, 1999) and that empathy, as the ability to listen to, understand and share the feelings of others, can function as a channel of sparking the dynamism in individuals' behaviors. I concludingly find that this dynamism in routines is what might often keep a department going, whenever managers do not or cannot interfere with the working process. Actors might, because of their professional identities in relation to their empathizing with those affected by their work quality, engage in additional actions to maintain and sustain work quality.

The contributions to both research and practice will become clear towards the end of each chapter and as a total at the end of the dissertation. In following sections, I will

---

<sup>1</sup> Past scholars, such as Luo (2001), Zahra et al. (2006) and Helfat et al. (2007) have referred to the use or utilization of capabilities as deployment

explain briefly the theoretical background of the studies in this dissertation, after which I will describe the structure of the dissertation.

## 1.3 Theoretical background

To be able to answer the question of how routines and dynamic capabilities are related to change and innovation, we make use of three major literatures. We draw firstly from research on organizational change and innovation, dynamic capabilities and routine dynamics. In addition, there are some literatures that we borrow from to ground certain cases, or to explain the phenomena that we encounter. In this regard, we utilize research on professional identity, empathy and problem complexity.

### *1.3.1 Organizational change and innovation*

Central to this dissertation is the literature on change and innovation. As environments change, organizations need to change and innovate also to maintain fit with their environment (Sorensen and Stuart, 2000). Scholars have consequently looked in a variety of ways at how organizations change and what enables them to change. Adaptation (Cyert and March, 1963; Levinthal, 1991), flexibility (Volberda, 1996) and transformation (Leifer, 1989) have all been ways of referring to how organizations change or innovate with regards to their organizational structure and output.

It is important to make a distinction between change and innovation. Scholars have argued that much of organizational change is not innovation (Woodman et al., 1993). Damanpour (1991) argues that an important distinction is ‘purpose’, being the intentionality behind the act of innovating. Following this line of reasoning, change within an organization as a byproduct of a policy that did not have this change as its goal in the first place, is not an innovation, but the intentional launch of a new series of product, such as smartphone, that differentiates itself from former types or series of products in notable ways, is. This of course

has great implications to organizational design and strategy, but is also important to take into account in research on organizations.

Our application of change is quite diverse. In terms of the routine dynamics research stream, I tap into how routines can inhibit and facilitate change. Also, I examine in what ways routines can change themselves, endogenously, and under which circumstances they may adapt to environmental disturbances. In terms of the dynamic capabilities research stream, I examine how dynamic capabilities can bring about change within organizations by themselves and how routines matter in this regard. This, I do by describing how organizations can change in response to various problems of various complexities, by utilizing a repertoire of different sorts of capabilities, routines and ad hoc approaches.

In terms of innovation, I make use of the concept of exploratory innovation, to understand to what extent routines and dynamic capabilities may or may not lead to innovations that are radical and require new-to-the-firm knowledge. Aside from the fact that exploratory innovation has been argued to be of vital importance to organizations (Tuncdogan et al., 2017), I do so because routines have been argued to be not suitable for such innovation as they would be backward looking and self-reinforcing, whereas also for dynamic capabilities the proof of their contribution to such innovations is absent. In this regard, I also look at how the possible contributions of routines and dynamic capabilities to exploratory innovation are possibly different from each other and examine whether both concepts might be interlinked in bringing about such innovations.

### *1.3.2 Dynamic capabilities*

The dynamic capabilities concept is an extension of the resource-based view, which has been an important theory in research on acquiring and sustaining competitive advantage (e.g. Wernerfelt, 1984; Peteraf, 1993). The resource-based view suggests that an organization should focus on its resource base first in performing actions, rather than on the external environment. However, as we live in an environment that is characterized by high levels of dynamism and turbulence, scholars have argued that the RBV was too static (Williamson, 1999; Priem and Butler, 2001). Hence, the dynamic capabilities concept was

introduced as a concept that would focus on how organizations could maneuver in dynamic environments to enhance their competitive position (Teece et al., 1997; Eisenhardt and Martin, 2000).

The concept of dynamic capabilities got immensely popular over the years (Barreto, 2010; Peteraf et al., 2013). An important reason for this has been that it seeks to address the potential of organizations to change themselves continuously in response to an ever changing environment, which is the hallmark of sustainable competitive advantage (Teece, 2007; Helfat and Peteraf, 2009; Teece, 2012; Di Stefano et al., 2014; Karali et al., 2018). However, at the same time the concept has received great amounts of criticism. Scholars questioned the concepts value-added, theoretical foundation, empirical support for its claims and consequently, its practical implications (Arend and Bromiley, 2009). Even though much of this critique has been addressed, the concept is still in need of further quantification of what dynamic capabilities are (Drnevich and Kriauciunas, 2011; Schilke, 2014), how they relate to organizational routines (Di Stefano et al., 2014), what the role of the manager is (Helfat and Peteraf, 2015) and how dynamic capabilities can affect innovation (Teece, 2012).

### *1.3.3. Routine Dynamics*

The routine dynamics literature has come forward as a response to the more ‘traditional’ way in which routines were treated by (strategic) management scholars. For years, scholars emphasized that routines could turn inert and could inhibit innovation and sustainable competitive advantage (e.g. Hannan and Freeman, 1984; Dougherty, 1992; Carroll and Teo, 1996). Whereas this may be indeed true in some occasions, often such views stemmed from making use of a more structural view on what routines are (Feldman and Pentland, 2003). However, Feldman (2000) and Feldman and Pentland (2003) coined a new stream of research, being routine dynamics, to draw attention to the fact that routines can be more dynamic than we might think on the first hand. They argue that routines are enacted by people that are mindful and thus act upon inefficiencies, through which routines could change endogenously. Much research has followed-up on these seminal articles, and scholars have shown that routines can indeed be highly dynamic, as they can vary over

occurrences (Pentland et al., 2011), can lead to novelty (Sonenshein, 2016) and to organizational change (Feldman and Orlikowski, 2011).

However, much is still to learn from delving further into this stream of research. Om particular, scholars have invited research on the relationship of routines with the context in which they reside (D'Adderio, 2014), have wondered to what extent routines could cause innovation (Teece, 2012) and how routine dynamics and dynamic capabilities literatures actually relate to each other (Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011; Teece, 2012).

#### *1.3.4 Professional identity, empathy and problem complexity*

In explaining our findings with respect to the relationship between routine dynamics, dynamic capabilities, change and innovation throughout the dissertation, we draw from a variety of literatures. We firstly draw from research on professional identities (Ibarra, 1999; Chreim et al., 2007). This literature prescribes that people can identify themselves with a particular profession, which leads their behavior to be in line with the beliefs and values attached to those professions. I make use of this literature as it helps me in answering the different patterns of actions that I see, relating to different people.

Secondly, I borrow from research on empathy (e.g. George, 2000; Kellet et al., 2002; 2006), defined in this dissertation as the ability to listen to, understand and share the feelings of others (Nadler and Tushman, 1990). For people to act upon something consciously, they need to make sense of it (Weick, 1995; Cornelissen, 2012). Empathy is an important way in which people can emotionally relate to someone else and act upon what is sensed (Kellet et al., 2002). Hence, empathy is quite often a trigger of action, which is especially effective in relation to certain professional identities, to which empathy and empathizing is central, such as those of nurses (Fagermoen, 1997).

Finally, I borrow from research on organizational problem-solving (e.g. Nickerson and Zenger, 2004; Foss et al., 2016). This line of research treats organizations as entities that solve problems. A problem does not necessarily have to be something negative. Rather, it should be something that an organization seeks to solve. Problems can be defined in terms



of how complex they are (Simon, 1962). Such complexity is contingent on two axes, being problem size and the amount of interdependencies between the factors within the problem. Even though much research has addressed problem complexity and how different problems can be solved, scholars have yet to unravel how it can be that organizations can solve different problems of different complexities. Scholars have suggested that dynamic capabilities can be seen as means of problem-solving (Zahra et al., 2006; Barreto, 2010). Hence, by applying a problem-solving perspective to the dynamic capabilities research stream, I seek to uncover what repertoire of resources allows organizations to resolve different problems of different complexities.

## 1.4 Research design

In attempting to research the challenging question of how routines and dynamic capabilities are related to change and innovation, I utilize a variety of approaches that eventually complement each other in coming to answer in the following ways:

- 1) How can current knowledge regarding routines and dynamic capabilities be utilized to explain how organizations can solve various problems of various complexities?
- 2) To what extent are insights from the routine dynamics and dynamic capabilities research streams utilized by scholars from both fields and what are the implications of the current state of conversation?
- 3) How do routines and dynamic capabilities relate to exploratory innovation?
- 4) Can routines display dynamic patterns when they are enacted in constrained settings, yet actors are pressured by high levels of environmental variation?

Each of the questions are asked with a different purpose and hence, require a substantially different approach. Hence, I have utilized four different methodologies throughout this dissertation.

My goal with the first study is to see what the literature in its current state offers, in terms of knowledge regarding when routines and capabilities are suitable for solving problems, and in what way they are. Subsequently, drawing from this knowledge, my goal has been to design a framework that would capture all of this information and could lead to propositions, by means of which the routine dynamics and dynamic capabilities literatures could be bridged and academic progress could be fueled. Hence, I utilize a conceptual, theory-building approach. In doing so, I draw from three major literatures, being the routine dynamics, dynamic capabilities and problem complexity and solving literatures, treat routines as the building blocks of dynamic capabilities and draw from the understanding that routinization is inversely related to problem complexity.

My goal with the second study is to extend past research on the state of interrelation between routine dynamics and dynamic capabilities (Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011) in two ways. Firstly, I seek to extend past reviews to the field of innovation, to see to what extent routine dynamics and dynamic capabilities scholars treat the role of routines in relation to innovation differently. Secondly, I seek to empirically show the pattern of conversation between both streams of research, at this point in time and over time. For this purpose, I firstly review the field of routines, also prior to the emergence of the routine dynamics literature, and dynamic capabilities. Then, I conduct a bibliometric analyses (e.g. Peteraf et al., 2013; Randhawa et al., 2016) to observe how currently, and over the past few years, scholars in both fields have referred to each other's research. To be able to do this, I select seminal articles from both fields as reference categories and make use of the VOSviewer and CitNetExplorer programs in analyzing the articles that cited these studies.

My goal with the third study is threefold. Firstly, I would like to test the limits of routine dynamics in relation to exploratory innovation, by analyzing the following question: To what extent are routines able to utilize new-to-the-firm knowledge in bringing forward new products and services for new markets? Secondly, I test to what extent dynamic capabilities are able to produce exploratory innovations. Thirdly, I aim to uncover to what extent, and how, routines and dynamic capabilities are interrelated in bringing about exploratory innovations. As my goal is to test the aforementioned relationships, but also to

empirically contribute to settling a debate on how routines and dynamic capabilities might differently relate to innovation (Helfat and Peteraf, 2009; Teece, 2012), I utilize a quantitative, theory-building and -testing approach. The sample I use originates from the Erasmus Innovation Monitor surveys of 2014 and 2015. I make use of a one year time lag in order to circumvent biases related to causality. In addition, to test how routines and dynamic capabilities relate to each other, I make use of mediation analysis. For this research, I have developed the scales for the routines and dynamic capabilities concepts myself.

Finally, in my forth study, the goal is twofold. Firstly, I seek to delve into how dynamic routines can be when they are enacted in constrained settings. To be able to do this convincingly, I have selected an environment that was characterized by high levels of variation (Child, 1972), which would put pressure on those enacting the routine to fuel the dynamism of the routine as much as possible so that they had to accommodate such variation. Secondly, I sought to unravel the antecedents of such dynamism. In order to go beyond merely observing associations, but also to be able to uncover the nature and triggers of associations, I make use of a qualitative, deductive, theory-building approach, which I label as an ethnographic case study (Obstfeld, 2012; Danner-Schröder and Geiger, 2016). The setting in which we perform this research is a care cycle within a leading hospital in the Netherlands (Porter and Teisberg, 2006), which faces varying influx of patients. We focus on the diagnosis routine. Firstly, I observe how people enact this routine in an unobtrusive, yet insightful manner, as I note everything in a time stamped way and only ask for clarifications whenever I do not understand something. After the observations round, I started interviewing in three rounds, in which each round was a narrowing-down on the themes identified in the previous round. Consequently, I found that many actions that were performed in this care cycle were stemming from actors' professional identities. The dynamism within the diagnosis routine, but also the care cycle as a whole, was mainly stemming from the professional identity of nurses and often came to the forefront during moments of peak patient influx. As patients were facing a decrease in care quality and nurses empathized with these patients, they engaged in voluntary actions that were meant to enhance the quality of care that patients received. Hence, I draw attention to the important role of empathy and identity in the dynamism of routines.

## 1.5 Dissertation overview

From chapter two to five, I will present the four studies that I have conducted as part of my PhD. Afterwards, I will present a conclusion chapter, in which I will discuss the main findings and contributions of my dissertation.

*Study 1: A tale of two routine conversations: Bridging work on dynamic capabilities and routine dynamics with regards to innovation*

In this study, I seek to better grasp what we currently know regarding the relationship between routines and innovation. For this purpose, I observe the field of routine dynamics and dynamic capabilities more closely, by taking a closer look at the extent to which both streams of research draw from each other's theoretical insights. I bring forward that currently, various explanations of the relationship between routines, dynamic capabilities and innovation coincide, which might hold back a better understanding of this relationship. As I delve into the reason of this divergence, I come to find that both streams of research tend to have an inward-looking citation pattern. This implies that scholars tend to build upon work within their own research stream, by drawing also from insights from that particular research stream. I describe six possible implications of doing so, for our understanding of the relationship between routines, dynamic capabilities and innovation, and encourage a more inclusive approach to researching routines and innovation. At the same time, I concur with past scholars that each of the research streams should also be researched in isolation (Parmigiani and Howard-Grenville, 2011), because there are questions that do not require borrowing from neighboring research streams, yet have to be researched also to get a better understanding of the topics that these research streams seek to uncover.

*Study 2: Routines and Adhocism: How (Dynamic) Capabilities Allow for the Resolution of Problems of Varying Complexities*

Building on the assumption that organizations are entities that solve problems, this study advances our understanding of how organizations are able to deal with a variety of

problems of varying complexities. We describe that there is no one best way in which can be dealt with each and every problem. Any type of problem requires an appropriate approach of problem-solving. We describe by means of examples that problem complexity ideally should be inversely related to the degree to which problem-solving approaches are routinized. Simpler problems should be dealt with by means of more routine approaches, whereas more complex problems by more improvisational ones. We define how such approaches look like by drawing from the dynamic capabilities literature, and define their microfoundations and thus their configuration by drawing from the routines literature. In doing so, we bring forward a highly intuitive and insightful framework regarding how organizations can solve various problems of varying complexities, through the possession of a repertoire of problem-solving approaches.

*Study 3: Integrating the notions of rules, routines and dynamic capabilities: A mediation model of their effect on exploratory innovation*

In study 3, I try to tease out a problem that is of fundamental importance to both the dynamic capabilities research stream as well as the routine dynamics research stream. I delve into the antecedents of exploratory innovation and look at dynamic capabilities and routines sequentially and simultaneously, to respectively see whether they facilitate exploratory innovation and whether one effect might be mediated by another. Thus, from a routine dynamics perspective, I seek to show whether routines can directly contribute to exploratory innovation and whether this effect runs through dynamic capabilities. From a dynamic capabilities perspective, I seek to show whether dynamic capabilities lead to exploratory innovation and to what extent such an effect stems from the routines that underpin such capabilities. In order to be able to more clearly address these questions, I split routines into complex and simple routines. This way, I have been able to capture the different effects of different routines on exploratory innovation. I find that dynamic capabilities and simple routines do facilitate exploratory innovation, whereas complex routines seem to facilitate dynamic capability deployment, but not exploratory innovation. This finding shows that different routines may have different properties and thus different contributions to innovation. I also find that the effect of dynamic capabilities on exploratory innovation is

stronger than the effect of simple routines. Finally, I find that the effect of simple routines on exploratory innovation is subsumed by dynamic capabilities deployment. Hence, in bringing about exploratory innovations, I show that routines are important, but the orchestration of routines through dynamic capabilities is decisive, whereas routines' contribution is more facilitative.

*Study 4: Environmental variation, contextual constraints and routine dynamics:  
Professional identity as a source of oscillation*

In this study, I test the limits of the dynamism of routines. To be able to do so, I observe how routines are enacted under financial, formal and physical setting constraints, when faced with great amounts of environmental variation. I find that contextual constraints can trigger dynamism in routines, whenever they result in a disadvantage towards those that are affected by the enacted routine and whenever the enactors empathize with those that undergo this disadvantage and act upon it due to their professional identities. Thus, I go beyond the notion that contextual constraints might also constrain dynamism, as I draw attention to the antecedents of enactors' behaviors that eventually spark routine dynamism. In particular, I underscore the importance of professional identity, empathy and emotion in sparking routine dynamism. However, in much broader terms, I draw attention to the important role that individual characteristics might have in acting upon imperfections and enabling routine dynamism.

## 1.6 Declaration of contribution

In this section, I declare my contribution to the chapters of this dissertation and acknowledge the contribution of my promoters and co-promotor.

Chapter 1: In this chapter, I described the topic of this dissertation, the conceptual approach I have taken to examine this topic, the theoretical perspectives I have made use of to make

sense of my findings and my research design. Aside from a conversation with my supervisory regarding the contents of this chapter, the work has been performed by me.

Chapter 2: This chapter consists of my first study. In this chapter, I assess our current understanding of how routines relate to innovation. I do so by firstly reviewing two prominent literatures that describe the relationship between routines and innovation. Then, I perform bibliometric analyses in which I examine the extent to which scholars from these literatures converse with each other. I came up with the idea behind the paper, designed the research, analyzed the data and wrote the manuscript. My supervisors helped me with finding the software with which to perform the analyses and provided me feedback on the content of the manuscript.

Chapter 3: This chapter consists of my second study. In this chapter, I develop a framework with which I describe how organizations as problem-solving entities can solve different problems of different complexities. I do so, to answer the question of how organizations can face the different types of problems they are continuously facing. I came up with the idea behind the paper. The framework is the result of repeated discussions between me and my supervisors. I wrote the manuscript.

Chapter 4: This chapter consists of my third study. In this chapter, I analyze to what extent routines can lead to exploratory innovation and whether such an effect is mediated by dynamic capabilities. In simpler terms, does the intentional act of orchestrating resources outweigh the effect that organizational routines may have on exploratory innovation? I came up with the initial idea behind the paper. The model is the result of my repeated discussions with my supervisory team. I performed the analyses, but repeatedly discussed the outcomes of the analyses with my supervisory team. I wrote the manuscript, but received feedback on various occasions.

Chapter 5: This chapter consists of my final study. In this chapter, I analyze the extent to which routines can be dynamic. I do so, by examining a routine in a highly constrained setting that is nevertheless subject to high levels of environmental variation. I came up with the idea of conducting this research within a hospital and set up the contacts with the hospital. My supervisory team assisted me in my talk with the hospital management and visited with me the hospital and its management several times to grasp the setting and be

able to provide me with better feedback. I performed the observations and the interviews at the hospital. I also analyzed the data myself, but had many conversations with my supervisory team in making sense of the data and designing the model that I used to visualize the data.

Chapter 6: In this chapter I will present the main findings, contributions and limitations of this dissertation. This dissertation has been crafted by me, but has benefitted from previous talks with my supervisors on the overall topic of this dissertation.



## Chapter 2. A tale of two routine conversations: Bridging work on dynamic capabilities and routine dynamics with regards to innovation

**Abstract:** This article deepens our understanding of how routines relate to innovation, amidst discussions on whether routines can lead to innovation by themselves, or only as part of capabilities. It does so in two ways. Firstly, in this article we review how the dynamic capabilities and routine dynamics literatures have addressed the relationship between routines, dynamic capabilities and innovation. Secondly, we perform bibliometric analyses to empirically assess the degree to which both research streams display relationships with innovation-related concepts and each other. We find that routine dynamics scholars have focused more on change, whereas dynamic capabilities have focused more on innovation. We trace this difference back to their ontological roots, but also the divided social structure of the communities of scholars underlying these research streams. Interestingly, we find a small group of boundary spanners that have sought to either bridge both research streams, or bring meaning to their differences. We discuss the implications that the current state of inter-stream conversation might have on the future development of the field, calling for an increase of boundary spanners.

## 2.1 Introduction

Throughout many years of research, organizational routines (from here onwards, routines) have been argued to be vital for organizational functioning (Nelson and Winter, 1982; Teece et al., 1997; Feldman and Pentland, 2003; Parmigiani and Howard-Grenville, 2011). In this regard, scholars have particularly pointed at the central role of routines in relation to innovation (Schumpeter, 1942; Cyert and March, 1963; Nelson and Winter, 1982; Feldman and Pentland, 2003; Becker, 2005). However, over the course of time, scholars have varied in terms of how they have explained the nature of this relationship, which has complicated our understanding of how routines are related to innovation.

Specifically, scholars have argued that routines can inhibit product innovation (Dougherty, 1992) and can lead to inertia (Hannan and Freeman, 1984) and rigidities (Gilbert, 2005), but can also lead to change and innovation on the one hand (Eisenhardt and Martin, 2000; Feldman and Pentland, 2003) and direct creativity (Sonenshein, 2016) and improvisation on the other hand (Bingham and Eisenhardt, 2014).

Arguably, the most dominant research streams that examine the relationship between routines and innovation are the dynamic capabilities (Teece et al., 1997; Eisenhardt and Martin, 2000) and routine dynamics research streams (Feldman, 2000; Feldman and Pentland, 2003). The former emphasizes that, because routines turn inert in the long run, they need to be altered exogenously so that organizations can remain adaptive and innovative. The latter however emphasizes the capacity of routines to change endogenously and in this way produce change and novelty within the routine but also the organization.

Underscoring their theoretical overlap in terms of the centrality of routines and change-related concepts, two seminal articles have compared the dynamic capabilities and routine dynamics research streams and have noted ontological and methodological divides. Parmigiani and Howard-Grenville (2011) have described that scholars from both research streams pursue different questions from different ontologies and with different methodologies. In their discussion, the authors have noted that capabilities scholars could embrace more the agentic approach that routine dynamics scholars are taking, whereas routine dynamics scholars were recommended to focus more on the role of artifacts and the context. Salvato and Rerup (2011) have described that routines and capabilities are not at

the same level of analysis and thus, that this has played an important role in the separation of dynamic capabilities and routine dynamics research. The authors argue that future research on routines and capabilities should transcend levels in order to have a more inclusive view on how capabilities and routines actually are interrelated.

Whereas both works have been invaluable for the development of the dynamic capabilities and routine dynamics research streams, they have examined these literatures rather broadly, that is to say, they have not specifically tuned into the relationship between routines, dynamic capabilities and innovation. Amidst discussions on whether routines can contribute to innovation at all without being part of dynamic capabilities (Helfat and Peteraf, 2009; Teece, 2012; Feldman et al., 2016), we believe that this is an avenue that needs to be explored further in light of the advancement of both literatures (Feldman et al., 2016; Schilke et al., 2018). In addition, both seminal works have been conceptual of nature. We believe that, in line with past bibliometric research (e.g. Peteraf et al., 2013; Randhawa et al., 2016), an empirical approach towards examining how the routine dynamics and dynamic capabilities research streams relate to innovation as a concept, but also each other, can provide a more fine-grained answer towards understanding the current state and future possible avenues of both research streams in relation to innovation.

Hence, in this paper, we meet the perceived need for a more granular examination of the relationship between routines and innovation, from the perspective of the dynamic capabilities and routine dynamics research streams. In this regard, we firstly perform a theoretical review of both research streams to assess how they approach, or could approach, the role of routines in relation to innovation. Then, we perform bibliometric analyses in order to empirically examine and ground the results of our review. In the first part of our analysis, we perform co-citation (Peteraf et al., 2013) and co-occurrence (Randhawa et al., 2016) analyses. In our co-citation analysis, we tease out which groups of scholars have been co-cited in a recurring manner and thus display patterns of interdependence. In our co-occurrence analysis, we apply text mining techniques in order to give insight beyond citation patterns of authors, by also looking at the content of the articles analyzed (Randhawa et al., 2016). This way, we are able to infer the relationship of the routine dynamics and dynamic capabilities research streams with innovation, as we are able to observe the distance between keywords that resemble overarching research streams. In the second part of our analysis, we

use temporal citation mapping (Van Eck and Waltman, 2014) to infer conclusions about the development of both literatures, based on how citation patterns have developed over time. In specific, this allows us to observe whether the way in which dynamic capabilities and routine dynamics scholars have conversed with each other has changed over time and thus cautiously infer whether their views on innovation have become more alike.

We extend our understanding of the relationship between the dynamic capabilities and routine dynamics research streams on the one hand and innovation on the other in a variety of ways. Firstly, we highlight that, even though both research streams portray great potential for enhancing our understanding of innovation, particularly the routine dynamics literature lags behind in conducting research in this area. This difference can be attributed to the distanced and isolated reference patterns that we find in relation to innovation, which on its turn could be attributed to the social structure of the communities of scholars that develop these research streams, as they pursue different questions and employ different approaches (Hargens, 2000; Parmigiani and Howard-Grenville, 2011). We question the extent to which this separation benefits these research streams, by discussing the benefits of a more integrative approach to understanding the role of routines and capabilities within organizations in general and innovation activities in specific, while acknowledging the importance of also pursuing an own research agenda (Parmigiani and Howard-Grenville, 2011). In this regard, we point at the presence of boundary-spanning articles that in recent years have tried to enhance our understanding of how the dynamic capabilities and routine dynamics literatures relate to each other (Felin et al., 2012; Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011; Teece, 2012).

## 2.2 Review

### 2.2.1 *What are routines?*

Prior to the emergence of the notion of routines that we are familiar with today, the behavioral theory of the firm coined the term of standard operating procedures to describe features of the organization, such as guidelines and rules, that could simplify and standardize the way in which certain tasks would be performed (Argote and Greve, 2007<sup>7</sup> Cyert and

March, 1963). The evolutionary perspective on organizations has followed up on this understanding through the notion of routines as broader account of how formal and informal routines, among which standard operating procedures, could provide stability to organizations through the concepts of knowledge accumulation, routine mutation and path dependence (Argote and Greve, 2007; Gavetti et al., 2012; Nelson and Winter, 1982). The account of Nelson and Winter (1982) has unfolded itself in various ways, one of which being the capabilities research stream that predominantly treats routines as organizational building blocks, or even genes (Dosi et al., 2000; Nelson and Winter, 1982; Salvato and Rerup, 2011).

Most recently, two definitions have come forward that capture most past definitions, while providing room for future developments and research on the routines concepts. Consequently, routines can be defined as repetitive, recognizable patterns of interdependent actions, carried out by multiple actors (Feldman and Pentland, 2003) or as repeated patterns of response involving interdependent activities that become reinforced through structural embeddedness and repeated use (Gilbert, 2005). Thus, routines consist of multiple actors that carry out actions that are interdependent and shape patterns that are recognizable as being routines. Furthermore, these routines may become reinforced because they recur and accumulate past knowledge, while being embedded in a particular structure, such as a physical space (Nelson and Winter, 1982; Becker, 2004; Bucher and Langley, 2016). Over the course of time, scholars have come to understand that routines are important for organizations in general and for innovativeness in specific from a variety of angles (Schumpeter, 1938; Cyert and March, 1963; Nelson and Winter, 1982; Feldman and Pentland, 2003; Becker, 2005).

### 2.2.2 *Routines and Innovation*

Various conversations have tried to deal with the way and the extent to which routines can contribute to innovation. With the former, we mean whether routines can contribute to innovation at all and if so, whether they can contribute directly. With the latter, we mean the magnitude of the innovation that can be brought about by routines and whether such an effect is not mediated. Innovation, we define as preemptive or responsive purposeful changes within an organization, via the adoption of an internally generated or purchased

device, system, policy, program, process, product, or service that is new to the adopting organization (Damanpour, 1991).

In terms of the magnitude and novelty of the innovations that routines can produce, some scholars have looked only at the magnitude of the outcome and have classified these outcomes as incremental or radical innovations (Chatterji and Fabrizio, 2014; Damanpour, 1988). Others have also looked at the extent to which innovations were produced by utilizing new-to-the-firm knowledge. Such innovations can be categorized by making use of the exploitative-exploratory innovation typology (Gupta et al., 2006; Jansen et al., 2006). The relevance of the latter is such that routines are perceived as back-ward looking repositories of knowledge and hence, would have a lower propensity to bring about exploratory innovations than radical innovations (Arrfelt et al., 2013; Chen, 2008; Nelson and Winter, 1982). Some have argued that routine have a propensity to bring about incremental innovations (Damanpour, 1991). Also, scholars have argued that routines lack intent (Helfat and Peteraf, 2009) and are by nature non-strategic (Teece, 2012), thus being not suitable for more novel and sizeable innovations in a direct manner. These scholars thus implied that routines could only indirectly breed exploratory and radical innovations. However, others have argued and shown that routines can directly lead to creative (Sonenshein, 2016), novel (Deken et al., 2016) and exploratory (Greve, 2007) outcomes, resulting in a yet to be reconciled confusion.

### 2.2.3 *The ‘traditional’ view on the routines-innovation relationship*

In what Feldman and Pentland (2003) labeled as the ‘traditional’ understanding of routines, it is typical that routines are generally perceived as genes, habits, heuristics, scripts, or standard operating procedures (Cyert and March, 1963; Gersick and Hackman, 1990; Nelson and Winter, 1982). All of these metaphors have in common that through them routines are treated as automatic structures, minimally considering the role of agents within these routines (Feldman and Pentland, 2003). In this view, scholars emphasize the efficiency that routines might bring to organizations by minimizing the discretionary role of the individual (Hage and Aiken, 1969). Key to this argument is that scholars perceive routines as structures that accumulate past knowledge regarding organizational successes and failures. Routines thus are argued to function as repositories of past knowledge, which

organizations could utilize in producing certain outcomes faster (Nelson and Winter, 1982). Scholars viewing routines as structures advocate their coordinative benefits to organizations, as these routines prespecify actions and consequently ease the monitoring of actions (Utterback, 1994). Both, the benefits from knowledge accumulation and from coordination, could be strengthened via standardizing routines and making them, for example, formal (Simons, 1995; Moorman and Miner, 1997).

In the traditional view, routines could contribute to the production of exploratory and radical innovation, by freeing-up cognitive capacity of managers and thus enabling managers to focus on these innovations (Becker, 2004). As these innovations often require less routine approaches in order to more substantially deviate from past paths (Ahuja and Lampert, 2001; Jansen et al., 2006; Sood and Tellis, 2005), scholars have considered routines to be incompatible with these types of innovations (Damanpour, 1988). Nevertheless, routines could help in the actual production of these innovations via, for instance, assembly routines, or in the gathering of information to produce such innovations via, for example, routines to tap into particular sources of knowledge (Teece, 2007). Still, routines have been argued to be more relevant in bringing about exploitative and incremental innovations, as routines accumulate past knowledge, are reinforcing and have a backward-looking nature, which is more supportive of innovations that develop along a relatively path dependent and predictable trajectory (Benner and Tushman, 2003; Chatterji and Fabrizio, 2014; Damanpour, 1988).

Aside from the contributive aspects of routines to innovation in the traditional view, scholars have often also emphasized the downside of routines. Research has underscored that routines might turn obsolete as the environment in which they reside might change at a higher pace than the routine itself, as routines tend to reinforce themselves (Gilbert, 2005; Teece et al., 1997). Also as routines have a self-reinforcing nature, altering routines was perceived as being difficult. These two aspects of routines are argued to lead to organizational inertia (Hannan and Freeman, 1984), which might consequently lead an organization to fall in an exploitation trap at the cost of exploratory and radical innovations (Sirén et al., 2012). Other scholars have more directly stated that routines might inhibit innovation, showing that routines might reduce interaction and learning that on their turn

could result in less novel outcomes (Dougherty, 1992), such as in the case of radical innovations.

Thus, scholars have suggested that routines might be mostly beneficial to exploitative and incremental innovations directly and to exploratory and radical innovation indirectly in terms of freeing-up cognitive space for the strategic aspect and directly in terms of the operational aspect of these innovations. In the long run, however, scholars have argued that routines could breed inertia, as they on the one hand need to be changed over time whereas on the other hand they are also difficult to change when they become too embedded in the context in which they operate. Hence, in order to sustainably produce exploratory and radical innovations, organizations would need to have mechanisms through which they could repeatedly alter the routines that would turn inert.

#### *2.2.4 The dynamic capabilities literature and innovation*

Through particularly the seminal article of Teece et al. (1997), the dynamic capabilities literature attempted to address how routines that turn inert could be continuously altered external to the routine. In doing so, this research stream taps into what Nelson and Winter (1982) explained as innovation that stems from puzzles and anomalies from prevailing routines. Dynamic capabilities can be defined as the capacity of an organization to “create, extend and modify” (Helfat et al., 2007, p.4) organizational resources in a repeatable, minimally acceptable, purposeful and reliable manner (Helfat et al., 2007; Helfat and Peteraf, 2009; Helfat and Winter, 2011). Routines are in this regard important a type of resource that may require to be altered over time (Volberda and Karali, 2015).

Dynamic capabilities are often being defined as a reactive mechanism of change. With this, we mean that dynamic capabilities are often depicted as capabilities that change routines when their performances are below what is aspired (Augier and Teece, 2008). In order to reactively change routines, an important component of dynamic capabilities is the ‘sensing’ component (Teece, 2007; Teece et al., 2016). This entails that organizations have the capacity to sense inert routines, by looking at actual developments in terms of e.g. technology or customer demands, and comparing that with the output of the routines an organization possesses. Subsequently, an organization can seize these discrepancies, by investing in and commercializing the solution found, after which organizations can



reconfigure the organization around the changes that are implemented, through e.g. adjusting governance or through knowledge management (Teece, 2007; Teece et al., 2016).

By adjusting current routines, and other resources, in line with organizational aspirations (Gavetti et al., 2012), dynamic capabilities are argued to facilitate the production of innovations that break away from past paths (Teece et al., 1997), such as exploratory innovations (e.g. Jansen et al., 2006) and radical innovations (e.g. Zhou and Li, 2012). However, dynamic capabilities need to be maintained in order to lead to these innovations. Dynamic capabilities require commitment to resources and hence, the absence of a necessity to change might lead to over-investment in dynamic capabilities (Winter, 2003). Because of the nature of dynamic capabilities to alter the status quo and requiring investments, scholars have not advocated the use of dynamic capabilities for exploitative and incremental innovation.

### *2.2.5 Routine dynamics and innovation*

The routine dynamics literature approaches the relationship between routines and innovation in a subtly different way than the other two streams of research. This literature seemingly anchors itself in what Nelson and Winter (1982) call mutation of routines (Feldman, 2000). They posit that routines can change themselves in addition to solely being changed from the outside (Feldman and Pentland, 2003; Pentland et al., 2011). Thus, routine dynamics scholars emphasize change of routines that is endogenous to the routine rather than exogenous. They underscore this potential of routines by treating routines as systems of mindful people, rather than as structures (Becker, 2004). This shift in understanding, these scholars argue, results in an understanding that because people may solve the imperfections that they may encounter during operations, routines can endogenously produce variations of themselves and even changing as some variations are retained as they depict better versions of themselves (Feldman, 2000; Pentland et al., 2011).

Through the routine dynamics research stream, we have come to a broader understanding of routines. Rerup and Feldman (2011) described that routines are able to lead to change in organizations and their schemata through trial-and-error learning during the performances of routines. Deken et al. (2016) have explained that routines are able to lead to novelty through flexing, stretching and inventing work. Also, Sonenshein (2016) has

shown that routines may facilitate creativity in the form of familiar novelty, implying the generation of novelty within certain guidelines. Even though routine dynamics scholars have shown to prefer to emphasize the dynamic aspect of routines, while acknowledging the possible negative aspects, such as inertia (Feldman and Pentland, 2003).

Approaching routines from this angle opens up the possibility to directly interlink routines with exploratory and radical innovations. As in this strand of research, scholars argue that actors within routines are able to delve into new knowledge sources in order to deal with any encountered imperfections (Feldman, 2000; Feldman and Pentland, 2003), routines are likely to be contributive to both radical and exploratory innovation. The routine dynamics literature advocates the idea that routine-based innovations do not necessarily have to lead to local, iterative refinements, as agents can embrace new knowledge and thus, the next performance of a routine could substantially differ from the past one. Some scholars argue that path dependence remains to be an issue, because regardless of the extent to which routines utilize new knowledge, an endogenously changed routine would be likely to be similar to the focal routine. Hence, the extent to which routines could breed novelty is perceived to be limited in this regard (Teece, 2012). However, magnitude of change is relative to the length of observation (Helfat and Winter, 2011), so continuous endogenous routine change could manifest itself as radical change over the course of time. Other scholars critique routine dynamics for the absence of purpose in the novelty that endogenous change of routines could bring about (Helfat and Peteraf, 2009), whereas Damanpour (1991) describes innovation as something that requires purpose. Also, Teece (2012) calls routines non-creative and non-strategic. Even though, indeed, endogenous routine change has as a goal the improvement of a routine rather than a strategic or innovation objective, this does not take away the fact that the novelty that endogenous routine change produces could strongly facilitate exploratory and radical innovations.

### *2.2.6 The 'routines or dynamic capabilities' dilemma*

Many scholars indicate that capabilities exist out of routines, in the sense that routines are the building blocks of capabilities (Salvato and Rerup, 2011) or that capabilities direct routines for a particular purpose (Helfat and Peteraf, 2009). Thus, scholars argue that routines are microfoundations of capabilities (Dosi et al., 2000). This means that knowledge

regarding routines is key for a correct understanding of capabilities and vice versa (Salvato and Rerup, 2011). Similarly, the joint understanding of routines and capabilities is key for the correct understanding of organizations. We want to uncover, however, to what extent dynamic capabilities scholars and routine dynamics scholars scholarly converse with each other. Parmigiani and Howard-Grenville (2011) already pointed at the fact that dynamic capabilities scholars treat capabilities as black boxes, whereas routine dynamics scholars delve into the microfoundations of these capabilities, being routines. Salvato and Rerup (2011) indicate that there is a need to understand how routines are related to higher-level entities and similarly that the black box of capabilities should be unraveled by closely observing the routines out which these capabilities are constituted. Our aim is to tease out to what extent routine dynamic and dynamic capabilities scholars converse with each other and what the implications are for routines, capabilities and innovation research.

## 2.3 Data and methodology

In order to better grasp the extent to which the routine dynamics and dynamic capabilities literatures are related to innovation, we performed bibliometric analyses so that we can make the ties between streams of research visual. Such analysis consists of mapping the structure of the Social Science Structure Index (SSCI) publications (e.g. Noyons and van Raan, 1998a; 1998b; Noyons et al., 1999) that cite the articles of Teece et al., (1997), Eisenhardt and Martin (2000), Feldman (2000) and Feldman and Pentland (2003). These four articles were chosen because these can be seen as early, specific and pioneering articles when it comes down to respectively research on dynamic capabilities and routine dynamism. Selection has thus occurred based on their citations as well as their role in subsequent debates (e.g. Eisenhardt and Martin, 2000; Becker, 2004 Helfat and Peteraf, 2009; Peteraf et al., 2013; Di Stefano et al., 2014; Feldman et al., 2016; Schilke et al., 2018). To capture the possibility that scholars cited Teece (2007) without citing any of the other aforementioned articles, as it has been an article in which the dynamic capabilities concept got a major update, we also included articles that cited this article in our database. We extracted the

required data regarding these core articles and those that cite these articles from the web of science database.

For our analyses, we made a pre-selection in the articles that we would use, aside from the condition that they should be citing any of the aforementioned five articles. We included journals in all domains of business, such as, but not limited to, the fields of economics, marketing, organization studies, information systems, and operations management. In selecting these journals, we have followed past bibliometric reviews, but have also paid close attention to outlets that have played a central role in the development of conversations, through for example special issues. We have scanned title, abstract and introduction for explicit naming of ‘dynamic capabilities’, ‘dynamic ... capabilities’ ‘routine dynamics’, ‘routines’ and/or ‘organizational routines’, in the appropriate context. We sought a minimum of 10 citations for articles to be included in our sample, which would allow us to also include relatively recent studies to our analyses as well. This is particularly important for these research streams as they continue to receive lots of traction (Feldman et al., 2016; Schilke et al., 2018). This procedure has led to the identification of 1619 articles. Subsequently, in each of the analyses we perform, we filtered references for the sake of readability of the maps produced, as is common practice (e.g. Peteraf et al., 2013; Randhawa et al., 2016).

The first part of our bibliometric analysis consists of co-citation (Peteraf et al., 2013) and co-occurrence (Randhawa et al., 2016) analyses. Similar to Randhawa et al. (2016), we made use of text mining techniques to be able to provide conceptual insights, by moving the level of analysis from authors and their citations to the actual written text. For both analyses, we used the VOSviewer program, which has been used in previous studies on organization studies and innovation, such as Volberda et al. (2010; 2014). The maps we produce are called density visualization maps. They are meant to reveal how dense clusters are, by simply taking into account that the publications in our sample comprise of different clusters<sup>2</sup>.

Co-occurrence analysis enabled us to observe to what extent keywords co-occur in the same publications. For a keyword to be picked-up, it could be provided by the web of

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<sup>2</sup> <http://www.vosviewer.com/download/f-z2w2.pdf>

science database, the journal as well as the authors of a publication. In the visualization maps that the program generates, the relatedness of keywords will be depicted by the distance between keywords. Keywords that according to the program jointly form a cluster based on their relatedness, and thus are selected to belong to each other based on key word co-occurrence analysis, will be assigned the same color.

Co-citation analysis enabled us to make visible which references have been co-cited within articles. The visualization maps will once again reveal relatedness by means of the distance between sources and the strongest links between articles will again be revealed by the program. Finally, again, clusters of articles will be assigned a color that indicates their strong relatedness.

The second part of our bibliometric analysis consists of temporal citation mapping, to examine the development of the routine dynamics and dynamic capabilities research streams over time (Van Eck and Waltman, 2014). For this analysis, we used the CitNetExplorer program, which produces citation network maps that present the names of maximum 100 of the first authors of the articles that were pre-selected over the desired timeframe. Those articles that belong together to a cluster are given the same color. Articles that are similar can be found by their horizontal proximity to each other.

## 2.4 Analysis

### 2.4.1 Cross-sectional analysis

We firstly start reporting the results of our co-occurrence analysis. We had to pre-specify a minimum amount of times that a keyword would have to occur in our database for inclusion in our analysis, so as to not dilute the readability of the visualization maps that were going to be acquired. In addition, not selecting a minimum would have resulted in clusters that would have been too encompassing to be informative. Rather, we were looking for clusters reflecting delineated streams of research that could actually bring insight into the bibliometric patterns found. For example, requiring keywords to occur at least 10 times, the program drew a map of 216 that were very hard to untangle from each other. Cluster one covered 55 keywords ranging from communication and reputation to organizational change

and organizational forms. Hence, for readability purposes, we limited the amount of time a keyword had to occur in an article to 15. Doing so resulted in visualization map existing of 112 keywords, from up to 3838 keywords. We found 5 clusters of keywords. The first cluster covers the keyword 'organizational routines' and depicts a conversation on the change, design, properties and effects of routines. Exemplary keywords are 'evolution', 'flexibility' and 'trust'. A second cluster, in which we see the keyword 'dynamic capabilities', scholars have been conversing about the properties and effects of dynamic capabilities within and on organizations. Characteristic keywords are 'organizational change', 'product innovation' and 'top management teams'. The third cluster depicts a conversation about innovation and its antecedents, with keywords such as 'alliances', 'innovation', and 'research and development'. The fourth cluster is characterized by a conversation about different forms of management and their effect on the firm, from the perspective of the resource-based view, reflected by keywords such as 'competitive advantage', 'resource-based view', and 'strategic management'. Finally, the fifth cluster is characterized by a conversation about knowledge and learning in relation to ambidexterity and adaptation. Characteristic keywords are 'adaptation', 'exploitation', and 'exploration'.

What we can see is that the distance between the keyword dynamic capabilities and the keywords innovation, product innovation, research-and-development and technological innovation is relatively small, whereas the opposite counts in the case of organizational routines, depicting the relatively low degree of relatedness between the routine dynamics research stream and innovation as a concept. On the other hand, the organizational routines keyword is relatively proximate to keywords such as transformation, evolution, dynamics and even organizational change. Routine dynamics scholars seem to have researched how routines can be dynamic and changing, and how this could affect the organization as a consequence, rather than directly researching innovation-related concepts, as have dynamic capabilities scholars.



the dynamic capabilities research stream begun and reflects its ontology. It embodies the Teece et al. (1997) article as well as articles that are known for their contributions to the resource-based view (e.g. Barney, 1991) and organization economics (e.g. Williamson, 1985). The third cluster depicts the routine dynamics research stream as well as its ontological point of departure and predominantly utilized processual and qualitative methods, consisting of e.g. articles of Eisenhardt (1989), Feldman and Pentland (2003), Nelson and Winter (1982) and Weick (1979). A final cluster centers itself around the more recent version of the dynamic capabilities literature, representing Zahra et al. (2006) and Teece (2007).

The visualization map that reflects the relatedness of articles based on co-citation shows that the articles that are characteristic of the routine dynamics literature are assigned a different cluster than the seminal dynamic capabilities articles, underscoring the divide between the dynamic capabilities and routine dynamics research streams. In addition, the distance on the map between innovation-related research streams and dynamic capabilities literatures is much smaller than is for the routine dynamics research stream. As a matter of fact, this distance is substantial as the routine dynamics articles are reserved a corner of the map. This implies a low degree of relatedness between research streams.



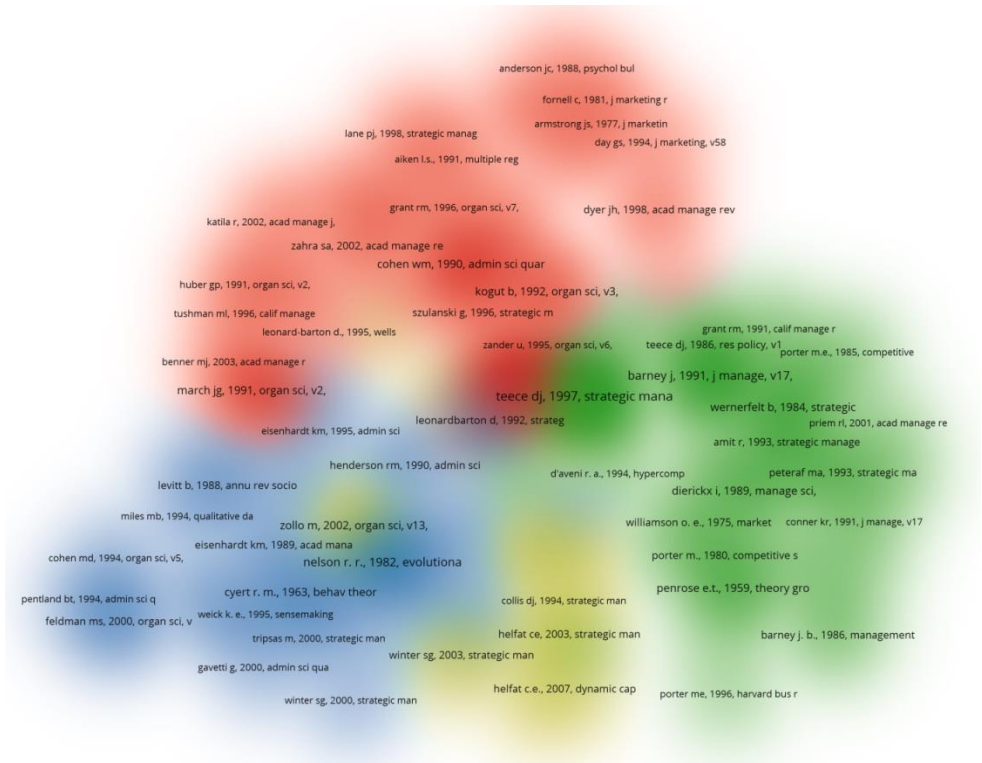


Figure 2.2: Co-citation analysis map based on co-citing references of the articles of Teece et al., (1997), Eisenhardt and Martin (2000), Feldman (2000), Feldman and Pentland (2003) and Teece (2007). References indicating the routine dynamics literature can be found at the far bottom-left corner, isolated from the more central dynamic capabilities references.

## 2.4.2 Temporal analysis

In our final round of analysis, we performed temporal citation mapping to trace the development of both the routine dynamics field and dynamic capabilities fields over time. The starting point of our analysis has been a map that resembles 100 articles between 1997 and 2014. Broadly speaking, we see two parallel streams of research, both by the program being identified as large clusters. One represents the routine dynamics research stream, whereas the other represents the dynamic capabilities research stream. Interestingly, connections between the two streams of research have been found to run via boundary-spanning articles. Sometimes, these anchor themselves in one literature and make use of the other in order to substantiate a certain case. In other cases, articles critique the other research stream (Teece, 2012) or review more broadly the routines and/or capabilities literatures (Felin and Foss, 2011; Salvato and Rerup, 2011). Whereas, some articles, such as Felin et al. (2012) and Teece (2012), are clear boundary spanners, others, such as d'Adderio (2014) and Dionysiou (2013) are clear within-field articles. The role of boundary spanners is clearly seeable if we transform our temporal citation map into a network map (see Figure 2.4).



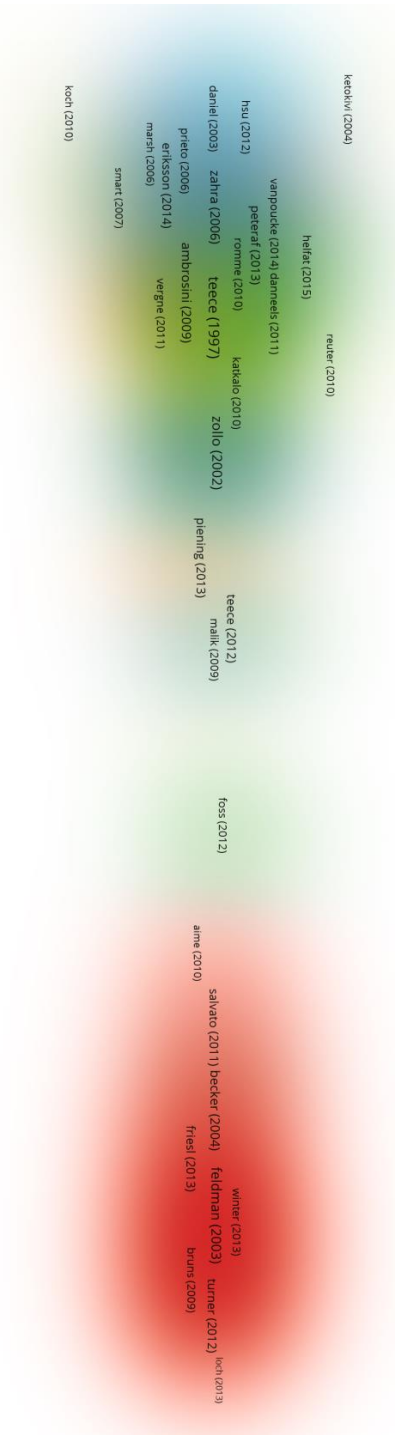


Figure 2.4: Network map of figure 2.3, in which we again clearly see a parallel development of the dynamic capabilities and routine dynamics research streams, underscoring earlier findings that indicated a disconnect between both research streams.

### 2.4.3 Additional analyses

We have performed additional analyses to infer whether our analyses display different patterns if we produce visualization maps from more recent publications only. For this purpose, we have firstly performed additional analyses for our cross-sectional analyses, by producing visualization maps for articles that were published over the last 10 years only. Subsequently, we have performed analyses for articles that were published over the last 5 years only.

In both cases, we see from our co-occurrence analyses (figures 2.5 and 2.7) that our inferences stay the same. With this, we mean that research from dynamic capabilities scholars display close proximity with innovation-related themes, whereas routine dynamics scholars have focused on explaining the possible dynamic manifestations of routine performance and its effect on the organization, predominantly in terms of change.

In addition, our co-citation analyses (figures 2.6 and 2.8) do once again underscore the ontological and methodological divide between the research streams, whereas they also indicate once again the closer proximity between the dynamic capabilities literatures and innovation-related other literatures, compared to the routine dynamics research stream.

Secondly, we have performed additional analyses for our temporal citation analysis, by zooming into the developments over the last 10 years as well as over the last 5 years (figures 2.9 and 2.10). In figure 2.9, we see similar results as we saw in figure 2.3, in the sense that we again see the presence of boundary spanners amidst two fields that develop in parallel. However, in 2.10, we do not see any boundary spanners anymore, meaning that over the past 5 years, no studies have been found that bridged the dynamic capabilities and routine dynamics research streams.

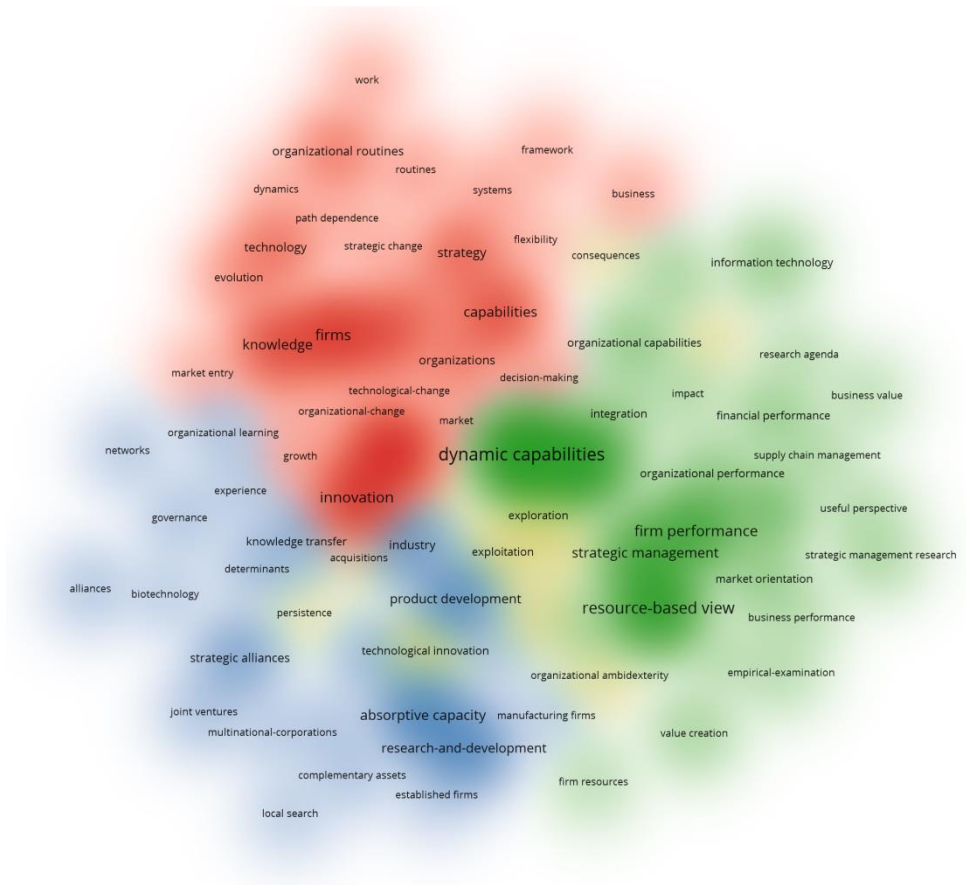


Figure 2.5: Co-occurrence analysis map of keywords stemming from articles that were published over the last ten years, citing Teece et al., (1997), Eisenhardt and Martin (2000), Feldman (2000), Feldman and Pentland (2003) and Teece (2007).

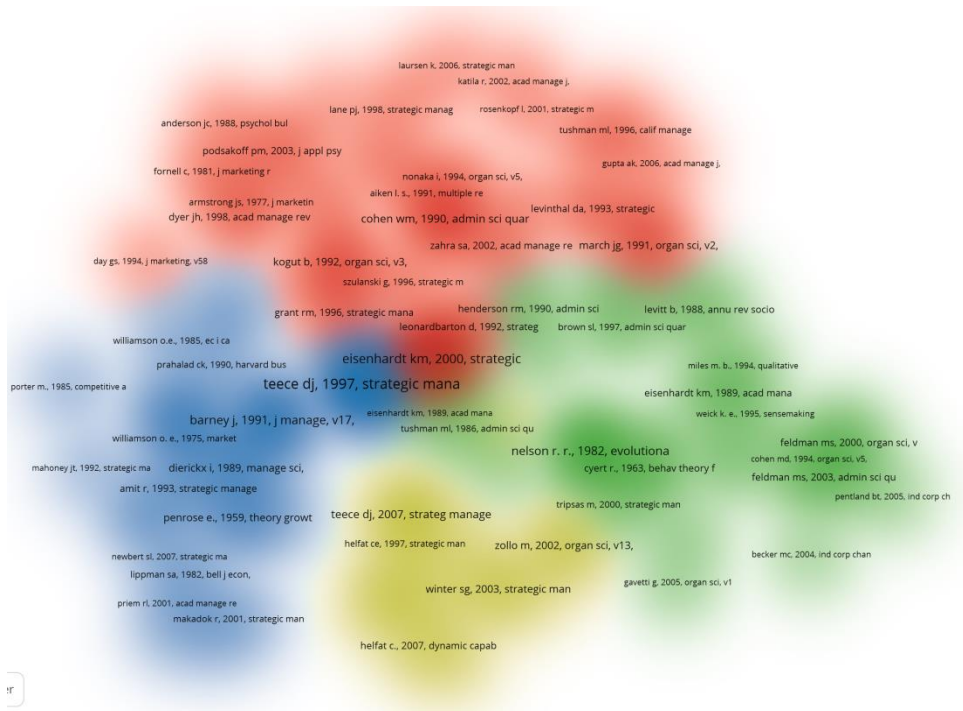


Figure 2.6: Co-citation analysis map of keywords stemming from articles that were published over the last ten years, citing Teece et al., (1997), Eisenhardt and Martin (2000), Feldman (2000), Feldman and Pentland (2003) and Teece (2007).

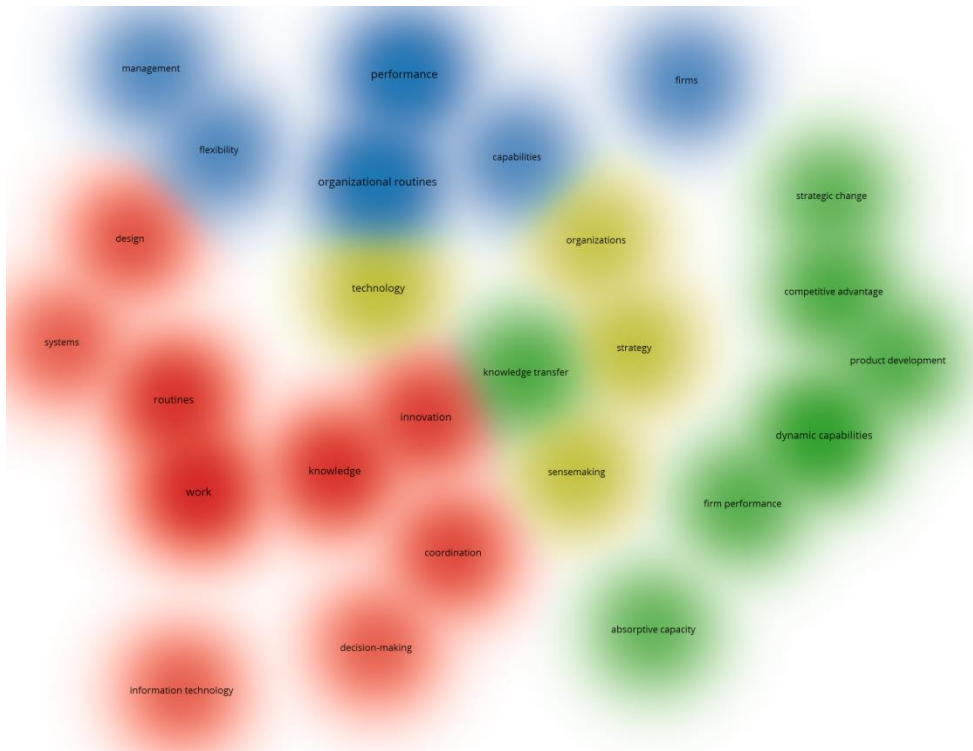


Figure 2.7: Co-occurrence analysis map of keywords stemming from articles that were published over the last five years, citing Teece et al., (1997), Eisenhardt and Martin (2000), Feldman (2000), Feldman and Pentland (2003) and Teece (2007).



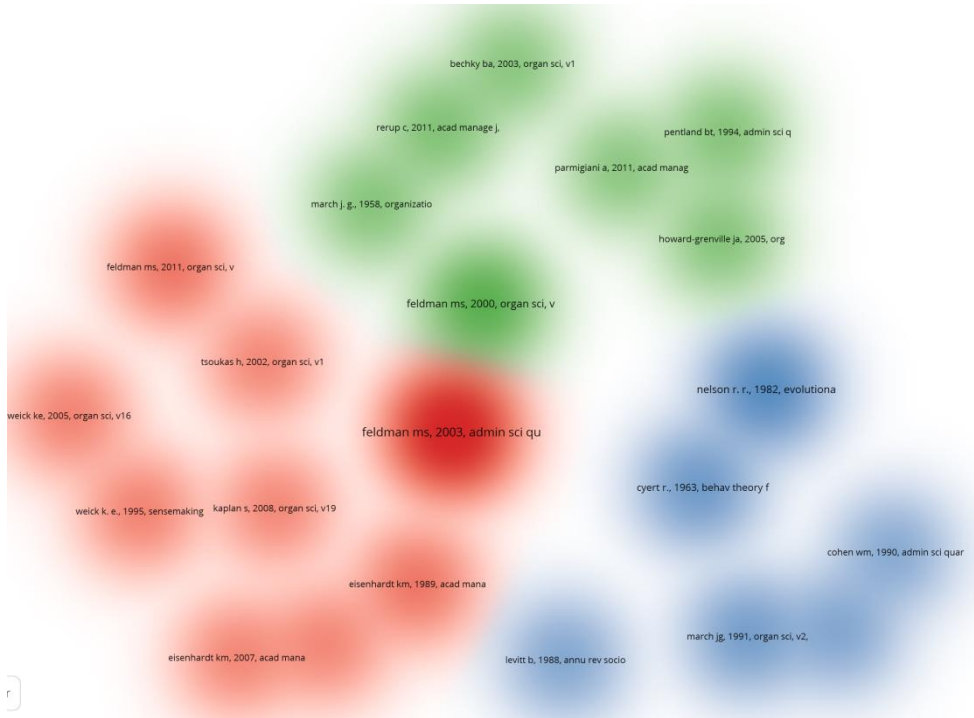


Figure 2.8: Co-citation analysis map of keywords stemming from articles that were published over the last five years, citing Teece et al., (1997), Eisenhardt and Martin (2000), Feldman (2000), Feldman and Pentland (2003) and Teece (2007).

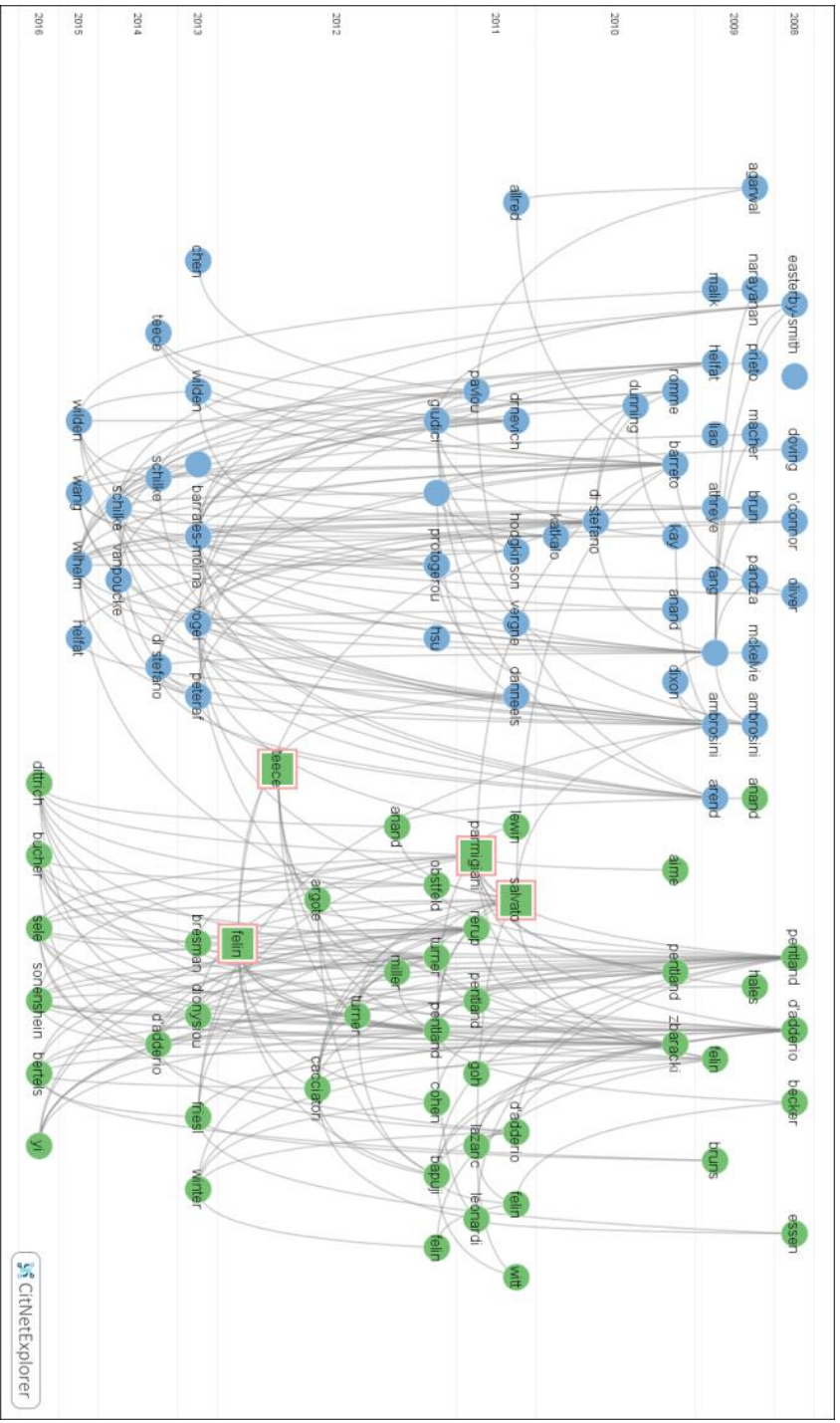


Figure 2.9: Temporal bibliographic analysis of developments over the past 10 years in the dynamic capabilities and routine dynamics literatures. We clearly see a parallel development of the dynamic capabilities and routine dynamics research streams over time, underscoring earlier findings that indicated a disconnect between both research streams.

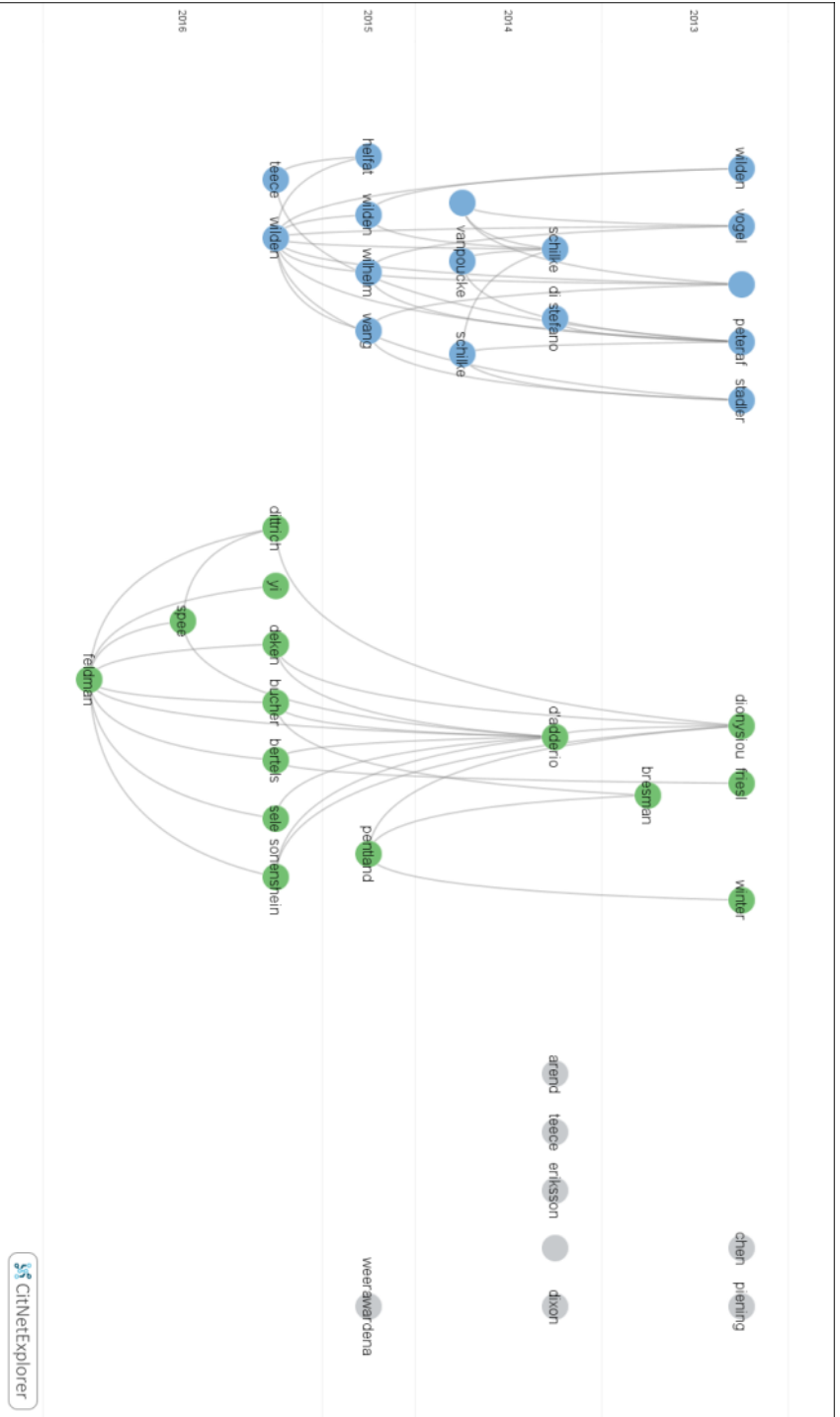


Figure 2.10: Temporal bibliographic analysis of developments over the past 5 years in the dynamic capabilities and routine dynamics literatures. We clearly see a parallel development of the dynamic capabilities and routine dynamics research streams over time, underscoring earlier findings that indicated a disconnect between both research streams. Noteworthy is the absence of boundary spanners in this figure.

## 2.5 An assessment of the state of the relationship between routines and innovation

Past research has repeatedly pointed at the importance of routines for innovation and innovative activities (Nelson and Winter, 1982; Eisenhardt and Martin, 2000; Teece, 2007; Sonenshein, 2016). Whereas particularly the routine dynamics and dynamic capabilities perspectives have enhanced our understanding in this regard, scholars have diverged on the nature of the relationship between routines and innovation. With this, we mean that past research shows different results in terms of the direction and nature of the relationship between routines and innovation. Parmigiani and Howard-Grenville (2011) described that the dynamic capabilities and routine dynamics research streams focused on different problems and approached their topics from different angles. Similarly have Salvato and Rerup (2011) described that the dynamic capabilities and routine dynamics research streams are often researched at different levels of analysis.

Past reviews in this realm have been conceptual and have focused more on the interrelation of the dynamic capabilities and routine dynamics research streams, rather than on how both relate to innovation. In a period of debate regarding whether routines can lead to innovation without being part of dynamic capabilities (Helfat and Peteraf, 2009; Teece, 2012), in this study, we examine more closely the relationship between dynamic capabilities, routine dynamics and innovation.

We find from our analyses that keywords resembling the dynamic capabilities research stream are much closer related to innovation-related keywords, than are keywords that resemble the routine dynamics research stream. We find similar results when we turn our attention to co-citation patterns of publications. These difference in reference patterns is unexpected based on the theoretical interrelatedness of both streams of research (Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011). Despite the theoretical interrelation of both research streams, past scholars have described that the separation of research streams can be the consequence of the social structure of communities (Hargens, 2000). Indeed, the emergence of the routine dynamics research stream was much needed in order to comprehend that routines could contribute to organizational innovation in a variety of ways,

besides the ‘traditional’ way, entailing the exogenous change of routines by e.g. dynamic capabilities (Teece et al., 1997; Feldman and Pentland, 2003). Hence, the emergence of the routine dynamics literature is coupled to a particular research agenda, which has been different than the agenda of the dynamic capabilities research stream, which was to explain how organizations can sustain their competitive advantage over time (Teece et al., 1997; Eisenhardt and Martin, 2000). However, a persistent parallel development of both streams of research potentially hampers the greater understanding of how routines relate to innovation, be it in a stand-alone fashion or as being part of capabilities. Interestingly, we find from our analysis that particularly over the past few years, scholars have sought to address this parallel development, by trying to explain how research streams should proceed, how they are similar, and how they are different (Felin and Foss, 2009; Felin et al., 2012; Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011; Teece, 2012). Underscoring the importance of these boundary spanners in bringing our understanding of the relationship between routines and innovation forward in an overarching manner, in the following section, we will try to delineate the dynamic capabilities literature could benefit from insights from the routine dynamics literature and vice versa.

### *2.5.1 How could the dynamic capabilities research stream benefit from a more inclusive approach towards the routine dynamics research stream?*

The routine dynamics literature has the overarching potential to add detail and contingencies to the dynamic capabilities literature. At the core of such insights lies the understanding that routines are not uniform and static (Feldman et al., 2016). More specifically, routines are dynamic and thus can vary from each other and can change over the course of time (Pentland et al., 2011; Deken et al., 2016). This aspect of routines is often black-boxed in the dynamic capabilities literature. As routines often are the building blocks of capabilities, interlinking the routine dynamics and dynamic capabilities research streams can refine our understanding of dynamic capabilities (Salvato and Rerup, 2011; Di Stefano et al., 2014). We will try to illustrate the impact that an integrated approach to the routine dynamics and dynamic capabilities research streams could have on our understanding of the relationship between routines and innovation.

Our first concern touches upon omission of the effect of endogenous routine variation and change on the dynamic capabilities that they are part of. As described, dynamic capabilities scholars treat routines as the microfoundations of capabilities (Dosi et al., 2000; Salvato and Rerup, 2011). Thus, routines are treated as given and capabilities are the level of analysis (Parmigiani and Howard-Grenville, 2011). This does not mean that dynamic capabilities scholars do not argue that difference in routinization has no impact on the configuration of dynamic capabilities. On the contrary, it is repeatedly stated that the manifestation of dynamic capabilities depends on the routines of which they are constituted (Eisenhardt and Martin, 2000; Schilke et al., 2018). However, scholars have insufficiently addressed that over the course of time, such configuration also evolves. As dynamic capabilities are argued to combine and direct these routines, the result of dynamic capability deployment might greatly vary based on the composition of these capabilities (Schilke et al., 2018). Omission of this consideration results in the fact that dynamic capabilities scholars treat dynamic capabilities as a fixed variable over the course of time. This on its turn might potentially affect research on dynamic capabilities in relation to innovation. As routines change, a dynamic capability might not be the same across a couple of years and not incorporating this fact into our analyses will probably lead to inaccurate results in especially longitudinal studies that do not capture the configuration of a dynamic capability over the course of time.

Our second concern addresses the omission of the fact that of a certain capability certain elements might matter more than others. Scholars have indicated that capabilities can constitute a variety of routines, which can be different among themselves (Teece, 2007), but can also constitute other things, such as coupling and decoupling mechanisms to balance these routines (Di Stefano et al., 2014), or managerial orchestration as a component of dynamic capabilities with which routines are purposefully directed (Helfat and Peteraf, 2009; Teece, 2012). When dynamic capabilities scholars research the effect of dynamic capabilities on, for instance, innovation, they do often not pay attention to what component of dynamic capabilities any found effects, because scholars depart from a more overarching definition of dynamic capabilities. Thus, in specific, scholars have yet to tease out to what extent any effect of dynamic capability deployment on outcomes relating to innovation stems from the underlying routines (and which routines), from the combination of these

routines (synergetic effects) and the direction of these routines by, for instance, orchestration.

Our third concern touches upon the potential limits to the suitability of dynamic capabilities. Winter (2003) has argued that dynamic capabilities would not be always needed, because not every situation requires a substantial alteration of organizational resources. Schilke (2014) has researched whether dynamic capabilities are more or less suitable under different levels of environmental dynamism and has found that they are most suitable to moderately dynamic environments. Apparently, dynamic capabilities are not equally beneficial in all contexts, which raises the unanswered question of when to invest in maintaining and when to deploy dynamic capabilities? Another important point is research on under which circumstances dynamic capabilities are actually required as an additional level on top of routines to bring about innovation. In other words, are dynamic capabilities even needed? Even though scholars suggest that routines lack purpose (Helfat and Peteraf, 2009) even though innovation is a purposeful activity (Damanpour, 1991), some routines are less structured than others and hence, leave room for managerial improvisation, such as simple rules (Eisenhardt and Martin, 2000; Bingham and Eisenhardt, 2011; 2014) or routines that facilitate the production of familiar novelty (Sonenshein, 2016). Thus, under which circumstances do dynamic capabilities have an added value that surpasses the cost of orchestrating a collection of routines?

### *2.5.2 How could the routine dynamics research stream benefit from a more inclusive approach towards dynamic capabilities research stream?*

The dynamic capabilities literature has the potential to contribute to an advancement of routine dynamics research, by drawing attention to the understanding that not everything can be solely routine and consequently, that in certain situations routines need to be orchestrated by a higher level dynamic capability (Augier and Teece, 2009; Teece, 2012). We will try to reflect on what types of important implications this can have for furthering routine dynamics research.

Our first point concerns the suitability of dynamic routines for innovation. We believe that the routine dynamics literature has become too focused on the positive aspects of routine dynamism. As described, through this research stream, we have become more

aware of the contributive aspects of routines themselves to innovation (Deken et al., 2016; Feldman et al., 2016; Sonenshein, 2016). However, routine dynamics scholars have often neglected the other side of the medallion, meaning that scholars have under-researched the limits to the extent that routines could be dynamic and hence, under which circumstances such dynamism would be insufficient to bring about innovations. Routine dynamism is constrained by the context in which a routine is enacted (Pentland et al., 2011). Also, scholars have argued that not all innovations can be produced in a routine manner (Teece, 2012). Thus, to what extent can routines themselves carry an organization to greater heights and in which cases do routines need to be overtaken by alternative approaches of innovation, such as dynamic capabilities (Teece et al., 1997; Teece, 2012)? This question takes the discussion to a more fundamental different question, being whether both concepts are substitutes (Teece, 2012), complements (Salvato and Rerup, 2011), or perhaps even the same (Zott, 2003)? Up to this point in time, scholars have widely diverged on this issue. In the end, routine dynamics scholars should delve into under which circumstances routine dynamism may be trusted upon as a source of innovation and under which circumstances organizations should deploy, for instance, dynamic capabilities.

Our second concern addresses that the routine dynamics literature has not yet tapped into how various concepts, such as bundles of routines (e.g. Kilduff, 1992; Collinson and Willson, 2006; Pentland et al., 2012) and clusters of routines (Kremser and Schreyogg, 2016), are different from the orchestration of routines through dynamic capabilities (Helfat and Peteraf, 2009; Salvato and Rerup, 2011; Di Stefano et al., 2014) in relation to innovation. Bundles and clusters of routines differ from single routines in that they first of all consist of multiple routines. Kremser and Schreyogg (2016) describe routine clusters as routines that are interrelated, grouped and are separated from other clusters. Scholars referring to bundles of routines seem to refer to a similar definition in the sense that routines often are described as being interrelated (e.g. Collinson and Wilson, 2006; Sele and Grand, 2016). However, these scholars tend to forfeit the condition of grouping and separation of integrated collections of routines. Dynamic capabilities scholars treat routines more as elements that are utilized and orchestrated by a dynamic capability (Helfat and Peteraf, 2009; Salvato and Rerup, 2011; Teece, 2012). There is thus a clear activity of orchestrating routines in a purposeful manner. Looking at these three ways of thinking about collections of routines,



our concern lies in the lack of research regarding how interrelatedness of routines and the presence or absence of the act of purposefully orchestrating routines impacts the way in and the extent to which such routines can contribute to innovation. Essentially, scholars have yet to show how single routines, bundles and clusters of routines and dynamic capabilities differ in bringing about innovations.

Our last concern addresses the fact that the routine dynamics has distanced itself from management and strategy. Whereas it is evident that scholars contributing to this valuable research stream have directly and indirectly also contributed to our knowledge on managing organizations and strategy-making, an active role of a manager or strategist has been omitted from the discussion of routine dynamism. This is quite different from the dynamic capabilities stream of research, where scholars have attributed an important role to managers and strategists in the birth and subsequent decisions regarding the development of such capabilities (Helfat and Peteraf, 2003). Also in the configuration of dynamic capabilities, managers have been assigned important roles in terms of orchestrating its components (Helfat and Peteraf, 2009). They have been important in altering capabilities from the outside, or initiating endogenous change of capabilities via hiring or legislation. In a similar fashion, routine dynamics scholars could benefit from examining the role of managers in the dynamism that routines can display. To what extent do managers exert influence on such dynamism? Similarly, how independent are routines in their development from managerial decision-making regarding the shape and continuation of routines? Finally, how can managers spark routine dynamism and what happens actually when routines are changed from the outside?

## 2.6 The way forward

In this study, we have examined the relationship between routines and innovation, from both the routine dynamics and dynamic capabilities literatures' perspectives. In addition, we have empirically observed to what extent these research streams converse with each other. We have shown that both literatures treat the role of routines in relation to innovation differently. Whereas routine dynamics scholars tend to magnify the direct role of

routines on innovation, dynamic capabilities scholars tend to favor the idea that dynamic capabilities orchestrate routines in the process of innovating.

A reason for both research streams to treat the role of routines in relation to innovation differently, has to do with their ontological point of departure (Parmigiani and Howard-Grenville, 2011). On top of this finding of past scholars, we have shown that an important reason has proven to be that both fields do minimally interact with each other. Scholars have shown to be familiar with such behavior, which would be able to be attributed to the social structure of research streams (Hargens, 2000). Whereas this is the case, we suggest in this study that the dynamic capabilities and routine dynamics fields may benefit from a better understanding of each other. In this regard, we underscore the importance of boundary-spanning articles that seek to foster our greater understanding of how routines relate to various organizational activities in general and innovation in specific.

Dynamic capabilities research often misses much-needed depth as scholars neglect the dynamism within and stemming from underlying routines. Routine dynamics researchers, on the other hand, often miss a higher level of understanding regarding routines, which might go beyond endogenous routine dynamism or dynamism from bundles and clusters of routines. An enhanced level of conversation between both research streams may lead to a more integrative and overarching understanding of the role of routines in organizational innovation.

That being said, we certainly do not advocate the loss of richness that each of these research streams brought forward. There is a need for focused research on routine dynamics and dynamic capabilities, because each of these literatures are vast by themselves. Also, both fields have a different purpose. Dynamic capabilities research seeks to uncover how combined and directed routines relate to organizational innovativeness, whereas routine dynamics research specifically seeks to uncover to what extent routines can be dynamic, without exogenously managing or changing these routines. These differences should be embraced and pursued. However, that does not mean that these fields should also reinvent already invented wheels. Nor should they neglect findings in proximate literatures that could ensure the understanding of e.g. boundary conditions or more fine-grained research.

# Chapter 3. Routines and Adhocism: How (Dynamic) Capabilities Allow for the Resolution of Problems of Varying Complexities

**Abstract:** In this study, we argue that organizations, as entities that solve problems, encounter problems of varying complexities and hence, need to solve these with different problem-solving approaches. We suggest that the routinization of these approaches should be inversely related to the level of problem complexity. On this line of thought, we build a framework by utilizing the dynamic capabilities literature and neighboring literatures and bringing forward propositions based on theory and practical examples. Our framework aids in showing that organizations can be seen as repertoires of problem-solving approaches, of which each approach is suitable only under particular circumstances and interacts with other approaches.

### 3.1 Introduction

Where many organizations perish, only few manage to persist and even fewer acquire and sustain competitive advantage. The change of organizational resources has been argued to be very important in this regard (Teece et al., 1997). Scholars have suggested that dynamic capabilities are of vital importance for the change of organizational resources. An important way in which this has been brought forward, is by treating dynamic capabilities as those aspects of the organization with which problems can be solved (Schreyögg and Kliesch-Eberl, 2007; Barreto, 2010). Scholars have described the adaptation of organizations as problem-solving entities through the optimization and alteration of organizational resources, by means of what we in this article call problem-solving approaches, such as operational capabilities, dynamic capabilities and ad hoc problem-solving (Barreto, 2010; Helfat et al., 2007; Schreyögg and Kliesch-Eberl, 2007; Winter, 2003; Zahra et al., 2006). In this regard, scholars have repeatedly emphasized the importance of both managerial and organizational level approaches (Helfat and Martin, 2015; Teece, 2007) and have pointed at routinization as a theme that is important to understand in relation to the novelty that problem solving might be able to produce (Di Stefano et al., 2014; Schreyögg and Kliesch-Eberl, 2007; Teece, 2012).

Even though much research has addressed how organizations may solve problems (Foss et al., 2016; Macher, 2006; Nickerson and Zenger, 2004) and how dynamic capabilities can enhance our understanding of this process by unfolding how organizations can reconfigure themselves (Teece, 2007; Helfat and Winter, 2011; Teece, 2012), there are three important unsolved issues in the current state of the literature that require further attention. Firstly, scholars have pointed at the absence of a sufficient understanding of how managerial level and organizational level dynamic capabilities are linked to and affect each other (Helfat and Peteraf, 2015). Secondly, even though scholars converge on the idea that solving problems via operational and dynamic capabilities goes beyond routinized problem solving (Di Stefano et al., 2014; Helfat and Peteraf, 2009; Teece, 2012; Teece et al., 2016), the field has yet to delve into the very question of how the way in which processes are routinized affects the nature and problem-solving potential of the capabilities of which they are part of.

Finally, scholars have described situations in which (dynamic) capabilities might be absent or not suitable for solving problems, because they might not have been developed or might have been too expensive to sustain (Winter, 2003; Eggers and Kaplan, 2013). Nevertheless, the relationship between ad hoc problem-solving, as coined by Winter (2003), and other problem-solving approaches has been under-researched, preventing a more complete understanding of organizational problem solving.

In this paper, we strive to enhance our understanding of how (dynamic) capabilities enable organizations to solve the problems they encounter. For this purpose, we develop a framework that captures the interaction between operational capabilities, dynamic organizational and managerial capabilities, and ad hoc problem-solving in relation to problem complexity. We draw from the problem-solving literature to define problem complexity in terms of the amount of factors multiplied with the amount of interdependencies that a problem consists of (Simon, 1962). An important building block of our framework is the suggestion of past scholars that less routinization favors more radical outcomes (Damanpour, 1988; Teece, 2012).

Our thesis in this article is twofold. Firstly, we try to advance the argument that problem-solving approaches that are change oriented, in contrast to those that are optimization oriented, favor the solution of problems of higher complexities as these problems require change of greater magnitude (Mihm et al., 2003). Secondly, we try to convey that problem solving approaches of which the locus of action resides in the manager, such as dynamic managerial capabilities and ad hoc problem solving, rather than at the organizational level, such as operational and dynamic organizational capabilities, are less routinized (Teece, 2012) and thus favor the solution of more complex problems. As such, we argue that dynamic organizational capabilities and dynamic managerial capabilities can be seen as two inherently different concepts. In addition, we argue that some problems might not even benefit from dynamic managerial capabilities, because these problems are too complex. Schilke (2014) e.g. found that dynamic capabilities are less relevant at high degrees of environmental dynamism. Consequently, in line with Winter (2003), we conceptualize ad hoc problem solving as a direct alternative to dynamic organizational capabilities and

dynamic managerial capabilities, which becomes necessary whenever past knowledge is irrelevant for the problem at hand.

We contribute to the literature in a variety of ways. To the dynamic capabilities literature we contribute by constructing a framework that describes boundary conditions of, interactions among, and the underpinnings of operational capabilities, dynamic organizational and managerial capabilities and ad hoc problem-solving. In doing so, this endeavor meets the call of scholars such as Teece (2012) and Helfat and Peteraf (2015), to better understand what dynamic capabilities are and how they relate to other capabilities and to routines. To the problem-solving literature, we contribute by showing how routinization of practices affects the suitability of problem-solving approaches. Routinization helps in dealing with complexity (Gupta et al., 2006), but too much routinization could backfire (Gilbert, 2005). Semistructured strategizing relaxes the extent to which the past determines future actions in order to be able to improvise based on real-time knowledge, this way being able to substantially deviate from past paths (Bingham and Eisenhardt, 2014) and thus being able to solve more complex problems.

## 3.2 Dynamic capabilities and related concepts

### 3.2.1 *What are dynamic capabilities?*

The dynamic capabilities concept has come forward as an attempt to explain how organizations can remain competitive in dynamic environments (Teece et al., 1997). The concept embodies various constructs, of which ‘dynamic capabilities’ is logically the most important one. First of all, dynamic capabilities are capabilities. A capability can be defined as one or multiple routines that are purposefully combined and directed towards a particular goal (Helfat and Peteraf, 2009; Di Stefano et al., 2014). If we dissect this definition, it is firstly important to note that capabilities are purposeful (e.g. Dosi et al., 2000). In addition, as capabilities resemble a capacity to do something, they are reliable and repeatedly used (Helfat and Winter, 2011). Finally, capabilities are minimally satisfactory, meaning that, as capabilities resemble a capacity to do something, the outcome of the use of a capability

should be recognizable as such (Helfat and Winter, 2011). Dynamic capabilities are deployed to utilize strategic goals, essentially by change organizational resources (Helfat and Winter, 2011; Schilke et al., 2017).

Scholars have approached the concept of dynamic capabilities from an organizational (Teece, 2007) and managerial (Adner and Helfat, 2003) perspective, of which the former can be defined as dynamic organizational capabilities and the latter as dynamic managerial capabilities. Whereas dynamic organizational capabilities represent the capacity of an organization as a whole to adapt to challenges faced, dynamic managerial capabilities represent the capacity of a manager to adapt an organization (e.g. Teece et al., 1997; Adner and Helfat, 2003; Helfat and Winter, 2011; Helfat and Martin, 2015). Until now, these components have been researched rather independently from each other, necessitating a more fine-grained understanding of how both components relate to each other (Helfat and Peteraf, 2015; Schilke et al., 2017). We suggest distinguishing both concepts by dividing and interlinking them based on their locus of action, which is respectively at the organizational level and at the managerial level. In the coming section, we clarify the implications of a focus on the locus of action within the dynamic capabilities concept.

In our proposition, dynamic organizational capabilities represent routine organizational adaptation of organizational resources (Helfat, 1998). The change is standardized and is executed based on pre-defined agreed-upon standards and parameters (McIver et al., 2013). The routine aspect of this alteration is possible due to the accumulation of knowledge over the years and the transformation of this knowledge to routines, turning them into knowledge repositories (Nelson and Winter, 1982, Schulz, 2001; Faulkner and Runde, 2009; Argote and Miron-Spektor, 2011). As March (1981) writes: *“Most change in organizations results neither from extraordinary organizational processes or forces, nor from uncommon imagination, persistence or skill, but from relatively stable, routine processes that relate organizations to their environments”* (p.564).

We suggest that routines underlying dynamic organizational capabilities are change routines (Danneels, 2008, Katkalo et al., 2010; Teece, 2012). These routines are by their nature already focused on repeatedly changing parts of the organization and thus facilitate routine organizational change. To illustrate, imagine a routine that is focused on continuously renewing organizational machinery, based on a systematic check once in a

certain period in specific knowledge databases that contain alternative machines. In addition, imagine a routine that is focused on repeatedly checking and changing the way in which patients are admitted to a particular hospital department. Deploying dynamic organizational capabilities could mean strategically bundling these two routines in order to improve the way in which a hospital department functions and competes with departments at other hospitals (Helfat and Winter, 2011). Managers that are part of dynamic organizational capabilities govern the change process, ensuring that the change that is brought about is in the desired direction and unfolds without complications (Teece, 2007).

Our focus on dynamic capabilities rather than their underlying routines as being key for change does not mean that we do not acknowledge that routines can endogenously change and thus can also lead to organizational change, novelty and creativity (Feldman and Pentland, 2003; Deken et al., 2016; Sonenshein, 2016). Rather, we draw from the understanding that endogenous change of routines has its limits (Pentland et al., 2011) and at a certain point, routines may require being orchestrated by dynamic capabilities (Teece, 2012). Whereas various routines naturally intersect with other routines through shared practices of individuals (Feldman, 2000), this is different from the external purposeful combination of entire routine processes through dynamic organizational capabilities. The thesis in this article thus takes a capability perspective and treats routines as microfoundations and building blocks of these capabilities (Teece, 2007; Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011), while acknowledging also routines' own value as dynamic mindful systems within organizations (Feldman and Pentland, 2003). To alter organizational resources, we argue that dynamic organizational capabilities build on sensing and seizing activities that are of reconfigurational nature (Teece, 2007). Processes comprising reconfigurational sensing activities are in this regard focused on noticing structural issues that require organizational change.

We propose that dynamic managerial capabilities, in contrast to dynamic organizational capabilities, represent a more managerially driven form of organizational change of resources. We propose that these capabilities are underpinned by routines that are less complex and thus of which the outcomes reside more in managerial action (Grant, 1991), as is the case with for instance simple rules (Bingham and Eisenhardt, 2011). As these routines draw from the past to a much lesser extent due to their semistructured nature (Brown



and Eisenhardt, 1997), they are more suitable for altering the status quo (Bingham and Eisenhardt, 2014) and so are the dynamic managerial capabilities that they constitute. Also, as the locus of action resides in the management rather than the organization, more radical decision can follow as the ideation process is less automatic and thus potentially more improvisational of nature (Harvey, 2014). As groups can, at the cost of communication and coordination costs, better cope with complexity than individuals can (Espinosa et al., 2007), the specific nature of an encountered problem determines whether deployment of dynamic managerial capabilities can occur best by an individual or by a group of managers.

Dynamic capabilities have been argued to alter operational capabilities, which are capabilities that ensure that an organization can make a living in the present (Helfat and Winter, 2011; Protogerou et al. 2011). These capabilities support day-to-day activities in a routine way and their goal is to optimize on-going processes (Helfat and Winter, 2011). We suggest that, to be able to do so, operational capabilities consist of operational sensing and seizing activities, entailing the search of and investment in opportunities for optimization. A dynamic capability can, by reconfiguring operational capabilities, alter the way in which an organization makes its living (Helfat and Winter, 2011). In the third part of our proposition, we suggest that operational capabilities are rooted in operating routines, which are focused on optimization rather than change (Zollo and Winter, 2002). Differently than Zollo and Winter (2002), we make a distinction between operating routines and operational capabilities because of the following. An organization that produces and sells phones day after day, makes use of different routines throughout the production and sales process for this purpose. The combination of all these routines to produce and sell phones to daily make a living is in our opinion an operational capability. This definition is in line with recent studies regarding the nature of operational capabilities (e.g. Helfat and Winter, 2011).

### *3.2.2 What dynamic capabilities are not*

Routines comprise a large part of organizational functioning (Winter, 2003). Even so, scholars have uncovered that in many cases, organizational-level factors guiding managers' actions might be absent (Kaplan, 2008). Some actions are executed only once or several times and in these cases, the benefits from maintaining capabilities may not cover the expenses (Winter, 2003; Teece, 2012). In other cases, an organization might not have

been able to develop desired capabilities (Eggers and Kaplan, 2013). In such cases, scholars have described that managerial cognition can be a substitute for capabilities (Kaplan, 2008; Eggers and Kaplan, 2013). Winter (2003) has described ad hoc problem solving as a direct substitute to dynamic capabilities in these cases in which organizational-level factors might be absent. To concretize this problem-solving approach, we reach out to the case of the Ebola outbreak in 2014. Even though the outbreak does not reflect managerial action, using the sad case of nurse Briana Aguirre helps us to better grasp how the principle of ad hoc problem solving may manifest in the real world and will enable us to subsequently project it to managerial action. During the global Ebola outbreak, a Texas nurse was diagnosed with having Ebola. As she reflects on her infection, she describes that the reasons why it couldn't be prevented were that she lacked relevant experience and that the hospital had not provided her with information on how to deal with Ebola. Nurse Briana Aguirre says that she and her colleagues did not know what protocol to follow in case a patient with Ebola arrived<sup>3</sup> and in a filed lawsuit of nurse Nina Pham, the following can be read<sup>4</sup>:

*'Nina was shocked. She had never been trained to handled infectious diseases, never been told anything about Ebola, how to treat Ebola, or how to protect herself as a nurse treating an Ebola patient. The hospital had never given her any ... training or guidance about Ebola. All Nina knew about Ebola is what she had heard on television.'*

Ad hoc problem solving is an action of an individual or groups of individuals that does not stem from organizational guiding or governing principles. Thus, it differs from dynamic managerial capabilities deployment in an important way. Whereas the former displays 'creative' problem solving, the latter displays routine-based problem solving (Lampel et al., 2014). In the aforementioned case of the Ebola outbreak, nurses did not know how to act because the problem (Ebola) was not encountered before, nor were any approaches institutionalized. Thus, it is a problem that resembles what Winter (2003) calls

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<sup>3</sup> <http://www.businessinsider.com/nurse-at-texas-health-presbyterian-speaks-about-ebola-crisis-2014-10?IR=T>

<sup>4</sup> <http://www.scribd.com/doc/257697491/Nina-Pham-Petition>

‘novel’ or ‘unpredictable’. Ad hoc problem solving might be in particular relevant to core tasks of organizations as these tend to be ‘highly uncertain and difficult to prespecify or codify into standards’ (Kwon, 2008). Translating this case to business, we argue that ad hoc problem solving may be of vital importance to top management in novel and unpredictable scenarios. Ad hoc problem solving

As ad hoc problem-solving is reached out for when in the absence of organizational guiding and governing factors, we propose that ad hoc problem solving is primarily dependent on the managerial experience of individuals or teams and their utilization of knowledge that past individual experiences have brought them through managerial cognition. These individual properties are then utilized to bring about ‘creativity’ in the sense that these solutions are essentially non-routine (Teece, 2012) and should bring forward approaches that are new to the firm (Harvey, 2014), but not necessarily new to each individual within the firm and thus not necessarily creative to each person (George, 2007). Greatest changes are produced in the absence of organizational features that limit the extent to which managers can break away from past paths (Gilson et al., 2005). With this, we however do not mean that managers that engage in ad hoc problem-solving cannot benefit from guidelines, routines or standard operating procedures that might e.g. preserve their cognitive capacity (Becker, 2004). Nor do we mean that creativity cannot be informed from past organizational paths (George, 2007). Rather, we mean that the ‘actual organizational creative act’ as a means of ad hoc problem-solving stems in our understanding from the unbound utilization of knowledge, accrued by managerial experience and made use of through managerial cognition. Scholars suggest that managers select appropriate experiences through cognitive encoding and consequently utilize this experience by cognitive retrieval (Eggers and Kaplan, 2013; Maitland and Sammartino, 2015).

Ad hoc problem-solving can be exercised by managers that are already employed by the organization that faces a complex problem, because, as aforementioned, not all individual experiences become translated to the organizational level, especially not if there has not been any reason or possibility to develop any routines and capabilities (Eggers and Kaplan, 2013) and costs of maintaining capabilities might have been simply too high to weigh up to their benefits (Winter, 2003)

In the absence of managers with relevant experience, another possibility would be to consult organizational social capital to acquire the experiences and knowledge that have been missing to be able to effectively cope with the problem at hand (Guthrie and Datta, 2008; Gittell et al., 2010). By utilizing social capital, organizations in troublesome situations can narrow down the scope of a problem by constructing heuristics based on these external experiences (Bingham and Eisenhardt, 2014), or at least ensure effectiveness of treatments by being able to draw from proven knowledge (Garud and Nayyar, 1994). The quality of this approach will be dependent on the quality of organizational social capital (Tsai and Ghoshal, 1998).

Finally, organizations can recruit someone from outside the firm, such as interim-managers (Teece, 2012). By gathering around the person or people that possess relevant experience and knowledge, and sharing that knowledge with other members of the management team, the experience can become a shared experience and the knowledge can be a shared knowledge (Kor, 2006). Based on the cognitive understanding of the management team, shared experience can provide the input for momentarily solving the problem (Eggers and Kaplan, 2013). Eventually, experiences related to solving this particular problem can be institutionalized at the organizational level for use in future problems (Garud and Nayyar, 1994; Carpenter et al., 2003; Eggers and Kaplan, 2013).

### 3.3 Employing a problem-solving perspective to dynamic capabilities

The concept of problem-solving is a means through which organizations can be seen as entities that have to match different solutions to different problems for pursuing their goals. More than half a century ago, Simon (1959) explained that understanding problem solving would have major implications for our understanding of innovation. Furthermore, Simon et al. (1987) have described that complexities in the world are central to the decision-making processes that aid in problem solving. Scholars have maintained their interest in seeing organizations as entities that solve problems of varying complexities, in order to tap into the additional understanding that we can have from treating organizations as such (e.g.

Nickerson and Zenger, 2004; Foss et al., 2016). We use this lens specifically to the notion of organizational change within organizations that maneuver in competitive environments, which aim to enhance their competitive edge, and utilize a repertoire of ‘problem-solving approach’ that they can deploy for this purpose.

We define a problem as any challenge an organization faces, either due to external pressures or due to its own willingness to enhance its competitiveness. In doing so, the act of organizational change can be defined as solving problems through changing organizational resources. The extent to which resources need to be altered depends on the characteristics of the problem an organization faces. More specifically, scholars have drawn attention to the notion that problems can vary in how complex they are (Eisenhardt and Martin, 2000) and Simon (1962) has described problem complexity as the interaction between the amount of factors and the amount of interdependencies between these factors. Problem complexity has implications for the degree to which an approach to solve problems is suitable (Simon and Newell, 1958; Mumford, 2000). The approach with which a problem is to be solved we define as problem-solving approaches. More specifically, problem-solving approaches we define as organizational or managerial activities or processes by means of which an organization can reconfigure (parts of) itself to solve a certain problem. Deploying these approaches means actually using them (Luo, 2001; Sirmon et al., 2008; Di Stefano et al., 2010).

In defining organizational problem-solving approaches, we draw from the dynamic capabilities literature. Scholars have described dynamic capabilities as means for problem solving (Winter, 2003; Zahra et al., 2006; Schreyögg and Kliesch-Eberl, 2007; Barreto, 2010). Research on dynamic capabilities has revealed us much about how organizations can be altered through routine and non-routine problem-solving approaches. A cornerstone of such an understanding was brought forward by Eisenhardt and Martin (2000), who argued that routinization plays an important role in how dynamic capabilities function in environments of varying dynamism. We extend this notion in arguing that routinization of problem-solving approaches plays an important role in deciding whether a certain problem-solving approach is suitable to deal with a problem of a particular complexity. With routinization, we mean the extent to which processes are routine. This does not necessarily entail managerial intentional routinization, such as processes that are tightly governed by

protocols. Rather, routinized processes could simply be processes along the lines of an abstract pattern of action with performances that vary across recurrences (Feldman et al., 2016). Variation in routinization however comes from the degree to which routines are tightly or loosely governing processes (Eisenhardt and Martin, 2000; Bingham and Eisenhardt, 2014) and whether routines are change or optimization oriented (Zollo and Winter, 2002; Teece, 2012). In the following section, we will more clearly describe the insights that can be accrued from the dynamic capabilities concept. Subsequently, we will use these insights to concretize what we mean by a dynamic capabilities perspective on problem-solving within organizations.

### 3.4 Building the problem-solving framework

In the following section, we build our problem-solving framework that integrates the insights from the problem-solving literature and the concept of dynamic capabilities into an understanding of organizational problem-solving in the face of varying levels of complexity. We will look at organizations as entities that respond to problems that they face. A problem can also be an opportunity to leapfrog the competition, because of which our thesis does not only apply to the reactive firm (Covin and Slevin, 1989; Greenwood and Hinings, 1993; Aragon-Corréa, 1998).

#### 3.4.1 *Assumptions*

Central to our framework is the assumption that organizations will prefer stability over change whenever it is possible, because change causes frictions and tensions due to a drift away from familiarity (Haveman, 1993). Yet, we also assume that change is preferred over stability when a goal does also require change. In doing so, we acknowledge that organizations are not uniform and thus that some organizations might prefer change over optimization. This way, our framework does also provide room for organizations with a change-orientation.

An important assumption of our framework is that it will apply only to problems of which their complexity can be examined by a problem-solving organization. This is

important, because some problems might be hard to examine and because of that might be perceived as being complex, even though they might consist of only a few amount of factors and interdependencies. Thus we take away the possibility that perceived complexity is the consequence of ignorance. In addition, in our framework, problems are subjective to an organization's interpretation of the amount of factors multiplied with its interdependencies. For example, the same problem might be less complex for an organization with more resources than an organization with fewer resources.

### *3.4.2 Procedure*

We will start with the problem type that is the least complex, which is a problem that embeds only few factors and interdependencies. Subsequently, we will step-by-step discuss more complex problems. Problems with many factors are more complex than problems with few factors, and problems with many interdependencies are more complex than problems with few interdependencies. Also, problems with few factors but many interdependencies are more complex than problems with many factors but few interdependencies, because the latter type of problems can be more easily decomposed in homogenous, simple categories (Volberda, 1998; Foss et al., 2016).

We will discuss the implications of each level of problem complexity for the degree to which problem-solving approaches are suitable. This, we will try to do as clearly as possible by means of illustrations as this will enable us to clearly delineate which problems can be targeted by means of which problem-solving approaches.

### *3.4.3 Problems with few factors and few interdependencies - Routine optimization*

The simplest problems are those problems that consist of only a few factors that display few interdependencies (Simon, 1962). Problems of this category are highly predictable and decomposable because they do not embody complex interactions (Daft and Lengel, 1983; Volberda, 1998; Macher, 2006). Scholars have suggested that perceiving a problem as one that contains few factors and few interdependencies displays that the magnitude of the change that an organization needs to undergo to solve this problem is also

relatively small of nature (Mihm et al., 2003). Essentially, these problems, which we label as optimization problems, are part of the way in which an organization daily ‘makes a living’ (Helfat and Winter, 2011), because solving simple problems is part of daily operations and continuous optimization of business processes is the result of continuously solving these simple problems that do not require organizational change. Consequently, we argue that when organizations aim to solve these simple problems, they should prioritize the use of highly routine problem-solving approaches (McIver et al., 2013). Routine problem-solving approaches lend themselves well to problems that are highly predictable, because they can draw from past knowledge to address future actions (Gilbert, 2005). Furthermore, because decomposable problems can be cut into simple and homogenous components (Volberda, 1998; Macher, 2006), routine problem-solving is especially suitable because they can solve these problems simultaneously from a common knowledge pool in an efficient manner (Bingham and Eisenhardt, 2011; Weigelt and Sarkar, 2012) and can cause the preservation of cognitive capacity mainly for those complex problems that require it the most (Becker, 2004; Bardolet et al., 2011). Finally, routine problem-solving approaches have been suggested to be suitable in those cases that organizations only need to change minimally (Damanpour, 1988).

We argue that the simplest problems are solved by the deployment of operational capabilities, because these capabilities focus on enhancing the status quo in a continuous and routine manner, without requiring substantial deviation from past paths and thus without causing unnecessary resistance (Helfat and Winter, 2011). Operational capabilities are able to solve these problems through employees that tap into sensing processes and employees that act upon the insights from the information sensed by utilizing underlying operating routines to continuously solve inefficiencies.

In order to concretize the functioning of operational capabilities, we take as an example the problem of having to replace obsolete machinery. Solving the problem of replacing obsolete machinery means that firstly the level of obsolescence of a machine needs to be identified, the need for an alternative needs to be discussed and the budget should be established. Thus, the process is not entirely routine and important decisions remain to be made (Teece, 2012). To perform these activities, deployment of operational capabilities in the example of replacing obsolete machinery would require initially utilizing the operational



sensing capacity through, for instance, routine checks of the efficiency and lifespan of machinery, processes to tap into employee expectations with respect to how to replace the current machine and IT-systems to tap into available options on the market and their price tags (Teece, 2007). Then, the actual replacement would be the outcome of employing the operational seizing capacity which may consist of processes that help to identify which machine could be a good substitute or processes that may guide the actual purchasing of machinery, bearing in mind which information has been gathered regarding the desires of employees and the specifications of machines on the market through operational sensing (Teece, 2007).

Deployment of operational sensing and seizing capacities has as their purpose a standardized, efficient way of identifying optimization problems and addressing them. Whereas the actual opportunities have to be selected and seizing decisions have to be made by managers, alleviating the strain on this decision by operating sensing and seizing capacities that capitalize on the accumulation of past experiences is of vital importance (Becker, 2004; Bardolet et al., 2011).

*Proposition 1: The complexity of problems with few factors and few interdependencies lies within the problem-solving scope of operational capabilities, because these problems are predictable, decomposable and reflect that the inability of the organization to address its environment is relatively small.*

#### *3.4.4 Problems with many factors and few interdependencies - Routine reconfiguration*

Not all problems are as simple as replacing a machine that is at the end of its economic lifespan. Some of the problems that organizations face can consist of many factors. Here, we consider the case in which the interdependencies between these factors remain low. These problems are similar to the problems we described in the previous section in that also these problems benefit from being decomposable in homogenous and simple segments (Volberda, 1998; Macher, 2006) and thus being solvable by problem-solving approaches that are rooted in routines (Daft and Lengel, 1983; Feldman and Pentland, 2003; Teece,

2007). Yet, these problems display more complexity because they embody more factors (Simon, 1962). As argued before, compared to a problem with few factors, one with many displays a problem of larger magnitude (Mihm et al., 2003) and this has implications for the degree to which problem-solving approaches are suitable. Operational capabilities are rooted in routines, but are also optimization focused. Even though it might make sense to optimize when there are not that many problems, when the amount of problems are many and thus the problems within the organization are also substantial (Mihm et al., 2003), we argue that organizations should favor change over merely optimization, because the existence of many problems signals the need for change (Hambrick et al., 1993). Having many problems to solve might be the result of an underlying structural issue that caused the accumulation of such problems. With change, then, we mean that the organization alters the way in which it daily makes a living (Helfat and Winter, 2011), and thus prevents facing similar problems in the future, in contrast to merely reinforcing the current way of doing business and not taking away this risk.

As these problem are decomposable and sizable and thus can be solved in a routine change-oriented manner, we propose that dynamic organizational capabilities are suitable, as problem-solving approaches that routinely act upon signals from predefined standards in order to adapt malfunctioning or inadequate parts of the organization (Helfat, 1998; McIver et al., 2013). An example of such a problem might be ‘dropping quality of healthcare across the hospital’. Hospitals consist out of many care cycles (Porter and Heisberg, 2006), meaning that this problem embeds many factors, because basically each care cycle can be considered a factor. At the same time, these factors are rather independent from other healthcare paths. The healthcare path of chest ache, indicating a probable cardiac illness, is different from the healthcare path of a broken wrist, even though both may briefly intersect at minor treatments such as taking an X-ray photo. This problem is thus solvable by downsizing the problem of furthering hospital quality to furthering the quality per care cycle, as a consequence of decomposing the problem (Daft and Lengel, 1983; Volberda, 1998; Macher, 2006). The hospital may employ change routines per healthcare path to change itself by changing the way each healthcare path is functioning as a result of deploying dynamic organizational capabilities, in contrast to merely optimizing by means of operational capabilities and their operating routines.

Let us describe these processes in more detail. By means of reconfigurational sensing activities (Teece, 2007) that, for instance, may check whether practices live up to standards, the hospital can routinely track down whether the criteria of ‘good patient care’ is met by the cardiology department. This can be done by combining routines that monitor quality of care, cost of care, turnaround time of patients and so on. Then, reconfigurational seizing activities can consist of decision-making support, such as decision-making protocols with respect to investment, that may aid the managerial reconfiguration of resources (Teece, 2007). Finally, processes that, for instance, manage post-seizing period adaptation and effective knowledge management can ensure that the organizational functioning can be reconfigured and that competitive advantage can be, at least temporally, sustainable (Eisenhardt and Martin, 2000; Teece, 2007).

*Proposition 2: The complexity of problems with many factors and few interdependencies lies within the problem-solving scope of dynamic organizational capabilities, because these problems are also predictable and decomposable, but are too complex to be solved through optimization.*

### *3.4.5 Problems with few factors and many interdependencies - Guided improvisation*

Organizations may be in the situation that they are not necessarily trouble by the amount of the problems they face, but by their interrelation. The issue with these problems is that problems cannot be easily decomposed into simpler homogenous pieces (e.g. Nickerson and Zenger, 2004; Macher, 2006). The interrelatedness of factors complicates thus problem-solving based on complex routines, because the inability to decompose a problem drives-up the complexity of the problem as a whole, as the problem becomes more dynamic and thus less predictable. This limits the extent to which these problems can be solved by past knowledge (Daft and Lengel, 1983; Volberda, 1998). Because these problems do not consist of many factors, we argue that the problem is complex yet relatively isolated, because of which it thus would not require total overhaul, as the accompanied issues within the organization are not that sizeable (Mihm et al., 2003).

As non-decomposable problems are less easy to predict and thus require more real-time decision making than rigid structures could provide (Brown and Eisenhardt, 1997; Volberda, 1998), scholars have suggested that heuristic-based problem solving could replace problem solving based on complex routines, whenever complex routines are not able to handle the complexity of a problem (Simon et al., 1987; Schoemaker, 1990). Eisenhardt and Martin (2000) suggested organizational simple routines to substitute complex routines in environments that are highly dynamic and thus difficult to predict. These simple routines are semistructures (Brown and Eisenhardt, 1997), such as simple rules (Bingham and Eisenhardt, 2014) that allow for managerial improvisation to deal with high levels of problem complexity, while preserving some level of efficiency by providing guiding principles that ease decision-making.

We argue that the dynamic managerial capability, as the ability of managers to reconfigure an organization (Helfat and Martin, 2015), is the approach through which problems consisting of few factors but many interdependencies can be solved in a heuristic-based manner. Compared to dynamic organizational capabilities, a dynamic managerial capability is less automatic and pre-defined, and thus more radical of nature, because it represents a managerial level activity that is less anchored in complex organizational routines. Dynamic managerial capabilities portray what Brown and Eisenhardt (1997) defined as 'balancing on the edge of chaos'. As they rest on simple routines, such as simple rules, these capabilities draw from managerial improvisation to cope with less-predictable problems by staying flexible and responsive (Eisenhardt and Martin, 2000; Bingham and Eisenhardt, 2014). At the same time, by drawing from past organizational experiences such as simple rules, dynamic managerial capabilities can narrow the complexity of problems by narrowing managers' choice set and acting subsequently upon the simplified problem (Bingham and Eisenhardt, 2014).

Especially in hospitals, interdependence of factors is relatively high due to the prominent role of individuals, mainly physicians, in healthcare processes and thus the effect of their cognitive frames on basically anything. For example, in Dutch hospitals, physicians in training (PiTs) have to consult senior physicians regarding their final decisions and thus are dependent on them. Senior physicians can decide to work from a distance as they can be consulted by phone too and thus don't need to be physically present. Introvert PiTs might

delay consultation of senior physicians until a point at which they can ask many things at the same time. This also affects the work that nurses execute. Thus, the decision-making process is highly interdependent. The amount of factors is on the contrary not that high. Nurses perform in accordance with standard operating procedures, which are thus fixed factors, and ICT-systems are also fixed factors unless they break down. We have already named PiTs and cardiologists as important factors.

As suggested by Eisenhardt and Martin (2000), deployment of dynamic capabilities should not be equated with success. Along these lines, the microfoundations of dynamic managerial capabilities, being managerial cognition, managerial human capital and managerial social capital, influence to a large extent the outcome of the deployment process (Adner and Helfat, 2003; Helfat and Martin, 2014). In this particular case, skills that are acquired through past trainings and education, provide management with the endowment they need to restructure a department that faces problems that are interrelated, yet isolated. They can do so by tapping into the experiences and knowledge gained from their social capital base (Moran, 2005). Their managerial cognition determines how well they will be able to read the deficiencies within the department, understand consequences of past and future actions and thus will be key in the eventual decision-making (Eggers and Kaplan, 2013).

*Proposition 3: The complexity of problems with few factors and many interdependencies lies within the problem-solving scope of dynamic managerial capabilities, because these problems are unpredictable, not decomposable, but can be simplified by using organizational simple routines.*

### *3.4.6 Problems with many factors and many interdependencies - The 'creative act'*

The most complex problems are those that are characterized by high amounts of factors that are also highly interdependent (Simon, 1962). We have discussed that even only one factor consisting of many interdependencies is difficult to grasp by problem-solving approaches that are highly routinized and requires relaxation of the routines' level of detail to allow for more managerial discretion (Bingham and Eisenhardt, 2014). In comparison to

the previous problem, the complexity of this problem is amplified as the factors it contains are many (Simon, 1962). We have described that a higher complexity of a problems points at a higher inability of an organization to deal with a problem (Mihm et al., 2003). Similar to the previous problem, this problem is difficult to predict a solution for by merely drawing from the past, because of the large amount of interdependencies across large amounts of factors (Daft and Lengel, 1983). Because the problem is even more complex than the previous problem and thus reflects the most inable situation in which an organization could find itself, we suggest that in these circumstances, organizations need to break away from their past to the best of their capacity.

Winter (2003) pointed at unpredictability and unfamiliarity as two aspects of problems that may require ad hoc problem solving. In these cases, an organization will not have been able to have any organizational routines, either complex or simple, in place to aid in the problem-solving endeavor of managers (Eggers and Kaplan, 2013). This makes that an organization in these situations faces many factors of which it does not know how they relate to each other and thus how to best deal with the problem. We label the ad hoc problem solving by managers as ‘the creative act’, because it goes beyond routine change and guided improvisation. Even though we acknowledge that also routine-based managerial actions may lead to creative solutions (Bingham and Eisenhardt, 2014; Sonenshein, 2016), we argue that, from the perspective of the organization, ad hoc problem-solving is the most pure manifestation of creativity as it leads to a complete departure of past paths without organizational factors that may aid managers in this process.

A characterizing problem within hospitals can be that they are for the first time confronted with a structural decline in patient influx. Hospitals compete with each other (Pfeffer, 1973; Boeker and Goodstein, 1991; Goes and Park, 1997; Douglas and Judge, 2001). A city such as Rotterdam embeds a large variety of hospitals, which often provide treatments for similar diseases. Even though patients might be inclined to choose the hospital that is most nearby, the fact that hospitals compete with each other implies that underperforming hospitals can be set aside by patients (Fennell, 1980). Many factors can thus underlie decreasing influx of patients. Hospitals have been pushed to disclose infection and mortality rates so that patients could select hospitals based on their perception of quality<sup>5</sup>

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<sup>5</sup> <http://www.wsj.com/articles/SB110722521039541957>

<sup>6</sup>. Indeed, scholars find that reputation and readmission rates are important for patients (Varkevisser et al., 2012). An important aspect of reputation might be impersonal care, as scholars have found that the personal touch is associated with higher levels of patient satisfaction (Cleary and McNeill, 1988). Impersonal care on its turn might be cause by emotional exhaustion (Vahey et al., 2004). Undercapacity of a department has been argued to also result in decreasing patient numbers (Nutt, 1984) and the list goes on (Sitzia and Wood, 1998). Factors are plenty and the interdependency of these factors is similarly very high.

Consequently, in cases that are similar to the aforementioned case in terms of complexity, the first way in which organizations can engage in ad hoc problem solving entails finding out whether someone in the organization already has relevant managerial experience with solving a similar problem and thus has cognitively encoded this experience, but has not had the chance to utilize it and thus to cognitively retrieve it because of the absence of a relevant strategic problem and thus the absence of a moment through which these experiences could have been translated to organizational complex or simple routines via institutionalizing best practices (Eggers and Kaplan, 2013).

The second option is that an organization might try to internally solve the problem by consulting external information sources within for example other organizations in e.g. an alliance (Inkpen and Tsang, 2005). The organization thus will make use of the social capital of its employees to inform managers with best practices in other settings and generate intellectual capital (Nahapiet and Ghoshal, 1998). The quality of the solution will be dependent on the one hand on this joint social capital and on the other hand on the capacity of its managers to assimilate this knowledge and enhance their understanding through their cognitive capacities and eventually skillfully act in accordance with their human capital (Helfat and Martin, 2015; Helfat and Peteraf, 2015).

The final option is that the organization might decide to employ someone with relevant individual experience, such as an interim-manager or transformational manager that embeds the solution to the particular problem (Teece, 2012). Hiring a candidate is a very practical solution, if an organization is able to carefully assess that a person has an excellently developed managerial cognition, sufficient human capital and perhaps even an

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<sup>6</sup> <https://www.theguardian.com/society/2008/may/29/nhs.health1>

extensive reach through its social capital. After solving the problem for which the manager was recruited, the organization will have acquired relevant knowledge that can be used to develop simple or complex routines to consult in subsequent encounters with similar problems (Gilbert, 2005; Bingham and Eisenhardt, 2014). The downside is that often, organizations lack perfect information (Barber, 1998) and thus, perceived past organizational level successes can't be fully ascribed to this candidate with certainty, even though people often attribute successes to themselves (Davis et al., 1997). The success of assigning an interim-manager will be highly dependent on the quality of the recruiting process.

*Proposition 4: The problem-solving scope of ad hoc problem-solving is limited to problems with many factors and many interdependencies, because these problems are unpredictable, not decomposable and cannot be simplified by organizational simple routines.*

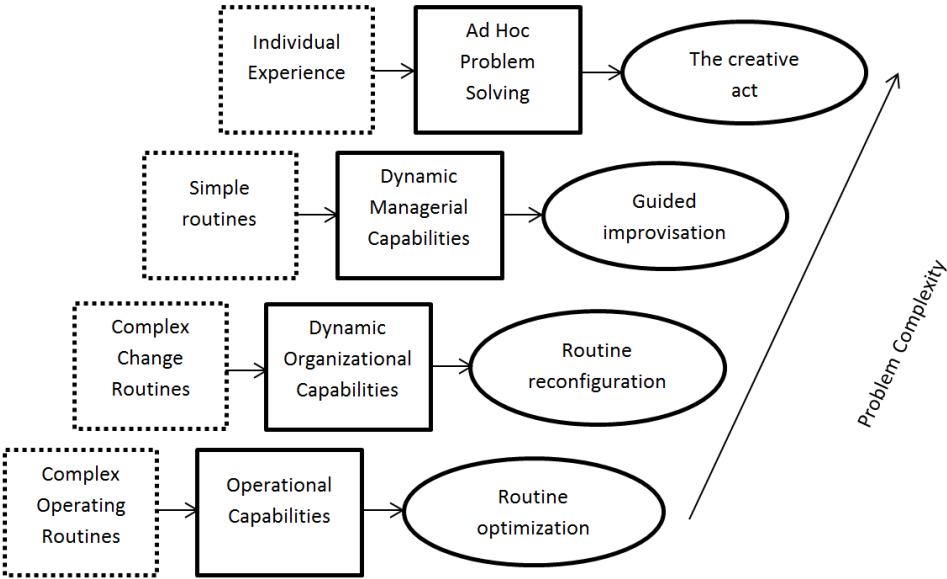


Figure 3.1: Dynamic capabilities framework



### 3.5 Interactions between problem-solving approaches

In the previous section we have shown in line with past research (Gupta et al., 2006) that an organization is able to consult a variety of problem-solving approaches, ranging from routine optimization through operational capabilities to ad hoc problem solving through cognitive encoding and retrieving. Such a repertoire enables an organization to economize on effort and risk by consulting more routine approaches prior to less routine ones (Becker, 2004), but is also able to drastically reconfigure the organization whenever problems become too complex by consulting less routine but more risky alternatives (Bingham et al., 2014; Winter, 2003). It is unthinkable that these problem-solving approaches are independent of each other. After all, altering organizational resources means altering the way in which an organization makes a living (Helfat and Winter, 2011) and we have brought forward three problem-solving approaches that alter organizations to solve problems.

In the coming section, we will illustrate the dynamics of an organization's repertoire of problem-solving approaches, by providing insight into how organizations alter lower-level problem-solving approaches whenever they need, by deploying higher-level problem-solving approaches. We argue that organizational change by a higher-level problem-solving approaches always requires lower-level problem-solving approaches to be altered in accordance, because the repertoire of problem-solving approaches is an integrated system that requires that all levels are aligned and synchronized with the strategy of the organization (Kaplan and Norton, 2001). Otherwise, the benefits from higher-level change will not be internalized by the organization and thus will this organization not be able to benefit from this change in future similar problems (Teece, 2007).

*Proposition 5: Higher-level problem-solving approaches alter the total of lower-level problem-solving approaches*

In the following sections we will describe how various problem-solving approaches interact and what the implications of these interactions are.

### 3.5.1 *The impact of dynamic organizational capabilities*

Past research has already extensively covered that dynamic organizational capabilities adapt operational capabilities and thus indirectly impact organizational performance (e.g. Drnevich and Kriauciunas, 2011; Helfat and Winter, 2011). However, the conceptualization that we presented allows us to further clarify this relationship, by arguing that the effect of dynamic organizational capabilities on operational capabilities impacts performance via altering the operational sensing and/or operational seizing capacities of the operational capability. This implies that through dynamic organizational capabilities deployment, initially a routine change process (Helfat, 1998) will be driven that senses the problem and its nature within daily operations. For example, an organization such as Shell operates reactively to the price of oil<sup>7</sup> <sup>8</sup>. Structural decline in the price of oil triggers alteration of the way in which an organization makes its daily living, based on predefined standards (McIver et al., 2013). Subsequently, an organization should invest and commercialize the opportunities that have been sensed (Teece, 2007), which can relate to both the operational sensing and operational seizing capacities of operational capabilities. For example, Shell might decide to pursue more efficient exploitation processes or might decide to automatize a large part of its operations for which it now might have been employing personnel. These would be clearly part of the operational seizing capacity of the operational capability. Finally, an organization should transform the underlying operational capability to internalize advantages of the change for further benefits (Teece, 2007). Thus, Shell, in this case, would have to transform and align the organization in line with opportunities seized. This implies redefining operational sensing and operational seizing capacities and eventually redefining the daily way of making a living.

### 3.5.2 *The impact of dynamic managerial capabilities*

The impact of dynamic managerial capabilities on the organization is less clearly covered in the literature, especially regarding the typology we propose. As aforementioned, we argue that the problem-solving scope of problems that consist of few factor and many

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<sup>7</sup> <http://www.bidnesstc.com/58341-is-royal-dutch-shell-bg-group-deal-destined-for-regulatory-approval/>

<sup>8</sup> <http://fd.nl/economie-politiek/1112974/shell-schrap-tuizenden-banen>

interdependencies is limited to dynamic managerial capabilities, because these problems can benefit from simple routines that firstly narrow down the choice set of managers and thus the problem complexity, and secondly can direct managerial improvisation while only minimally hindering it (Eisenhardt and Martin, 2000; Bingham and Eisenhardt, 2014). This resembles descriptions by studies concerning dynamic managerial capabilities and management-based change (Brown and Eisenhardt, 1997; Helfat and Martin, 2015). Complex routines may draw too much from past knowledge and may allow too little for managerial discretion in changes that necessitate the resolution of complex problems (Bingham and Eisenhardt, 2014). Being able to substantially anchor future actions in past organizational paths would mean that the problem that is dealt with is close to what the organization currently exercises or has recently experienced (Majchrzak et al., 2004), which would imply that the problem is predictable and thus relatively simple (Volberda, 1998; Winter, 2003). As this is not the case and problems of high complexity require foresight, deployment of dynamic managerial capabilities is suitable for substantial reconfiguration of organizational resources (Helfat and Martin, 2015). The consequence of reconfiguring an organization is firstly that the way in which it makes its living changes. Thus, operational capabilities will be reconfigured by deployment of dynamic managerial capabilities. In addition, as dynamic organizational capabilities are tailored towards adapting operational capabilities in line with predetermined standards, which are on their turn aligned to organizational strategy (Kaplan and Norton, 2001), dynamic organizational capabilities will also need to be adjusted in accordance.

Essentially, we thus argue that dynamic managerial capabilities work twofold. On the one hand, they adapt operational capabilities directly. Management will pursue the establishment of operational sensing and seizing capacities that will aid the organization in performing new day-to-day activities in line with the new path that follows from the organizational reconfiguration by dynamic managerial capability deployment. Then, the next step will be to adjust dynamic operational capabilities, which entails establishing new projected ideal operations and predefined agreements regarding deviation from this ideal (McIver et al., 2013). These adjustments affect the composition of processes that form substantial parts of reconfigurational sensing, reconfigurational seizing, and transforming activities of dynamic organizational capabilities (Teece, 2007).

In the aforementioned case of Shell, dynamic managerial capability deployment could be necessary, for instance, when the oil price shows such negative tendencies that in order to survive, Shell would need to back away from oil. Based on past organizational experiences with differentiation and alteration, managerial action could steer the organization towards a future in more durable energy. This would require on the one hand the establishment of new operational processes that define how day to day businesses will proceed for the redesigned Shell and on the other hand will necessitate new standards regarding, for example, when an organization will be in need of structural organizational change in a routinized way by dynamic organizational capabilities deployment.

### *3.5.3 The impact of ad hoc problem solving*

The impact of ad hoc problem solving on an organization is similar to that of dynamic managerial capabilities in that both predominantly draw from strategic actions and both aim for substantial deviation from past paths, because the past has not been able to provide the solution for dealing with current problems (Winter, 2003; Bingham and Eisenhardt, 2014). Whereas in the case of dynamic managerial capabilities managers were able to draw from simple rules, we have discussed that in the case of ad hoc problem solving this is not possible anymore. The size of the inability of the organization to address problems of many factors and interdependencies from its current knowledge base substantiates the need for a drastic overhaul so that the organization can sustain its businesses (Mihm et al., 2003). In addition, the size of the problem complexity outbalances the benefits that current guiding principles might have on decision-making. Thus, the organizational past becomes a burden (Gilbert, 2005) and needs to be broken away from maximally (Hammer, 1990).

Similar to dynamic managerial capabilities, through ad hoc problem solving an organization pursues readjustment of operational capabilities and dynamic organizational capabilities. However, on top of that, ad hoc problem solving will also need to alter the simple routines which the organization builds on in deploying dynamic managerial capabilities. The simple routines of an organization are developed in line with its paths and not adjusting these in line with the new direction that the organization goes to, would mean a misalignment between the organization's routine problem-solving approaches (operational and dynamic organizational capabilities) on the one hand, and its semistructured

improvisational problem-solving approach (dynamic managerial capabilities) on the other hand.

Thus, the organizational guidelines, rules and routines need to be reengineered for what is possible (Hammer, 1990) and reestablished as time goes by (Becker, 2004; Kor, 2013). Simple rules can be set up by acquiring people that are knowledgeable of the new direction in which the organization has set sail or by acquiring relevant knowledge from organizations that follow a similar route through the social capital of its employees. Also, because organizations learn from past actions, an organization that pursues ad hoc problem solving will be able to infer simple routines from this ad hoc problem-solving (Bingham and Eisenhardt, 2011), which it can use to decrease the complexity of a future similar problem so that deployment of dynamic managerial capabilities becomes suitable.

For example, Shell as an organization might have no experience with durable energy or even with substantial altering its scope beyond oil-related products. Reconfiguring itself would thus boil down to depending on experienced managers to alter the organization, because organizational repositories of past knowledge are absent. Similar to dynamic managerial capabilities, this would eventually imply establishing operational processes and standards for routine change (McIver et al., 2013). Also, the establishment of different, relevant simple routines ensures alignment between operations, routine-based change and simple-routines-based change. However, ad hoc problem solving would also pave the way for the simplification of future reconfigurations of Shell in similarly complex scenarios due to the establishment of simple routines based on the experiences that are gained by shifting to durable energy (Bingham and Eisenhardt, 2011).

*Proposition 6: Ad hoc problem solving results in the establishment of simple rules, because of which similar future scenarios become less complex and dynamic managerial capabilities can replace ad hoc problem solving as a more suitable problem-solving approach.*

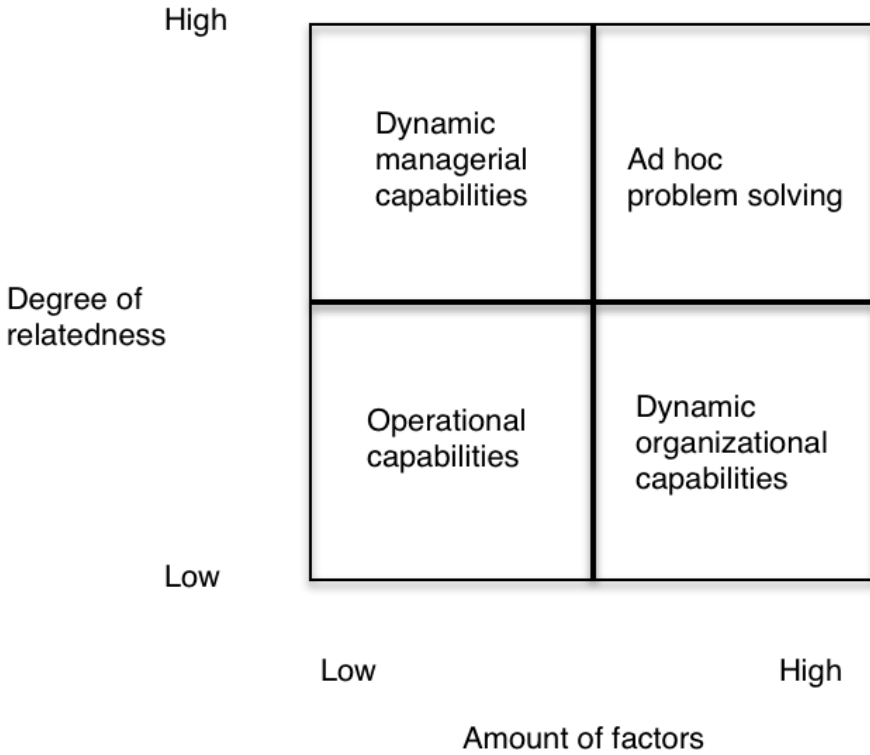


Figure 3.2: Relationship between problem complexity and problem-solving approaches

### 3.6 Concluding discussion

By means of this article, we have tried to shed new light on how organizations can solve problems of varying complexities in a variety of ways. We have rooted ourselves in the dynamic capabilities literature as a new perspective to organizational problem-solving, which has allowed us to show how a varying degree of routinization brings with it implications for problem-solving approaches and eventually their potential to solve problems. In doing so, we have tried to portray that organizations can be seen as institutions that have a repertoire of problem-solving approaches and that the orchestration of these

approaches is key for sustainable competitive advantage. In this section, we highlight the implications of this study for respectively theory, research and practice.

### *3.6.1 Implications to theory*

We believe that the presented problem-solving framework will have important implications to future theory building within the fields of problem solving and dynamic capabilities (E.g. Foss et al., 2016; Schilke et al., 2017). To the problem-solving literature, this research adds three important implications. First of all, we show that scholars that aim to unravel how organizations solve problems should take into account that routinization is an important aspect of the actual problem solving activity. The problem-solving scope of problem-solving approaches is determined by the extent to which they are routinized, here presented in terms of orientation to change (Teece, 2012) and extent of detail (Brown and Eisenhardt, 1998)). Secondly, we indicate that organizations have a repertoire of problem-solving approaches, which implies that deploying a particular problem-solving approach should be contingent on careful examination of problem complexity and the suitability of the problem-solving approach (Burnes, 1996). Thirdly, we enrich the literature by arguing that problem-solving approaches within this repertoire interact with each other after deployment in such a way that higher level approaches alter the way in which the lower level approaches have been designed, as these are aligned to organizational strategy (Kaplan and Norton, 2001) and thus need to be changed as organizational strategy changes.

To the dynamic capabilities literature this study has the following implications. We provide clarification to a field that has received lots of criticism (Arend and Bromiley, 2009), by describing what problem-solving approaches consist of and how the various constructs within the dynamic capabilities literature are related to each other, as has been pointed out to be an important need (Helfat and Peteraf, 2015; Schilke et al., 2017). In addition, we suggest that the role of ad hoc problem solving should be more prominent within the dynamic capabilities literature, because strategizing by means of dynamic capabilities means also considering its alternatives, to anticipate cases in which investment in maintaining these capabilities may not pay off (Winter, 2003). Finally, we contribute to past literature by finding support for the findings of Schilke (2014), who argued that dynamic capabilities would be most useful in moderately dynamic environments. As dynamism is highly correlated with complexity (Dess and Beard, 1984), we find support by showing that

dynamic capabilities matter most for moderately complex problems, because too complex problems need unrestricted managerial action whereas it is not be beneficial to deploy dynamic capabilities for the resolution of simple problems.

### *3.6.2 Implications to research*

We more broadly contribute to research in that we suggest that future studies that will research organizational problem solving explicitly consider the routinization of the problem-solving approaches that are of interest to their particular study. Furthermore, we invite research on how organizations construct, evaluate and alter their repertoire of problem-solving approaches. Qualitative research can provide important insight in this regard, as could quantitative research in terms of assessing the antecedent of repertoire change. In addition, the propositions that we have developed provide a foundation for future research regarding which problem-solving approaches within the dynamic capabilities literature are most effective under which conditions. We also invite researchers within the dynamic capabilities literature to delve into the interaction of the problem-solving approaches, in so far as it has not been examined in this article. For example, specifically, how do ad hoc problem solving lead to the development of simple routines? What are the phases of this trajectory?

### *3.6.3 Implications to practice*

This study breeds important insights for practitioners. We show that managers should be aware of the fact that each situation may require a different approach, which on its turn is differently related to the organizational resource base. Sustainable competitive advantage is dependent on orchestrating resources and managing the repertoire of problem-solving approaches. We also show that routinization is not per se something that should be avoided. On the contrary, for some situations, routinization might be the most efficient solution. On the other hand, in some cases, routinization is absolutely not applicable as radical change and thus improvisation is required. In order to be able to be prepared to problems of varying complexities, managers should assess their organization's repertoire of problem-solving approaches continuously.



## Chapter 4. Integrating the notions of rules, routines and dynamic capabilities: A mediation model of their effect on exploratory innovation

**Abstract:** While the conventional view has been that routines are entrenched and unchanging patterns of activity, recent literature on routine dynamics suggests that routines undergo transformation and can be catalysts for innovation. In this article, we distinguish dynamic capabilities from organizational routines and argue that both simple rules and complex routines can be expected to have a direct effect on exploratory innovation and also an indirect effect through the mediating influence of dynamic capabilities. Time-lagged cross-sectional data provide support for the direct and mediated effects of simple rules, but the results for complex routines are more ambiguous. We discuss the study's contributions to the literature on routines and dynamic capabilities, and its practical implications.

## 4.1 Introduction

Since the seminal work of March (1991), there has been a sustained interest in understanding why firms differ in their capacity for exploratory innovation. Exploratory innovations are distinct from other types of innovation in that they refer to completely new products and services, which are developed by utilizing new technical and market knowledge. (e.g. Jansen *et al.*, 2006). While much research has been conducted with the aim of furthering our understanding of exploratory innovation, recent developments in the behavioral (e.g. Cyert and March, 1963) and evolutionary (e.g. Nelson and Winter, 1982) view on organizations have complicated our understanding of how routines and capabilities are related to exploratory innovation.

Organizational routines (from here onwards, routines) can be defined as repetitive, recognizable patterns of interdependent actions, carried out by multiple actors (Feldman, 2000), or as repeated patterns of response involving interdependent activities that become reinforced through structural embeddedness and repeated use (Gilbert, 2005). Scholars often count routines as part of the organizational resource base (e.g. Barney, 2001; Mahoney and Pandian, 1992; Peteraf 1993; Priem and Butler, 2001; Volberda and Karali, 2015; Wernerfelt, 1984) and suggest that routines are important in many different ways for organizational functioning (e.g., Feldman, 2000; Feldman and Pentland, 2003; Nelson and Winter, 1982). In particular, routines can provide reliability (Cohen and Bacdayan, 1994) and efficiency (Grant, 1996) because they allow the organization to utilize its existing knowledge. However, because routines make extensively and repeatedly use of past knowledge and associated practices, scholars have described that routines tend to reinforce themselves and become rigid, which may inhibit innovation and cause inertia (Dougherty, 1992; Gilbert, 2005; Nelson and Winter, 1982) if not timely altered (Helfat, 1998; Nelson and Winter, 1982; Sorensen and Stuart, 2000).

However, scholars have increasingly started to look at routines in different ways. In particular, routine dynamics scholars have uncovered that routines are more dynamic and diverse than previously thought (e.g. Berente *et al.*, 2016; Feldman, 2000; Howard-Grenville, 2005; Pentland *et al.*, 2011; 2012). Feldman (2000) argued that using an agency

perspective on routines enables us to see them as mindful rather than mindless. Employing this perspective, scholars have found that routines can also adapt to imperfections and that enactors of routines can utilize new knowledge to refine the routine from within (e.g. Berente *et al.*, 2016; Feldman, 2000; Feldman and Pentland, 2003), which could result in organizational change, innovation, novelty and creativity (Deken *et al.*, 2016; Feldman and Pentland, 2003; Pentland *et al.*, 2011; Rerup and Feldman, 2011; Sonenshein, 2016). In addition, as routines often span different people, professions and departments (Collinson and Wilson, 2006; Feldman and Pentland, 2003; Zbaracki and Bergen, 2010), they magnify the utilization of new knowledge production throughout the organization and catalyze synergies. Following this line of thought, routines might contribute directly to exploratory innovation because they can be the source of new-to-the firm output.

Researchers have distinguished between different types of routines, suggesting that they can vary in their complexity. Whereas routine dynamics scholars have often treated routines as complex phenomena (Feldman and Pentland, 2003; Salvato and Rerup, 2010), others have suggested that routines can vary from simple to complex (Eisenhardt and Martin, 2000; Grant, 1996; Nelson and Winter, 1982). Scholars have especially drawn attention to simple rules as a specific type of simple routines that would be less restricting managerial improvisation than more complex routines (e.g. Bingham and Eisenhardt, 2014; Di Stefano *et al.*, 2014; Eisenhardt and Martin, 2000; Peteraf *et al.*, 2013). Accepting that complex routines and simple rules can be very different from each other, and that the latter may be more in harmony with managerial action than the former, makes it plausible that especially simple rules may contribute substantially to exploratory innovation.

A third and final research stream suggests that routines are parts of a bigger whole and thus are not the sole drivers of exploratory innovation (Di Stefano *et al.*, 2014; Teece, 2012). An important part of this discussion takes place in the dynamic capabilities literature. Teece *et al.* (1997) coined dynamic capabilities as a concept that explains how routines, and other resources that are strongly rooted in the past, could be altered in order to achieve novel outcomes. Dynamic capabilities continue to be regarded as having an orientation towards strategic change (Schilke *et al.*, 2017). Following past scholars, we focus on dynamic capabilities as those capabilities that can alter an organization's resource base<sup>[1]</sup>, through

asset orchestration, to alter the way in which it makes a living (e.g. Augier and Teece, 2009; Di Stefano *et al.*, 2014; Helfat *et al.*, 2007; Helfat and Peteraf, 2009; Helfat and Winter, 2011; Schilke *et al.*, 2017; Teece, 2012). In this regard, we focus at organizational dynamic capabilities (Helfat and Winter, 2011) rather than managerial dynamic capabilities (Helfat and Martin, 2014), as the locus of change that we research resides at the organizational level. Nevertheless, also organizational level dynamic capabilities are argued to differentiate themselves from complex routines and simple rules by what Di Stefano *et al.* (2014) call coupling and decoupling mechanisms or what Teece (2012) calls semi-continuous asset orchestration. Even though it is people and the interdependent activities across people, with the management as the most important node that steer this activity (Felin *et al.*, 2012), it is an organizational change activity that the dynamic organizational capabilities we focus on set in motion (Teece, 2007; Helfat and Winter, 2011).

Whereas some scholars have argued that dynamic capabilities are some type of routines (e.g. Zott, 2003; Barreto, 2010), we explicate and focus on the difference between routines themselves and dynamic capabilities based on the definitions we utilize and the scholars we draw from, describing the latter as entities that purposefully utilize underlying routines for strategic reasons, in line with many other scholars who have suggested that dynamic capabilities are more than only routines (e.g. Augier and Teece, 2009; Di Stefano *et al.*, 2014; Galunic and Eisenhardt, 2001; Helfat and Martin, 2014; Helfat and Peteraf, 2009; Knight and Cavusgil, 2004; Teece, 2012; Zahra *et al.*, 2006).

In this study, we leverage the distinction between the concepts of simple rules, complex routines and dynamic capabilities in order to better understand what drives exploratory innovation. Building on recent work that emphasizes how human agency influences the adaptation of routines (e.g. Berente *et al.*, 2016; Deken *et al.*, 2016), we posit that both simple rules and complex routines can be expected to positively influence exploratory innovation. In line with past research, we argue that what distinguishes dynamic capabilities from routines is the deliberate utilization of routines (Helfat and Peteraf, 2009), such as for the purpose of exploratory innovation. Hence, dynamic capabilities consist of routines and their purposeful orchestration (Augier and Teece, 2009; Teece, 2012).

Subsequently, we perform a mediation analysis to test whether complex routines and simple rules drive exploratory innovation, or this effect is mediated by dynamic capabilities.

We find that there is a strong positive effect between the extent to which organizations build on simple rules and their amount of exploratory innovation, providing support for the notion that they facilitate managerial improvisation (Bingham and Eisenhardt, 2014; Teece, 2012), which on its turn is important for exploratory innovation. We only find a weak relationship, however, between the extent to which organizations build on complex routines and their amount of exploratory innovation, suggesting that complex routines play a different, less pivotal, role in exploratory innovation. Finally, we find that the deployment of dynamic capabilities is a strong driver of exploratory innovation and mediates the relationship between the extent to which an organization builds on simple rules and the amount of exploratory innovation.

Our findings suggest that simple rules and complex routines are important for exploratory innovation, but also that they might not ultimately be sufficient by themselves and thus that an overarching dynamic capability would be required for these routines to be utilized (Di Stefano *et al.*, 2014; Helfat and Peteraf, 2009; Teece, 2012). This is because exploratory innovation is complex and requires purposeful strategic activity that transcends change (Damanpour, 1988; 1991; Woodman *et al.*, 1993), be it endogenous change or change through the facilitation by guiding principles. Rather, exploratory innovation requires dynamic capabilities to bundle and direct both, tailored to an organization's need. By means of this study, we provide important insights into how simple rules, complex routines and dynamic capabilities relate to each other and how they may contribute to exploratory innovation.

## 4.2 Theoretical Framework

### 4.2.1 *Exploratory innovation*

Gaining a better understanding of how exploratory innovation can be realized is important in terms of developing our understanding of how organizations can enhance their competitive edge. Exploratory innovation is defined as a radical type of innovation that arises from utilizing new knowledge in order to develop new products and services (Benner and Tushman, 2003; Jansen et al., 2006). By pursuing exploratory innovation, organizations can radically alter the course of their organization, deviating from past paths and addressing new opportunities (Jansen et al., 2006). The evolutionary perspective on organizations (e.g. Nelson and Winter, 1982) has suggested that routines and capabilities are important drivers of innovation within organizations. However, with recent advances in research on routine dynamics, our understanding of how routines and capabilities contribute to the exploratory innovation of organizations has become more complex.

### 4.2.2 *'Traditional' research on routines*

Scholars used to emphasize the idea that routines can produce unchanging activities (Helfat, 1998) or can lead to lack of fit between an organization and its changing environment (Sorensen and Stuart, 2000), because routines are repositories of past knowledge (Nelson and Winter, 1982), and draw more from that knowledge rather than from anticipation of the future (Levitt and March, 1988). It was argued that because routines may reduce uncertainty by utilizing the knowledge an organization possesses (Becker, 2004), they may draw attention away from exploratory practices in favor of exploitative practices (Gilbert, 2005). Following this line of reasoning, routines were considered detrimental to exploratory innovation because they were thought to keep out new knowledge and block activity that might result in new products and services that would enable the organization to pursue new opportunities. Feldman and Pentland (2003) describe this stream of research on routines as 'traditional', and for the sake of clarity we adopt this terminology throughout the article.

In the traditional view, exogenous change of routines is required to ensure that the organization is adaptive (Helfat, 1998) and can stay aligned with the environment (Sorensen and Stuart, 2000). This is perceived to be rather difficult though, due to certain underlying properties of routines. Scholars have suggested, for example, that routines can be seen as a form of truce and that the fear of breaking a truce is a strong force that will prevent organizations from exogenously changing routines (Nelson and Winter, 1982). Furthermore, as routines are embedded in organizations and contexts (Howard-Grenville, 2005), past research has argued that routines can be difficult to adapt because they are self-reinforcing and often not built to be able to deal with discontinuities (Gilbert, 2005).

#### *4.2.3 Routine dynamics and complex routines*

Recently, a new train of thought has emerged that extends past research in which routines were treated mainly as structures. Scholars have reconceptualized routines as mindful complex systems that consist of mindful agents (e.g. Feldman, 2000; Feldman and Pentland, 2003; Salvato and Rerup, 2010; Sonenshein, 2016). In this conceptualization, when complex routines are repeated over and over again, agents carrying out those routines come across new information, and because they are mindful human beings who use that new information to overcome imperfections, complex routines are thus subject to ‘functional adaptation’. (Feldman and Pentland, 2003). Scholars have found complex routines to show a variety of patterns as a consequence of this adaptation process (e.g. Feldman and Pentland, 2003; Pentland et al., 2011). The implications may be that rather than being structures that eventually require exogenous adaptation from the outside, routines can also be seen as systems that change endogenously through the actions of those who enact them.

As complex routines span different people, professions and departments, they form the basis of a large part of organizational functioning (Collinson and Wilson, 2006; Feldman and Pentland, 2003; Zbaracki and Bergen, 2010). It is due to this organization-wide and boundary-spanning nature of routines that their endogenous change is a way in which organizations can adapt themselves continuously (Feldman and Pentland, 2003). Even though Pentland et al. (2011) have not found variations of complex routines to be associated with better performance of routines, they argue that this may very well have been because

the type of complex routines that were observed were prevented from changing by something external to the routine, such as rules and physical systems. Indeed, Rerup and Feldman (2011) have highlighted how routines can play an important role in organizational change by evoking change in schemata. Also, Berente et al. (2016) have described how routines can adapt to contextual changes through the change of management requirements, practices, tools and artifacts. In addition, Deken et al. (2016) have found that complex routines can be antecedents of novelty, by the engagement of their enactors in different types of routine work to either flex or stretch the routine that they enact, or by inventing a new routine that might be better able to cope with a particular situation.

Whereas often scholars emphasize the exploitative nature of routines, Cyert and March (1963) have described that distant search would follow local search in case of inertia, underscoring the potential for exploratory innovation in case agents recognize the shortcomings of local search. Since this seminal work, various scholars have indicated that individuals can engage in distant, exploratory search under various circumstances (Ardichvili et al., 2003; Lumpkin and Lichtenstein, 2005; Baron, 2006). All in all, we argue that the more an organization draws on complex routines, the more it will be related to exploratory innovation.

*Hypothesis 1a: A greater reliance on complex routines for managing the organization's business processes will have a positive influence on exploratory innovation*

#### *4.2.4 Simple rules*

The recent reconceptualization of routines has led to a wave of research on many aspects of 'dynamic routines', in which scholars have often viewed routines as complex systems. However, even though many scholars have indicated that routines can vary in how complex they are and that this has implications for the functioning of these routines, important information on the different effects of more complex and less complex routines on exploratory innovation has been overlooked. Grant (1991) highlights that more complex routines may involve many interactions between members and may require the integration



of many different ideas, skills and knowledge. Simpler routines might, however, depend greatly on a single resource, such as a highly capable individual. Cohen et al. (1996) pointed out the difference between routines that are complex in nature and those are simpler of nature, which according to the authors can be defined as rules of thumb.

Arguably, simple routines are most well known as heuristics, as named by Nelson and Winter (1982). In their seminal account, they identified the potential of simple routines to act as guiding principles for managers and to direct managerial activity towards innovation. In subsequent years, simple routines have come forward in a variety of occasions and ways. Brown and Eisenhardt (1997) have provided insights into how semistructures, as a type of simple routines, might be beneficial for organizations, by allowing managers to set responsibilities, meetings and priorities, while also allowing them to act freely. These semistructures enable organizations to ‘balance on the edge of chaos’, by allowing them to work efficiently by capitalizing on their established knowledge base, while also allowing them to maneuver dynamically (Brown and Eisenhardt, 1997). Similarly, Greve (1995) has argued that simple routines, which they call heuristics in line with Nelson and Winter (1982), can be useful for organizations, enabling them to increase their knowledge base by examining, interpreting and imitating the visible actions of competitors in situations where there is insufficient information available. Teece (2012) has focused on guiding principles as simple routines that could steer ‘creative’ acts.

Scholars have described a specific type of simple routines, called simple rules, as organizational heuristics that can aid managers in strategy-making (Davis et al., 2009; Bingham and Eisenhardt, 2011; 2014; Eisenhardt and Bingham, 2017). Simple rules, as routines that are rule-like, simple and semistructured (Eisenhardt and Martin, 2000; Peteraf et al., 2013; Di Stefano et al., 2014), make it easier for organizations to break with their past, as they provide much more room for improvisation than more complex routines (Eisenhardt and Martin, 2000). Recently, scholars have shown that, by using simple rules, organizations are able to develop novel products across different stores (Sonenshein, 2016). Even though these products shared commonalities and thus were familiar to the organization as a whole, simple rules enabled the organization to move into new directions.

Unconditional reliance on simple rules may come at a cost. Brown and Eisenhardt (1997) have argued that it is difficult to keep balancing continuously on the edge of chaos, as it requires constant managerial attention and effort to avoid an organization to fall in to too much structure or too much chaos. Davis et al. (2009) have shown that more or less organizational structure has important implications for the effect of simple rules on opportunity capture and thus that it is difficult to build or design the optimal semistructure. Besides organizational design, opportunity capture is also contingent on the alignment of the design of simple rules and the alignment with the demands of the actors who will operate within them (Strong and Volkoff, 2010). Then again, problem with misalignment or with the effectiveness of structures and systems can always arise in any part of the organization. In general, though, and *ceteris paribus*, we argue that organizations that build more on simple rules tend to display a higher level of exploratory innovation, because those simple rules are beneficial in helping them utilize new knowledge to develop new products and services.

In addition, building on the aforementioned differences between complex routines and simple rules, we argue that, within organizations, simple rules contribute more to exploratory innovation than complex routines, because they can open up more possibilities for utilizing new knowledge. Rather than only interlinking sources of knowledge and changing endogenously, simple rules strongly facilitate improvisation and hence breaking away from past paths, which we expect to more strongly benefit exploratory innovation because it is directly linked to managerial action and discretion.

*Hypothesis 1b: A greater reliance on simple rules for managing the organization's business processes will have a positive influence on exploratory innovation*

*Hypothesis 1c: Within a firm, simple rules contribute more to exploratory innovation than complex routines*

#### 4.2.5 *Simple rules, complex routines and dynamic capabilities*

Even though complex routines and simple rules might be important for exploratory innovation, recent developments in research (Teece, 2012; Di Stefano et al., 2014;

Sonenshein, 2016) have necessitated a debate regarding whether such a relationship is mediated by dynamic capabilities or is a direct one. Whereas dynamic capabilities scholars do not deny that complex routines and simple rules may matter for exploratory innovation (Helfat and Peteraf, 2009; Teece et al., 2016), their emphasis is somewhat different. Dynamic capabilities scholars emphasize that well-functioning dynamic capabilities are valuable assets for enhancing competitiveness (Helfat et al., 2007; Teece, 2007) and distinguish these from routines. Helfat and Peteraf (2009) argue that dynamic capabilities utilize routines, but that it would be hard to claim that the two are the same, as routines would lack intent. Also, Teece (2012) argues that dynamic capabilities are more than just a collection of routines or guiding principles, as routines would not have a strategic component, hinting at the lack of purposeful asset-orchestrating acts.

Recently, Di Stefano et al. (2014) described dynamic capabilities as aligned bundles of complex routines and simple rules, which were argued to together drive key organizational activities. The aligning of these complex routines and simple rules is what Augier and Teece (2009) describe as “orchestrating necessary responses to technological and market changes”. For example, an organization might face severe competition and be in need of strategic action to enhance its competitive position. By means of simple rules for playing into visible actions of competitors (Greve, 1995), an organization might sense valuable opportunities for geographical expansion, for instance (Bingham and Eisenhardt, 2011; 2014). Complex routines for tapping into internal R&D sources, and for investing in and commercializing specific products, could enable the organization to seize these opportunities and reconfigure itself accordingly (Teece, 2007). A manager then could act as an orchestrator of both types of routines. Without such orchestration, simple rules and complex routines would not be able to transform an organization.

Table 4.1: Research streams within the broader routines literature

	Traditional view on routines	Routine dynamics research stream	Dynamic capabilities research stream
Examples of characteristic research	(Hannan and Freeman, 1984; March, 1991; Dougherty, 1992; Utterback, 1994; Rumelt, 1995)	(Feldman, 2000; Feldman and Pentland, 2003; Becker, 2004; Howard-Grenville, 2005; Pentland et al., 2011; Rerup and Feldman, 2011; D'Adderio, 2014)	(Teece et al., 1997; Eisenhardt and Martin; Helfat et al., 2007; Teece, 2007; Helfat and Peteraf, 2009; Teece, 2012; Peteraf et al., 2013; Di Stefano et al., 2014)
Ontological point of departure	Behavioral theory of the firm, evolutionary theory of the firm, population ecology of organizations	Behavioral theory of the firm, evolutionary theory of the firm, social practice theory	Behavioral theory of the firm, evolutionary theory of the firm, industrial economics, organization theory, resource-based view
Dominant view on routines	Routines are structures	Routines are complex, agentic and dynamic systems	Routines are the building blocks of capabilities
Emphasis in relation to innovation	Routines can lead to inertia and may need to be changed timely	Routines can display variety and endogenous change and can lead to novelty and creativity	Routines can lead to change and innovation by being part of dynamic capabilities.
Empirical focus on	Organizational change, innovation and performance	Routine stability, variation and change	Antecedents and consequences of dynamic capability deployment

Although complex routines can, as explained, also bring about changes in how an organization operates without being part of dynamic capabilities (e.g. Rerup and Feldman, 2011), by producing variations of themselves (Pentland et al., 2011) and through endogenous change (Berente et al., 2016), the purpose of these routines in such cases is not to produce variations of themselves or to change themselves. Nor is it to drive exploratory innovation. Rather, complex routines serve their own specific functions, such as governing budgeting or hiring processes (Feldman and Pentland, 2003). Change that originates from the recurrence of complex routines is thus an unintended consequence of the enactment of those routines, which arises from the mindful actions of those who are carrying out the routines and act upon the imperfections that they encounter (Feldman, 2000). The change therefore lacks

intent at the organizational level (Helfat and Peteraf, 2009) and is non-strategic (Teece, 2012), even though it is mindful and might be intentional at the individual level. Similarly, simple rules might steer managerial improvisation (Bingham and Eisenhardt, 2014) and lead to ‘familiar novelty’ (Sonenshein, 2016), for example, but their goal is not to produce exploratory innovations. Rather, it is to support managers in making decisions that require a greater level of improvisation, but these decisions may have nothing to do with exploratory innovation and thus might also lack the purpose of producing exploratory innovations in particular.

The absence of purpose in the change that might stem from complex routines and simple rules is an important point, as scholars have argued that change is different from innovation in that innovation requires purpose whereas change does not (Damanpour, 1991). As Woodman et al. (1993) describe, ‘although organizational change can include innovation, much of organizational change is not innovation’. In this understanding, for routines to be direct antecedents of exploratory innovation, organizations would need purposeful exploratory innovation routines and rules. However, Teece (2012) argues that change is difficult, if not impossible, to routinize intentionally, and indicates that many strategic actions and transformations are non-routine. At the same time, scholars suggest that dynamic capabilities are purposeful and are argued to be particularly important for innovation (Helfat et al., 2007; Helfat and Peteraf, 2009; Teece, 2012; Teece et al., 2016).

We argue that complex routines and simple rules are important for exploratory innovation by being utilized by dynamic capabilities (Helfat and Peteraf, 2009). In line with Di Stefano et al., (2014), we contend that dynamic capabilities add purpose to simple rules in the sense that they are directed towards facilitating decision-making with regard to exploratory innovations. Similarly, we argue that dynamic capabilities utilize complex routines by directing them towards the enabling of desired innovations. When effectively deployed, dynamic capabilities will ensure that an organization is able to sense new knowledge, seize the opportunities that come out of the sensing process and finally reconfigure its organizational assets in accordance with the opportunity that was seized. This way, dynamic capabilities can pave the way for the development of new products and services as they enable breaking free from past paths and processes (Teece, 2007). The

composition of the routines that are utilized by dynamic capabilities will determine the way in which the deployment of dynamic capabilities will manifest itself (Di Stefano et al., 2014; Eisenhardt and Martin, 2000). While complex routines will provide the reliability and detail that some aspects of dynamic capability deployment require, simple rules will facilitate the improvisation of managers, through which they can utilize past knowledge to develop new products and services (Bingham and Eisenhardt, 2014; Di Stefano et al., 2014; Eisenhardt and Martin, 2000). In the end, even though complex routines and simple rules are both important for exploratory innovation, we argue that their importance is contingent on being part of an overarching dynamic capability that utilizes them for exploratory innovations.

*Hypothesis 2: The more an organization deploys dynamic capabilities, the higher the level of exploratory innovation*

*Hypothesis 3a: The positive relationship between the extent to which an organization relies on complex routines and its level of exploratory innovation is mediated by the deployment of dynamic capabilities within the firm.*

*Hypothesis 3b: The positive relationship between the extent to which an organization relies on simple routines and its level of exploratory innovation is mediated by the deployment of dynamic capabilities within the firm.*

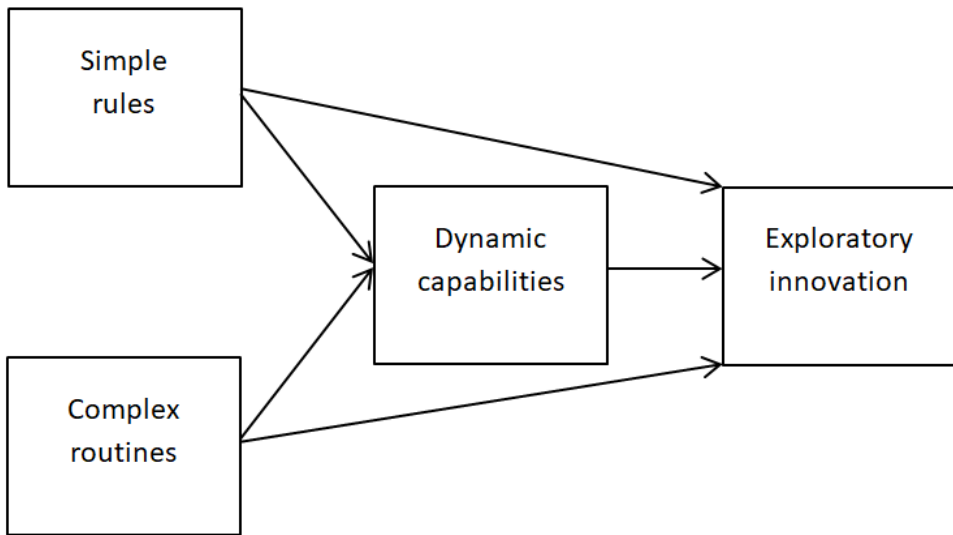


Figure 4.1: Theoretical Framework

## 4.3 Data and methods

### 4.3.1 Data

We employed a survey approach in order to obtain the data that we required for our analysis. In 2014, we randomly selected 5,000 companies from the Dutch Chamber of Commerce and sent these companies the questionnaires that form part of our survey. We were able to receive responses from 387 respondents for 2014, giving us a response rate of 7.74%. From the same 387 respondents, 82 responses were retrieved by means of a follow-up study in 2015. Eventually, we were able to build a model with a one-year time-lag for 82 respondents. This means that we were able to analyze 164 observation points.

The data were collected from respondents across different industries, varying from construction and commerce to financial services and transportation, in order to have a sample that would be representative of different types of sectors with differing characteristics. We split these sectors into four broad categories: construction, manufacturing, services, and other industries (Alexiev et al., 2010).

We sent out questionnaires to employees in management positions who were expected to be capable of enlightening us about the company's situation with respect to the environment it operates in, its routines, organizational change and its innovativeness. To prevent any social desirability biases we assured our respondents that they would remain anonymous (Fischer, 1993). Items that we developed went through various iterations with peers and were pretested with managers who were expected to be similar to our respondents. This pretest round led to a considerable change in our formulation. In order to make our sample as representative as possible, we approached organizations with only a few employees as well as organizations with over 100,000 employees. Similarly, the age of the organizations ranged from two years to 147, indicating that we were covering both start-ups and incumbents. The average age of the organizations in our sample is 52.32. Comparing the mean of the constructs across responses from the first respondents and comparable second respondents gave us confidence that our first respondents were representative of the organizations for which they were responding.

The number of respondents in our study reflects the organizations in 2014 for which we have been able to infer data regarding our independent and control variables, and for which we were able to gather data in 2015 regarding our dependent variable. A temporal split between the years of data collection reduces concerns over reverse causality compared to datasets in which the data that are collected in the same year (Delgado-Garcia and Fuente-Sabaté, 2010; Oli et al., 2014; Simsek and Heavey, 2011). In our case, we collected the dependent variables in the first year and the independent variable in the second year. This enables analysis to go beyond merely associating variables that have been collected in the same year. Also, the time lag reduces potential issues with single informant bias in various ways (Podsakoff et al., 2003). First, the saliency of retrieval cues provided by the context is reduced, lessening the bias that can arise during the retrieval stage. Secondly, the respondents' ability to use answers from the previous year in answering questions the next year can be reduced. Finally, in the response reporting stage, bias is reduced as respondents were not able to access previous answers and thus could not draw on those.



### 4.3.2 *Independent and mediating variables*

Our *simple routines* variable refers to the extent to which an organization builds on simple routines. The items for this construct were self-constructed, based on the descriptions by Eisenhardt and Martin (2000) and Bingham and Eisenhardt (2011, 2014), and can be found in the Appendix. The articles were examined thoroughly in order to understand the construct's core idea. This appeared to be that *simple routines* should be 'guiding principles' that channel action and are 'simple' and 'generic' in nature. We developed a two-item scale that captures this core idea. These items were measured using a seven-point Likert scale. The corresponding Cronbach's alpha is 0.72.

Our *complex routines* variable reflects the extent to which an organization builds on complex routines. The items for this construct were self-constructed, based on the traditional definition of routines provided by Feldman and Pentland (2003). The items can be found in the Appendix. We have tried to grasp the core idea of complex routines, namely that they should be 'complex' and 'detailed'. We developed a two-item scale with which we sought to capture this core idea. These items were measured using a seven-point Likert scale. The corresponding Cronbach's alpha is 0.81.

Our *dynamic capabilities* variable reflects the extent to which an organization deploys dynamic capabilities. While complex routines will provide the reliability and detail that some aspects of dynamic capability deployment require, simple routines will facilitate the improvisation of managers, through which they can utilize past knowledge to develop new products and services. This variable was also self-constructed and can be found in the Appendix. In defining the construct, we followed the definition by Helfat *et al.* (2007), being 'the capacity of an organization to purposefully create, extend, or modify its resource base'. To measure the degree to which an organization deploys dynamic capabilities, the components we identified were 'the capacity to continuously reconfigure the resource base' and the ability to 'successfully adapt these resources recurrently in order to address current demands'. We developed a four-item scale, with which we tried to capture the definition of dynamic capabilities. These items were measured using a seven-point Likert scale. The corresponding Cronbach's alpha is 0.81.

### 4.3.3 *Dependent variables*

As explained, our dependent variable is exploratory innovation. We chose to align our scales with those of Jansen et al. (2006, 2008), given their seminal work on quantifying and establishing exploratory innovation as a dependent variable. We also think that the definitions put forward in these studies are in line with those used in more recent studies on exploratory innovation.

Jansen et al. (2006, 2008) argue that exploratory innovations are radical innovations and address the needs of new customers and markets, as they bring forward new designs, create new markets and develop new channels of distribution. They argue that exploratory innovations do this by utilizing new knowledge and departing from existing knowledge. Of the six items put forward by Jansen et al. (2006, 2008), we selected four which we believed would be sufficiently representative of the definition provided by both articles (see, Items) and we tested the reliability of our exploratory innovation construct. The corresponding Cronbach's alpha is 0.79.

### 4.3.4 *Control variables*

We control for environmental competitiveness so as to account for the effect of the extent to which an organization's environment is characterized by intense competition, on its structure and strategies (Jansen *et al.*, 2006). Zahra (1996) pointed out the impact that organizational competitiveness has on R&D intensity and innovative output among others, forcing organizations to explore. Grant (1996) has argued that increased competitiveness forces organizations to be more efficient and effective. Similarly, Jansen *et al.* (2006) find that increased environmental competitiveness is associated with an increase in exploitative behavior. As such, competitiveness has been shown to have an important effect on organizational choices and characteristics. Our environmental competitiveness scale is based on items from Jansen *et al.* (2006). The corresponding Cronbach's alpha is 0.90.

In addition to environmental competitiveness, we control for firm size so as to incorporate the fact that larger companies may be inclined to pursue more exploitative types of innovation, than smaller companies, as has been argued by Benner and Tushman (2003) and supported by Uotila *et al.* (2009), for example. Firm size is measured as the number of

employees that work within the company. We log-transform this variable in order to find a better approximation of the normality condition of the ordinary least-squares (OLS) method.

The age of the companies in our dataset is also used to control for the fact that firm age may have an impact on the extent to which simple routines are developed and embedded in the design of the organization. Helfat and Peteraf (2003) described the development of capabilities, pointing out the time dimension involved. It may also be that firms in the growth stage tend to favor exploratory types of innovation, whereas those that have reached maturity are more inclined to pursue exploitative types of innovation (Lumpkin and Dess, 2001). Furthermore, Sorensen and Stuart (2000) indicate that aging is related to increasing rates of innovation, but also to increasing difficulty in keeping pace with external developments. Once again, we log-transform the 'age' variable so that it fits better with the conditions in which OLS works best.

We control for organizational slack (Cyert and March, 1963; Bourgeois, 1981; Singh, 1986; Yanadori and Cui, 2013) using an item in which we ask respondents whether or not their organization has large financial reserves. In the first place this is to control for the various effects slack may have, such as increasing R&D intensity (Greve, 2003), which might drive up exploratory innovation, or such as encouraging greater risk-taking (Singh, 1986; Nohria and Gulati, 1996). Secondly, slack signals the past performance of organizations; a high level of slack, for example, is indicative of previous strong performance (Cyert and March, 1963; Singh, 1986). Finally, since there are many different kinds of slack, the relationship between slack and innovativeness can be either positive or negative, depending on the particular situation (Nohria and Gulati, 1996; George, 2005).

We also incorporate the revenue growth over 2014 as a control variable in order to control for possible effects of revenue growth in that year on exploratory innovation in 2015. Even though slack is associated with revenue growth, we believe that the overlap is minimal in our case, because the size of financial reserves would most likely be attributable to revenue growth prior to 2014. Thus, we believe that revenue growth over 2014 is an important addition to the list of control variables.

Finally, we control for industrial sector effects using four dummy variables, dividing our sample into the following categories: construction, manufacturing, services, and other industries. This we do to isolate substantial industry-specific effects on the level

of innovativeness (e.g. Kochar and David, 1996), but also to see for ourselves how a seemingly more dynamic industry, such as services, might compare with one that might appear less dynamic, such as construction.

As the Cronbach's alpha of our constructs goes beyond the 0.70 (e.g. Nunnally, 1978) threshold, the results have been satisfactory in terms of agreed-upon reliability standards.

#### 4.3.5 *Method*

When analyzing the hypotheses we applied Baron and Kenny's (1986) methodology in order to execute a mediation analysis correctly. We first looked at the relationship between the independent variables and the dependent variables, thus 'simple routines' and 'complex routines' as independent variables and 'exploratory innovation' as a dependent variable, using regression analysis. Next, we looked for the relationship between the independent variables and the mediating variable, 'dynamic capabilities'. After all, mediation could only occur when this relationship is significant. Lastly, we analyzed the effects of the independent variables together with the mediating variable. Regression analysis was executed using OLS. We employ this method on a database that includes a one-year lag. As outlined earlier, the data collection for our independent variables was carried out a year before the collection for the dependent variable, which helps us to better deal with biases and enables us to infer causality better than would have been possible using cross-sectional datasets.

At the end of our results section, we present additional analyses. First, we cover recent suggestions and practices regarding the use of bootstrapping techniques, to produce confidence intervals that allow for a more theory-driven evaluation of mediation analysis (Zhao *et al.*, 2010; MacKinnon *et al.*, 2012; Oli *et al.*, 2014). Secondly, we re-do our analysis using only our 2014 sample in order to see whether the results remain similar with a bigger sample.

#### 4.3.6 *Analysis*

We tested our constructs for common method bias and found that this was not of concern. Specifically, we performed Harman's one-factor test using the items in our model.

If common method bias was present, we would expect a single factor to account for more than 50% of the variance in the variables included in our model (Podsakoff and Organ, 1986). Using Harman's one-factor test, we find that the first factor explains only 36% of the variance and thus there are no indications of common method bias.

Continuing our analysis, we performed confirmatory factor analyses for our independent and mediating variables. We found that simple routines, complex routines and dynamic capabilities load separately on different factors, suggesting that these three theoretically distinct constructs are also distinct enough in our sample for analysis. The factor loadings are in line with current standards and can be found in the Appendix. With regard to the variance extracted, we find AVE scores that range between 0.52 and 0.81, which is in line with recent research. Dividing chi-squared by degrees of freedom results in a score of 2.142, which is also in accordance with what scholars suggest as acceptable. The corresponding NFI and CFI scores are .93 and .96 and are in line with current standards. In addition, the highest shared variance among constructs, which is calculated by squaring the inter-construct correlations, is below the recommended threshold of 0.50. Also, factor analysis did not reveal any other potential latent variables.

We have tested for non-response bias by analyzing whether the responses from early respondents for our independent and mediating variables differed from those of late respondents (Armstrong and Overton, 1977). For the sake of this analysis, late respondents were assumed to be similar to non-respondents. An independent samples t-test for variables such as firm age, firm size and our independent variables has enabled us to conclude that non-response bias is not of concern.

## 4.4 Results

In this section, the results of the data analysis will be described step by step. First, we look at the relationship between complex routines and simple rules on the one hand, and exploratory innovation on the other. Then, for the independent variables that display a strong relationship with the dependent variable, a mediation analysis will be presented.

Table 4.2 presents descriptive statistics and shows the correlations for the variables used for this study. Most outcomes were as expected. A notable outcome is that the correlation between complex routines and simple rules is weakly negative, which might indicate that, in line with Di Stefano et al. (2014), complex routines and simple rules have different functions and thus are not necessarily two ends of a spectrum, nor do we claim them to be. We did not find outcomes that led us to suspect multicollinearity. Nevertheless, we tested for multicollinearity among the variables by calculating variance inflation factors (VIF) for each of the regression equations. The highest VIF score was 1.82, which according to previous suggestions indicates that there is no problematic multicollinearity (Neter et al., 1990).

Table 4.2. Correlation table

No	Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10
1	Exploratory innovation	4.57	1.30	1.00									
2	Environmental competitiveness	5.02	1.38	.27	1.00								
3	Firm size <sup>a</sup>	4.22	1.73	-.11	.00	1.00							
4	Firm age <sup>a</sup>	3.55	1.01	-.13	-.20	.54	1.00						
5	Revenue growth in %	5.10	1.34	.20	.15	.19	-.08	1.00					
6	R&D intensity	2.51	5.48	.17	.08	.28	.09	.30	1.00				
7	Slack	4.47	1.88	.05	-.05	.19	.28	.24	.17	1.00			
8	Simple routines	4.83	1.28	.32	.12	-.16	-.05	.27	.16	.02	1.00		
9	Complex routines	4.34	1.36	-.11	.04	.16	.10	-.04	-.00	.08	-.09	1.00	
10	Dynamic capabilities	4.43	1.03	.62	.26	-.03	.00	.39	.25	.09	.36	.14	1.00

Correlations equal to or larger than |0.24| are significant at the  $p < 0.05$  level, and correlations larger than |0.28| are significant at the  $p < 0.01$  level.

a) Log-transformed

From here onwards we will discuss the regression analysis: First the models relating to exploratory innovation, then the mediation analysis.

Table 4.3 shows the models that are used to assess the relationship between complex routines, simple rules, dynamic capabilities and exploratory innovation. The regression output from model 1 contains our baseline model, with solely our control variables. The directions of the relationships are largely as expected. We find strong support for a positive relationship between environmental competitiveness and exploratory innovation ( $p = 0.005$ ), indicating that with increasing levels of competitiveness, exploratory innovation becomes more relevant and is therefore pursued more often. Of the industries that we control for, we have taken the services industry as our reference category, because it is known to be a relatively innovative industry and thus is expected to stand out. We observe that, compared to the services industry, the construction industry in particular engages in considerably less exploratory innovation ( $p = 0.005$ ).

In model 2 we introduce the variables 'simple rules' and 'complex routines' to determine to what extent these variables are related to exploratory innovation. Also, we seek to compare the strength of these relationships. Thus, we are using model 2 to test hypotheses 1a, 1b and 1c. We find strong support for simple rules having a positive effect on exploratory innovation ( $p = 0.003$ ), whereas we find complex routines to have a very weak negative effect on exploratory innovation ( $p = 0.590$ ). Our findings support hypotheses 1b and 1c, which suggested respectively that building more on simple rules is positively related to exploratory innovation and that simple rules would have stronger effect in facilitating exploratory innovation. We do not find support for hypothesis 1a, which suggested that organizations that build more on complex routines would display more exploratory innovation.

Prior to performing a mediation analysis, we needed to examine whether there is a strong relationship between the deployment of dynamic capabilities and the amount of exploratory innovation within organizations. In model 3, we found a strong positive relationship between the two variables ( $p < 0.001$ ), which indicates that the deployment of dynamic capabilities is strongly related to exploratory innovation. As we have found that both building on simple rules and deploying dynamic capabilities are strongly related to exploratory innovation, we pursue with reporting our results for the mediation analysis. We



do this only for simple rules, as we did not find complex routines to have a strong direct effect on exploratory innovation and mediation analysis would thus be meaningless. To see whether the exploratory innovation is driven mainly by simple rules, or by the deployment of dynamic capabilities, in model 4 we assess what happens when we put ‘simple rules’ and ‘dynamic capabilities’ into the same model. We can infer from model 4 that ‘dynamic capabilities’ still display a strong relationship with ‘exploratory innovation’ ( $p < 0.001$ ), whereas the effect size of the ‘simple rules’ variable is considerably weaker ( $p = 0.089$ ). According to Baron and Kenny (1986), such a strong jump in effect size provides support for the presence of a mediation effect. More precisely, it provides support for the idea that the extent to which organizations deploy dynamic capabilities has a strong mediating effect on the relationship between how much those organizations build on simple rules and their level of exploratory innovation.

	Exploratory Innovation	Exploratory Innovation	Exploratory Innovation	Exploratory Innovation	Dynamic Capabilities	Dynamic Capabilities
Variables*	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Environmental competitiveness	0.305*** (0.106)	0.296*** (0.100)	0.149*** (0.093)	0.161* (0.092)	0.201*** (0.074)	0.195*** (0.073)
Firm size <sup>a</sup>	-0.123 (0.101)	-0.028 (0.101)	0.001 (0.088)	0.033 (0.089)	-0.098 (0.073)	-0.114 (0.073)
Firm age <sup>a</sup>	0.124 (0.175)	0.060 (0.167)	-0.065 (0.151)	-0.074 (0.149)	0.197 (0.124)	0.203 (0.122)
Revenue growth	0.097 (0.119)	-0.027 (0.120)	-0.101 (0.106)	-0.139 (0.107)	0.165* (0.087)	0.175** (0.085)
R&D investments (% of revenue)	0.036 (0.029)	0.027 (0.028)	0.009 (0.025)	0.007 (0.025)	0.029 (0.020)	0.031 (0.019)
Slack	-0.036 (0.081)	-0.036 (0.077)	0.002 (0.069)	-0.004 (0.068)	-0.044 (0.057)	-0.052 (0.056)
Industry dummy for construction	-1.448*** (0.505)	-1.820*** (0.497)	-0.950** (0.434)	-1.212** (0.454)	-0.931** (0.352)	-0.954*** (0.347)
Industry dummy for manufacturing	-0.553 (0.393)	-0.636* (0.374)	-0.488 (0.330)	-0.546 (0.327)	-0.239 (0.272)	-0.283 (0.269)
Industry dummy for rest	-0.550 (0.356)	-0.446 (0.343)	-0.693** (0.300)	-0.640** (0.298)	0.190** (0.246)	0.115 (0.246)
<b>Hypothesis Testing</b>						
Simple routines		0.353*** (0.115)		0.185* (0.107)	0.253*** (0.086)	0.256*** (0.084)
Complex routines		-0.054 (0.099)				0.129* (0.072)
Dynamic capabilities			0.730*** (0.134)	0.645*** (0.141)		

Table 4.3. Regression table. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

#### 4.4.1 Additional analyses

In line with recent academic suggestions and developments, we have ran additional tests of our mediation model by using bootstrapping, in order to provide a more subtle analysis than could be provided by relying on partial or full mediation cut-off points, as suggested by Baron and Kenny (1986) (Zhao et al., 2010; MacKinnon et al., 2012). Following Preacher and Hayes (2008), we obtained a 95% bias corrected confidence interval with 5,000 bootstrap samples. We find the confidence intervals that we depict below. As can be seen, these intervals do not cover '0', providing additional support for our hypothesis that the relationship between the extent to which organizations build on simple rules and their

amount of exploratory innovation is mediated by the extent to which they deploy dynamic capabilities.

Table 4.4. Bootstrapping

	Indirect effects of simple routines on exploratory innovation			
	Effect	Bootstrap standard error	Bootstrap LLCI 95%	Bootstrap ULCI 95%
Indirect effect of simple routines on exploratory innovation	0.1699	0.0690	0.0519	0.3367
Partially standardized indirect effect of simple routines on exploratory innovation	0.1401	0.0582	0.0224	0.2551
Completely standardized indirect effect of simple routines on exploratory innovation	0.1690	0.0682	0.0493	0.3244

Besides bootstrapping, we have performed several additional analyses to further examine the nature of the relationship between complex routines and exploratory innovation. We have seen that there is not a strong direct relationship between making more use of complex routines and the amount of exploratory innovation. We attempted to see whether building on complex routines within organizations does significantly and positively relate to the extent to which those organizations deploy dynamic capabilities. A strong positive effect could indirectly indicate that complex routines still contribute to exploratory innovation, be it only by providing the foundations of dynamic capabilities. We observe in model 6 that there is a weak, yet notable positive relationship between the extent to which organizations build on complex routines and the extent to which they deploy dynamic capabilities ( $p = 0.076$ ). We thus do find some weak support for the indirect contribution of complex routines to exploratory innovation. As complex routines and simple rules seem to both contribute to exploratory innovation, this finding provides support for the notion that both concepts may not be two ends of a spectrum.

Finally, we checked whether our results would remain the same if we re-did our analysis on the data that were acquired from our sample of 387 companies for 2014 only. Even though this means that we lose the benefits of a time-lagged analysis, it allows us to conduct an analysis on a larger sample. The variable ‘exploratory innovation’ from our 2015 sample is highly correlated with the variable ‘exploratory innovation’ from our 2014 sample ( $p < 0.001$ ), which makes us believe that this analysis can prove valuable in reinforcing the strength of our findings. We find results that are similar to ones from our main analysis.

## 4.5 Discussion and conclusions

This study delves into how complex routines, simple rules and dynamic capabilities relate to exploratory innovation. Traditional research argued that innovation stemming from routines that are repositories of past knowledge (Nelson and Winter, 1982) would be incremental of nature because routines were considered to be self-reinforcing and to be minimally departing from existing practices (Damanpour, 1988; Gilbert, 2005). Consequently, in this view, it was not deemed plausible that routines themselves could be a source of exploratory innovation. Dynamic capabilities scholars argued that instead, these routines would need to be purposefully utilized and orchestrated (Helfat and Peteraf, 2009; Teece, 2012; Di Stefano et al., 2014). After all, innovation is a purposeful activity and dynamic capabilities are similarly regarded as purposeful (Damanpour, 1991; Helfat and Peteraf, 2009). However, recently scholars have suggested that routines can also by themselves contribute to exploratory innovation (Feldman, 2000).

To investigate this quantitatively, in this study we have researched how complex routines (Feldman and Pentland, 2003; Salvato and Rerup, 2010), simple rules as a specific type of simple routines (Di Stefano et al., 2014; Peteraf et al., 2013), and dynamic capabilities (Helfat et al., 2007; Teece, 2007; Helfat and Winter, 2011) relate to exploratory innovation. Complex routines are argued to contribute to new outcomes because they can change endogenously through the utilization of new information obtained from various people, spanning professions and boundaries (Collinson and Wilson, 2006; Feldman and Pentland, 2003; Zbaracki and Bergen, 2010), and simple rules are argued to contribute to

exploratory innovation because they can facilitate decision-making without these decisions being much constrained by previous paths (Bingham and Eisenhardt, 2011; 2014; Teece, 2012; Sonenshein, 2016). We first tested whether the extent to which a firm relies on complex routines or simple rules in bringing about exploratory innovation. Subsequently, we tested whether any effects found would be mediated by the extent to which organizations deploy dynamic capabilities.

Our findings suggest that both complex routines and simple rules can be important for exploratory innovation. We find two indications for this. Firstly, simple rules display a strong positive relationship with exploratory innovation. Scholars have argued that simpler routines can operate as guiding principles for entrepreneurial and managerial acts and decision-making (Eisenhardt and Martin, 2000; Nelson and Winter, 1982; Teece, 2012; Sonenshein, 2016). Our finding supports the notion that even though simple rules do guide managers, they restrict their actions only to a small extent and thus allow them to utilize new knowledge to deviate from past paths, which can then translate into exploratory innovations.

Secondly, even though we do not find a strong relationship between reliance on complex routines and exploratory innovation, we do find a noteworthy positive relationship between reliance on complex routines and the deployment of dynamic capabilities. The latter on its turn is strongly and positively related to a firm's exploratory innovation. The absence of a direct relationship support the line of thought of Di Stefano et al. (2014), who put forward in their organizational drivetrain metaphor that routines have different functions. They describe how complex routines represent the way that decisions, that have been facilitated by simple rules, are put into actions that are interdependent and are carried out by multiple actors (Feldman and Pentland, 2003). We help to generate a better understanding of the role that complex routines play in exploratory innovation by showing that, even though such routines might not contribute directly to exploratory innovation, there is some evidence to suggest that they may do so indirectly through being utilized by dynamic capabilities.

Our findings also show that the effect that a firm's reliance on simple rules has on exploratory innovation is mediated by the firm's deployment of dynamic capabilities. With this finding we shed light on an important issue in the strategic management literature regarding how rules, routines and dynamic capabilities collectively relate to exploratory

innovation. Our finding is in line with past suggestions, in that we find that dynamic capabilities are based on routines, but are at the same time more than only routines (e.g. Helfat and Peteraf, 2009; Teece, 2012; Di Stefano et al., 2014; Teece et al., 2016). Scholars have suggested that the change that dynamic capabilities evoke is purposeful and strategic, whereas that of routines is not (Helfat and Peteraf, 2009; Teece, 2012). The latter does not mean that routines are not mindfully enacted. Rather, it means that organizational change that stems from endogenous routine change is not purposeful and strategic of nature, but is a byproduct of the recurring enactment of the routines. Similarly, simple rules are not exploratory innovation rules, but are rules supporting particular activities in dynamic circumstances (Bingham and Eisenhardt, 2011; 2014). Hence, for exploratory innovation, scholars suggested that both complex routines and simple rules need to be orchestrated by dynamic capabilities (Di Stefano et al., 2014; Teece, 2012), because innovation is a purposeful activity (Damanpour, 1991). Our results combine both lines of thought as we show that even though dynamic capabilities are the main drivers of exploratory innovation, simple rules and complex routines contribute to exploratory innovation via dynamic capabilities.

Together, our findings indicate that there are important differences between simple rules, complex routines and dynamic capabilities. This study adds to past research that has sought to tease out the differences between these concepts (e.g. Teece, 2012; Di Stefano et al., 2014). Dynamic capabilities scholars suggest that innovation stems from a purposeful act of utilizing routines to reconfigure organizational resources (e.g. Helfat and Peteraf, 2009; Di Stefano et al., 2014). Endogenous change of routines lacks purpose in that this type of change, and the change that it might cause within the organization, is an unintended consequence of their ongoing performance and their corresponding functional adaptation (Feldman and Pentland, 2003). Even though our research has not shown there to be routines that are specifically focused on exploratory innovation, we have nevertheless found that routines are important for exploratory innovation, via dynamic capabilities, as we find evidence of the organizational drivetrain of Di Stefano et al. (2014). We find that simple rules are strongly related to exploratory innovation and complex routines are also related, albeit to a lesser extent. We argue that this is due to the fact that simple rules are more strategic whereas complex routines are more operational of nature (Teece, 2012; Bingham

and Eisenhardt, 2014). Specifically, whereas simple rules facilitate the actual decision to engage in exploratory innovation, complex routines merely operationalize this decision (Di Stefano et al., 2014) and are thus important, yet less decisive.

#### *4.5.1 Managerial implications*

Our research has a number of key implications for managers. Exploratory innovation is an important way in which organizations can enhance their competitive edge. We have highlighted the importance of intent and purpose in producing exploratory innovation. Even though routines have been found to contribute to exploratory innovation, it is the purposeful utilization of routines that has been identified as being decisive, and this is thus what managers should pay careful attention to in strategy-making. That being said, exploratory innovation also requires managers to design and manage the routines through which dynamic capabilities function. Simple rules, used to guide managerial decision-making, have been found to make a greater contribution to exploratory innovation than complex routines that enable the decisions made to be put into operation. In the end, our research shows that exploratory innovation success depends on both the maintenance and utilization of routines.

#### *4.5.2 Limitations and suggestions for further research*

In conducting this research to the best of our ability, we have nevertheless encountered some limitations. Even though we employ a one-year lagged dataset and thus avoid many of the disadvantages of cross-sectional datasets, we suggest that it would be valuable for this study to be replicated using panel data in order to acquire further insights into the longitudinal effects of routines and capabilities on innovation. Because routines and capabilities are shaped and change over time, panel data could provide very useful insight into how routines and capabilities develop, and what different effects may be found at various stages in this process (Helfat and Peteraf, 2003). We also have not studied the relationship between simple and complex routines because this was beyond the scope of this paper. However, future research on whether these two types of routine are synergistic or entirely parallel to each other could help sharpen our knowledge regarding the relationship

between routines and innovation. Finally, even though we have provided some insight into how routines, dynamic capabilities and exploratory innovation relate to one another, we have not been able to delve into the great dynamics that these constructs might display in real life, and unraveling this might require research with a more qualitative approach.

This research first provides fertile ground for further research on how simple rules and complex routines contribute to organizational innovativeness. Many aspects of the relationship between simple and complex routines and exploratory innovation need further study. Future research should look, for example, at the boundary conditions of relying on simple rules and complex routines. For instance, when should we favor one type of routine over another, and in what circumstances is it better to abandon routines altogether and switch to ad hoc problem-solving (Winter, 2003)? Our research also draws attention to the need for a better understanding of how dynamic capabilities contribute to innovativeness. We have shown that dynamic capabilities subsume simple rules to produce exploratory innovations. However, is it possible that with less complex innovations, such as exploitative innovations, dynamic capabilities might not mediate the effect of complex and simple rules? Once again, we call for further qualitative research on dynamic capabilities, that specifically delves deeper into how simple and complex routines are utilized in the production of exploratory innovations. With concrete qualitative examples, we might be able to understand more clearly how the organizational drivetrain operates (Di Stefano et al., 2014), how dynamic capabilities utilize routines in practice (Teece, 2012), and what the role of the manager is in dynamic capabilities (Helfat and Martin, 2014). Finally, we would like to once more emphasize the importance for strategic management of having a better understanding of routines and dynamic capabilities. Many of the actions of organizations rely on routines and capabilities, which makes a partial understanding of these concepts troublesome for management and strategy-making. That being said, scholars have been able to throw considerable light on the routines-innovation relationship substantially over the past few years, and through this research we seek to join these scholars in contributing to a better understanding of why organizations perform as they do.



## 4.6 Notes

[1] Even though dynamic capabilities are also known to be able to change the external environment or organization strategy (Schilke et al., 2017), this is beyond the focus of our paper.

[2] Scholars have suggested that dynamic capabilities can be deployed effectively or ineffectively (Eisenhardt and Martin, 2000). Possessing a dynamic capability is thus not a guarantee for success. Effective deployment of dynamic capabilities means utilizing their potential well, in order to reconfigure organizational resources.

## 4.7 Appendix: Confirmatory factor analysis and Items

Constructs and items (seven-point Likert scale)	Standardized factor loadings*
<b>Dynamic capabilities (Helfat et al., 2007; Helfat and Winter, 2011): AVE 0.52, HSV 0.254</b>	
Our company is always able to adapt to its environment.	0.618
Our company is successful in adjusting business processes to environmental needs.	0.567
As the environment changes, the routines in our company undergo transformation.	0.852
If the environment requires it, we are open to restructuring our company.	0.808
<b>Reliance on simple routines (Eisenhardt and Martin, 2000; Bingham and Eisenhardt, 2011;2014): AVE 0.75, HSV 0.127</b>	
A hallmark of our company is that decisions and actions are guided by general rules rather than detailed instructions.	0.947
To steer our employees, we mostly rely on broad guidelines rather than elaborate rules and regulations.	0.779
<b>Reliance on complex routines (Feldman and Pentland, 2003): AVE 0.81, HSV 0.038</b>	
For managing our business processes, we have elaborate formal routines in place.	0.895
Adherence to well-established rules and procedures is sacrosanct for executing business operations.	0.904

**Dynamic capabilities (Helfat et al., 2007; Helfat and Winter, 2011): Cronbach's alpha 0.81**

Our company is always able to adapt to its environment.

Our company is successful in adjusting business processes to environmental needs.

As the environment changes, the routines in our company regularly undergo transformation.

If the environment requires it, we are open to restructuring our departments.

**Reliance on simple rules (Eisenhardt and Martin, 2000; Bingham and Eisenhardt, 2011;2014): Cronbach's alpha 0.72**

A hallmark of our company is that decisions and actions are guided by general rules rather than detailed instructions.

To steer our employees, we mostly rely on broad guidelines rather than elaborate rules and regulations.

**Reliance on complex routines (Feldman and Pentland, 2003): Cronbach's alpha 0.81**

For managing our business processes, we have elaborate formal routines in place.

Adherence to well-established rules and procedures is sacrosanct for executing business operations.

**Slack (Greve, 2003; George, 2005): HSV 0.06**

Our company has ample financial reserves to pursue new opportunities.

**Environmental competitiveness (Jansen et al., 2006): Cronbach's alpha 0.90**

Competition is intense in our local markets.

Our organization has relatively strong competitors.

Competition in our local markets is extremely high.

Our market can be characterized by price competition.

**Exploratory innovation (Jansen et al., 2006; 2008): Cronbach's alpha 0.79**

We frequently pursue new opportunities.

We often go beyond existing products / services.

We often experiment with new distribution channels.

We frequently commercialize products/services that are completely new.

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## Chapter 5. Environmental variation, contextual constraints and routine dynamics: Professional identity as a source of oscillation

**Abstract:** We examine how, in the face of contextual constraints, environmental variation affects the patterns of interdependent actions, carried out by multiple actors, of which a routine is constituted, by executing an ethnographic case study in a leading hospital in the Netherlands. Under financial, formal and physical setting constraints, the diagnosis routine that we observed displayed patterns of *oscillation*, by shifting between states of expanded and contracted sets of interconnected performances. Specifically, during moments of peak patient influx, the professional identities of nurses spawned actions to maintain the level of patient care quality stemming from the diagnosis routine's enactment. These actions were subsequently ceased during off-peak periods. We observe the importance of empathy in triggering this dynamic pattern. We discuss how routine oscillation differs from routine

## 5.1 Introduction

The dynamic way in which organizational routines can be enacted has been researched from a variety of angles, since the seminal article of Feldman (2000). This has resulted in an understanding of routines as patterns of interdependent actions, carried out by multiple actors (Feldman and Pentland, 2003), that can vary and change over the course of time, due to, for instance, reflective talk (Dittrich, 2016), artifacts (d'Adderio, 2008; Glaser, 2017), or as a response to inertia (Yi et al., 2016). As routines are highly embedded in their contexts (Becker, 2004; Feldman and Pentland, 2005), much research has addressed the extent to which the performances of routines are affected by a routine's context. For instance, Howard-Grenville (2005) describes that a context might shape the performances of a routines and might influence the adoption of new practices to a routine. D'Adderio (2014) shows how the context plays an important role in the transfer of routines and their post-transfer enactment. Also, Bertels et al. (2016) describe that organizational culture can provide a toolkit by means of which the performances of routines can be altered.

Despite this attention to the relationship between routines and their contexts, further clarity on how contextual constraints might have bearing on organizational routines has yet to be provided. Contexts provide a 'lexicon of possible actions' (Pentland et al., 2012, p. 1493) and constrained environments might thus lessen the choice set of actions via, for instance, constraining adaptation (Howard-Grenville, 2005) or change (Pentland et al., 2011). However, a smaller choice set does not necessitate stability or inadaptability, if the choice set of actors remains large enough and if there is a big enough pressure for them to spur routine dynamism. As a matter of fact, scholars have shown that resource-constrained actors can bring forward novel solutions by exploiting inputs that are ignored by actors that might have access to more resources (Baker and Nelson, 2005; Desa and Basu, 2013). Others have shown that resource constraints might trigger team creativity (Rosso, 2014). As scholars have pointed at the importance of adaptability and change under environmental conditions that vary (Sorensen and Stuart, 2000; Raisch and Birkinshaw, 2008), we believe that the tension between stability and dynamism within routines is greatest in those settings in which actors are bound by contextual constraints, yet are also repeatedly experiencing

varying environmental conditions that magnify the continuous need for different enactment of routines to match such change.

To address the research question of how routines might be differently enacted under changing environmental conditions in constrained contexts, we carried out an ethnographic case study (Obstfeld, 2012; Danner-Schröder and Geiger, 2016) focused on the “acute cardiac complaints” care cycle, an administrative path of various treatments a patient passes through during the treatment that transcends specializations (Porter and Teisberg, 2006; Kaplan et al., 2014), of a leading hospital in the Netherlands. Within this care cycle, we observe the “diagnosis routine”, comprising the process by means of which a patient is diagnosed through analyses and diagnoses by various medical personnel. The context in which this routine is enacted, is on the one hand characterized by financial constraints (Hoegl et al., 2008), formal constraints (North, 1994) and physical setting constraints (Robertson et al., 1993), and on the other hand by a continuously varying patient inflow, in terms of frequency of change, degree of difference and degree of irregularity, on the other hand, representing environmental variability (Child, 1972).

Drawing from the insights we have obtained from our research, this paper introduces the notion of routine oscillation to capture the continuous and specific shifting of a routine between states of expanded and contracted sets of interconnected performances underpinning this routine. We ascribe the extended state of the routine that we examine to nurses’ professional identities that spawned additional behavioral actions during peak periods of patient influx, compared to off-peak periods, as the consequences of contextual constraints became more visible in these situations. Consequences manifested predominantly as longer waiting times, which led to a reduced quality of care provision. To enhance care quality, nurses tried to align the treatment routine’s enactment with what was espoused (Bertels et al., 2016), via two types of actions. Maintaining actions had as a goal the maintenance of a routine’s performance by aiding those enacting the routine, whereas sustaining actions had as a goal the sustaining of a routine’s performance by aiding those affected by a routine’s performance. The contracted state was enacted during off-peak periods, as nurses ceased the additional actions they performed, in the absence of the context’s constraining influences on the routine’s enactment and hence, care quality. We

find that particularly nurses' empathizing with patients is an important source of routine oscillation, as empathy seems to trigger their maintaining and sustaining actions under situations of decreased quality of care provision.

By highlighting that during situations in which the consequences of contextual constraints become more visible, actors' professional identities (Ibarra, 1999; Chreim et al., 2007) may spawn responses that have bearing on the performance of routines, our study provides new insight into routine dynamism and to the routine dynamics literature. Firstly, we contribute to the routine dynamics literature by describing a phenomenon, namely routine oscillation, which is substantially different from our current understanding of routine variation and change. Routine oscillation entails the temporary expansion and contraction of the pattern of actions that constitute a routine, in the face of events that require adaptation. Being a rather different manifestation of routine dynamism than documented in past research, routine oscillation proves to be an important means for constrained organizations to maneuver in environments that display great amounts of variation and require adaptation. Secondly, we add to our understanding of the sources of routine dynamism, by showing that professional identities can be the source of dynamism in the patterns of actions that constitute a routine, when the beliefs, goals and values that underpin them (Ashforth et al., 2008) are triggered. Finally, we underscore the importance of empathy, as the ability to listen to, understand and share the feelings of others (Nadler and Tushman, 1990), in triggering the dynamism of routines. In this study, empathy has come forward as a way in which actors can connect with those that are affected by the outcome of routine enactment. In line with scholars who have stated that behavior, obligations and sensemaking are influenced by one's professional identity (Cornelissen, 2012; Fagermoen, 1997; Leavitt et al., 2012), empathy was found in this study to be the channel through which actors' professional identities were triggered and the dynamism of routines was spurred (Bertels et al., 2016).



## 5.2 Theoretical framework

Organizational routines make up important parts of organizational processes. Scholars have defined routines as the building blocks of organizations (Becker, 2008). More concretely, routines can be defined as repetitive, recognizable patterns of interdependent actions, carried out by multiple actors (Feldman and Pentland, 2003) or as repeated patterns of response involving interdependent activities that become reinforced through structural embeddedness and repeated use (Gilbert, 2005). Thus, routines consist of multiple actors that carry out actions that are interdependent and shape patterns that are recognizable as being routines. Furthermore, these routines become reinforced because they recur and because they are embedded in a particular structure, such as a physical space.

Routine dynamics scholars have argued that routines consist of two parts, being actions of mindful agents (performative aspect of routines) and the enacted abstract pattern (ostensive aspect of routines) (Feldman and Pentland, 2003; Feldman et al., 2016). Scholars have, in drawing from practice theory, argued that any practice is, to some extent, novel and that any enactment of a routine is thus an occasion for variation (Bourdieu, 1977, 1990; Feldman and Penland, 2003; Feldman et al., 2016). Through the retention of certain variations, routines can change endogenously (Feldman and Pentland, 2003; Feldman et al., 2016). This understanding has spurred research on the antecedents of dynamism in routines (e.g. Lazaric, 2008; Deken et al., 2016; Dittrich et al., 2016) and the consequences of such dynamism for, in particular, organizations (Rerup and Feldman, 2011; Sonenshein, 2016). An important aspect of this research has been to see under what conditions routines tend to be stable or dynamic (Feldman et al., 2016).

Routines are embedded in a particular context (Feldman and Pentland, 2003; Gilbert, 2005) and scholars suggest that this embeddedness stems from three types of specificities, being local, historic and relational specificities (Becker, 2004). Contexts have a material aspect, such as the physical space and the artefacts with which actors interact (d'Adderio, 2008; 2014) as well as an immaterial aspect, such as culture (Bertels et al., 2016). A context provides complementarities (Becker, 2004) and especially the utilization of social practice theory (e.g. Feldman and Orlikowski, 2011) has led to a more fine-grained

understanding of how routines may be related to different contexts. We have come to understand that practices can vary across recurrences (Pentland et al., 2011), because stability and change are tightly interlinked with each other (Farjoun, 2010) and because in the end, the actions of the enactors of routines are dependent on the context in which they are situated (Becker, 2004; Feldman and Orlikowski, 2011). Routines scholars have for example indicated that routines are able to adapt to contexts, as they can never be entirely pre-specified and hence, actors need to improvise in order to match contextual conditions (Feldman and Pentland, 2003). Scholars have subsequently shown that routines can be designed in such ways that they can provide space for novelty by playing into these contextual idiosyncracies, while allowing for the efficiency of pre-specification (Sonenshein, 2016).

Of particular interest in this regard has been research on how contextual constraints might affect the way in which routines are performed. For example, Howard-Grenville (2005) has observed that contextual constraints relating to technology in use, pattern of coordination and culture, might constrain the ability of a routine to adapt. Pentland et al. (2011) have found that formal constraints, such as rules, laws and constraints (North, 1994), might prevent the retention of routine variations and thus, might prevent routine change. These findings are in line with other literatures' prescriptions on the potential drawbacks of contextual constraints. Some scholars have argued that resource constraints could harm innovativeness (Holmstrom, 1989) and the seizing of growth opportunities (Bottazzi et al., 2014). Others have indicated that bureaucracy might, for example, hamper the utilization of obtained knowledge (Teece, 2007). However, only few studies have addressed the other side of the medallion.

Literature in other fields of inquiry also indicate, however, that the counterintuitive, thus that constraints might spark dynamism, is far from impossible. Scholars have shown that financial resource constrains can act as a stimulus to innovation success and to resource reconfiguration (Hewitt-Dundas, 2006). Baker and Nelson (2005) point at bricolage as means by which under resource constraints, new outcomes can emerge by making use of the available tangible and intangible resources. Desa and Basu (2013) come up with a similar finding in the context of globalization. Also, Rosso (2014) has taken a more neutral take on

the influence of constraints on creativity, by describing that constraints can both hamper and structure creative processes, elucidating that moderate levels of constraints might actually be more facilitative to creativity than the absence of constraints. Hence, other literatures show that individuals might respond in creative, novel and innovative ways to constraints in order to circumvent any damage that might come from abiding to such constraints.

Scholars have repeatedly pointed at the important role of the environment in pressuring organizations, and thereby also the actors that together constitute these organizations, to, for instance, adapt or change the way in which they operate. Sorensen and Stuart (2000) for example highlight the importance of organizational adaptation for maintaining fit with the environment. In addition, Song and Montoya-Weiss (2001) describe that organizations respond to technological uncertainty, by adapting their new product development processes to the degree of uncertainty faced, to “optimally and effectively utilize their firms’ skills, resources and competencies” (p. 75). Also, Voss et al. (2008) indicate that organizations adapt to the environment, by adjusting their levels of exploration in the face of environmental threats. Finally, Kozhikode (2015) points out that some organizations choose to respond to detrimental public policy by temporarily adjusting activities, anticipating on a retraction or adjustment of such a policy. So, we see that many studies have addressed how organizations and the individuals that constitute these organizations might respond to changes in the environment, in order to prevent losses, maintain fit and to sustain their position within an industry.

Drawing from previous research, in this study we aim to unravel what the influence of contextual constraints is on the patterns of actions that constitute routines, in the face of changing environmental conditions.

## 5.3 Methods

### 5.3.1 *Research setting*

As indicated, in this study, we strive to add to the current understanding on the relationship between the enactment of routines and their contexts (e.g. Howard-Grenville,

2005; d'Adderio, 2014). For this purpose, we draw from a case of care cycle restructuring in a leading hospital in the Netherlands, as patient processes have been an exemplary setting for inquiry into routines and dynamism (Patton, 2002; Bucher and Langley, 2016). The hospital employs around 4200 people, excluding an amount of approximately 300 specialists, and possesses more than 400 beds and 10 surgery beds. The hospital is part of an alliance with another, sizable hospital in the area. Together, the hospitals obtained 420 million euros of revenue over 2015.

Our subject of inquiry is the care cycle of acute cardiac complaints (ACCs). A care cycle is at a level of observation that transcends departments and is argued to be more effective for policy-making as treatments only seldomly stay within the boundaries of only one department (Porter and Teisberg, 2006). Care cycles in this regard connect multiple departments for treatment purposes (Porter and Teisberg, 2006; Kaplan et al., 2014). For example, a patient with a fracture will need to be seen by different nurses and doctors across different departments for the treatment to be possible. ACCs are, similar to the definition, complaints that most likely stem from conditions related to the heart and which are seemingly acute of nature.

In our hospital, the former care cycle can be characterized as follows. Firstly, patients entered the Emergency Aid department at the first floor in three ways: after being forwarded by the general practitioner, being brought-in by ambulance, or as a self-referral. The patient was supposed to take a seat in the waiting room. Then, at the EA department, these patients were invited to the triage room, where nurses would diagnose to what illness group a patient's complaints belonged, after which the patient again had to take place at the waiting room until a nurse would come and take the patient to a free bed at the EA department. In case complaints were cardiac of nature, the patient would become part of the ACC health care cycle. Nurses would take blood samples and take an ECG clip, through which heartbeats are monitored. When results would come back, doctors would analyze these results alongside insights from and discussions with nurses and cardiologists. In any case, this patient was sent home if the complaint was not terminal of nature. In cases that the patient was fine, there was no need for the patient to remain at the hospital. However, if the preliminary data happened to be inconclusive and further analyses were desired, the patient

had to make an appointment with the outpatient clinic at the 3rd floor after her stay, causing delays in diagnostics and treatment.

In 2011, the ACC healthcare path experienced a notable change. As the hospital wanted to compete better with other hospitals on care quality and wanted to accommodate the rise in patient influx, it decided that the cardiac specialization should be taken apart from the EA department. From this moment onwards, patients were going to be treated at a new cardiac center to which all former EA activities were transferred. This center was called the cardiac first aid (CFA) center and was installed just next to the space in which the coronary care unit (CCU) was already situated, at the 8th floor. At the CCU, patients that require monitoring as a consequence of their conditions are admitted and observed following diagnosis.

The CFA center was going to allow patients to remain at the hospital for additional analyses, in contrast to the former care cycle, where patients had to go home first and could only return at the date of the new appointment. Also, CFA nurses follow an education that is tailored to the cardiac specialization. Thus, they were argued to be more competent in dealing with patients with ACCs. The hospital expected in addition that a CFA would lead to an increased amount of patients, as it would signal higher care quality to new patients, favorably affecting patients' choices. The CCU unit on its turn would continue to allow patients that needed monitoring for longer periods of time, the time and care they would need.

At the moment of installment, the hospital faced financial, formal and physical setting constraints, which limited the way in which the CFA was installed, in terms of its capacity to handle peak-moment patient influx. An important consequence was that the care cycle change was going to be active only between 8.00 and 17.00. Outside of these hours, the former care cycle would still be operational and patients would still be sent home after a round of diagnostics at the EA. The CFA would also have only 4 beds, limiting the amount of patients that simultaneously could be admitted by the CFA. In addition, both the CCU and the CFA were going to be handled by one physician only, leading to a situation in which the physician would have to switch continuously. As the influx of patients unpredictably shifted between peak and off-peak moments, which could not be predicted either, these

constraints placed a notable burden on the enactors of the diagnosis routine, which drew our attention.

Thus, whereas the installment of CFA centers is an embraced trend within hospitals in the Netherlands, our case is peculiar in the sense that the CFA center was installed under the aforementioned contextual constraints, not allowing for an espoused enactment of routines despite a document which prescribes such an enactment. We believe that this case provides great insights on how contextual constraints can affect the way in which routines are enacted, under constantly unpredictably changing environmental conditions. In specific, we focus on the diagnosis routine, which succeeds patient admission and marks the “patterned activities set in motion” (Bucher and Langley, 2016, p. 597) between the beginning and the end of a diagnosis process. Such a routine comprises the patient data retrieval, patient data examination, discussion of results, and communication of results. These activities are patterned and repetitive and are dependent on multiple actors’ enactment, being the nurses, physicians-in-training [PiTs] and the cardiologists. Hence, the diagnosis routine that we examine is in line with the generally embraced definition in routines research (e.g. Feldman and Pentland, 2003; Feldman et al., 2016; Bucher and Langley).

### *5.3.2 Data collection*

We firstly performed an ethnographic approach as we wanted to fully extract the richness of the interactions and processes at our setting, to unravel what people do and what it means to them (van Maanen, 2011). This approach consisted initially of a familiarization phase, consisting of visiting the hospital regularly to get acclimatized to the fact that it is a unique organization, and archival data gathering, to understand the actual setting in which the hospital was operating. Subsequently, we observed the actions and interactions of people that were part of the care cycle and joined their meetings. In addition, we sought to go beyond what we could infer from just our observations and informal conversations. For this purpose, we conducted both semi-structured and fully structured interviews, to complement the data we gained from participant observation, as is common in case study research (Yin, 2009). Thus, in line with past research, we employed an ethnographic case study approach to

combine our rich observational data with interview and archival data (Obstfeld, 2012; Danner-Schröder and Geiger, 2016).

This study primarily centers itself around approximately 103 hours of observations over the course of 23 days. On average, observations lasted for 5 hours a day. An even larger amount of days of presence, spread over two years in the two centers at the cardiology department and the EA department. We chose for this option because of the nature of our case. First of all, hospitals are diverse types of organizations, in the sense that besides being organizations, their business is focused on the treatment of patients. Thus, many practices have a medical component that is hard to grasp by merely asking about. One needs to experience practices as they flow, rather than by asking about these practices, to also not needlessly long occupy the time of those responsible for taking care of peoples' lives. We particularly ensured blending in to the department and being unobtrusive. Blending-in was done by joining coffee breaks and lunches and by often engaging in small talk. Being unobtrusive was possible by minimally interfering with practices and by being basically invisible by properly choosing the place of observation.

The first author often attended the hospital for a full CFA day shift, which was between 08:00 and 15:00, which allowed him to capture all of the dynamics within a shift. Other days, he observed while he was there for interviewing people. It was made known to the employees that the first author would be visiting the department for research regarding the CFA center and thus not regarding the patients, so that nobody felt at ease the moment he arrived. During observations, nurses were allowed to interact with him to make the observations feel natural and the first author also regularly engaged in informal conversations (Spradley, 1979). However, the first author interacted formally only when he really needed a clarification. The observer took extensive, time-stamped notes to be able to reconstruct the days of observation. Any note-taking that was not time-stamped and thus was not part of reconstructing the day, was followed-up by transferring notes into electronic documents and providing relevant context, within 24 hours (Emerson et al., 1995).

To complement observational data, the first-author has interviewed 25 people within the care cycle that were representative of the various professional groups, so as to illuminate what could not have been observed and partially to confirm or reject images that

the researcher constructed based on observations. The different groups that have been interviewed are physicians, nurses, department managers and a general coordinator. Interviews were held by the observer in order to make the interviewees feel at ease. In addition, prior to each interview the interviewer conveyed that questions did not target people, but targeted the CFA. This was, once again, done to make interviewees feel at ease. Interviews were conducted after extensive observation and thus were highly informed, minimally straining the time of medical staff.

Interviews were broadly held in three phases and were semi-structured to ensure flexibility in questioning and responses. In the first phase, questions were asked on pre-defined potential avenues of interest, which completely came forward from the observation phase. These were: choices, decisions, emotion, management of logistics, management of the department, prioritization, spaces and transfer of patients. In the second phase, the first author asked questions about understanding, emotions and satisfaction as these seemed to be topics that were raised and felt to be important, both from the observation phase and the interview phase. Questions were neutrally stated, not making the interviewee act differently than they would. In the third round, the first author ensured that final blind spots were addressed, mainly in relation to identity, emotion and the relationship of these concepts to behavior. As can be seen, we iterated through several stages for theoretical insights to emerge (Charmaz, 2006; Locke, 2001).

Observational and interview data were complemented by archival data and visual data. With this we mean first of all news report regarding developments in the Dutch healthcare sector, the hospitals in geographical proximity and the CFA. In addition, we mean internal documentation regarding the CFA, as well as pictures and videos that depict the shape of and the artifacts hung and used at the department. Information regarding performances and understandings of routines were inferred from informants' accounts and the observations of daily enactment of the routine at hand (Pentland and Feldman, 2005; Bucher and Langely, 2016).



## 5.4 Results

We begin reporting our results by highlighting the rationale behind the initiation of the CFA. We will show that the idea behind the CFA is patient comfort, quality of care provision and smoothening operations. Then, we will highlight that we observed three types of constraints under which the diagnosis routine was being enacted and will describe the implications that these constraints had on the routine's enactment. Most importantly, we will explain that the implications of these constraints were that the CFA was not able to accommodate patient influx during peak periods, leading to the jamming of patient turnaround. This led to an expansion of the interdependent activities that together constitute the diagnosis routine, to accommodate this peak-period influx. In specific, nurses actively reminded physicians of certain activities and pushed them to do them in a particular order as soon as possible. In addition nurses comforted patients by assuring them that the department did what it could. Hence, nurses seemed to respectively maintain and sustain the diagnosis routine under continuously varying environmental conditions. We trace this behavior of nurses back to their professional identities, which seemingly prescribe them to observe patients and ensure provision of a certain level of care quality. We continue our findings by discussing the importance of empathy. We have found that the actions that constituted the diagnosis routines contracted again whenever the level of patient influx or occupation decreased. As the diagnosis routine's pattern of actions continuously shifted between two states, we present a case of routine oscillation.

### *5.4.1 Rationale behind the initiation of a Cardiac First Aid center*

The replication of the diagnosis routine was set in motion by three people: a healthcare manager, a medical manager and a manager of the cardiology department. In line with the archival documents that suggest that the CFA was installed in order to enhance patient care quality, nurses underscore the importance of the CFA for patients, as it can fasten the care process, make it more convenient and of quality.

“I think, in general, when everything goes well, it is more comfortable for the patients. Some patients that come frequently know us and know the doctors, which is also comfortable. But especially that the process can go quickly. Then we can also look at whether the patient has to stay. The patient can then stay here or can go to the CCU. Or, the patient is allowed to go home and then the patient goes home from here.”

Another nurse explains the care benefits of the new setting as follows:

“There is a room where you can better monitor patients than you would have been able at the EA. Also, sick patients can be directly transferred to the CCU”

Again, a different nurse adds the following regarding the benefits of an optimally working CFA:

“When it would work as it should work, it would be very good for evaluating. It works, [as in these cases] the right doctor with the right knowledge discusses directly with the cardiologist, because of this you skip the EA and you can directly execute other analyses such as the biking test and an echo (...)”

#### 5.4.2 *Financial constraints*

Even though the benefits on paper of the CFA center were clear, the context in which it would be installed and operated was equally important. The medical manager of the time in which the diagnosis routine was replicated, who currently is a cardiologist, explained us the financial conditions under which the replication took place:

“(...) we had one problem, since we cannot do it 24/7 because of logistics, we should hire an extra assistant [PiT] and we cannot afford this. So we are open from 8:00 to 18:00. This is disadvantageous to our CFA.”

The cardiologist highlighted the financial situation at the department also from a different angle:

“Well you know who the people are. So, you could want all different kind of things but you also have to be realistic. When I only have 10,000 euros, and I want to buy a car, I know I won’t be able to buy a Rolls-Royce. So you could imagine things but I have been medical manager for years and I always looked with the operational manager at what is realistic. When we thought we had good arguments we put them on paper and went for it. With the CFA we actually wanted it [to be open] 24/7, but the directors didn’t want to pay for it and we neither, so then it ends.”

Financial constraints are, aside from the limited availability of funds, partly also the consequence of the pluralistic nature of the hospital, which complicates the expenditure of available funds. During an observation, on Thursday April 21<sup>st</sup>, at 10:48, we come to find out the possibility for alleviation of the pressure on doctors via the employment of nursing specialists, who would have more qualifications than nurses and thus would be able to make decisions, which would otherwise have to be taken by the doctor. We ask about the possibilities for utilizing such an initiative during a meeting with the current manager of the CCU and CFA, to which the manager responds by saying that she is aware of this, but that:

“this would be on my account”

As she is financially responsible for nursing and doctors are organized in a ‘company’, initiatives concerning the nursing staff would be on her account. She continues explaining the situation as follows:

“As doctors do not want to pay for such measures, neither will I by myself”

Hence, pluralism limits the accessibility of certain available funds.

### 5.4.3 *Formal constraints*

Besides financial constraints, our data also revealed the importance of formal constraints within the setting that we have been observing. As a cardiologist indicates:

“If you see the rosters, then they’re just covering well. But people just fall out. People get sick, have private problems, people get pregnant, and that is especially our problem.”

Thus, we observe and are told that, in addition to aforementioned issues, it has been the arrangement regarding what would happen in case of the absence of colleagues that often preventing the department from working optimally. In addition, the cardiologist also pointed us at another form of formal constraint that has been important for the amount of doctors that the department employs, as follows:

“We are for a big part dependent on the stream that comes from Medicine. That whole stream of doctors that do the most of the work, that is part of Medicine. (...) That is centrally governed.”

Should there have been sufficient funds, then still, the department is tied by the amount of students the medical school could provide at the moment a hospital would need it.

#### *5.4.4 Physical setting constraints*

Nurses and physicians have indicated that they are constrained in their possibilities by the physical setting at the cardiology department. A cardiologist explains that simply, in order to accommodate the peak influx of patients, the CFA is in need of more beds, especially without them going at the cost of the CCU and thus, leading to cannibalization.

“The expectation is that the patient stream is definitely going to get larger. Based on that, I would say that the amount of beds is definitely too little. Ideally, I would have liked to have more beds without them going at the cost of the CCU (...) but there is physically no space anymore to place additional beds.”

And as another cardiologist explains, it is not about having beds themselves available, but rather having the space to place a bed in, together with the required equipment:

“Beds there are plenty of, [so] that is not the problem.”

Thus we see that the CFA department faces financial, formal and physical setting constraints. The next section describes the manifestation of these constraints during peak moments of patient influx.

#### 5.4.5 *Environmental variation and consequences of contextual constraints*

Amidst contextual constraints, patient influx is highly unpredictable. As a cardiologist describes:

“I do have the impression that for example on Monday it is more. We have taken track of this some time ago, but I have been away for some time now. But then there were fluctuations and then we had the feeling that it was more on the Tuesday and the Monday afternoon. But one day you have ten patients and the other day three, and then you hear nothing in the morning and then they all come in the afternoon. It is not a continuum flow. That is the difficulty.”

An important consequence of the contextual constraints under these varying environmental conditions that the department faces is the absence of more physicians. In our meetings with the manager of the cardiology department, it becomes clear that financial constraints restrict additional staffing of especially physicians. A PiT described how this impacted her.

“The past two months, I was at the department by myself. It then easily happens that they ask too much from you. A second assistant [PiT] is in my opinion necessary to deliver good care.”

In addition, on various occasions have observations showed that the absence of more physicians places a cap on patient turnaround. As can be read from an observation on Friday, 20<sup>th</sup> of November, 2015:

PiT says, to a nurse, that four patients is the max, but 5th is already accepted and now there is also a call about the 6th. The nurse defensively says 'but it is full', meaning that it is the duty of the CFA to admit another patient because the EA is full, to which the doctor replies with 'did you check whether it is really full?', meaning that the PiT suggests that the EA is perhaps lying. It seems that the PiT is saying this in an attempt to dodge having to answer the ethical aspect of the question. The nurse replies by saying 'well, I trust them on their word'. She says this in a slightly cynical tone and seemingly can't believe the doctor's question. (...) I'm now alone, the PiT says. She continues by saying: if there was another doctor, it wouldn't have been a problem. (...). The nurse replies, assuringly, by saying: "if 1 person leaves, we'll have more room". Doctor is silent for a bit, after which she says 'no we do not actually' in a correcting and slightly cynical way (implying that if someone leaves, they would still be stuck with 5 patients, which is beyond the cap of 4 CFA patients). Nurse eventually says "you're right, I won't take-in anyone anymore", clearly relieved that the discussion is over.

The shortage of doctors has major implications for the way in which the diagnosis routine functions. A PiT explains the consequences for her working:

"It is difficult, because you have to do the visitations as usual. You saw me do the visitations and if there are patients at the CFA, if patients then come in for the CFA, then you see them too, so you have to decide what you are going to do first and what is more urgent. And when things jam, you also have to do the supervision at the end of the morning. If it goes well with a patient, then things go well, but when things do not go well, then patients stick around."

And as a cardiologist sheds lights on how he experiences the fact that the department has often only one PiT:

"I am convinced [that it is a reason for delays]. For both the CCU and CFA patients it gives delays. We have ... (pauses) ... sometimes we see it at the

transfer of patients already, before we even arrive at the CCU, so when we are downstairs. We see that ‘this’ patient can go home, but then a doctor needs to go past there to explain things and make a plan for the future, but if there is a constrained capacity, then sometimes patients at the CFA get priority, and then it can be that a patient waits for hours on a bed without it being necessary.”

As said, the physical setting constraints at the cardiology department limited the amount of beds that could be put to use. Physicians argued that the current amount of beds is sub-optimal in the current fashion. A cardiologist describes the joint implications:

“I think that there should be 6 beds. (...) often it is that at 11 AM you already cannot get rid of your patients. Then you have from 8 AM to 11 AM, 3 hours of a day. Then, from 11 to 18, you have to tell no to all patients.”

So, amidst financial constraints, the CFA operates only between office hours and with a shortage of personnel and with only 4 beds. The fact that physicians have to switch between departments and the low capacity of the CFA combined often lead to longer dismissal times for current patients, as aforementioned, but also a rejection of new patients. A nurse describes the process as follows:

“So, we call the EA before any patients arrive and tell them that we are full and that the next one is for them. So, if I then get an announcement, then I call them to tell that we are full and the next one then should end there. And in these cases it is first come, first served.”

As another nurse fills in the blanks on the consequences of a ward that is too full:

“Especially if there is only one doctor, the ward is full and the patients do really need attention, then I will ask the doctor if he is able to see the patient. So in fact we are, I think, all willing to see extra patients. However, we can also say no occasionally, because if we would have done it, the quality would have gone down badly. That is something we do not want,

because we want to deliver quality at any time. In that case the patient is better off at the EA.”

Thus, we see that, during peak moments of patient influx, contextual constraints often result in the jamming of the patient turnaround, causing massive delays in patient diagnosis and treatment, leading to a lower quality of care in the ACC care cycle.

#### 5.4.6 *Reactions to the jamming of the diagnosis routine*

The jamming of the diagnosis routine led to strong reactions among patients. We observed that nurses started to complain about the length of waiting lists. Partly, this was the case because nurses compared enacted patterns of actions with an espoused pattern of action. This means that nurses have their own understandings of how long a patient maximally should be at the department, indicating their espoused diagnosis routine. As one nurse describes:

“(…) you know, you just want someone to give a plan within 2 hours. That is I think also what a goal from a CFA is.”

And as another nurse describes:

“We strive to have the whole policy ready between 4 and 6 hours.”

When a patient stays for too long, we found that nurses start to feel uncomfortable and complain to their peers, but also to the observer, about the situation at the department. This has two components to it. On the one side, patients complain and nurses have to deal with these patients. As a nurse explains her experience:

“So I just told to that person. ‘How long?’ they ask. ‘2 hours?’ he says. I tell that I hope so (starts laughing loudly, I join). That, they already perceive as quite long, so there things already start to play. Then you start thinking, ‘oh my, what is this going to turn out to be’.”



On the other side, nurses themselves get irritated by the idle time a patient spends at a department. As another nurse describes her discomfort with this situation:

“[...] the doctors still have not been there and all the patients are still lying there.

Nurses got quite disturbed by the long waiting duration of patients and reacted strongly whenever asked about how they felt about this situation at the department. One nurse says:

“I feel embarrassed for the hospital that things take so long”

And as another nurse points out:

“You would almost start apologizing to patients that things take so long”

#### 5.4.7 *Professional identity of nurses*

Compared to other people working at the hospital, the nurses share the longest time with the patient and consequently are most aware of how patients are affected by any imperfections in their treatment. Physicians only see patients for short conversations or for communicating decisions, whereas nurses are involved in admission and providing care during the complete length of a patient's stay. As a physician describes, this is inherent to the professions and the division of tasks across these professions:

“At the CCU/CFA, on average, there will be 4 to 5 nurses and only one PiT. Because of this, it is not possible for the PiT to spend the same amount of time with the patients as nurses are. Besides that, we need to find out what is wrong, evaluate results, request analyses, discuss with the cardiologists and if needed, with other specialists. That costs a lot of time.”

As a cardiologist explains:

“It is purely logistics. I would rather be closer to the patient. (...) You’ll probably have seen that there are 6 nurses walking around and only one doctor. And those nurses than have 1 or 2 patients, and the doctor has all of them. Then you have to spread your attention and that means that you have less time per patient.”

As a nurse describes their profession:

“We are an observing profession. When I go to a patient, I also look at what the non-verbal appearance is and then you also ask about the complaints, then I ask it verbally. And if you treat people for a longer time, you also see whether someone becomes livelier or gloomier”

During our observations and interviews, we found that an important aspect of this identity is empathizing with patients and ensuring their well-being:

“Yeah (interrupts me), I do look at that, whether they have enough pillows or have a headphone. Sometimes you forget, but I try to pay attention to that. These are important things, that you feel comfortable and that there is attention to it”

And as two other nurses explain:

“You need to have empathy, I think, and you need to have understanding for people, be able to weigh the situation, you shouldn’t be judging.”

“Empathy, patience, ability to live into someone else’s feelings are very important. We have to cope here with patients that are terrified because they also come with infarcts. So it is really feeling. Feeling and patience.”

In our observations, we also come across the following case that is exemplary for the way in which nurses focus on patient well-being and the quality of care. An anecdote from our observations on the 1<sup>st</sup> of March, 2017, is as follows.

At 09.12:

‘Heart monitor alarms a couple of times after each other. Two nurses call with the department that is responsible for a check. Apparently, it is also the reason for the patient being admitted to the department’.

Then, at 09.16:

‘Patient monitor alarms again, so the nurse tells the reason also to the doctor and that has been called to the responsible department.

At 09.22:

‘Heart monitor keeps on alarming (VT). Nurses keep on going hence and forth to mute alarms’.

Then, finally, at 09.27:

‘CFA representative has arrived. CCU manager has introduced me to her and she agrees with an interview. She tells me that she is going to check her mail and that we can after that proceed with our interview. Funny that also she directly asked about the ongoing VTs, what it is all about’.

Indeed the way in which nurses describe how they feel regarding patients’ experience of the jamming of the department has much resemblance with the very meaning of the word empathy. For example, a nurse explains her feelings towards the jamming of the diagnosis routine, which is a feeling that many nurses voiced throughout our research:

“Well, I also often perceive this as frustrating.”

Another nurse describes her feelings regarding the jamming of the evaluation routine:

“I find this very troubling, especially towards my patient. And it becomes sometimes unpleasant saying ‘I still cannot tell you anything because I am dependent on the doctors and the feedback’. So that is frustrating indeed when they lay down for a long time and I do not think that this has to be.”

Also, when we ask about how a nurse feels regarding the delays of the diagnosis routine, she responds as follows:

“I think it is irritating. Especially for the patient.”

Such empathizing, we discovered, resulted in different ways in which nurses can, and do, play into the patient turnaround pace of the department.

#### 5.4.8 *Empathic actions – Maintaining the routine*

One type of actions, which we label as ‘maintaining’, are actions from nurses towards the physicians, to maintain the quality of care via maintaining alignment of the performance of the routine with what is espoused. Nurses can, for instance, ask doctors why things are taking so long. They can do so for fastening analysis of blood results and for fastening the process of contacting the cardiologist for a definite decision regarding the patient. As nurses explain:

“(…) I always tell that I think it is really irritating and then I try to ask the doctor like ‘why does it take so long?’ “

And another nurse describes this process by saying:

“You try to ask the doctor ‘hey, can you speed it up?’ “

It can even go one step further, in the sense that nurses can map the situation of a patient and of the department, to ease the physician’s decision-making.

“You can play into this as a nurse by of course mapping the story, warning the doctor, you of course have waiting times of the lab for which you have to wait anyway. So you can, as a nurse, bring all those things in motion.”

And as comes to the forefront during observations, nurses often stand for their patients and sometimes even clash with physicians on the matter, as long as patients receive the care they should receive. For example, on July 11<sup>th</sup> at 14.33 the following was observed:

‘Coordinator [a nurse] went to the doctors to push through some things. She indicates that some patients can be dismissed relatively quickly. The doctor gets slightly irritated/annoyed by this. She says ‘you’re doing as if things could have gone better/different, but I think that everyone does his

[or her] best.' The doctor continues by saying 'I think we should come together more often, we did this only once before.' Coordinator confirms this (as she thinks that the doctor is serious), after which the doctor, cynically and irritatedly, says and points "there is my room and I have a phone on which you can reach me".

Despite these clashes, physicians acknowledge the important role of nurses as 'maintainers', by describing their value as follows:

"They are very active in indicating that results are retrieved, when they see things that are not normal, or when things take too long they also come to tell us. (...) I think that when it is busier, that they are more on top of things."

As another cardiologist states:

"Purely by emphasizing where the issues lie and by indicating who needs most care or which patients can leave, or by simply taking over tasks."

#### *5.4.9 Empathic actions – Sustaining the routine*

On the other hand, nurses engage in activities directly involved with the experience of patients. As aforementioned, patients complain about waiting lists that are too long, or even leave the CFA center as they do not want to wait anymore. Whereas this is bad for the hospital, it is even worse for patients as they were admitted to the CFA center because they had acute cardiac complaints and thus won't be able to get diagnosed and treated in case they leave. The staying or leaving of a patient is contingent on the comfort of a patient and the extent to which a patient knows why he or she is waiting so long and nurses try to assure patients that nurses are doing whatever they can as quickly as possible. By assuring patients of the performance of the routine, nurses prevent the damage from the routine that malfunctions to escalate and hence, sustain the routine. As one nurse explains the importance of patient comfort, she tells the following:

“Well, I think that that is important, that when you come here you can explain what is wrong. In that sense, patient comfort, I think that it is comfortable that you are not here for too long, that you get good information, about what is wrong and what is going to happen next.”

Nurses have a great sense of understanding of what makes a patient feel comfortable and the absence of information is part of not feeling comfortable, so when things take longer than desired, nurses turn towards actions that directly play into this aspect of patient experience. As a nurse explains:

“Ehm, what I always do when I’m at the CFA is indicate that we are working as hard as we can, but do keep into account that the amount of hours can take longer. (...) And I immediately explain that we are dependent of other departments, because, yeah, I also sometimes have patients that arrive and still do not know anything at 4PM. Then I always tell that I think it is really irritating (...).”

And as another nurse explains:

“Yes, very annoying (interrupts me). I think it is irritating. Especially for the patient. Also for yourself. You cannot continue sometimes. And you just have to wait and wait. So often, when they enter, I tell them already that it can take quite some time.”

#### *5.4.10 Temporary nature of maintain and sustaining actions*

Nurses’ actions of maintaining and sustaining the diagnosis routine are only enacted whenever the enacted routine’s enactment deviates substantially from what is espoused. It is not always the case that patient turnaround jams and thus, nurses do not always have to intervene with the treatment process, beyond what they normally already do. An example of the intervention of nurses, during an observation on the 11<sup>th</sup> of Juli, in 2016, is as follows:

At 11.35:

‘Nurses talk about that a mother and father of a newborn is still waiting for where they can go to and say that they [the nurses] get irritated by this’.

Then, at 11.51:

‘Nurse tries to push the parents of the newborn through the system by communication with nurses and doctors’.

Hence, we perceive a situation in which the influx of patients varies and that nurses engage in empathic actions during peak moments of patient influx, as contextual constraints become more visible and jam patient turnaround. During off-peak moments, which are characterized by flowing patient turnaround, nurses limit their involvement in the activities of physicians to a minimum and focus again on their own duties only. After all, the efforts of nurses to maintain and sustain the routine are voluntary, and definitely not always appreciated by physicians, as we have shown.

#### *5.4.11 Routine oscillation*

We have come to define the dynamism that the diagnosis routine displays amidst contextual constraints and environmental fluctuation as one of routine oscillation. The diagnosis routine that we have observed is found to expand, in terms of the interdependent actions that constitute this routine, in the face of peak patient influx and contract during off-peak moments of patient influx. Hence, we see that this routine has two states, an expanded and a contracted state, between which it shifts continuously in the face of an environment that continuously and unpredictably fluctuates between peak and off-peak moments of patient influx. As nurses seek to mitigate the potential negative consequences for patient care quality, the routine expands when the constrained capacity of the department cannot keep up with moments of peak patient influx. The diagnosis routine contracts to cease the additional efforts that nurses execute when they are not needed, being during moments of off-peak patient influx. Thus, our findings suggest that that this shifting between states is the consequence of engaging and disengaging in actions to respond to the consequences of fluctuating environmental conditions. Nurses are found both maintain and sustain the

diagnosis routine, as a consequence of their empathizing with their patients as part of their professional identities.



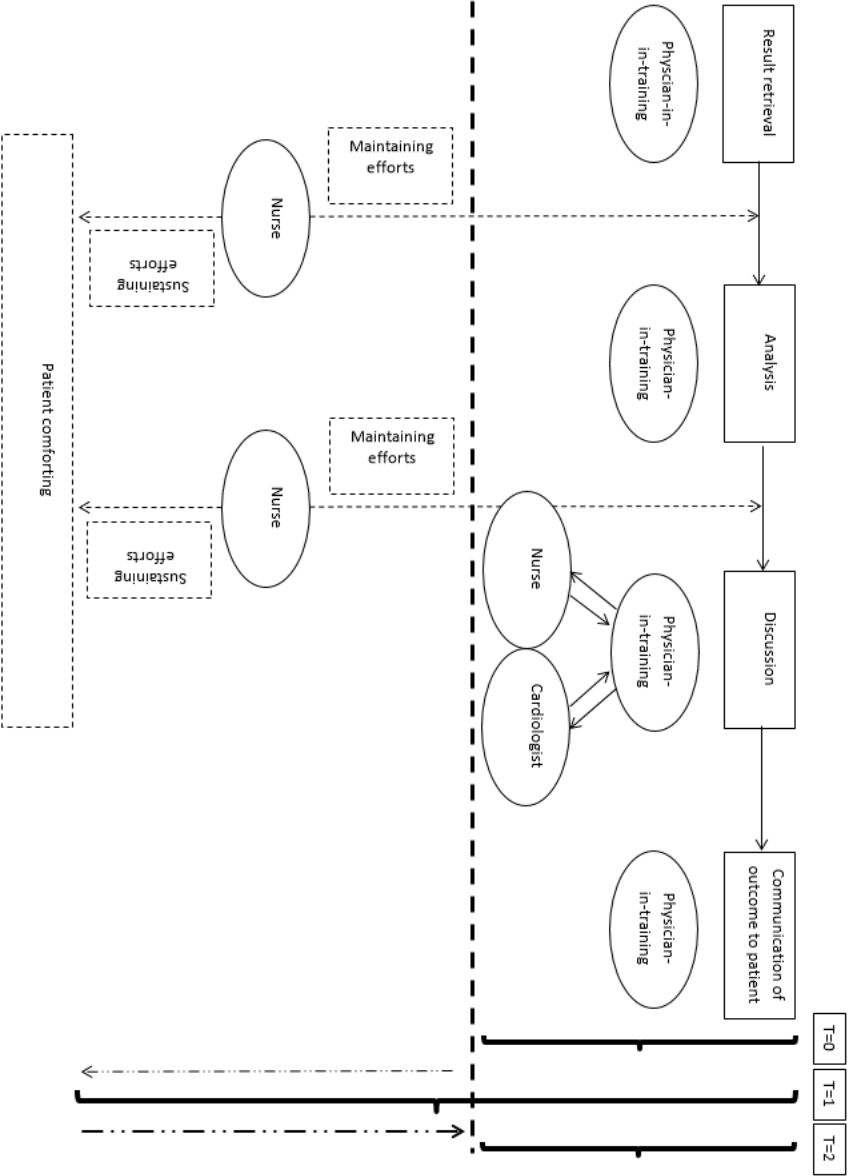


Figure 5.1 Framework of routine oscillation amidst environmental variation and contextual constraints

## 5.5 Discussion

Much research has gone into understanding how routines can be dynamic and what could cause this dynamism. Routine dynamics research has underscored the ability of routines to be dynamic, either through variety or change of the patterns of action that constitute a routine (Feldman and Pentland, 2003; Pentland et al., 2011; Berente et al., 2016), or through facilitating, for instance, creativity and novelty as an outcome of the on-going functioning of a routine (Deken et al., 2016; Sonenshein et al., 2016). Also, scholars have found that the dynamism of routines could be sparked by routine work (Dekent et al., 2016), inertia (Yi et al., 2016), and talk (Dittrich, 2016). However, notably less research has addressed the relationship between routines and their contexts, which requires further inquiry as scholars have repeatedly underscored the fact that routines are embedded in contexts and that consequently, the enactment of routines is dependent on the context in which they reside (Becker, 2004; Feldman et al., 2016). In specific, scholars have shown that in the process of managing the tension between stability and change in routines, actors interact with social and material aspects of the context in which they carry out the pattern of independent actions that constitute routines (Feldman and Orlikowski, 2011; d'Adderio, 2014).

Routines research has described that contexts and their constraints provide actors a limited choice set and hence, limit the degree to which novelty can occur (Pentland et al., 2012). Whereas also previous studies in other literatures have described that, for instance, bureaucratic features (Teece, 2007) and resource constraints (Holmstrom, 1989; Bottazzi et al., 2014) might lead to a lesser extent of dynamism in organizations, other scholars have contradictingly found an increased level of novelty and creativity under particular constraining circumstances. Scholars have found that individuals might engage in bricolage, whenever resources are highly constrained (Baker and Nelson, 2005; Desa and Basu, 2013). Hewitt-Dundas (2006) has found that under conditions of constrained information access and low profit margins, individuals might engage in higher levels of innovation to face, rather than try to escape, such constraints. As a final example, Rosso (2014) has shown that

under certain levels of contextual constraints, individuals might engage in creative problem-solving rather than be restricted in their creativity.

Extrapolating the multiplicity of outcomes in other literatures, in this paper, we have performed an ethnographic case study (Obstfeld, 2012; Danner-Schröder and Geiger, 2016) to better understand the relationship between the enactment of routines and the context in which they reside, to see whether contextual constraints might actually spark routine dynamism. We have done so in a setting that was characterized by financial, formal and physical setting constraints, but also was subject to environmental variation, in terms of its frequency of change, degree of difference and irregularity (Child, 1972). The latter we deemed important, because scholars have repeatedly indicated that strongly varying environmental conditions could spark adaptation of organizations and their processes (e.g. Sorensen and Stuart, 2000; Kozhikode, 2015). Hence, we believed that settings characterized by high levels of environmental variation would even more pressure the tension between stability and dynamism within routines, as they would more clearly bring forward the influence of contextual constraints on routine enactment. The setting of our choice has been the acute cardiac complaints care cycle of a leading Dutch hospital.

We have firstly performed observations to comprehend our setting and understand the dynamics at play. With this, we mean that we observed the people, their actions and their interactions with each other, the context and the environment, as is advocated in both ethnographic research (van Maanen, 2011) and social practice theory (Feldman and Orlikowski, 2011). Subsequently, we have complemented our emerging understandings with interviews and archival data to delve deeper into the themes we observed as having a defining character of our setting and research question (Yin, 2009).

In line with Pentland et al. (2012), we have found that contextual constraints limit actors' choice sets. However, we also found that within these choice sets, actors can display actions that translate to great amounts of dynamism at the routine level. This dynamism, even though in line with the tension between stability and change (Feldman and Pentland, 2003), displays a concrete pattern that is insufficiently covered by the variation and change dichotomy, because of which we have yielded additional efforts to grasp the nature of this pattern and the conditions under which it is, or is not, enacted. More concretely, we perceive

a pattern of routine oscillation, which we defined as the continuous shift between states of expanded and contracted sets of actions that constitute a routine. We find that this pattern of oscillation stems from actors' professional identities (Ibarra, 1999; Chreim et al., 2007). A professional identity is the way in which a member of a profession defines her- or himself and scholars have described that this associated with the way in which a particular role is carried out (Ibarra, 1999). Scholars have, for instance, shown how identities play an important role in moral judgements (Leavitt et al., 2012) and making sense (Cornelissen, 2012). Consequently, professional identities have been driving individuals' behavior as they are rooted in their beliefs, goals and values (Ashforth et al., 2008). Our findings concur with past research as we find that nursing identities (Fagermoen, 1997; Hoeve et al., 2014) can spawn actions, whenever the values underpinning these identities are triggered.

In the following sections, we will delve into the specifics on routine oscillation and the roles of professional identities and empathy.

### *5.5.1 Contextual constraints and routine oscillation*

By means of our inquiry, we have shown that contextual constraints have an important influence on the way in which routines are enacted, under situations of environmental variation (Child, 1972). Namely, we found that contextual constraints can trigger behavioral responses of those that enact routines, whenever the consequences of these constraints become more evident, for example as the environmental conditions vary, and have bearing on actors' professional identities. In line with past research that identified that constraints could trigger change, creativity and novelty (Baker and Nelson, 2005; Hewitt-Dundas, 2006; Rosso, 2014), our findings suggest that routines can display dynamism in constrained contexts when their enactors seek to circumvent any possible harm of these constraints.

We found a pattern of routine enactment that we define as routine oscillation. Oscillation as a term implies the continuous switching between two states, such as learning and forgetting (Haunschild et al., 2015). In our particular case, oscillation comes to the forefront in terms of continuous switching between two states of a routine's performance,

an extended state and a contracted state. More specifically, whenever the diagnosis routine that we observed was not able to accommodate peak-level patient influx, the set of actions that constituted the diagnosis routine expanded to maintain care quality. On the other hand, during off-peak levels of patient influx, the routine was observed to be performed in a contracted manner that suffices during off-peak occasions.

We found that this pattern of expansion and contraction of the actions that constitute routines does not have its counterpart in current literature and hence is an important contribution to the literature on routine dynamics. Routine oscillation is not fully captured by routine variation, as an expanded version of the routine is clearly more than just performing the same routine differently. Rather, under oscillation, the routine is temporarily enacted differently, with possibly different actors and particularly different actions. Oscillation is also not fully captured by routine change, as the word ‘change’ implies a departure from something to something else, whereas oscillation refers to shifting hence and forth repeatedly. Our research shows that there is much richness in the patterns that routines might display, and that specific patterns of actions that constitute routines require additional research, beyond explaining these patterns under the labels of variation and change.

### *5.5.2 Professional identity and empathy as a source of routine oscillation*

We trace the dynamism of routines that we perceive to the literature on professional identities (Ibarra, 1999). Chreim et al. (2007) have argued that the way in which we view our roles, reflects the way in which we interpret, and act in, work situations. Identities are constituted out of a load of beliefs, goals and values regarding the self (Ashforth et al., 1999) and in the case of professional identities, these attributes are inherent to a profession. Our case revealed that, under conditions of environmental variation, the constraints in the context in which they operated, prevented the enactment of the routine of which they are part of to be aligned with what was espoused (Feldman and Pentland, 2003; Bertels et al., 2016). As this misalignment between the enacted and espoused routine endured, the consequences activated actors because their perception of their professional-self required them to do so. These actors’ professional identities required them to be concerned with the comfort and well-being of those that were dependent on the outcome of the routine (Fagermoen, 1997).

They tapped into the level of comfort and well-being through empathy, defined as the ability to listen to, understand and share the feelings of others (Nadler and Tushman, 1990).

### *5.5.3 Suggestions for further research*

Our inquiry breeds fertile ground for future research. Firstly, to our knowledge, no studies have researched the role of professional identities in the routine dynamics literature, even though such an angle has great potential for further clarification of the dynamic patterns that routines can display. Many behaviors of the actors that enact routines stem from their professional identities and as different professional identities are constituted by different beliefs and values, we invite research on how different professional identities might differently shape routine dynamics.

Secondly, even though some scholars seek to make sense of the various patterns that we uncover (Pentland et al., 2011; 2012), much more research on this matter is needed. Even though routines are highly unique, the patterns they display can show great amounts of commonalities, which on their turn can give great insights for managers in designing and redesigning organizations.

Thirdly, only few studies have utilized the realms of emotion in explaining the dynamic patterns that routines can constitute. Grodal (2015) has shown how important emotion can be in dynamizing a routine. From other literatures, we also know how central emotion is in the behaviors of people. As the routine dynamics literature seeks to bring the actor within routines to the forefront, emotion and neighboring literatures such as empathy need to be researched in a much broader fashion.

### *5.5.4 Conclusion*

In this study, we attempted to uncover how organizational routines would respond to environmental variation in the face of contextual constraints. For this purpose, we have performed an ethnographic case study within a care cycle that was characterized by environmental variation amidst financial, formal and physical setting constraints. We

uncovered a pattern of routine oscillation, meaning the expansion and contraction of the pattern of interdependent actions that constitutes a routine, as the environmental pressure on the care cycle heightened and lessened. These actions were found to stem from the professional identities of nurses, which were triggered by their empathizing with patients. Hence, we find routines can be highly dynamic, even under contextual constraints, as long as there remains enough space for the routine to vary and change. Routines were found to display patterns of actions that resembled the pressure they were put under. In addition, we draw attention to the important role of professional identity and empathy in fueling the dynamics of routines.





## Chapter 6: General discussion and conclusion: the relationship between routines, dynamic capabilities, change and innovation

What is it that allows organizations to change and innovate? It is a question that has bothered both practitioners and academics for many years. In trying to find a solution to this vast question, scholars had emphasized that routines would lead to inertia over time and thus, would need to be changed exogenously for organizations to be able to change and innovate. The dynamic capabilities literature sought to explain how such change and innovation could be brought about, explaining that those organizations that would possess dynamic capabilities and would be able to deploy them well, would be able to reconfigure themselves, clearing the path for future change and innovation. Recently, however, the routine dynamics literature has suggested that routines themselves can also lead to change and novelty, complicating our understanding of what components of organizations enable such change and innovation. Hence, in this dissertation, we tap into the question of how routines and dynamic capabilities relate to change and innovation within organizations by means of four studies.

In the first study, I drew from the dynamic capabilities, routine dynamic and problem-solving literatures to build a framework and identify propositions on how the routines, dynamic capabilities and ad hoc problem-solving concepts relate to each other. In study 2, I tested the degree to which routines, both simple and complex, and dynamic capabilities can lead to exploratory innovation. I did so, by testing both concepts first separately in relation to exploratory innovation and after that altogether in a mediation analysis, to uncover to what extent exploratory innovation stems from routines, dynamic capabilities or both. Thus, I explicitly tested the possibility that the effect of routines on exploratory innovation is subsumed by dynamic capabilities. In study 3, I sought to understand to what extent the dynamic capabilities and routine dynamics literatures converse and thus, utilize each other's insights. Finally, in study four, I seek to uncover how routines

are enacted in settings that are highly constrained, yet agents are pressured to engage in actions to spur routine dynamism due to environmental variation. In specific, I sought to understand the effect of contextual constraints on, and the antecedents of, routine dynamism. In the following section, I summarize the findings of each study alongside the contributions. After that I will describe the managerial implications of this dissertation, limitations and suggestions for further research.

## 6.1 Main findings and contributions

In this section, the key findings and major contributions of each study are highlighted.

### 6.1.1 *Study 1*

By means of the first study, I have tried to theoretically and empirically assess how routines and dynamic capabilities relate to innovation. I have focused on similarities and differences between both concepts to understand how they are interrelated. Also, I have conducted bibliometric analyses (Peteraf et al., 2013; Randhawa et al., 2016) to empirically assess and show to what extent both literatures are conversing with each other and with the innovation literature. This study extends past studies that have conceptually discussed the interrelation of the dynamic capabilities and routine dynamics literatures (Parmigiani and Howard-Grenville, 2011; Salvat and Rerup, 2011) and builds on research that has shown the complementarity of both literatures (Di Stefano et al., 2014).

I have shown that, conceptually speaking, both literatures provide important insights on innovation research. Similar to Parmigiani and Howard-Grenville (2011), I find that both research streams nest themselves in different ontologies, which empirically reflects itself in a low level of conversation and a parallel, disconnected evolution between the dynamic capabilities and routine dynamics research streams over time. Also, whereas both research streams are complex by themselves and should also be researched in isolation for

that purpose, the complementarities between both fields require a higher level of interrelation (Salvato and Rerup, 2011). I conclude by outlining the benefits of a more integrated approach in six points.

### *6.1.2 Study 2*

The second study in this dissertation brought forward a framework in which I tried to reconcile the routines and dynamic capabilities literatures, in order to be able to describe how organizations can respond to and solve different problems of different complexities. In doing so, I have come across calls from scholar who suggested that research on routines and dynamic capabilities should be multi-level of nature (Salvato and Rerup, 2011; Pentland et al., 2012) and that we should better grasp how managerial and organizational dynamic capabilities relate to each other (Helfat and Peteraf, 2015).

Drawing from past literature, I have firstly described that problem complexity is a function of the size of a problem and its decomposability (Simon, 1962). Then, I argued that the simplest problems can be solved at the organizational level and by the most routine problem-solving drivers, being operational capabilities (Helfat and Winter, 2011), as these problems are highly predictable and decomposable into smaller, comprehensible parts (Volberda, 1998; Macher, 2006) and thus are also receptive to being solved collectively. The most complex problems on the other hand require a managerial and fully improvisational approach, as these problems are vast and their components are highly interdependent (Simon, 1962), being more receptive to be solved by an individual or small team (Eisenhardt et al., 2010). Such approaches I call ad hoc problem-solving (Winter, 2003). In between, I argued that problems that are decomposable, but bigger of size, can be solved by dynamic organizational capabilities that are underpinned by routines that are change oriented (Danneels, 2008, Teece, 2012), whereas problems that are not decomposable but smaller of size can be solved by dynamic managerial capabilities that result in managerial improvisation and are steered by guiding principles (Teece, 2012; Bingham and Eisenhardt, 2014).

### 6.1.3 *Study 3*

The third study in this dissertation addressed the interrelationship between routines and dynamic capabilities in relation to exploratory innovation in a quantitative manner. I have performed this study to better understand how routines and dynamic capabilities relate to each other and how both may or may not contribute to innovation (Pentland et al., 2012; Teece, 2012; Di Stefano et al., 2014).

I find that simple routines and dynamic capabilities directly contribute to exploratory innovation, whereas complex routines facilitate dynamic capability deployment, but do not directly contribute to exploratory innovation. From the mediation analysis (Baron and Kenny, 1986; Oli et al., 2014), I inferred that the effect of simple routines on exploratory innovation was mediated by dynamic capabilities deployment. Altogether, these findings underscore that routines can have different functions (Di Stefano et al., 2014; Feldman et al., 2016) and that this could result in different contributions to organizations. In specific, our findings support past scholars' suggestions that simple routines might facilitate novelty more than more complex routines (Bingham and Eisenhardt, 2011; 2014). Also, routines are found to be more facilitative of exploratory innovation, whereas dynamic capabilities are more direct antecedents, providing a solution to the dilemma of how routines and dynamic capabilities are different from each other in relation to their contribution to innovation (Helfat and Peteraf, 2009; Teece, 2012).

### 6.1.4 *Study 4*

By means of the forth study, I tried to better understand how routine enactment is influenced by context, addressing an important call in the routine dynamics research stream (d'Adderio, 2014). For this purpose, I researched how routines would be enacted under contextual constraints. In order to be able to observe this more closely, I sought a setting that was characterized by environmental variation (Child, 1972). I chose the care cycle (Porter and Teisberg, 2006) of acute cardiac complaints within a leading hospital as an appropriate setting, being both characterized by various financial (Hoegl, 2008), formal (North, 1994) and physical space constraints (Robertson et al., 1993) on the one hand and high degree of variation in patient influx on the other hand.

I came to understand that even in highly dynamic environments, routines can display great amounts of variability. I find that as the environment varies, the performed pattern of the routine matches such variation. In specific, as level of patient influx was higher, the routine displayed a different pattern of enactment than when the level of patient influx was lower. This, I found to be related to the identification of nurses with their patients through empathy (Nadler and Tushman, 1990) and matching their performance according to the need for additional effort. Hence, I found the triggering importance of empathy and professional identification (Ibarra, 1999; Chreim et al., 2007) in routine dynamism.

## 6.2 Theoretical contributions to change and innovation within organizations

In this dissertation, the aim has been to enhance our understanding of routines and capabilities are involved in change and innovation. This dissertation aims to do so through the following contributions:

- Routine dynamics, change and innovation
- Dynamic capabilities, change and innovation
- Interrelationship of routines and dynamic capabilities in relation to change and innovation

Overall, firstly this dissertation meets the calls from scholars to deepen our understanding of how dynamic routines can be, how routine enactment is related to the context and what causes routine dynamism (Helfat and Peteraf, 2009; Teece, 2012; d'Adderio, 2014). Secondly, in this dissertation I try to meet the call from scholars to better understand the interrelation of, and differences between, the routine dynamics and dynamic capabilities research streams (Parmigiani and Howard-Grenville, 2011; Salvato and Rerup, 2011; Teece, 2012; Di Stefano et al., 2014; Helfat and Peteraf, 2015). Finally, in this dissertation, I try to better interlink routine dynamics and dynamic capabilities research with

change and innovation, by describing antecedents, moderators, mediators and contextual variables (Augier and Teece, 2009; Helfat and Peteraf, 2009; Teece, 2012).

### *6.2.1 Dynamic capabilities, change and innovation*

As time passes by, many organizations fail to maintain their competitive edge and cease to exist. In a changing world, organizations need to reinvent themselves also in order to stay relevant and sustain their competitive advantage by, for instance, maintain environmental fit (Sorensen and Stuart, 2000). Scholars have extensively embraced dynamic capabilities research in order to explain how organizations can repeatedly alter themselves in dynamic environments (Peteraf et al., 2013). Past research has described and shown that indeed, dynamic capabilities are important for organizational change and enhanced performance (Drnevich and Kriauciunas, 2011; Protogerou et al., 2011; Schilke, 2014).

However, even though various scholars have described the natural link between dynamic capabilities and innovation (Zahra et al., 2006; Teece, 2007; 2012), and some have performed empirical research in this regard (Verona and Ravasi, 2003; Piening and Salge, 2015), much empirical research remained to be needed in clarifying the nature of this relationship. In specific I have tried to provide answers to three questions. Firstly, how are operational capabilities, dynamic organizational and managerial capabilities and ad hoc problem solving different from each other in relation to change and innovation of organizations and can they be complementary? Secondly, how related are dynamic capabilities really to innovation? Finally, can dynamic capabilities be antecedents to exploratory innovation and thus, be the antecedents of novel outcomes by utilizing new-to-the-firm knowledge, despite being rooted in routines?

In study 1, I have conceptually shown how the dynamic capabilities concept can help us to achieve a more inclusive understanding of how organizations can, via organizational innovation, respond to different problems of different complexities. I have reviewed the literature and delineated the different constructs within the field of dynamic capabilities. I have described that due to their configurations, each is applicable to a particular scope of problems, meaning that for an organization to be able to solve all kinds

of problems, it will need different problem-solving approaches. I describe how such approaches interact with each other.

In study 2, I firstly have described the potential of the dynamic capabilities concept to deepen our understanding of innovation, by reviewing the origin, premises and recent developments of the dynamic capabilities concept. I have conceptually showed how the concept means to describe change and innovation in organizational processes and structures. Then, I have shown through bibliometric analyses that also citation patterns reveal that dynamic capabilities as a field is and has been close to the fields of organizational change and innovation.

Finally, in study 3, I take the findings of study 2 even further as I focus on describing how dynamic capabilities relate to exploratory innovation. I show that dynamic capabilities are strongly related to exploratory innovation and thus provide support to past scholars' arguments on the importance of dynamic capabilities for innovation that breaks with past paths.

### *6.2.2 Routine dynamics, change and innovation*

As organizations consist for a great part of routines, scholars have repeatedly touched upon the role of routines in change and innovation. From past research we know that change and innovation processes could be partly routine (Amburgey et al., 1993; Di Stefano et al., 2014; Pisano, 2015), that some routines could facilitate change (Teece, 2012; Bingham and Eisenhardt, 2014; Sonenshein, 2016) or that routines could be seen as structures that would need to be changed for organizations to innovate (Hannan and Freeman, 1984; Dougherty, 1992). Whereas we now have a richer understanding of the role of routines in change and innovation, it was not like this for a long time as routines were in the end seen as rather static entities that could only reinforce the status quo, rather than causing renewal. However, as scholars have more recently emphasized that routines could also endogenously affect change in a positive way, a research stream emerged that focused on magnifying the dynamics of and within routines (Feldman, 2000; Feldman and Pentland, 2003).

Yet, much regarding what sparks such change and whether routines could also lead to innovation had yet to be researched. Whereas the routine dynamics research stream has attributed great importance to the agents that enact routines (Feldman and Pentland, 2003; Feldman and Orlikowski, 2011), research that shows why such actors spark routine dynamism has been under-researched. In addition, scholars have left unaddressed whether routines can truly lead to exploratory and innovative outcomes, even though they tend to be self-reinforcing and might lack purpose (Gilbert, 2005; Teece, 2012). Hence, an important theoretical contribution of this dissertation has been to research exactly these two questions.

In study 2, I focused on describing conceptually what role routines could have in the adaptation of organizations, through organizational change and innovation. I described that routines can be more or less detailed and that this is inversely related to their potential contribution to organizational change and innovation. This is so, because routines that are less detailed enable managers more discretion. Also, I showed how organizations could possess a repertoire of a variety of routines with which they could respond to or anticipate on developments of varying complexities simultaneously. Overall, I explicate the centrality of routines to different types of organizational change and innovation and the contingency of types of routines to problem characteristics.

In study 3, I focused on quantitatively examining how routines relate to innovation. I wanted to focus on those innovations that are radical and are characterized by the utilization of new knowledge. In addition, I wanted to capture the fact that routines are different from each other. Thus, I focused on the relationship between both complex and simple routines on exploratory innovations. I show that routines can contribute to exploratory innovation and that the configuration of routines is substantial. Simple routines are found to have a stronger effect on exploratory innovation than complex routines. I explain that this is because the former has more room for managerial improvisation than the latter, which is essential for the utilization of new knowledge for new products and services, as is required for exploratory innovation.

In study 4, I have tried to uncover what makes that routines are enacted differently over performances. For this purpose, I sought a setting that was characterized by contextual constraints and at the same time by conditions that necessitated a continuous different



enactment of routines. I found that the acute cardiac complaints care cycle of a leading Dutch hospital met these characteristics, as it operated amidst financial, formal and physical space constraints on the one hand and environmental variation on the other hand. I found that different routine enactment was triggered by the empathizing of nurses, as a consequence of their professional identities.

### *6.2.3 Interrelationship of dynamic capabilities and routines in relation to change and innovation*

My final contribution is to interlinking the fields of dynamic capabilities and routine dynamics. Both strands of literature are key for understanding organizations in general and change and innovation in specific and have been, accordingly, researched jointly. Parmigiani and Howard-Grenville (2011) have shown how both research streams differ from each other and looking at similar issues differently. Salvato and Rerup (2011) have described how dynamic capabilities and routines are at different levels of analysis, yet have substantial interdependencies and hence could benefit from a more inclusive approach. Whereas Teece (2012) has indicated that dynamic capabilities and routines are different from each other and should be further delineated, Di Stefano et al. (2014) have shown how dynamic capabilities, complex routines and simple routines could be perceived as complementary aspects of a bigger whole.

Despite much interest in and great importance of delineating the dynamic capabilities and routine dynamics research streams, much of the assessment of the state of the field has been conceptual. In addition, scholars have yet to bring routines and the different concept within the dynamic capabilities literature together to explain how both are interlinked and matter in different circumstances. Finally, scholars have yet to further empirically delineate the different effects of routines and dynamic capabilities on innovation.

In study 1, I have empirically shown how the dynamic capabilities and routine dynamics research streams theoretically relate to each other in bringing about change and innovation. Dynamic capabilities consist of routines and hence, both display a natural

interrelationship. However, I have also shown that this cannot be read from the bibliometric analyses that I have conducted. Both fields seem to minimally refer to each other and seem to develop in parallel fashion over time. I describe that while each field needs to be researched in isolation in order to be able to delve into their respective complexities, a greater understanding of routines and dynamic capabilities can only be achieved by a better conversation.

In study 2, I have conceptually forged the dynamic capabilities and routine dynamics literatures into a framework of organizational problem-solving. I have shown how both literatures complement each other, by showing how actually routines are the microfoundations of capabilities and hence, how they determine what impact capabilities might have. As I have described how routinization of capabilities is inversely related to their propensity to solve more complex problems and have described the interrelationship of different layers of routines and capabilities, I have provided a conceptual framework of organizational change and innovation in relation to problems of varying complexities.

In study 3, I have quantitatively shown how routines and dynamic capabilities relate to exploratory innovation in a different manner. Whereas I have found that dynamic capabilities and simple routines show a strong positive relationship with exploratory innovation, complex routines only showed a positive strong relationship with the deployment of dynamic capabilities. In addition, our mediation analysis showed that the effect of simple routines on exploratory innovation was mediated by dynamic capabilities. Hence, I have shown quantitatively that routines and dynamic capabilities are interrelated and matter both for exploratory innovation. However, whereas routines are more facilitative of exploratory innovation, dynamic capabilities are found to be more decisive. This finding I attribute to what scholars call purpose and intent, that might be absent in the relationship between routines and innovation, but not in the relationship between dynamic capabilities and innovation.

## 6.3 Managerial implications

This dissertation is of great importance to practitioners. Overall, I describe how key organizational resources, being routines and dynamic capabilities, are invaluable to the transformation and innovation of organizations. In this regard, I firstly provide managers with a framework of organizational problem-solving that depicts how different problems can be best solved. In this framework, I delineate managerial from organizational, and routine from improvisational means of problem-solving, and argue which are most suitable for solving which types of problems. I describe that problem complexity is inversely related to the degree to which the problem-solving approach is routine and organization-wide, compared to improvisational and managerial-level. Secondly, I empirically display the importance of dynamic capabilities to exploratory innovation. I find that the managerial function of bundling and directing resources leads to a higher level of new products and services that stem also from new-to-the-firm knowledge. Thirdly, in this dissertation I empirically also show that routines that are properly designed can, through endogenous change, be a great source of adaptation. In this regard, I show how important it is to pay attention to individual characteristics, such as people's empathizing and professional identities, as these seem to spur such adaptation in organizations by fueling the dynamism in routines.

In study 1 and 2, I bring insight into what routines and dynamic capabilities are and how they relate to each other. For organizations to be able to adapt and innovate, they need to be able to extract the most out of their resource base, which requires knowing what its components are capable of and designing these components in line with what is needed. In essence, I argue that the degree to which a problem-solving approach is routine, is inversely related to its ability to solve complex problems. Also, I argue that a problem-solving approach that is performed organization-wide, is less suitable for more complex problems than approaches that are performed only at the managerial level.

In more detail, I firstly describe that routines can exist in parallel to or as part of dynamic capabilities and that this difference is important to uncover and seize. Both are vital components of organizations, yet both are different from each other and have different

functions within organizations. Specifically, I describe that routines can contribute to organizational change and to novelty without being bundled and directed as part of dynamic capabilities, because the people that perform these routines are mindful and thus can address inefficiencies that are encountered. However, by being part of dynamic capabilities, routines are orchestrated by management in line with the desire of the organization. Hence, dynamic capabilities are argued to be more suitable for solving complex problems and for innovating.

I explain that routines can be complex or simple. Whereas simple routines are semistructures that provide much room for managerial discretion, complex routines are more operational of nature. Thus, both are complementary, yet distinct. Also, I emphasize that routines can be change-oriented or operational and this together with whether they are simple or complex of nature, affects the manifestation of the capability that they underpin. Managerial dynamic capabilities are underpinned by simple routines, organizational dynamic capabilities by complex change routines and operational capabilities by operating routines. I also highlight the invaluable importance of ad hoc, one-time actions that might not have been executed by an organization in the past, but may have to be at a certain point due to the absence of capabilities that are suitable for a particular problem. I discuss the improvisational nature of these actions and describe that they are most suitable for the most complex types of problems that an organization might face, because they are highly risky.

In study 3, I leverage study 1 and 2, in that I delve into the extent to which routines and dynamic capabilities contribute to innovations that stem from new knowledge source and address new consumers and markets. I find that routines facilitate such exploratory innovations. I argue that this is because actors can themselves reach out to new-to-the-firm sources of knowledge in order to utilize them in their daily operations. Simple routines are stronger related to exploratory innovation than complex routines are, meaning that structures within organizations that allow more managerial discretion, favor higher levels of exploratory innovation. However, I find that dynamic capabilities are stronger related to exploratory innovations than routines are. Also, I find that the effect of routines on exploratory innovation is mediated by dynamic capabilities, meaning that such an effect runs through the effect of dynamic capabilities on exploratory innovation. Thus, designing

organizational routines is of major importance for innovativeness, but the managerial role of orchestrating and leveraging these routines is decisive for innovation.

In study 4, I provide an account of the triggers and manifestation of routine dynamism. I point out that individual characteristics are key determinants of how people react to what happens around them, aside from what their jobs may prescribe them. Such effects may be desired or may not be. In this study, we show that the empathizing of nurses and their identification with their profession together leads to an enhanced performance at the department and care cycle. However, this effect is only possible because nurses had the room to act upon their empathizing and professional identities. In designing routines, capabilities and other aspects of organizations, managers should carefully pay attention to the individual characteristics of employees, possible synergies among employees and enabling or constraining actions that stem from individual characteristics.

## 6.4 Limitations and suggestions for further research

Even though this dissertation has addressed major calls of past scholars and needs of the literature, its studies have certain limitations that one should be aware of and could be addressed in future research. In addition, findings breed possibilities for future research in many angles.

### *6.4.1 Limitations and directions for future research of each study*

In my first study, a limitation is that even though I try to address the implication of the current state and development of the fields of routine dynamics and dynamic capabilities on innovation, I do not distinguish in the analysis itself between types of innovations. The reason for this is that the routine dynamics research stream has not extensively considered the relationship with innovation, complicating a comparison of it with the dynamic capabilities research stream. Whereas I try to fill this gap through theoretical reasoning, I invite future research on this regard once both fields start to increasingly more

research innovation. A second limitation concerns the fact that this study is of explorative nature and hence does not utilize, for instance, network analyses to test more specifically to what extent research streams relate and target certain research topics.

In my second study, a limitation is the fact that I have not been able to test our framework in an empirical fashion. Whereas I have been able to substantiate the propositions that I theoretically bring forward, future research is invited to test the propositions in practice. In other studies I have targeted also change at the routine level and innovation at the organizational level. However, these studies do not specifically delve into problem complexity. A second limitation concerns that even though I provide a framework of organizational problem-solving, I do not distinguish between problem-solving as a means of change and innovation, which requires a different approach to routines and dynamic capabilities. Whereas problems of different complexities are carefully described and delineated, future research is invited to extend this framework and translate its implications to innovation within organizations.

In my third study, a limitation is that even though I do make use of a time-lagged data set to meet concerns of causality (Delgado-Garcia and Fuente-Sabaté, 2010; Oli et al., 2014; Simsek and Heavey, 2011), a panel data setting would have been preferred in order to be able to better trace developments over time and hence, be able to infer more robust claims regarding these developments. The reason for this is that routines and capabilities develop over time, as expertise and knowledge is accumulated and stored (Helfat and Peteraf, 2003; Becker, 2004). Another limitation in this study concerns that even though I have chosen exploratory innovation as my dependent variable to perform an inquiry on how routines and dynamic capabilities relate to innovation, many other dependent variables could have been chosen as innovation can be categorized and measured in many different ways. Hence, future research is invited to replicate this study by employing different conceptualizations of innovation, to subtly provide us an even greater understanding on how routines and dynamic capabilities relate to innovation.

In my final study, an important limitation is that I do not measure empathy via experiments or brain scans, nor do I measure professional identity. Rather, I infer about empathy and professional identity with my questions and observe these and their

consequences through the actions of agents. Even though other studies have preceded me in doing so (Grodal et al., 2015), experiments might be able to more directly illuminate the trigger preceding the relationship I observe. Another limitation I encountered is the issue of generalizability. The setting in which this research was executed was one in which empathy was important to the functioning of employees. However, this might be lesser so in many other settings, such as those within the construction and financial sectors.

## 6.5 Conclusions

Many scholars have written about the fact that routines and dynamic capabilities play a vital role in the change and innovation of organizations. However, I found that many questions regarding this relationship had been left untouched at the very moment I started with my doctorate. Hence, in this dissertation, I researched the nature of routines and dynamic capabilities and empirically analyzed how they relate to change and innovation within organizations. In specific, the four studies in this dissertation are aimed at conceptually understanding the role of routines and dynamic capabilities in how organizations solve problems, conceptually and empirically understanding how the routine dynamics and dynamic capabilities research stream converse with each other in furthering our understanding of how change and innovation can be brought about, empirically investigating how routines and dynamic capabilities relate to change and innovation within organizations and how possible dynamism within routines can be triggered. In doing so, this research points at several important areas for further research.

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# Summary

For an organization to outperform others, change and innovation are invaluable. This importance is even greater in a business landscape that becomes increasingly more dynamic. A better comprehension of how organizations can successfully change and innovate thus allows us to understand why one organization may thrive while another might fail. In this dissertation, I seek to advance this understanding by means of four articles at the intersection of dynamic capabilities, organizational routines, change and innovation. In this regard, organizational routines are repetitive, recognizable patterns of interdependent actions that are carried out by multiple actors. Dynamic capabilities represent the capacity of an organization to alter its resource base in a purposeful manner for strategic reasons, through asset-orchestration.

In study 1, I review the literature on organizational routines and dynamic capabilities in a conceptual manner and describe consequently in a theoretical fashion what their roles are in bringing about change and innovation. In addition, I empirically find that even though both concepts are highly interrelated, they tend to advance in a parallel fashion, which holds back a possibly faster and more overarching advancement of the field.

In study 2, I perform a second conceptual endeavor. This time, I do not only review, but also conceptually build a model based on past research regarding how organizations as problem-solving entities can solve problems of varying complexities. I formulate propositions on the boundary conditions under which certain problem-solving approaches may or may not be applicable to certain problem complexities, based on which I describe that in for organizations to thrive in a complex world, they need to possess a repertoire of varying problem-solving approaches.

In study 3, I empirically test the extent to which routines and dynamic capabilities contribute to exploratory innovation. Even though I find that both matter, the effect of organizational routines appears to flow through dynamic capabilities. This finding implies that what decisively matters for exploratory innovation is the intentional orchestrational act of managers, rather than features of the organization that are more facilitative of nature.

Finally, in study 4, I empirically observe the extent to which organizational routines can provide organizations flexibility. I do so in a setting, being a leading Dutch hospital, that is characterized by various constraints, yet faces continuous pressures to adapt itself as the influx of patients is extremely volatile. I observe that routines can be extremely flexible. In specific, I observe the way in which the routine is performed oscillates between an extended and contracted state, meaning that when patient influx is high, the routine embeds more actions than when patient influx is low. We attribute this finding to the professional identities and empathizing of nurses with patients. The flexibility of routines and the corresponding flexibility of organizations thus may flow from softer and more intangible aspects of people and organizations.

Altogether, in this dissertation I show how routines and dynamic capabilities matter, but also matter differently, for change and innovation. I describe the importance of conversation between scholars to further our insight in both concepts and provide a framework that shows how organizations can solve problems of varying complexities. Also, I bring insight into how routines and dynamic capabilities may contribute to exploratory innovation, while zooming in on the capacity of routines to provide flexibility to organizations. In doing so, by means of this dissertation, I contribute to our understanding of why organizations are differently successful and am part of a better tomorrow as I ensure that organizations, as the building blocks of our societies, can be managed in a better way.

## Samenvatting (summary in Dutch)

De waarde van verandering en innovatie is onschatbaar voor organisaties die anderen proberen te overtreffen. In een omgeving die almaar dynamischer wordt, neemt ook deze waarde almaar toe. Een beter begrip van hoe organisaties succesvol kunnen veranderen en innoveren stelt ons dus in staat om te begrijpen waarom de ene organisatie voorspoedig is terwijl de ander mislukt. In deze dissertatie probeer ik te zorgen voor een beter begrip omtrent dit onderwerp door middel van vier artikelen op het kruispunt van de thema's: dynamische vaardigheden, organisatieroutines, verandering en innovatie. In dit kader zijn organisatieroutines patronen van acties die van elkaar afhankelijk zijn, herkenbaar zijn en uitgevoerd worden door meerdere actoren. Dynamische vaardigheden representeren de capaciteit van een organisatie om op een doelgerichte wijze haar middelen te kunnen veranderen voor strategische redenen, door het orkestreren van de bezittingen van het desbetreffend bedrijf.

In studie 1 herzie ik de literatuur over organisatieroutines en dynamische vaardigheden op een conceptuele manier en beschrijf ik theoretisch wat hun rollen zijn in het voortbrengen van verandering en innovatie. Bovendien ontdek ik dat ondanks beide concepten erg verweven zijn met elkaar, ze op een parallelle manier zich ontwikkelen, wat een snellere en meer overkopelende manier van voortzetting tegenhoudt.

In studie 2 voer ik een tweede conceptuele inspanning uit. Deze keer herzie ik niet alleen de literatuur, maar bouw ik ook op conceptuele wijze een model dat gebaseerd is op voorgaand onderzoek, omtrent hoe organisaties als entiteiten die problemen oplossen, verschillende problemen van verschillende complexiteitsniveau's kunnen oplossen. Ik formuleer proposities over de randvoorwaarden onder welke bepaalde manieren om problemen op te lossen wel of niet passend kunnen zijn. Hierop gebaseerd suggereer ik dat organisaties die willen voortbestaan in een complexe wereld, een repertoire nodig hebben van verschillende manieren van probleemoplossing.

In studie 3 test ik ook empirische wijze de mate waarin organisatieroutines en dynamische vaardigheden bijdragen aan exploratorische innovatie. Ondanks dat ik vind dat beide belangrijk zijn, blijkt dat het effect van organisatieroutines loopt door die van

dynamische vaardigheden. Deze vondst impliceert dat wat uiteindelijk beslissend belangrijk is voor exploratorische innovatie, is de doelgerichte orkestrerende actie van een manager, in plaats van de faciliterende aspecten van een bedrijf.

Tenslotte, in studie 4 observeer ik op empirische wijze de mate waarin organisatieroutines flexibiliteit kunnen verlenen aan bedrijven. Deze studie voer ik uit in een setting die gekarakteriseerd wordt door verschillende belemmeringen, terwijl het ook onderhevig is aan een voortdurende druk om zich aan te passen, omdat patiëntenstromen erg volatiel zijn. Ik observeer dat routines extreem flexibel kunnen zijn. In het specifiek observeer ik dat de manier waarop routines worden uitgevoerd oscilleert tussen een uitgezette en samengekrompen staat, wat betekent dat wanneer patiëntinstroom hoog is een routine bestaat uit meer acties dan wanneer een patiëntinstroom laag is. We wijzen deze vondst toe aan de professionele identiteiten van verpleegkundigen en het empathiseren van verpleegkundigen met patiënten. De flexibiliteit van routines en de hierbij behorede flexibiliteit van organisaties kan in essentie dus de consequentie zijn van individuele acties, die voortkomen uit veel zachtere en meer ontastbare kenmerken van personen en organisaties.

Alles samengenomen laat ik in deze dissertatie zien hoe routines and dynamische vaardigheden belangrijk zijn, maar ook verschillend belangrijk zijn, voor verandering en innovatie. Ik beschrijf het belang van gesprekken tussen wetenschappers om onze inzichten in beide concepten te vergroten en toon een raamwerk dat laat zien hoe organisaties verschillende problemen van verschillende complexiteiten kunnen oplossen. Ook vergoot ik ons inzicht in hoe routines en dynamische vaardigheden kunnen bijdragen aan exploratorische innovatie, waarna ik inzoom op de capaciteit van routines om organisaties te voorzien in flexibiliteit. Op deze manier draag ik door middel van deze dissertatie bij aan ons begrip van waarom bedrijven verschillend succesvol zijn. Ook ben hoop ik onderdeel te hebben uitgemaakt van een beter morgen terwijl ik ervoor zorg dat organisaties, als de bouwblokken van onze samenleving, op een betere wijze gemanaged kunnen worden.

## Özet (summary in Turkish)

Değişikliğin ve innovasyonun, başka şirketleri geride bırakmak isteyen şirketlere paha biçilemez bir önemi vardır. Gittikçe daha dinamik bir hale gelen bir çevre içerisinde, bu değer de artarak çoğalmaktadır. Durum böyle olunca, şirketlerin değişimini ve nasıl yenileyici olabildiklerini ve kalabildiklerini daha iyi anlamamız, niye bir şirketin başarılı olabilmesine rağmen başka bir şirketin başarısız olduğunu anlamamızı sağlayacaktır. Tezimde bu konu ile alakalı anlayışımızı dört makale aracılığıyla daha yüksek noktalara taşımayı hedefliyorum. Bu tezde ki makaleler, dinamik kabiliyetler, şirket rutinleri, değişim ve innovasyon temalarının örtüşme noktalarını hedef alıyorlar.

Birinci makalemde, şirketlerin rutinlerini ve dinamik kabiliyetlerini ele alan literatürleri tekrar gözden geçiriyorum, ve iki konseptin değişime ve innovasyona ne şekilde yaklaştığını ve faydası olduğunu ayrıntılı bir şekilde açıklıyorum. Ayrıca, iki konseptin birbirleriyle teoretik açıdan çok bağlantılı olmalarına rağmen, araştırma bazında birbirlerinden ayrı kaldıklarını keşif ettim ve bunun olası zararlarını kaleme aldım.

İkinci makalemde, şirketlerin rutinlerini ve dinamik kabiliyetlerini ele alan literatürlerden esinlenerek, şirketlerin, farklı problemleri hangi farklı şekillerde çözebildiklerini ve çözmeleri gerektiğini açıklayan bir model geliştirdim. Şirketlerin, birtane problem çözüme yöntemi olmaksızın, farklı yöntemleri olmasını, ve daha kompleks olan problemleri daha az rutin olan yöntemlerle çözmeye odaklanması gerektiğini açıklıyorum.

Üçüncü makalemde, rutinlerin ve dinamik kabiliyetlerin innovasyona ne türlü katkı sağlayabileceklerini ölçüyorum. Bulgularımın göre, rutinlerin genellikle düşünülene aykırı olarak innovasyona önemli faydaları var. Böyle olmasıyla birlikte, dinamik kabiliyetlerin faydaları, rutinlerin faydalarını da içerdiğini keşif ettim. Yani, şirketin yapısı önemli olsa da, şirketin kaynaklarını yönetebilecek kabiliyetlerin bir şirkette bulunması innovasyon için çok daha mühim.

Son olarak, dördüncü makalemde, rutinlerin ne derecede şirketlere esneklik sağlayabildiklerini açığa getiriyorum. Araştırmamı, farklı kısıtlandırmalar içerisinde işlemesi beklenen bir hastahanelerin ünitesinde gerçekleştirdim. Bu ünitenin çevresinde aynı anda hastaların farklı yoğunlukla üniteye başvurmalarından dolayı oluşan yoğunluğa karşılık

olarak, unite daima adapte olma baskısıyla karşı karşıya. Boyle bir alanda, rutinler sayesinde bu ünitenin devamlı olarak adapte olabilmeyi sağladığını buldum. Yoğun zamanlarda rutin genişlerken, sakin zamanlarda rutin tekrar küçülerek, rutini oluşturan insanların eforları bir organizasyonun esnekliğinin en önemli unsurlardan biri olabildiğini keşf ettim. Bu durumlarda ki elde edilen esneklik, yönetimin kabiliyetlerinden ziyade, çalışanlarının kişilikleri ile alakalı olduğu bulgu bilhassa genellikle zannedilene ters, şaşırtıcı bir bulgu.

Herşeyi bir araya getirecek olursak, bu tezimde rutinlerin ve dinamik kabiliyetlerin, değişim ve innovasyon için ne şekilde önemli olduklarını ve önemlerinin ne şekilde farklı olduğunu gösteriyorum. Böylece, şirketlerin niye farklı beceriler elde ettiklerini daha iyi anlamamızı sağlıyorum.

## About the author



Emre Karali was born on the 12<sup>th</sup> of October, 1991, in Enschede. After finishing his Bachelor's in Economics and Business and his Master's in Urban, Port and Transport Economics, he started as a PhD Candidate at the Rotterdam School of Management, Erasmus University Rotterdam. He chose for this trajectory because of his interest in why some organizations are successful whereas others are not. In this regard, his research interests include change, competitive advantage, dynamic capabilities, healthcare management, innovation, organizational design and organizational routines.

Emre's work has been presented at a great amount and variety of conferences, such as the Academy of Management Annual Conferences (Anaheim, 2016; Atlanta, 2017), the Competence-Based Strategic Management Conference (Bochum, 2015), European Academy of Management Conference (Paris, 2016), European Group for Organization Studies (Rotterdam, 2014; Athens, 2015; Naples, 2016; Copenhagen, 2017), the International Symposium on Process Organization Studies (Koš, 2015; Koš, 2017) and the Strategic Management Society Annual Conferences (Denver, 2015; Berlin, 2016).

Aside from generic paper presentations, Emre has been invited to, and has consequently presented at, symposia that were held at the Academy of Management Annual Conferences in Anaheim (2016) and Atlanta (2017). He has also chaired a variety of the sessions at the conferences he attended, such as at the Strategic Management Society Annual Conference in Denver (2015) and at Academy of Management Annual Conference in Anaheim (2016). Emre has participated in competitive paper development workshops, such as the AMR-OMT Paper Development Workshop in Rotterdam (2016), the OMT Doctoral Consortium in Anaheim (2016) and the Strategy-as-Practice Paper Development Workshop at Cass Business School in London. In addition, Emre has co-hosted an international community at the Rotterdam School of Management, called the 'Routines.Research.Community', that researches the dynamics of routines.

Emre has a publication in the journal of *Management and Organization Review*. Also, Emre has written a book chapter on the role of dynamic capabilities in healthcare innovation, which will be part of a book on healthcare entrepreneurship and management that is planned to be published this year by a leading publisher. His article in which he researches how organizations as problem-solving entities can solve problems of varying complexities in a variety of ways (Chapter 3 of his dissertation), was nominated for the best conference paper award at Strategic Management Society Annual Conference in Berlin (2016). All of his articles are either under review at leading academic journals, or are very close to submission.

Currently, aside from his position as PhD Candidate, Emre holds a position as researcher at the Erasmus School of Accounting and Assurance (ESAA), where he continues with his research on the relationship between routines and how organizations function. In addition, he investigates the role of softer aspects, such as love, within organizations and as part of leadership and management. His research at ESAA is in close collaboration with Prof.dr. Harry R. Commandeur. From September onwards, Emre will be an Assistant Professor in Strategy at Özyeğin University in Istanbul, while he will continue to hold his position at ESAA.



# Portfolio

## Publications

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Volberda, H. W. and Karali, E. 2015. Reframing the Compositional Capability: A Resource-Based View on 'A Composition-Based View of Firm Growth'. *Management and Organization Review* 11 (3), 419-426

## A selection of work-in-progress

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Karali, E., Volberda, H.W., and Sidhu, J.S. Integrating the notions of rules, routines and dynamic capabilities: A mediation model of their effect on exploratory innovation. (Quantitative) *Under review*

Karali, E., Sidhu, J.S., and Volberda, H.W. Environmental variation, contextual constraints and routine dynamics: Professional identity as a source of oscillation. (Qualitative) *Preparing for submission*

Karali, E., Sidhu, J.S., and Volberda, H.W. Rethinking organizational routines for innovation: a synthesis and agenda for future research. (Bibliometric review) *Preparing for submission*

Karali, E., Volberda, H.W., and Sidhu, J.S. Routines and adhocism: how (dynamic) capabilities allow for the resolution of problems of varying complexities. (Conceptual) *Preparing for submission*

Karali, E., and Angeli, F. Understandings as a source of inter-departmental conflict (Qualitative) *Working paper*

Slob, H., Karali, E., and Commandeur, H. R. Love in Leadership, Management and Organization (Qualitative) *Working paper*

#### Book chapters

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Karali, E., Angeli, F., Sidhu, J.S., Volberda, H. W. 2018 (forthcoming). *Dynamic capabilities in the healthcare sector* in Garbuio, M., Mascia, D., Angeli, F., and Wilden, R. *Healthcare Entrepreneurship*. Routledge

#### PhD Courses

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2015	Advanced Qualitative Methods
	Topics in the Philosophy of Science
	Executive Compensation and other Managerial Incentives
2014	Advanced Survey Methods
	Corporate Governance
	Statistical Methods
	Advanced Topics of Research in Strategy
	Going Beyond data synthesis: Meta-analysis for theory advancement in business economic research
	Multilevel Analysis in SPSS
	Data Analysis with R
	Eden Doctoral Seminar on Methods, Techniques and Theories in Entrepreneurship and Innovation
2013	English (CPE taken and passed in 2017)

## Scientific Integrity

### Notable consortia, Symposia and Workshops

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- 2017 Strategy-as-Practice Paper Development Workshop at Cass Business School in London
- 2017 Annual Meeting of the Academy of Management (Atlanta, GA). Symposium presentation, facilitated by Chris Bingham and Oliver Schilke
- 2016 Annual Meeting of the Academy of Management (Anaheim, CA). Symposium presentation, facilitated by Oliver Schilke and Timo Vuori
- 2016 OMT Doctoral Consortium (competitive), tutored by Joel Baum
- 2016 AMR-OMT Paper Development Workshop (competitive), tutored by Jean Bartunek
- 2013 EDEN Doctoral Seminar on Methods, Techniques and Theories in Entrepreneurship and Innovation

### Conference Presentations

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- 2017 Routines and adhocism: how (dynamic) capabilities allow for the resolution of problems of varying complexities. 2017 Annual Meeting of the Academy of Management (Atlanta, GA)
- 2017 How contextual constraints fuel the dynamism of routines by evoking empathic action. 33rd EGOS Colloquium (Copenhagen, DEN)

- 2017 How contextual constraints fuel the dynamism of routines by evoking empathic action. 9th International Symposium on Process Organization Studies (Koš, GR)
- 2016 Understanding organizational problem-solving through applying a dynamic capabilities perspective. 36th Strategic Management Society Annual International Conference (Berlin, GER)
- 2016 Understanding organizational problem-solving through applying a dynamic capabilities perspective. 2016 Annual Meeting of the Academy of Management (Anaheim, CA)
- 2016 Routines, Dynamic Capabilities & Exploratory innovation. Annual Conference European Academy of Management (Paris, FRA)
- 2016 Adaptation in the cardiac healthcare path: The role of routines and dynamic capabilities. 32nd EGOS Colloquium (Naples, ITA)
- 2015 Routines or (Dynamic) Capabilities? On Unraveling the Change and Innovation Process. 35th Strategic Management Society Annual International Conference. (Denver, CO)
- 2015 Curing healthcare through dynamic managerial capabilities? Investigating the role of protocols in hospitals' adaption process. Strategic Management Society. (Denver, CO)
- 2015 Routines or (Dynamic) Capabilities? On Unraveling the Change and Innovation Process. Competence-based Strategic Management Conference. (Bochum, GER)
- 2015 On the Mechanics of Change: How Organizational and Managerial Capabilities Interact When Needed. 9th Competence-based Strategic Management Conference. (Bochum, GER)

- 2015 Routine Adaption? On how protocols and routines enable or inhibit the adaption of hospitals to dynamic environments. 31st EGOS Colloquium (Athens, GR)
- 2015 Enablers or inhibitors of the dynamic capabilities process? A qualitative inquiry into the role of protocols within the adaption of hospitals to dynamic environments. 7th International Symposium on Process Organization Studies (Koš, GR)
- 2014 What difference is there in innovation between dynamic capabilities and dynamic managerial capabilities deployment? 30th EGOS Colloquium (Rotterdam, NL)

#### Teaching

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- 2017 - 2018 Teaching 'Managing Team Dynamics' in the MSc course 'Strategy Formulation'
- Executive teaching on 'Team Dynamics and Research' in the course 'Company Project'
- Coordination of the executive course 'Company Project'
- Developing and grading case-based assignments for the executive course 'Strategy' and the course 'Strategy Formulation'
- Coordination of the executive course 'Strategy'
- Guidance of executives and executive teaching during the PTO kick-off day
- 2016 - 2017 Teaching in the research clinic of the Strategic Management master's program
- Thesis supervision and assessment
- Internship supervision and assessment

	Developing assignments and arranging a workshop for the course 'Managing Strategy Formulation'
2015 - 2016	Teaching in the research clinic of the Strategic Management master's program  Thesis supervision and assessment
2014 - 2015	Teaching in the research clinic of the Strategic Management master's program  Thesis supervision and assessment  Internship supervision and assessment
2013 - 2014	Teaching in the research clinic of the Strategic Management master's program  Thesis supervision and assessment

## The ERIM PhD Series

The ERIM PhD Series contains PhD dissertations in the field of Research in Management defended at Erasmus University Rotterdam and supervised by senior researchers affiliated to the Erasmus Research Institute of Management (ERIM). All dissertations in the ERIM PhD Series are available in full text through the ERIM Electronic Series Portal: <http://repub.eur.nl/pub>. ERIM is the joint research institute of the Rotterdam School of Management (RSM) and the Erasmus School of Economics at the Erasmus University Rotterdam (EUR).

### Dissertations in the last five years

Abbink, E.J., *Crew Management in Passenger Rail Transport*,  
Promotors: Prof. L.G. Kroon & Prof. A.P.M. Wagelmans, EPS-2014-325-LIS,  
<http://repub.eur.nl/pub/76927>

Acar, O.A., *Crowdsourcing for Innovation: Unpacking Motivational, Knowledge and Relational Mechanisms of Innovative Behavior in Crowdsourcing Platforms*,  
Promotor: Prof. J.C.M. van den Ende, EPS-2014-321-LIS, <http://repub.eur.nl/pub/76076>

Akemu, O., *Corporate Responses to Social Issues: Essays in Social Entrepreneurship and Corporate Social Responsibility*, Promotors: Prof. G.M. Whiteman & Dr S.P. Kennedy,  
EPS-2017-392-ORG, <https://repub.eur.nl/pub/95768>

Akin Ates, M., *Purchasing and Supply Management at the Purchase Category Level: Strategy, structure and performance*, Promotors: Prof. J.Y.F. Wynstra & Dr E.M. van Raaij, EPS-2014-300-LIS, <http://repub.eur.nl/pub/50283>

Alexander, L., *People, Politics, and Innovation: A Process Perspective*,  
Promotors: Prof. H.G. Barkema & Prof. D.L. van Knippenberg, EPS-2014-331-S&E,  
<http://repub.eur.nl/pub/77209>

Alexiou, A. *Management of Emerging Technologies and the Learning Organization: Lessons from the Cloud and Serious Games Technology*, Promotors: Prof. S.J. Magala, Prof. M.C. Schippers and Dr I. Oshri, EPS-2016-404-ORG, <http://repub.eur.nl/pub/93818>

Almeida e Santos Nogueira, R.J. de, *Conditional Density Models Integrating Fuzzy and Probabilistic Representations of Uncertainty*, Promotors: Prof. U. Kaymak & Prof. J.M.C. Sousa, EPS-2014-310-LIS, <http://repub.eur.nl/pub/51560>

Alserda, G.A.G., *Choices in Pension Management*, Promotors: Prof. S.G. van der Lecq & Dr O.W. Steenbeek, EPS-2017-432-F&A, <https://repub.eur.nl/pub/103496>

Benschop, N, *Biases in Project Escalation: Names, frames & construal levels*,  
Promotors: Prof. K.I.M. Rhode, Prof. H.R. Commandeur, Prof. M. Keil & Dr A.L.P. Nuijten, EPS-2015-375-S&E, <http://repub.eur.nl/pub/79408>

Berg, W.E. van den, *Understanding Salesforce Behavior using Genetic Association Studies*, Promotor: Prof. W.J.M.I. Verbeke, EPS-2014-311-MKT, <http://repub.eur.nl/pub/51440>

Beusichem, H.C. van, *Firms and Financial Markets: Empirical Studies on the Informational Value of Dividends, Governance and Financial Reporting*, Promotors: Prof. A. de Jong & Dr G. Westerhuis, EPS-2016-378-F&A, <http://repub.eur.nl/pub/93079>

Bliek, R. de, *Empirical Studies on the Economic Impact of Trust*, Promotor: Prof. J. Veenman & Prof. Ph.H.B.F. Franses, EPS-2015-324-ORG, <http://repub.eur.nl/pub/78159>

Boons, M., *Working Together Alone in the Online Crowd: The Effects of Social Motivations and Individual Knowledge Backgrounds on the Participation and Performance of Members of Online Crowdsourcing Platforms*, Promotors: Prof. H.G. Barkema & Dr D.A. Stam, EPS-2014-306-S&E, <http://repub.eur.nl/pub/50711>

Bouman, P., *Passengers, Crowding and Complexity: Models for Passenger Oriented Public Transport*, Prof. L.G. Kroon, Prof. A. Schöbel & Prof. P.H.M. Vervest, EPS-2017-420-LIS, <https://repub.eur.nl/>

Brazys, J., *Aggregated Marcoeconomic News and Price Discovery*, Promotor: Prof. W.F.C. Verschoor, EPS-2015-351-F&A, <http://repub.eur.nl/pub/78243>

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Hout, D.H. van, *Measuring Meaningful Differences: Sensory Testing Based Decision Making in an Industrial Context; Applications of Signal Detection Theory and Thurstonian Modelling*, Promotors: Prof. P.J.F. Groenen & Prof. G.B. Dijksterhuis, EPS-2014-304-MKT, <http://repub.eur.nl/pub/50387>

Houwelingen, G.G. van, *Something To Rely On*, Promotors: Prof. D. de Cremer & Prof. M.H. van Dijke, EPS-2014-335-ORG, <http://repub.eur.nl/pub/77320>

Hurk, E. van der, *Passengers, Information, and Disruptions*, Promotors: Prof. L.G. Kroon & Prof. P.H.M. Vervest, EPS-2015-345-LIS, <http://repub.eur.nl/pub/78275>

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Change and innovation are the hallmark of successful organizations. Still, there is much to learn on these topics. Many organizations and their managers are concerned with finding an answer to the seemingly ever-lasting question of why it is that some organizations outperform others. This dissertation aims to enhance our understanding in this regard.

The author unravels how routines and dynamic capabilities, which are argued to be vital elements of organizations, are related to change and innovation within organizations. He approaches this question in a conceptual, qualitative and quantitative manner, spread across four studies.

In his first study, the author reviews the literature on routines in relation to change and innovation and performs bibliometric analyses to assess the level of conversation across two dominant routine-based research streams, being the routine dynamics and dynamic capabilities research streams. Then, in his second study, he builds a framework of organizational problem-solving, based on these literatures. In his third study, he addresses the question of how the concepts of routines and dynamic capabilities relate to each other, finding that routines are more facilitative and dynamic capabilities more decisive for innovation. Finally, he examines the extent to which routines can contribute to the adaptation of organizations. He finds that individual characteristics, such as professional identity and empathy, can be a source of organizational adaptation and resilience, this way also substituting management.

Overall, this dissertation provides key knowledge for those organizations that seek to thrive in an ever-changing environments and seek to know what routines and dynamic capabilities are, why they are vital components of organizations and how they are, or should be, involved in the change and innovation process.

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