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NHH/26 2016

SERVICE, INNOVATION, AND DYNAMIC CAPABILITIES: FROM CONCEPTUALIZATION TO EXPLANATION

BY SEIDALI KURTMOLLAIEV

PhD THESIS
NO. 2016/26
NOVEMBER 2016
ISBN/978-82-405-0353-6

Department of Strategy and Management

NHH

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EFMD EQUIS ACCREDITED CEMS PIM Partnership in International Management

Department of Strategy and Management

SERVICE, INNOVATION, AND DYNAMIC CAPABILITIES: FROM CONCEPTUALIZATION TO EXPLANATION

Seidali Kurtmollaiev

Dissertation submitted to the Department of Strategy and Management at NHH – Norwegian School of Economics in partial fulfilment of the requirements for the degree of Doctor of Philosophy (PhD)

June 2016

ABSTRACT

The overall purpose of this dissertation is to investigate the role of dynamic capabilities in service innovation. However, I do not accept the notions of service innovation and dynamic capabilities as given, but instead I start with exploring their meanings. Next, due to the lack of an adequate instrument for measuring dynamic capabilities, I operationalize sensing, seizing, and transforming capabilities. Finally, I investigate how managerial dynamic capabilities can be developed and how they affect innovation and operational capability in a service organization. Thus, my research questions are as follows: 1) What is service innovation? 2) What are dynamic capabilities? 3) How can dynamic capabilities be operationalized? 4) How can dynamic capabilities be developed, and how do they affect service innovation and operational capability? I answer each question in a series of four articles.

In Article 1, I demonstrate that service innovation is neither a well-established concept nor a commonly understood phenomenon. Instead, I outline six existing perspectives on what service and service innovation are: new service development (NSD), service engineering, service infusion, service design, service reconfiguration, and service integration. Each of these perspectives has its own research focus, logic, and vocabulary, but the NSD perspective creates a strong gravitational field that decelerates the real advancement of other perspectives. Moreover, NSD itself is under the influence of new product development research. As a result, perspectives suffer from lexical cross-contamination and parallelism in approaches that obstruct researchers from making novel and relevant contributions. To overcome these challenges, I encourage a more distinct pluralism of perspectives while not excluding the possibility of meaningful conversations across them.

In Articles 2, 3, and 4, I take the NSD perspective, but I do so in an unconventional manner. I examine dynamic capabilities—a factor that, at least in theory, influences the

success of changes in the bundle of the organization's services, the latter defined as the organization's core activities.

In Article 2, I critically assess dynamic capabilities as a notion, concluding that the current interpretations of the term are unsustainable and unsatisfactory. I suggest a new definition of dynamic capabilities that specifies necessary and sufficient conditions for dynamic capabilities: the individual's intention to change the status quo in the organization as well as the individual's high level of influence in the organization. I further outline possible antecedents and outcomes of dynamic capabilities.

In Article 3, I apply the original tripartite disaggregation of dynamic capabilities to managers. I clarify the notions of managerial sensing, seizing, and transforming capabilities by delineating what they are and what they are not. I then develop and empirically validate a brief measure of managerial sensing, seizing, and transforming capabilities. Using structural equation modeling, I provide evidence that transforming is dependent on seizing, and in turn, that seizing is dependent on sensing. Moreover, I demonstrate that managerial seizing capability is positively related to innovation, while managerial transforming capability is positively related to cost reduction.

In Article 4, I theorize that training team leaders in design thinking principles and tools leads to the development of their managerial sensing, seizing, and transforming capabilities, which then influences their teams' innovation and operational capability. Testing the model relies on a quasi-experimental field study with a control group and a four-month time lag. The intervention is presented randomly over time in six geographically isolated business units of a large multinational telecommunications company. The results show that the training program has a positive effect on the participants' managerial sensing and seizing capabilities, which have a positive effect on managerial transforming capability, the teams' innovation, and the teams' operational capability. These positive effects are paralleled by a direct negative effect

of the program on the operational capability of the participants' teams. In addition, the effect of managerial transforming capability on the teams' operational capability is non-significant.

In this summary, I provide a general overview of the theoretical and methodological choices I made while working on my dissertation. I also present the key results, discuss implications and limitations of this work, and suggest future research opportunities.

ACKNOWLEDGEMENTS

I owe every single word of this dissertation to Professor Per Egil Pedersen. It is because of him, the founder and the first director of the Center for Service Innovation (CSI), that I received the job and necessary funding. Because of him, I got a chance to strengthen my knowledge through the prime courses and workshops. Because of him, I gained access to the unique empirical setting. He believed in me, supported me in all of my endeavors, and genuinely shared my interests and concerns. Despite having a busy life in another part of the country, he was available at any time. Always attentive, always knowledgeable, and always precise, he gave feedback of the utmost quality and incredible accuracy. I felt prioritized, heard, understood, and respected. For me, he has always been so much more than a supervisor. He has been my sculptor who masterly carved a researcher out of me. A true teacher and a true leader, he has been my ultimate source of inspiration. A kind-hearted polymath with an extraordinarily agile mind and a strong character, he has been my real hero. I am infinitely and eternally grateful to him.

I am also very thankful to all of the wonderful people who consciously and unconsciously turned my doctoral program into a memorable and pleasurable experience. I am very thankful to two amazing researchers from Telenor—Annita Fjuk, for her phenomenal energy, empathy, and social skills, and Knut Kvale, for his remarkable diligence, patience, and reliability. My data collection would not have been possible without them. I am very thankful to Professor Tor Wallin Andreassen, the current CSI director, for his great enthusiasm, creativity, and interest in me. His exciting ideas about the development of the Norwegian Innovation Index as well as an invitation to join his team have proven to be very fruitful for me. I am very thankful to Paal Fennell, the head of administration, for every minute of time that he spent on me. His excellent administrative skills, broad knowledge, and sincere support have always been inspiring. I am very thankful to our helping and highly

professional administrators: May-Britt Rød, for her friendship, kindness, and knowledge of everything in the school; Irene Haukås Moe, for her wisdom, optimism, and smoothly running the CSI; Elaine Pettersen, for her sincerity and humor; and Liz-Beth Lindanger, for her always practical advice. I am very thankful to Professors Herbjørn Nysveen, Sigurd Villads Troye, Keld Laursen, and Simon Clatworthy for sharing their broad experience and competence with me. I am very thankful to my current and former colleagues Pjotr Akulinitsev, Natalia Drozdova, Line Lervik-Olsen, Vasilisa Sayapina, and Aleksander Sivertsen for their warm attitude and readiness to discuss my research at any time. I am very thankful to all of my other colleagues and friends for the wonderful times and laughter we shared. It is a pity that I cannot mention them all individually. Nevertheless, I would like to mention Karoline Ulrikke Dahr, Alena Golyagina, Alexander Hem, Linn-Therese Holsen, Charlotte Hui, Olga Iermolenko, Dmitri Jegorov, Nasun Moadmuang, Evgenia Ponomareva, Linda Rud, Monica Rydland, Sebastian Schwalbach, Njål Sivertstøl, Birgit Apenes Solem, Hågen Solheim, Natalie Truong, Burak Tunca, and Danielius Valuckas. These people made my life in Bergen considerably more enjoyable. I am also very thankful to professors who shared their knowledge with me in courses; to managers whom I interviewed; to friendly researchers I met at conferences, workshops, and meetings; and, of course, to the great faculty of the Department of Strategy and Management at NHH.

Beyond all measure, I am grateful to my parents, Gulnar Kurtmollaieva and Envier Kurtmollaiev, without whom neither this dissertation nor myself – as a human or a person - would exist. Thousands of kilometers away and yet so close to my heart, they have always supported me in all of my decisions and stoically endured our time apart. Their love and care have been the two pillars that have helped me stand firmly against the winds of life.

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The kaleidoscope of service innovation: A perspective on perspectives

In revise and resubmit at the *Journal of Service Research*

Article 2

Kurtmollaiev, S.

Explaining dynamic capabilities and explaining with dynamic capabilities: A necessary step further

In revise and resubmit at the *Journal of Management Inquiry*

Article 3

Kurtmollaiev, S., Fjuk, A., Kvale, K., and Pedersen, P. E.

Measuring managerial dynamic capabilities: Construct development and measurement validation

In revise and resubmit at the *Journal of Management Studies*

Article 4

Kurtmollaiev, S., Fjuk, A., Kvale, K., and Pedersen, P. E.

Developing managerial dynamic capabilities: A quasi-experimental field study of the effects of a design thinking training program

Published in the *Academy of Management Annual Meeting Proceedings, 2016*

In revise and resubmit at the *Academy of Management Learning & Education*

INTRODUCTION

Given the exceptional importance of services in the global economy, it is time to consider the existence of a "service revolution" that is on par with the agricultural and industrial revolutions (Spohrer and Maglio, 2008). Services have taken an uneasy path from being an appendage of the manufacturing sector to becoming the dominant economic activity of many countries, and the growth in research related to innovation in services has been no less impressive than the growth of the service sector itself (Schilling and Werr, 2009). Research has grown especially during the last decade, which marked the beginning of the "Golden Age" of service innovation research. In 2008, the Marketing Science Institute described innovation as a top research priority and called for more attention to service innovation in particular (Papastathopoulou and Hultink, 2012). Four years later, the same institute explicitly defined the research priority of "designing experiences, not products," encouraging the transfer of concepts from service science to research on experience with products.

The above paragraph is a typical introduction to an article on service innovation. In fact, it served as the opening of my and Per Egil Pedersen's first review of service innovation literature, which I used to shape the focus of my dissertation. Submitted to the *Journal of Service Management* in May 2013, this review underwent three rounds of revision before getting rejected in August 2014. I was furious, not because of the rejection, but because the review process took more than a year. Although it was feasible to address the comments—one of the two reviewers asked for a minor revision—the article was too out of date to send to another journal. I decided to set it aside for awhile. Now, when I look back at the old review, I am grateful to the anonymous reviewers for rejecting it. More precisely, I am grateful for the unintended consequence of their action: the new review article it prompted. Written at the end of my doctoral program together with Per Egil Pedersen, it is unlike any other review of service innovation (see Carlborg et al., 2014; Droege et al., 2009; Johne and Storey, 1998;

Papastathopoulou and Hultink, 2012). Instead of readily discussing themes and topics, I start with arguing that neither the words "service" nor "innovation" have a common meaning across the research field. In some cases, different terms describe the same phenomenon. In other cases, the same terms convey incommensurable interpretations. Not surprisingly, Biemans et al. (2015) conclude that service innovation is a large but disintegrated research field that lacks both impact and a generally accepted body of knowledge. They demonstrate that only a handful of researchers remain faithful to the field, with others entering it only occasionally. Like Ole Bull's colony Oleana, service innovation as a field offers fantastic opportunities, but it fails to retain its "colonists."

Service innovation is indeed loosely coupled, but 35 years of research have resulted in such a rich variety of interpretations of both service and innovation that the time has come to embrace the diversity of perspectives and accept their autonomy with respect to research focus, logic, and vocabulary. I identify and characterize six such perspectives: new service development (NSD), service engineering, service infusion, service design, service reconfiguration, and service integration. Some of these perspectives share a common ground, whereas others are cardinally different. Within some of them, the opening paragraph that I used in this introduction would simply have no meaning.

Currently, NSD is the prevailing perspective on service innovation. Its main characteristic is the treatment of services as intangible outputs that are developed to gain advantages in existing or potential markets (Johne and Storey, 1998). Its "holy grail" is and has always been so-called "success factors" (i.e., factors that ensure the success of the NSD process and of its outcomes) (e.g., de Brentani, 1991; Storey et al., 2015). Common examples are firms' strategy, culture, resources, formalization of the NSD process, collaboration with internal and external parties, and characteristics of new services (e.g., Atauhene-Gima, 1996; Ettlie and Rosenthal, 2011; Froehle and Roth, 2007; Hull, 2004; Lyons et al., 2007; Carbonell

et al., 2009). Most reviews of the service innovation literature clearly take this perspective as given and tend to assign it to all service innovation studies. Our old review did not escape from this practice, which is one of the main reasons why most of this dissertation takes the NSD perspective, albeit rather implicitly.

The current trend within the NSD perspective and innovation research in general is that many authors tend to use, mostly interchangeably, the terms "capabilities," "competences," and "capacities" when discussing success factors for innovation. The main idea is that if a certain company achieves success in the market with new services and/or products, this company should possess some capability, competence, or capacity for doing so. Unabashed by the circularity of this reasoning, hundreds of researchers turn their attention to searching for various innovation capabilities (e.g., Agarwal and Selen, 2009; den Hertog et al., 2010; Menor and Roth, 2007; Ordanini and Parasuraman, 2011; Salunke et al., 2011). If judged by the variety of the identified capabilities, this search is clearly gratifying, although it sometimes results in rather vague constructs such as "potential operational absorptive capacity capability" and "realized operational absorptive capacity capability" (Setia and Patel, 2013).

The interest in innovation capabilities represents a shift from "static" factors that are simply "out there," either inside or outside a company (e.g., strategy, resources, or market characteristics), to "dynamic" ones (i.e., something that a company uses to purposefully build up and manipulate static success factors). The quintessence of this thinking is the dynamic capabilities framework that focuses on the firm's "competences/capabilities which allow the firm to create new products and processes, and respond to changing market circumstances" (Teece and Pisano, 1994, p. 541). The spectacular popularity of the framework is reflected in the fact that its main foundational paper by Teece et al. (1997) was the most cited article in economics and business from 1995–2005, according to ScienceWatch by Thomson Reuters (Helfat et al., 2007).

I was excited by the research opportunities that the dynamic capabilities framework offered, and I devoted my efforts to what Pavlou and El Sawy (2011, p. 239) called "understanding the elusive black box of dynamic capabilities." The black box turned out to be a Pandora's box of ambiguity, tautology, and reification (for criticism, see Arend and Bromiley, 2009; Collis, 1994; Giudici and Reinmoeller, 2012; Williamson, 1999; Zahra et al., 2006). As a result, I focused my efforts on clarifying and refining the main concept and developing a new instrument for its measurement. In line with the microfoundations movement in strategy and organization theory (Abel et al., 2008; Felin and Foss, 2005; Felin et al., 2012; Felin et al., 2015), I defined dynamic capabilities as regular actions, attributed them to individuals in organizations, and then operationalized Teece's (2007, 2012) tripartite framework of sensing, seizing, and transforming. Luckily, I got an opportunity to test my new interpretation of dynamic capabilities when one of the world's largest telecommunications companies decided to train its managers from several geographically isolated business units in service design. Together with Annita Fjuk, Knut Kvale, and Per Egil Pedersen, I examined the influence of dynamic capabilities on innovation in a quasi-experimental setting. I used design thinking training as manipulation and investigated how managers' knowledge of service design principles and tools could contribute to the development of managerial dynamic capabilities. I also examined how this development affected the innovation output and operational capability of the participating managers' teams.

Thus, the overall purpose of my dissertation was to investigate the role of dynamic capabilities in service innovation. Instead of merely accepting the notions of service innovation and dynamic capabilities as given, I began by exploring their meanings. Due to the lack of an adequate instrument for measuring sensing, seizing, and transforming capabilities, I proceeded with the operationalization of the constructs. Finally, I investigated how managerial dynamic capabilities can be developed as well as how they affect innovation and

operational capability in a service organization. The research questions that guided this dissertation are as follows:

1) What is service innovation?
2) What are dynamic capabilities?
3) How can dynamic capabilities be operationalized?
4) How can dynamic capabilities be developed, and how do they affect service innovation and operational capability?

The pursuit of these research questions resulted in four separate articles. Figure 1 illustrates the logical flow between the four articles, demonstrating how I examined each research question and which actions were decisive in formulating a subsequent research question.

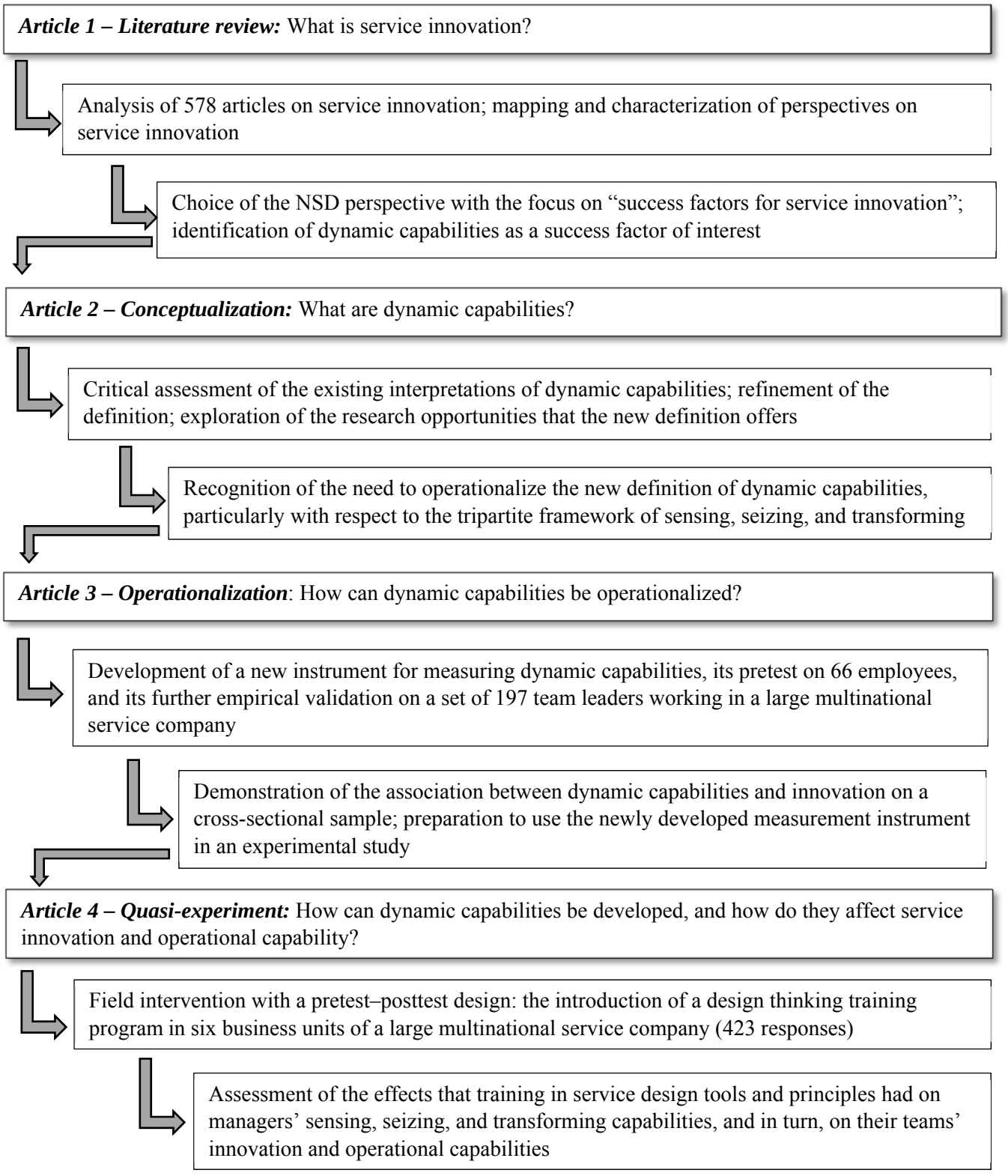

Figure 1. The logic of the dissertation

Because I had to position each article with respect to discussions in particular journals, they might seem less interconnected or relevant to service innovation than they actually are. For example, I used the phrase "design thinking tools" instead of "service design tools" because the former started to include the latter (e.g., Brown and Katz, 2011; Kolko, 2015). This allowed me to join the discussion on the effects of design thinking education (e.g., Dunne and Martin, 2006; Glen et al., 2014). Neither in my conceptual paper on dynamic capabilities nor in our empirical papers did I explicitly use the term "service innovation," although we conducted the empirical studies in a classic service context. Obviously, I had to re-explicate dynamic capabilities in a manner that would be relevant for all researchers working with this notion, including myself. After all, there is no theoretical reason to assume that dynamic capabilities as I defined them should differ in service innovation and product innovation.

This dissertation contributes, directly or indirectly, to several bodies of literature. To the service innovation field in general, it contributes by suggesting a novel classification of the multiple interpretations of service innovation into six autonomous perspectives, each with its own research focus, logic, and vocabulary. To the NSD perspective and innovation research in general, this dissertation contributes by examining the influence of a specific factor—dynamic capabilities—on innovation outputs. To the dynamic capabilities literature, this dissertation contributes by refining and operationalizing its main constructs and by investigating the antecedents and outcomes of dynamic capabilities. To the microfoundations movement in strategy and organization theory, this dissertation contributes by demonstrating a way to define organizational constructs, explaining organizational capabilities based on individuals' actions, and suggesting a way to conduct multilevel empirical studies. To the design thinking and service design literature as well as to management learning and education

literature, this dissertation contributes by investigating the effects of design thinking training on managers and the managers' teams.

In the following chapters, I present the dissertation's theoretical and methodological choices, contributions, limitations, and implications. Particularly, I focus on aspects that I omitted from the articles due to space limitations or other journals' requirements but that are nevertheless important for gaining a more holistic view of the work behind this dissertation.

THEORETICAL FRAMEWORK

What is service innovation (from the NSD perspective)?

Innovation is *the* buzzword of our time, taking over the position that the word "invention" occupied until the 1970s (Google Ngram Viewer). As a scientific concept, however, it has been in use for over a century. In 1911, Joseph Schumpeter suggested the first most comprehensive definition of innovation, using the term for the introduction of a new good, the introduction of a new method of production, the opening of a new market, the conquest of a new source of supply, and the carrying out of a new organization of industry (Schumpeter, 1934). The multifaceted nature of the definition attracted the attention of researchers and professionals from various fields (Fagerberg, 2005; Fagerberg et al., 2012). With manufacturing being the main economic activity for most of the 20th century, they understandably saw innovation as a phenomenon that was inseparably associated with products (Coombs and Miles, 2000). The service sector residually covered firms that were neither within the primary nor secondary sector of the economy, had no significant R&D investments, and in most researchers' view, dealt with ephemeral entities: What and how would service companies innovate? If they did innovate, why would be there any difference between manufacturing and service firms?

Things started to change in the 1980s with Shostack's (1982) service blueprinting, Barras' (1986) reverse product cycle, and Easingwood's (1986) and Reidenbach and Moak's (1986) new product development for services. As their choice of terms shows, these early authors were rather reserved about fully alienating their ideas from product innovation research. Yet, purposefully or not, they were building a new research field that, following the service marketing literature (Zeithaml et al., 1985), regarded services as products that are unique in their intangibility, heterogeneity, perishability, and inseparability of production

from consumption. The idea of unique characteristics was decisive in identity-building, and already by the end of the decade, de Brentani (1989) and Scheuing and Johnson (1989) clearly favored the term "new service development" over "new product development." The NSD perspective was born, quickly becoming the paradigm for service innovation research.

Many researchers have since devoted their efforts to justifying the right of service innovation research to exist alongside product innovation research. Because NSD generated new immaterial entities with unique characteristics, brought changes to both "front office" and "back office" with every new service, and could receive a continuous input from front-line employees, it had to be different, at least theoretically (Menor et al., 2002). Empirical studies indeed showed some differences. For example, despite being bound by manufacturing-focused measurement instruments such as the Community Innovation Survey (CIS), researchers managed to find evidence that "services are much more active with respect to innovation than is widely thought" (Hipp et al., 2000, pp. 417–418). They also found that, as compared to manufacturing, the success of new services depended more on a high degree of novelty, short formal beta testing, internally sourced ideas (Ettlie and Rosenthal, 2011), and a high level of trust between external partners in the case of collaboration (Schleimer and Shulman, 2011). On the other hand, common metrics often ensured that identified differences were more of degree than of kind. Some researchers even demonstrated that there were more similarities than differences in innovation processes between manufacturing and service sectors (Evangelista, 2000), with more differences within each of these sectors than between them (Forsman, 2011). In their recent meta-analysis, however, Storey et al. (2015) concluded that service innovation was certainly different from product innovation, although differences in innovation factors between service types might be as significant as they are between services and products. They based their conclusion on a comparison with the corresponding meta-analysis of product innovation studies (Evanschitzky et al., 2012). Storey et al. (2015)

found that the commercial success of new services, in contrast to new products, largely depended on absorptive capacity, organizational design, innovation strategy, the efficiency of the development process, service innovativeness, front-line staff involvement, external relations, and the formal development process. Only launch proficiency and internal communication appeared on both Storey et al.'s (2015) and Evanschitzky et al.'s (2012) lists of the most important success factors.

Although the empirical papers in my dissertation feature the NSD perspective, I take it with some reservations. As I argue in the Article 1, the existing industry classifications are critically out of date. It is more accurate to view them as reflecting the time when services were defined by the intangibility of outputs and non-belonging to the primary and secondary sectors. Other "unique" service characteristics were the result of post hoc theorizing over already-established industry classifications. With the recent changes in economic activities, they have become obsolete (Edvardsson et al., 2005; Lovelock and Gummesson, 2004; Vargo and Lusch, 2004). Now, when scholars recognize intangible commodities, homogeneous services, and product–service systems, the unrestrained use of existing classifications in empirical studies is unreliable. This is the main reason why other perspectives on service innovation have emerged. Until some re-classification attempt succeeds, the best solution for the adherents of the NSD perspective, in my opinion, is to select services for the analysis based on the original criterion of intangibility.

Within the NSD perspective, "service innovation" can mean 1) a new service (e.g., Sundbo, 1997); 2) a significantly modified service due to changes in, for example, service concept, client interface, delivery system, or technological options (den Hertog, 2000); or 3) the process of developing and carrying out a new or significantly modified service (Toivonen and Tuominen, 2009). The third meaning is what the term "NSD" typically denotes (e.g., Menor and Roth, 2007). Decades of research with a constant focus on the context of

development and commercialization have brought an impressive number of internal and external characteristics that may act as success factors for service innovation, given proper management or fortunate coincidence. Table 1 provides an overview of these factors and their outcomes, identified in the previous reviews of NSD studies. I organized them at a higher level according to their belonging to a general internal or external organizational context (e.g., strategy, culture, resources and capabilities, external factors), to the NSD process itself (e.g., cooperation, process management, process formalization), or to the outcomes of the process (e.g., the service offering itself and its effects).

Table 1. Factors affecting the NSD process and their outcomes as identified in the previous literature reviews

Category	Type
Strategy	Overall strategy (Johne and Storey, 1998; Carlborg et al., 2014; Biemans et al., 2015); strategic fit: product synergy, marketing synergy, managerial synergy (Johne and Storey, 1998; Kupper, 2001; Storey et al., 2015); business vision, innovation objectives (de Jong et al., 2003; Greenhalgh et al., 2004); NSD strategy (Droege et al., 2009; Papastathopoulou and Hultink, 2012)
Organizational culture	Market orientation, innovation orientation (Johne and Storey, 1998; Storey et al., 2015); organizational support (Johne and Storey, 1998; Kupper, 2001; de Jong et al., 2003; Greenhalgh et al., 2004; Storey et al., 2015); NSD culture (Kupper, 2001; de Jong et al., 2003; Droege et al., 2009); internal communication, cross-functional teams (de Jong et al., 2003; de Jong and Vermeulen, 2003; Schilling and Werr, 2009; Papastathopoulou and Hultink, 2012; Storey et al., 2015); motivation; social networks (Greenhalgh et al., 2004); internal politics (Schilling and Werr, 2009); team climate (Storey et al., 2015)
Resources and capabilities	Market knowledge, distribution systems (Johne and Storey, 1998; Kupper, 2001); front-line expertise (Johne and Storey, 1998; de Jong et al., 2003; de Jong and Vermeulen, 2003; Greenhalgh et al., 2004; Schilling and Werr, 2009); employee skills and quality of staff; resource allocation (Kupper, 2001; Storey et al., 2015); organizational knowledge (Kupper, 2001; Droege et al., 2009; Schilling and Werr, 2009); information technology (Kupper, 2001; de Jong et al., 2003; de Jong and Vermeulen, 2003; Droege et al., 2009); innovative roles; organizational structure (de Jong et al., 2003; de Jong and Vermeulen, 2003; Greenhalgh et al., 2004; de Jong et al., 2003; Carlborg et al., 2014); absorptive capacity; innovation resources; firm reputation (Storey et al., 2015); financial resources; firm size (de Jong et al., 2003)
External conditions	Non-price competition; technological change; demand pull; knowledge infrastructure (public, private); government policy (de Jong et al., 2003); industry context (Biemans et al., 2015); sociopolitical climate; incentives and mandates; inter-organizational norm-setting and networks; environmental stability (Greenhalgh et al., 2004); market

Category	Type
	attractiveness, turbulence, and uncertainty (Storey et al., 2015); national differences (Bryson and Monnoyer, 2002)
Cooperation and other networking	Customer involvement (Johne and Storey, 1998; de Jong et al., 2003; de Jong and Vermeulen, 2003; Greenhalgh et al., 2004; Schilling and Werr, 2009; Papastathopoulou and Hultink, 2012; Carlborg et al., 2014; Storey et al., 2015); external focus; co-operation with other parties (de Jong et al., 2003; de Jong and Vermeulen, 2003; Greenhalgh et al., 2004; Schilling and Werr, 2009; Biemans et al., 2015; Storey et al., 2015); front-line staff involvement (Storey et al., 2015)
Process management / management control	Performance measurement (Johne and Storey, 1998; Carlborg et al., 2014; Papastathopoulou and Hultink, 2012; Biemans et al., 2015); human resource management (de Jong and Vermeulen, 2003; Droege et al., 2009; Greenhalgh et al., 2004; Schilling and Werr, 2009); efficiency of development process; task proficiency (Storey et al., 2015)
Process formalization	Testing (Johne and Storey, 1998); launch (Johne and Storey, 1998, Kupper et al., 2001; de Jong et al., 2003; de Jong and Vermeulen, 2003; Carlborg et al., 2014); NSD process stages (de Jong et al., 2003; Droege et al., 2009; Greenhalgh et al., 2004; Schilling and Werr, 2009; Papastathopoulou and Hultink, 2012); design (Papastathopoulou and Hultink, 2012); degree of formalization (Storey et al., 2015)
Service offering characteristics	Product advantage/superiority; degree of novelty; product/service quality (Johne and Storey, 1998; Kupper, 2001; Storey et al., 2015); quality of experience, communicativeness (Johne and Storey, 1998); proficient operations, responsiveness (Storey et al., 2015), compatibility; complexity; trialability; observability; potential for reinvention; fuzzy boundaries; risk; task issues; nature of knowledge; technical support (Greenhalgh et al., 2004)
Effects of the NSD process	Business process effects; capability effects; relationship effects; financial performance effects; competitiveness effects (Aas and Pedersen, 2010; de Jong et al., 2003); impact on supply conditions, trade mechanisms, demand conditions; economic growth (de Jong et al., 2003); service profit (Carlborg et al., 2014); commercial success of new services; strategic competitive advantage (Storey et al., 2015)

Table 1 is purely suggestive. The number of factors and outcomes proposed in NSD studies borders on the infinite and covers constructs with varying degrees of precision and discriminant validity. Yet, the categorization reflects the inherent logic of NSD studies, further illustrated by Figure 2. It implies that certain contextual factors or their combinations affect the development process. The latter, in turn, generates new services, which then have organizational-level effects. Clearly, the complexity of links between factors is much higher than Figure 2 depicts, and no study focuses on all factors simultaneously. However, I believe that it provides an adequate representation of the theory behind the NSD perspective.

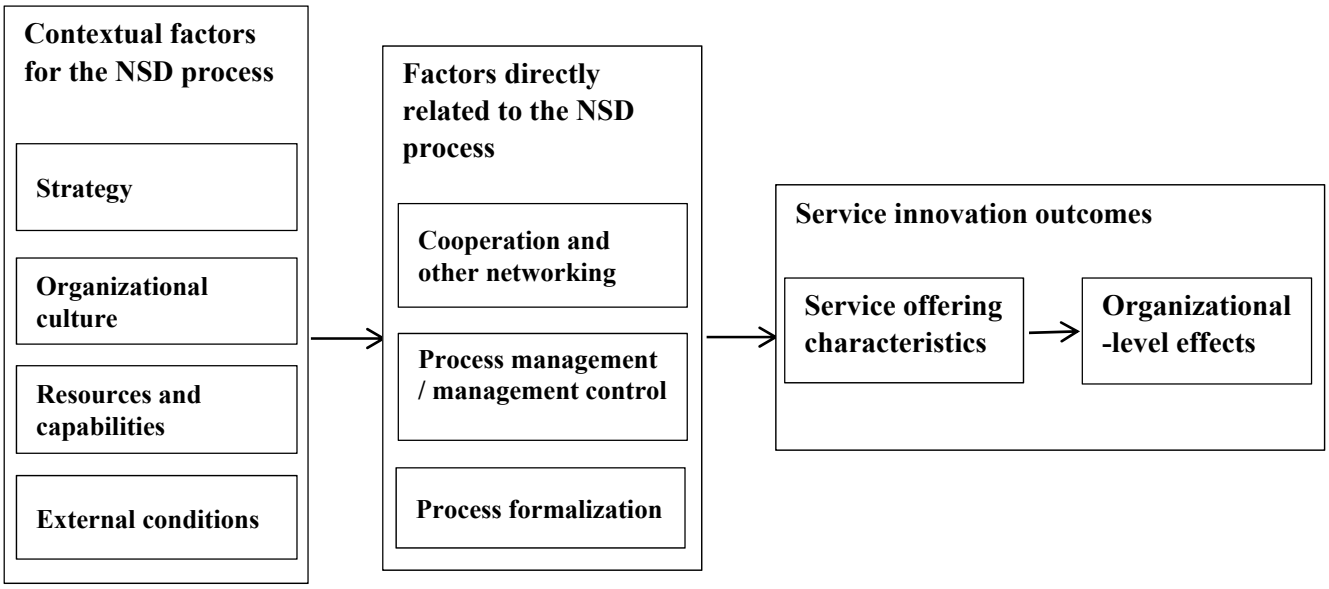

Figure 2. The logic of NSD studies

What are dynamic capabilities and what are their effects?

Success factors for service innovation have proven to be fertile ground for numerous investigations. Although this topic has yet to be exhaustively examined, the requirements for researchers wishing to add something new are rather high. In this light, some researchers have turned their attention to the dynamic capabilities framework that has long been immensely popular in business research; however, it has remained completely unexplored with respect to service innovation. Despite the rapidly growing interest, service innovation studies focusing on this particular type of capability are still mostly conceptual and qualitative, or they often use dynamic capabilities only as an umbrella term rather than as a specific construct (e.g., Agarwal and Selen, 2009; Chen et al., 2015; den Hertog et al., 2010; Kindström et al., 2013; Salunke et al., 2011). The situation is somewhat similar in the production innovation research. As a result, dynamic capabilities are absent from both Evanschitzky et al.'s (2012) and Storey et al.'s (2015) meta-analyses, which makes the topic even more interesting as a research opportunity.

Obviously, to study dynamic capabilities, it is necessary to understand what they are. The original idea is that firms have competences in the form of bundles of routines that the firms use to manipulate their tangible and intangible assets (resources). Dynamic capabilities are "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Teece et al., 1997, p. 516). In other words, they "reflect an organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions" (Teece et al., 1997, p. 516). As such, dynamic capabilities are regarded to be the source of new paths and positions, new resources and resource configurations, superior firm performance, and competitive advantage (Helfat and Peteraf, 2009; Teece et al., 1997; Teece, 2007).

A close inspection reveals that the original conceptualization of dynamic capabilities relies on a circular definition of capability as an ability and includes explanandum in the explanans (i.e., explains competitive advantage by the ability to achieve competitive advantage) (Arend and Bromiley, 2009; Williamson, 1999). These issues, however, had little effect on the idea's overall attractiveness, and two decades of inquiry into dynamic capabilities have resulted in thousands of papers transgressing the bounds of strategic management—the framework's "birthplace." Many authors suggest their own definitions, mostly following the original idea and describing dynamic capabilities as abilities. Other authors, however, try to avoid circular definitions and instead build a hierarchy of organizational routines where lower-order ordinary, or operational, capabilities are bundles of routines for "earning a living," whereas dynamic capabilities are higher-order bundles of routines that bring changes to ordinary capabilities (Eisenhardt and Martin, 2000; Zollo and Winter, 2002; Winter, 2003).

In Article 2, I explain why the ability-based approach and the routine-based approach to defining dynamic capabilities are neither sustainable nor theoretically sound. Some authors

have already expressed concerns about the compatibility of these approaches, but they either suggested reconciliation (Peteraf et al., 2013; Di Stefano et al., 2014) or called for abandoning the notion of dynamic capabilities altogether (Schreyögg and Kliesch-Eberl, 2007; Arend and Bromiley, 2009). Regarding the first suggestion, the current approaches are radically different, and as long as one maintains that both address dynamic capabilities, any reconciliation is unlikely (see Teece, 2007; Teece, 2014). Abandoning the notion may certainly be an option, but I propose another solution: by exploring the meaning of capability and trying to avoid circular and overlapping definitions, I explicate dynamic capabilities as the regular actions of creating, extending, and modifying the organizational resource base. I share March and Simon's (1958) view of organizations as assemblages of interacting individuals and use Helfat et al.'s (2007) notion of an "organizational resource base" to describe the organization's resources and routines. Since action is intentional behavior, and only individuals can have intentions (Elster, 2015; Cyert and March, 1963), I argue that the notion of dynamic capabilities is a construct that applies to specific individuals in organizations.

Essentially, I take methodological individualism as a philosophical standpoint for Articles 2, 3, and 4. By this, I do not mean that I treat the individual as separate from society nor that a social group is a mere sum of individuals. Summing up the actions of hypothetical hermits does not leave room for individuals' actions toward each other (i.e., interactions); the latter is central to my papers on dynamic capabilities. Neither do I mean that a memory of a single individual contains all information about society. The latter is a typical but fallacious argument against methodological individualism. My standpoint implies that I focus on humans and their actions in social groups, and I use these to explain events that, for an observer, happen at the group level. Whenever it is relevant, I refer to various social groups by commonly used terms, for example, teams, firms, organizations, and customers, but only as

useful shortcuts to describe the interacting people whom these terms represent. A discussion of the merits and drawbacks of methodological individualism does not belong here and has been present in the literature for several centuries (e.g., Elster, 2015; Hollis, 1994; Udehn, 2001). I do not argue for the superiority of this standpoint over others, but instead I demonstrate how taking it may enrich our understanding of innovation, opening up new opportunities for research.

The action-based approach I suggest allows me to define dynamic capabilities precisely (i.e., by delineating necessary and sufficient conditions). These conditions are as follows: 1) the individual's regularly emerging intentions to change the status quo in the organization, as the definition is about regular action to change, and 2) the individual's high level of influence in the organization, as the definition is about regular changes in the resources and routines of organizational members. It is necessarily to address each of these conditions to explain dynamic capabilities. The first condition can be explained by examining the individual's beliefs, desires, and emotions (Elster, 2015). The second condition can be explained by analyzing the change recipients' beliefs, desires, and emotions.

It is no less important that the definition I suggest allows me to retain the existing logic of dynamic capabilities as antecedents of organizational-level outcomes (see Helfat and Peteraf, 2009; Teece, 2007). Although there have been some attempts to theorize about types of dynamic capabilities that are specific to service innovation (e.g., den Hertog et al., 2010), I accept Teece's (2007) original tripartite framework of sensing, seizing, and transforming[1] as the most parsimonious and yet most comprehensive. Consistent with my definition of dynamic capabilities, in Articles 3 and 4, I explicate sensing as a regular action of recognizing opportunities, seizing as a regular action of taking advantage of opportunities, and

[1] Originally, reconfiguring

transforming as a regular action of modifying existing organizational routines, assets, and business model elements.

Figure 3 illustrates the theory behind the sensing–seizing–transforming framework based on Helfat and Peteraf's (2009) interpretation of Teece (2007) and Teece et al. (1997).

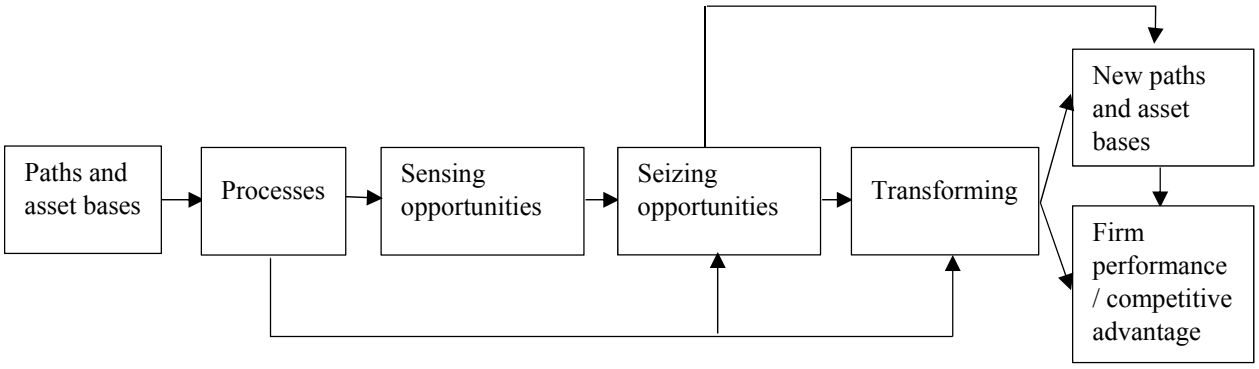

Figure 3. Logic of the sensing–seizing–transforming framework (adapted from Helfat and Peteraf, 2009, p. 96)

Strictly speaking, firm paths (firm history, previous investments), asset bases, and processes that influence dynamic capabilities are relevant only in the case of the existing organization. In a general sense, however, these factors should be viewed as information about the status quo (i.e., facts about internal and external environments). This information may trigger sensing, which is necessary for seizing. The combination of sensing and seizing leads to new positions and paths, which influence firm performance. Transforming, since it covers changes to the existing organizational base, requires both sensing and seizing because individuals must rely on viable alternative solutions that they see as opportunities. It may also influence firm performance and lead, in the long term, to new paths and asset bases.

It is easy to convert Figure 3 into Figure 2 from Article 2, where I re-visualize Coleman's (1990) framework. Paths, asset bases, and processes are macro-level proposition 1, whereas new paths, asset bases, and firm performance are macro-level proposition 2. Sensing, seizing, and transforming represent an individual's actions and interactions with other

organizational members. Figure 3 is also directly comparable to Figure 1 from Article 4, where a team's innovation substitutes new paths and asset bases and a team's operational capability stands for organizational-level performance. Since innovation is a more specific notion than "new paths and asset bases," and transforming is theoretically about changes in the existing routines, the link between transforming and a team's innovation is absent from Figure 1 in Article 4. In fact, Article 3 provides empirical evidence for the insignificance of that link.

How can dynamic capabilities be developed?

Dynamic capabilities are not the type of actions that can be induced by merely saying, "Just do it." Having a capability implies taking a particular action regularly because there are some appropriate conditions. In the case of dynamic capabilities, these conditions are the individual's regularly emerging intentions related to sensing, seizing, and transforming as well as the individual's high level of influence. Correspondingly, dynamic capabilities develop in the course of the establishment of these two conditions. In the empirical part of my dissertation, I study managerial dynamic capabilities, which allows me to control for the individual's level of influence. Essentially, I follow the universal practice within the dynamic capabilities framework and presume that managers of a centralized organization have the right to affect organizational routines, or in other words, formally have a high level of influence. Thus, in my empirical examination of dynamic capabilities and their effects, I focus on the individual's regularly emerging intentions related to sensing, seizing, and transforming.

In explaining intentions to act, I prefer Elster's (2009, 2015) alternative to the traditional rational choice theory. He uses beliefs and desires (preferences) to account for rational behavior, the latter defined as acting for sufficient—albeit subjective—reasons (i.e., in conformity with the individual's reasons for action) (Elster, 2009). He also includes

emotions to account for irrational behavior, thus creating an opportunity to provide a more realistic explanation of human behavior. Emotions may lead to an action directly (weakness of will) and indirectly through either desires (a temporary change in preferences) or beliefs (wishful thinking). In turn, they may be induced by beliefs (such as appraisal theory). An external factor that influences individual action is information; it does so through affecting beliefs.

Figure 4 provides a more nuanced view of Figure 2 from Article 2 with respect to Elster's model. Information includes various facts about an organization's external and internal environments such as market changes, ordinary capabilities, and firm-level performance. This information affects individuals' beliefs, which—with or without emotions and desires—often lead to the enactment of ordinary capabilities (operational capabilities, administrative capabilities, or governance capabilities depending on the individual's level of influence). However, it may also induce an intention to change the status quo, and if the individual's level of influence is high, it will imply dynamic capabilities.

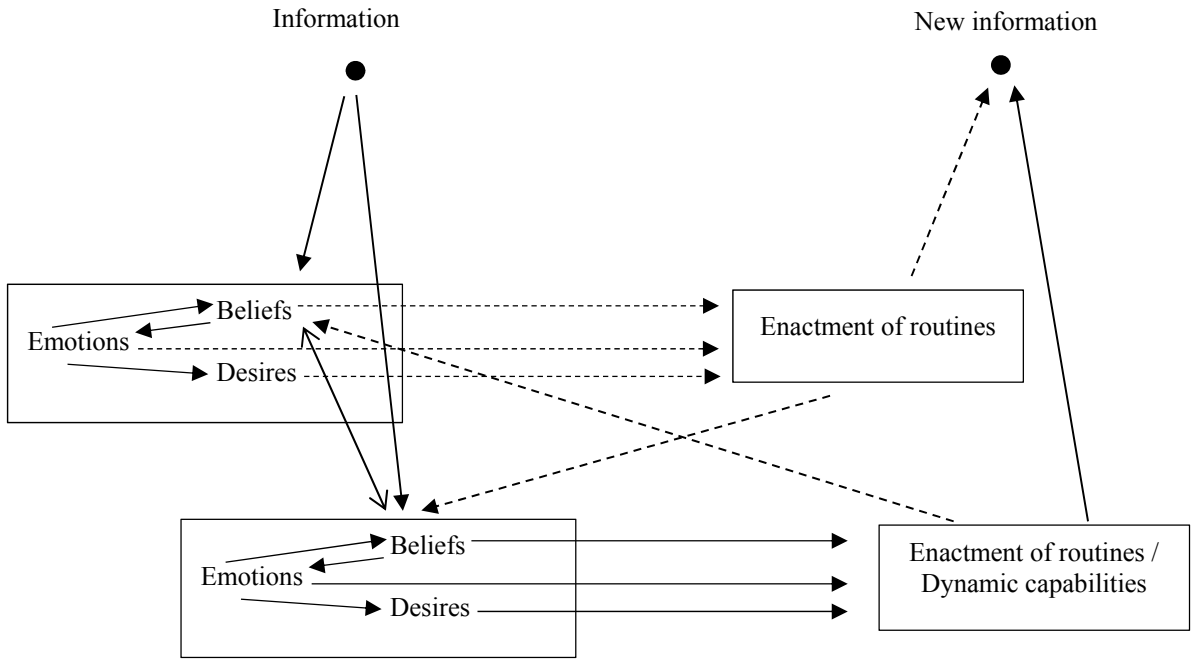

Figure 4. A multi-level perspective on studying dynamic capabilities

This thinking, although possibly seeming too abstract thus far, lies at the foundation of Article 4. My focus on individuals and access to a large multinational company allowed me to apply an experimental approach to empirically investigating dynamic capabilities. For understandable reasons, I could not directly manipulate managers' dynamic capabilities; thus, I tried to do so indirectly using a training in service design principles and techniques. Service design, with its focus on customers' latent needs, questioning of the status quo, search for potential alternatives, and innovation of experiences and environments (Dunne & Martin, 2006; Stickdorn and Schneider, 2012), was ideal for stimulating the development of dynamic capabilities. I assumed that facts about service design principles and techniques (i.e., information) provided during the training would shape the participants' knowledge (i.e., justified true beliefs) of service design. I theorized further that this knowledge would positively affect dynamic capabilities. Those participants that succeeded in developing dynamic capabilities would in turn ensure the launch of innovations in their teams and have a positive effect on the team's operational capability.

I wrote Article 4 for the *Academy of Management Learning & Education Journal*, which has a specific focus on management learning and education. Since I followed the journal's focus and standards, the presentation of hypotheses in the paper is somewhat unconventional, and the article might seem to be more about design thinking than dynamic capabilities. Instead of starting with dependent variables and theorizing about every mediational link in detail, I paid attention to describing the nature of the training and its effects (see Gielnik et al., 2015; Rauch and Hulsink, 2015). Nevertheless, Article 4's Figure 1, which illustrates our theoretical model, is essentially the combination of this chapter's Figure 3 and, at least partially, Figure 4. Although it starts with design thinking training as an

independent variable, it proceeds with the theoretical links suggested by Teece (2007) and Helfat and Peteraf (2009).

The article contains a detailed presentation of the main reasons why I hypothesized that that training in design thinking would lead to the development of dynamic capabilities. Because of the article's positioning, it does not explicitly address service innovation. However, a careful observer might notice that the notion of a team's operational capability builds upon the idea that a service firm's efficient and high-quality performance ensures a good customer experience. In essence, it is a combination of what Aas and Pedersen (2010) refer to as the business process effects and relationship effects of service innovation. In turn, a team's innovation is a typical NSD output that builds on the idea of the novelty of a service. This means that since dynamic capabilities are obviously capabilities, Article 4's theoretical model is a variation of this chapter's Figure 2, logically interconnecting all four articles.

METHODS

Since each article in my dissertation, except the conceptual Article 2, explicitly presents its method, in this section, I focus on some details that I omitted from the articles due to space limitations and other journals' requirements. Table 2 provides an overview of the articles' research designs and of relevant work that was not directly used in the articles but that inspired them or enriched the understanding of the results.

Table 2. Research design of the articles in this dissertation

Article	Research design	Relevant work not included in the dissertation
Article 1 (Literature review)	Content analysis and systematic review of 578 articles	Preceding unpublished review of 158 articles
Article 2 (Conceptualization of dynamic capabilities)	Case study in the philosophy of social science based on methodological individualism and informal logics	Qualitative pre-study (semi-structured interviews with 25 innovation and strategic managers)
Article 3 (Operationalization of dynamic capabilities)	Construct development and two cross-sectional studies (pretest on 66 managers and employees, empirical validation on 197 managers)	-
Article 4 (Development of dynamic capabilities)	Field intervention in the form of a training program with a pretest–posttest design (423 responses from participating managers)	Qualitative study (observations, informal conversations, and 18 semi-structured interviews with participants during and after training)

Literature review (Article 1)

The somewhat unconventional literature review procedure used in Article 1 deserves special attention. The large number of identified articles—578 papers—inspired me to explore their content with techniques available in NVivo, a software package for qualitative data analysis. NVivo does not conduct an analysis, but instead it assists in the analysis by increasing the effectiveness and efficiency of learning from data (Bazeley and Jackson 2013).

I used abstracts as input data, manually removing irrelevant words such as “abstract,” “keywords,” and “imported from.” I did not use the bodies of the papers as input data for three reasons. First, the period I focused on was from 1980–2015, and characters in many early articles could not be recognized properly for an import into the program; in fact, I had to retype some of the abstracts in order to use them with NVivo. Second, the bodies of the papers contained a lot of information irrelevant for my content analysis, such as numbers, titles, or references, which would make a proper cleaning of texts virtually unfeasible and negatively affect the quality of the results if left untouched. Third and most importantly, using the bodies of the papers would not be superior to using the abstracts because an abstract, as a summary of a paper, as the first gate in a peer-review process and often as the only part of the paper that is ever read, conveys the essential information about the paper’s content.

I started with clustering abstracts by word similarity using Pearson’s correlation coefficient. This was mainly to gain an initial thematic understanding, but I (secretly) hoped for a ready-to-use, meaningful, and preferably novel theme structure. Some articles were grouped into topics similar to ones defined in earlier literature reviews. However, many articles that had seemingly related topics or positioning were, for unclear reasons, separated from each other. This implied that studies similar in word usage did not necessarily deal with similar issues. For example, service design studies fell into various groups together with studies on NSD stage models, NSD success factors, engineering tools, service innovation in the manufacturing sector, and customer experiences. Some of the studies positioned within the service-dominant logic—which is notorious for its specific vocabulary—were clustered with studies on balanced scorecards, NSD processes, and NSD performance. The example in Figure 5 demonstrates the scope of this dispersion, and with it, the disparateness of the studies. The vertical multicolored line on the left-hand side is an extremely zoomed out dendrogram of all 578 articles. At the very top of, a fragment shows a relatively coherent

group of articles. They address issues that are central to the service-dominant logic, although they are not necessarily positioned within it. This includes articles by Michel et al. (2008), Prahalad (2004), Karpen et al. (2012), and even Norman and Ramírez's (1993) article, which is strikingly close to the service-dominant logic despite being 11 years older than the service-dominant logic itself. Near the bottom of Figure 5, a fragment depicts the location of Ordanini and Parasuraman's (2011) article positioned within the service-dominant logic and yet neighboring Carlborg et al.'s (2013) literature review and Damanpour et al.'s (2009) and Tseng et al.'s (2008) studies of service innovation effects. The latter two articles focus, similarly to Ordanini and Parasuraman (2011), on the impact of new intangible outputs on organizational performance.

Figure 5. Results of the initial automatic clustering

Thus, clustering did not provide a perfect solution, but it did what, according to Bazeley and Jackson (2013), it was actually meant for—it provoked ideas. The coherent sub-clusters indeed provided an initial thematic understanding, whereas those that were not coherent called for more exploration. I proceeded with text search queries about the initial search words and the most frequent words in abstracts. This, in the form of word trees, provided information about the contextual relations of words. Essentially, word trees depict the links between a specific word and the words that precede and follow it. Multiple links imply a stable word combination. As an example, Figure 6 presents a collage of some fragments of the word tree for "service."

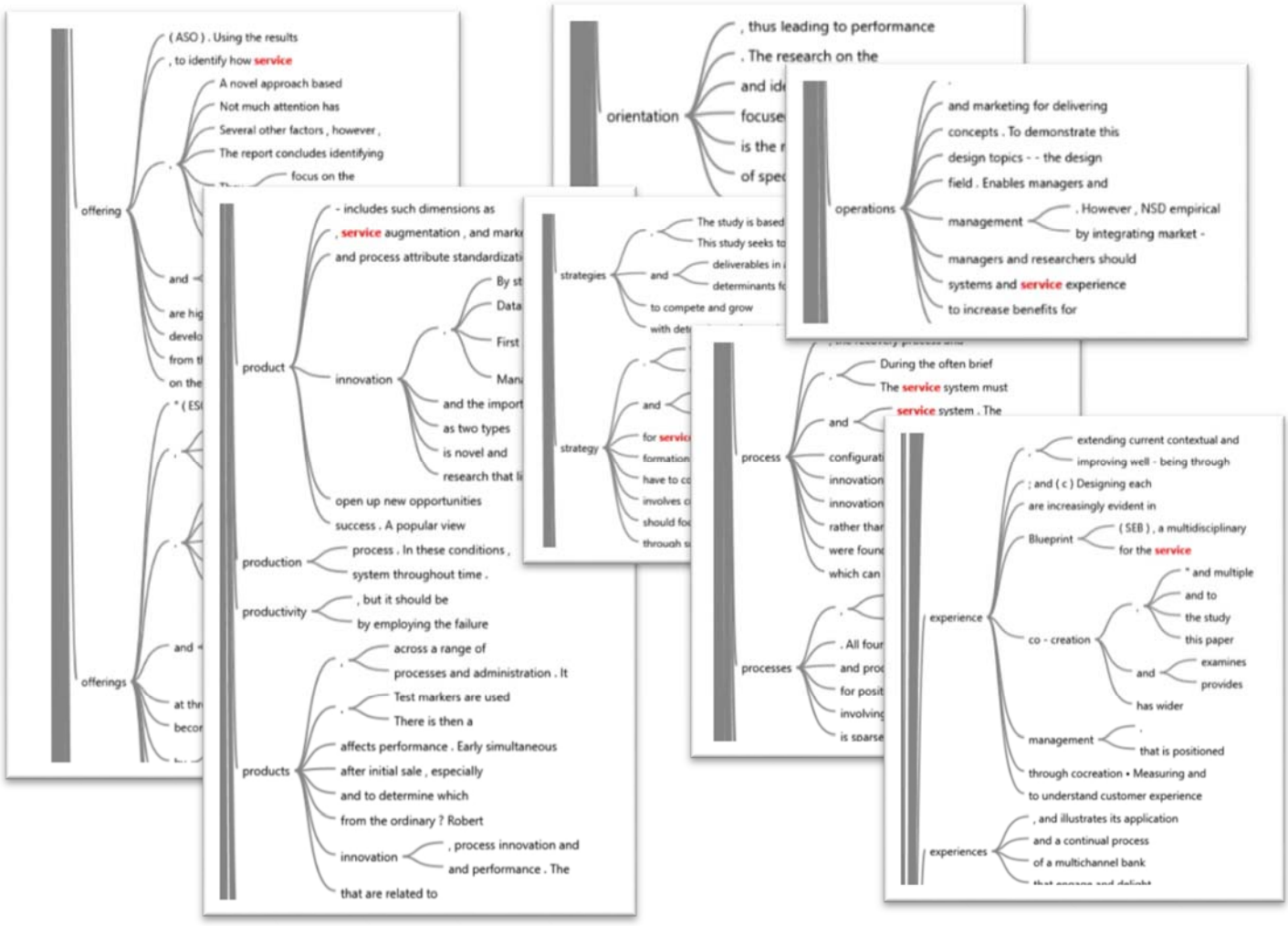

Figure 6. Fragments of the word tree for "service"

These fragments provide examples of words that lie at the foundation of our classification of service innovation perspectives. Other examples of similarly identified terms are "service activity," "service concept," "service provision," "service system," "service design," "service development," "service engineering," and "service infusion." Authors had different understandings of service innovation because they had different interpretations of service. After aggregating and matching, I ended up classifying service innovation perspectives into six groups. This process was followed by the individual examination of articles with respect to their content (i.e., focus, interpretation of service and service innovation, relationships between variables, sample, measures) and vocabulary (i.e., positioning, concepts).

I deliberately avoided making statements about the precise amount of articles within each of the six groups, except for commenting abstractly on the dominance of the NSD perspective. Considering that the encouragement of a more distinct pluralism of perspectives is one of Article 1's core messages, I did not want to encourage researchers to flock to perspectives with fewer studies. I believe that the choice of a particular service innovation perspective should rely only on its relevance to a research context.

Conceptualization of dynamic capabilities (Article 2)

Article 2 is purely conceptual, but I was inspired to focus on (dynamic) capabilities via exploratory research in addition to my old literature review. In the beginning of my doctoral program, I gained access to the transcriptions of nine semi-structured interviews conducted by a former colleague at the CSI. I then conducted six similar interviews myself. The interviewees were mostly innovation managers and strategic managers, and of these combined 15 interviews, eight were conducted in a large telecommunications company and seven in two large insurance companies in Norway. Using a shortened version of the interview guide due to time limitations, I conducted 10 additional interviews with various team leaders in the

telecommunications company. In all 25 cases, the main questions covered personal and organizational innovation practices (i.e., the routines and procedures used in the NSD process).

The telecommunications company had a formal stage-gate process and a rigid control system of innovation management. Specially educated facilitators or product managers gathered ideas from around the organization and initiated innovation projects. The process itself began with the idea development stage, and the criteria at the first decision gate were either high technological effects or high economic gains in a short-term period. It was crucial that the first evaluation concluded that the project would be able to show benefits early—otherwise, the project would be terminated at the first gate. Usually, less than half of the new ideas passed the first gate and proceeded to the initiation phase. The next gate was based on the evaluation of costs, after which very careful analyses of technical capabilities and the expected customer experience were conducted. If this third gate was passed, the project received the necessary means to continue, enabling the development and implementation phases.

In contrast, none of the insurance companies had a formal NSD process. Ideas either accidently came from customers, when field workers made "a discovery" during interviews with clients, or just popped up in employees' minds during informal conversations. A manager could sketch a preliminary project, prepare a budget, and then present these to general managers. Although profit increase or cost savings were decisive as evaluation criteria, all calculations were "guesstimations." After acceptance of the preliminary project, the manager passed it to other entities with relevant employees who realized it, and there was often no follow-up on the project.

Clearly, these service companies had two different innovation practices, but the results were strikingly similar—innovation was mostly incremental, while radically new services

appeared once or twice per year. As one of the interviewees from an insurance company lamented,

> *Organizational structures, decision-making criteria, communication channels . . . People build them up with good intentions to organize and facilitate dialogue, but, unfortunately, when all of this starts functioning, it often leads to the opposite. People do not get things done because they have to write papers and plans, which by themselves are not deliverables and have no intrinsic value. Things start to take time.*

In fact, the implementation of radically new ideas seemed to depend more on their proponents than on organizational processes. Thus, few managers resorted to unconventional methods in avoiding organizational processes and implementing their ideas. In the case of the telecommunications company, an interviewee said the following about one of his projects:

> *On the whole, it took less than one year to launch the new service after the project start. If it was run as a usual project, it would not have been launched even in three years. Actually, it would not be developed at all. . . . The main determinant of this rapid acceptance and development was the proper lobbying, access to the right people, and enthusiastic engagement of the external partners.*

Some managers in the insurance companies had a similar attitude. For example, when a steering group of one company rejected an interviewee's project, he re-guesstimated the calculations and conducted a small-scale customer survey. The results showed that most of the customers liked the idea, and as the interviewee stated, *"Now the steering group had problems with the refusal. They just had to accept the project. In fact, it is largely a kind of a 'takeover' job: the more radical idea is, the more takeover there should be."*

If it was possible to find a way to incorporate radical innovations, why were they so few? First, not all managers who formally or informally worked with innovation were willing

to take the unconventional path. Some managers commented on their company's strategic focus on incremental improvements. Others admitted that radical innovations often had negative effects or required longer periods to demonstrate positive results, whereas personal key performance indicators (KPIs) had to be reported annually. Nevertheless, side by side with these managers were managers who had to follow the same strategy and report the same KPIs, yet they enthusiastically pushed their ideas through. Thus, even within the same organization and in similar positions, managers differed in their intentions to bend the rules.

Second, intention alone was not enough. Although the most active respondents managed to maneuver through the system effectively and enjoyed support from their colleagues, top managers sometimes suppressed their activity. In one case, an interviewee regularly affected the routines of his colleagues by, for example, organizing service staging with real customers and their families, involving outsiders with humanistic education, or setting up a creative space specially designed to stimulate novel ideas. After a change in the top management, he left the organization—to his peers' and subordinates' disappointment—because he started to feel that his work had become much more constrained and less appreciated. In his words, he lost his "degrees of freedom." In the interviews, his colleagues nostalgically recollected working with him as the most dynamic time in the organization. Thus, the level of authority or another similar notion had to be taken into account as well.

Intention to change and level of influence have become the core elements of my definition of dynamic capabilities. There are no qualitative data in Article 2, but a careful reader might still find allusions to this exploratory study. However, my understanding of the link between service innovation, actors, and dynamic capabilities did not come all at once or exclusively because of interviews. Certainly, recognizing the role of individuals in innovation was not revelatory. An entrepreneurial individual—an innovator and creative destructor—was the main force behind economic development for Schumpeter (1934). An intrapreneur—a

corporate entrepreneur—was the main force behind innovation in large organizations for Pinchot (1985). Nevertheless, when I turned to innovation research, I saw that it had long shifted its focus from individuals to companies. For example, none of the success factors for innovation in Evanschitzky et al.'s (2012) and Storey et al.'s (2015) meta-analyses explicitly refers to organizational members. Next, I examined the research on corporate entrepreneurship and realized that it had faced a similar fate. In 1990, Guth and Ginsberg expressed an inclusive attitude in their guest editors' introduction to the issue on corporate entrepreneurship in the *Strategic Management Journal*. For them, those researching the topic could choose both individuals and companies as a unit of analysis. Yet, seven of the nine articles in that issue had chosen companies. Later, Zahra (1991, 1993) also assigned corporate entrepreneurship to the organizational level. Recognizing the problem, Sharma and Chrisman (1999) re-defined corporate entrepreneurship in a way that explicitly mentioned organizational members. In their view, corporate entrepreneurship was "the process whereby an individual or a group of individuals, in association with an existing organization, create a new organization or instigate renewal or innovation within that organization" (p. 18). This mostly fell on deaf ears (see Dess et al., 2003; Hitt et al., 2001; Ireland et al., 2003). Although Corbett et al. (2013) featured papers focusing on the individual level of analysis in their special issue on corporate entrepreneurship, even the papers they mentioned did not share their understanding of the notion. For example, Heavey and Simsek (2013) defined corporate entrepreneurship as "the process through which firms innovate, create new businesses, and transform themselves by changing the business domain or key strategic processes," or "higher order construct reflecting the firm's innovation, venturing, and renewal acts" (p. 838). In short, firms lexically and theoretically substituted individuals in both the innovation and corporate entrepreneurship research fields.

In my search for individual innovation capabilities, I also turned my attention to creativity research, which provided rich, although contradictory, findings on creative people (Kaufman, 2009; Sternberg, 2009). However, it almost exclusively addressed invention; thus, it was not sufficient for organizational studies on innovation, except for the idea generation stage (Mumford et al., 2011). Finally, I landed on the dynamic capabilities framework because it operated with all of the notions I needed: capability, change, innovation, organization, and an emerging focus on individuals in the form of managerial dynamic capabilities (Adner and Helfat, 2003; Augier and Teece, 2009; Zahra et al., 2006). I was not aware, though, how contradictory and ambiguous the understandings of all these notions were across the field.

My interpretation of dynamic capabilities developed gradually over four years, influenced by courses, readings, and discussions, especially with my supervisor. I also presented Article 2's earlier versions at the ISPIM Innovation Conference, the Conference of the Norwegian National Research School in Business Economics and Education, and the DRUID conference, where I received helpful feedback. Anonymous reviewers from the AoM annual meeting also provided interesting comments on the paper. However, despite applauding my interest in the individual level of analysis, most of my discussants, consistent with the mainstream organizational research, failed to acknowledge a simple fact—no organizational-level concept à la competence, capability, or learning has meaning if it does not imply a reference to organizational members. As Felin et al. (2015) righty noticed, many constructs in the organizational research, such as routines, absorptive capacity, or organizational cognition, were created by a direct analogy to individual-level constructs. Yet, the proponents of this type of construct are fiercely against any association between their constructs and the individuals who constitute organizations. It seems that they assume—in my

view, mistakenly—that those who call for using organizational constructs with a reference to organizational members mean nothing more than summing up facts about hermits.

My interest in the philosophy of social science and logic helped me to take a clear position on this issue. Especially influential were Jon Elster's books. I was also delighted to see the development of the microfoundations movement in strategy and organization theory (Abel et al., 2008; Felin and Foss, 2005; Felin et al., 2012; Felin et al., 2015) that largely followed James Coleman's ideas. Coupled with the examination of the vast literature on dynamic capabilities, including both the most cited and recent articles, my search efforts and reflections resulted in the interpretation of the construct that I presented in Article 2.

It is important to realize that the individual's intention to change and the individual's level of influence—the necessary and sufficient conditions for dynamic capabilities—are merely the logical substitution of the expressions "action" and "change in organizational resource base" that I use to define dynamic capabilities. Intention comes from the definition of action as intentional behavior (Elster, 2015). Intentional changes in organizational resource bases (i.e., in resources and routines of organizational members) (Helfat et al., 2007) imply changes in the organizational members' behavior in response to another individual. The latter is the definition of influence (Battilana and Casciaro, 2012). However, the individual's intention to change and the individual's level of influence are not *causes* of dynamic capabilities. The meaning of defining in terms of necessary and sufficient conditions becomes easy to grasp on a popular example of the definition of the bachelor as an unmarried man. To be bachelor, it is necessary and sufficient to be unmarried and to be a man. Obviously, it would be a tautology to say that a person is a bachelor *because* he is an unmarried man. This is the reason why in Article 2 I stressed several times that the explanation of dynamic capabilities should involve the explanation of causes of both intention to change and the level of influence.

Interestingly, the dynamic capabilities framework seems to follow the same route as the innovation and corporate entrepreneurship research fields, but in an opposite direction. Initially, it exclusively addressed firms and then began to move toward individuals. The meeting point, as I see it when I turn back to Sharma and Chrisman's (1999) definition of corporate entrepreneurship, is that sensing, seizing, and transforming are essentially those regular actions that are necessary for corporate entrepreneurship. Although my view might not be the only correct way to conceptualize dynamic capabilities, I still hope that it has the right to exist.

Operationalization of dynamic capabilities (Article 3)

In empirically investigating dynamic capabilities, authors typically follow one of two approaches. The first approach relies on using dynamic capabilities as an umbrella term to unite various existing constructs that to a greater or lesser extent describe phenomena of organizational flexibility and innovativeness (see Malik and Kotabe, 2009; Zahra and George, 2002). Within this approach, authors tend to resort to existing constructs and use them as proxies. Numerous examples include the use of R&D intensity as a measure of both R&D capability (Helfat, 1997) and technological capability (Coombs and Bierly, 2006), prior alliance experience as a measure of alliance capability (Kale et al., 2002), new product development performance as a measure of new product development capability (Marsh and Stock, 2006), the combination of market orientation and innovativeness as a measure of dynamic capability (Menguc and Auh, 2006), and decision comprehensiveness as a measure of integrative capability (Liao et al., 2009). The second approach consists of developing a specific measurement of constructs described as dynamic capabilities, such as alliance management capability (Schilke and Goerzen, 2010); sensing, learning, integrating, and coordinating capabilities (Pavlou and el Sawy, 2011); or just general dynamic capability (Marcus and Anderson, 2006). Surprisingly, virtually no study has operationalized the

original sensing, seizing, and transforming framework that Teece (2007, 2012) suggested. Although there were some qualitative attempts to use the framework to map the data (Ellonen et al., 2009; Gebauer, 2011; Kindström et al., 2013), only two articles—by Wilden et al. (2013) and Plattfaut et al. (2015)—apply it in a quantitative investigation. However, neither article provides an adequate measurement instrument. Thus, Wilden et al. (2013) take the first approach and largely use proxies, such as knowledge utilization as a proxy for seizing capability or organizational and marketing innovations from the CIS as a proxy for reconfiguring capability. In contrast, Plattfaut et al. (2015) take the second approach, but they shift the burden of understanding what capability is to respondents. They use such items as "we are capable of prioritizing market opportunities appropriately," "we are capable of elaborating on the most promising market opportunities in detail" (items for sensing), and "we are capable of elaborating on selected service concepts in detail" (an item for seizing).

In the operationalization of sensing, seizing, and transforming, we chose to develop a specific measurement scale and followed the procedure suggested by MacKenzie et al. (2011) and Venkatraman and Grant (1986). The whole of Article 3 is essentially a documentation of the methods we used. The only issue that deserves special attention here, as it was not fully covered in the article, is how the 19 items that were discussed in the focus group (Table 2) shrunk to a final 11 items (Article 3, Table II).

At the time of compiling the items, Article 2 was not ready, and I was still under the influence of the conventional approaches to dynamic capabilities. Neither had we decided upon the systematic use of synonyms denoting routine. Most items came from the established constructs identified through an extensive literature search, although I adjusted them to reflect the individual level and the regularity of action. In the selection of items, I attempted to cover all four dimensions that Teece (2007) outlined for each of the three capabilities (see pp. 1326, 1334, 1340). All of this becomes evident in Table 3; further it emerges that, in this form, the

items are rather manifestations of operational capabilities such as market research or cross-functional collaboration. Although many authors praise these activities within both the ability-based approach and the routine-based approach to dynamic capabilities (Teece, 2007; Eisenhardt and Martin, 2000), this conflates with the notion of ordinary capabilities, as I explain in Article 2.

Table 3. The 19 items discussed in the focus group

Item	Sources	Justification
Sensing		
I regularly try to understand users by observing or interacting directly with them.	Kohli et al. (1993), Lukas and Ferrell (2000), Narver et al. (2004)	Direct customer interaction is essential in identifying customer needs and customer innovation (Leonard and Rayport, 1997; Liedtka, 2014)
I regularly collect industry and market information by formal or informal means.	Kohli et al. (1993), Li and Calantone (1998)	Processes to tap supplier and complementor innovation; developments in exogenous science and technology (Teece, 2007)
I regularly try to understand our users better by imagining how things look from their perspective.	Narver et al. (2004), O'Connor and Rice (2001)	Empathy is the central element in understanding customer needs (Leonard and Rayport, 1997; Liedtka, 2014; Brown, 2008).
I regularly try to discover additional needs of our customers of which they are unaware.	Narver et al. (2004)	Reflects the combination of customer focus and empathy (Liedtka, 2014; Brown, 2008)
I regularly and actively seek innovative ideas.	Hurley and Hult (1998)	Reflects the search process, processes to direct internal R&D, and selecting new technologies (Teece, 2007)
I regularly try to identify target market segments, changing customer needs, and supplier and customer innovation.	Teece (2007)	"Direct" borrowing from Teece (2007)
Seizing		
I continuously try to ensure that potentially good ideas do not get lost or overlooked.	Teece (2007)	Reflects the process of addressing opportunities by recognizing, acknowledging, and valuing new ideas; reflects Teece's avoiding anticannibalization proclivities (Sutton and Hargadon, 1996; Liedtka, 2014; Teece, 2007)
I systematically support employees when they come up with innovative ideas.	Hornsby et al. (2002), Pearce et al. (1997)	Reflects the leadership dimension (within Teece's building loyalty and commitment) needed for seizing

Item	Sources	Justification
I often take risk of championing new projects.	Hornsby et al. (2002), Wilden et al. (2013)	Reflects "the probability that incumbent enterprises will explore risky radical innovations" (Teece, 2007, p. 1328)
I systematically support investments in finding solutions for our customers.	Wilden et al. (2013)	Seizing "almost always requires investments in development and commercialization activity" (Teece, 2007, p. 1326)
As a rule, I require employees to set definite objectives and quality standards for designing new services.	Schneider et al. (1980)	Reflects the procedure for delineating new services (Teece, 2007)
I systematically and efficiently get proposed actions through bureaucracy and into practice.	Pearce et al. (1997)	Reflects "manager's ability to override certain 'dysfunctional' features of established decision rules and resource allocation processes" (Teece, 2007, p. 1327)
I regularly promote the innovation's advantage and express confidence in what the innovation can do.	Howell et al. (2005)	Reflects demonstrating leadership and motivating employees (Teece, 2007)
Transforming		
I periodically revise our service development efforts to ensure that they are in line with what customers want.	Kohli et al. (1993)	Reflects activities used "to meet changing customer needs, and to sustain and amplify evolutionary fitness" (Teece, 2007, p. 1344)
I systematically support changes to the traditional ways of doing things.	Chiva and Alegre (2009)	Reflects activities used to change and adapt existing routines and structures (Teece, 2007)
I continuously contribute to sharing knowledge about service development processes and exchanging lessons learnt.	Ma Prieto and Revilla (2006), Pavlou and El Sawy (2011)	Reflects activities used for learning and knowledge transfer (Teece, 2007)
In the process of developing services, I regularly encourage employees with different skills and functions to work together as well as with customers.	Kindström et al. (2013), Atauhene-Gima and Ko (2001)	Reflects integration and coordination skills and the "reconfiguration" of employees (Teece, 2007); as well as the importance of cross-functional teams for service design (Liedtka, 2014; Brown, 2008)
I systematically promote the adoption of successful practices from other organizations.	Wilden et al. (2013), Goh and Richards (1997)	Reflects activities used for learning and knowledge management as well as integrating outside know-how (Teece, 2007)
I periodically get together with managers from other departments to plan a response to changes taking place in our business environment.	Kohli et al. (1993)	Reflects activities used to maintain evolutionary fitness (Teece, 2007)

Discussing the items in the focus group with expert practitioners was of great help, especially because it brought me down to earth regarding the level of abstraction and the amount of items that managers would bother to read and respond to. The fine-tuning of items and the parallel work in Article 2 resulted in a modified version of the questionnaire (Table 4) that we sent to a sample of both managers and employees to pretest. Although one might raise a question as to why we chose to include regular employees to respond to items reflecting managerial dynamic capabilities, it is important to realize that the pretest's objective was to inspect how business people—not academics or students—would interpret sentences and react to the questionnaire in general.

Table 4. The 11 items used in the pretest

	Items
	Sensing
1.	I frequently imagine how things look from the customer's perspective.
2.	I systematically identify opportunities from changes in customer needs, new technologies, and the activities of other companies.
3.	I regularly discover additional needs of our customers of which they are unaware.
4.	I routinely observe or interact directly with customers in order to understand them.
	Seizing
5.	I routinely ensure that potentially good ideas do not get lost, but that they are developed and actioned.
6.	I regularly support employees when they come up with innovative ideas and new ways of working.
7.	I frequently take the risk of championing investments in finding solutions for our customers.
8.	I systematically get proposed actions through bureaucracy and into practice.
	Transforming
9.	I frequently share knowledge that has the potential to influence service development.
10.	I regularly modify our service development efforts to ensure that they are in line with changing customer needs.
11.	I systematically introduce changes to traditional ways of doing business (e.g., existing routines and structures.

One of the most frequent comments in the feedback from respondents was that some of the questions were similar. This similarity was exactly what I was aiming for because conceptual redundancy is a central requirement for reflective multi-item scales (McGrath, 2005). Moreover, the irritation that some of the respondents expressed in this comment

convinced us of the appropriateness of our decision to focus on a concise measure. In fact, the use of 3- or 4-item scales in the development of constructs is a common practice in organizational research (see Barrales-Molina et al., 2013; Govindarajan and Kopalle, 2006; Jerez-Gómez et al., 2005; Menor and Roth, 2007; Schilke and Goerzen, 2010). This reduces the load on respondents (their fatigue, frustration, and boredom), increasing the quality of their responses (e.g., Saucier, 1994; Robins et al., 2001; Drolet and Morrison, 2001; Gosling et al., 2003).

I conducted a confirmatory factor analysis on the pretest sample to examine whether the underlying structure corresponded to our theoretical assumptions. Since all of the indicators were ordinals, I used robust maximum likelihood estimation based on polychoric correlations and their asymptotic covariance matrix (Flora and Curran, 2004; Joreskog, 2002; Yang-Wallentin et al., 2010). Although it might seem that the sample was too small for a factor analysis (66 valid responses), it was enough, considering the amount of items and our interest in only the preliminary evaluation of correlations and modification indices (Hair et al., 2010; MacCallum et al., 1999).

The analysis was indeed helpful, for it showed that the data favored the two-factor structure due to high correlations between the items for sensing and items 7 and 10. The reason for this, in my view, was the focus on customers that these items shared. In addition, I decided to improve the discriminant validity of transforming by ensuring that the items clearly referred to changes in existing services. After making corresponding changes to our formulations, I ended up with the 11 items reported in Article 3.

In the empirical validation, I maintained sensing, seizing, and transforming as three separate constructs and did not create a second-order construct of dynamic capabilities. The reason for doing so is that the use of higher-order factor analysis is a questionable practice

that introduces equivocal levels of abstraction, limits opportunities for analysis, and camouflages fit statistics (Hair et al., 2010).

Quasi-experiment (Article 4)

Most of the empirical research on and in organizations is either correlational or qualitative, but only experiments allow researchers to draw causal inferences (Shadish et al., 2002). More than 90% of the papers published in the *Strategic Management Journal* (Hamilton and Nickerson, 2003), and up to 90% of studies on leadership (Antonakis et al., 2010), fail to address the problems with endogeneity, providing unreliable results and making causal claims invalid. Since organizational researchers often criticize laboratory experiments for their lack of external validity, there have been calls for a trade-off in the form of quasi-experimentation in the field (e.g., Grant and Wall, 2009; Lawler, 1977; Miller and Tsang, 2010). In particular, a non-equivalent control group design featuring pretest and posttest was praised as "a definite improvement over static, one-time correlational studies" (Lawler, 1977, p. 578).

The benefits of quasi-experimental field studies are numerous. They provide the opportunity to strengthen causal conclusions when random assignment and controlled manipulation are not ethical or possible, minimize ethical dilemmas, and facilitate collaboration with practitioners, thus ensuring that the study is directly relevant to them (Grant and Wall, 2009). Nevertheless, they are not traditional experiments due to the lack of random assignment and thus often require unique—and creative—procedures to ensure the validity of the results.

I took advantage of several factors in designing our study to maximize its validity. The company I studied is a large centralized organization with a multi-divisional structure that unities 35,000 employees in 13 countries. When a group of enthusiastic actors in the parent

organization succeeded in convincing the top management of the advantages of design thinking, two experienced professionals specialized in service design were employed to create a training program. The training had to be launched in business units in six countries, and it had to follow the same procedure with the same content in all of them. The business units were functionally and geographically isolated and were receiving the program at various points in time on a random basis. The participants were managers who had full formal decision-making authority in the groups of people they worked with (in the paper, we refer to these participants as "team leaders," defining "team" in an inclusive way as a group of people whom the participants managed or had responsibility for). Being in similar positions and performing similar functions in the same areas in the same company, the participants were as homogeneous as they could be in a field study.

Thus, I essentially got treatment, experimental, and control groups (with controls being the groups that had not received their treatment yet) as well as the possibility for pretest and posttest measurements with a time lag. Moreover, I got an opportunity to form an additional control group of managers who worked in the same business units and performed similar functions as the participants. All of this was a perfect setting for a quasi-experimental field study with high internal validity and external validity (see Grant and Wall, 2009; Shadish et al., 2002). Figure 7 provides a general illustration of the study's logic using an example of three countries (termed "general" because the measurements and treatments were not perfectly aligned between countries in terms of time). In Article 4, we used the results from all six countries.

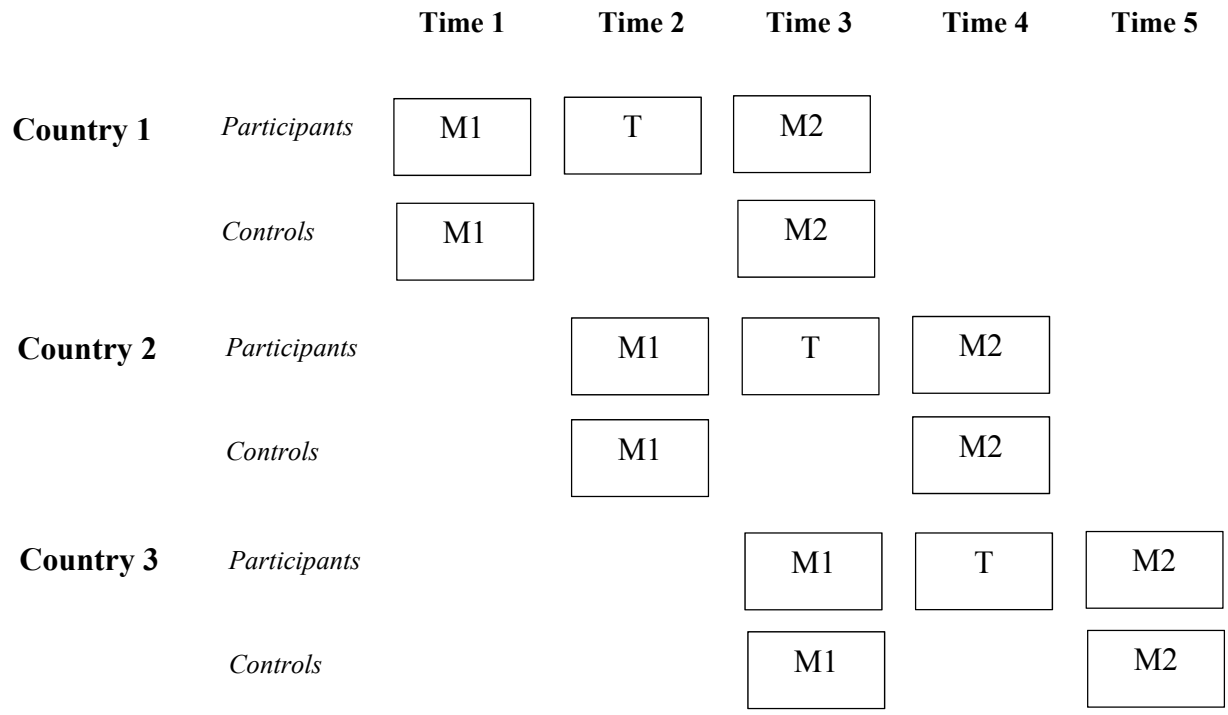

Figure 7. Logic of the study using three example countries (six countries in the actual study)

Note. For each country, the first line represents the group that received training, while the second line represents the control group. M1: pretest measurement, T: treatment (design thinking training program), M2: posttest measurement. There is a four-month time lag between T and M2.

Since the main variables of interest were latent and were involved in complex interrelationships, neither parametric nor non-parametric tests were suitable for the analysis. Instead—and as in Article 3—I used structural equation modeling, which provided me with the required estimation techniques. Researchers praise its precision in analyzing data from experimental studies because it enables separating the variance related to the latent construct from random and measurement error variances (Russell et al., 1998; Shadish et al., 2002). I used robust maximum likelihood estimation based on polychoric correlations and their asymptotic covariance matrix (Flora and Curran, 2004; Joreskog, 2002; Yang-Wallentin et al., 2010) because all of the observed variables were ordinals. This is also why I did not report means: they, just as variances and covariances, have no meaning for ordinal variables (Joreskog, 2002). This does not influence the interpretation of effect sizes, though. Just as the

regression coefficient renders the same value as the mean difference from ANOVA, path coefficients for a dichotomous variable reflect differences in the effects for experimental and control groups.

In addition to surveying, we conducted qualitative research in the form of observation, informal conversations, and 18 semi-structured interviews with participants both during and after the training. Two of my co-authors were from the case company, and as insiders, they had the chance to conduct further real-time on-site data collection. I did not report the results of the qualitative study in Article 4 due to the article's format, but we used these data in a separate paper that currently has a "revise and resubmit" status in the *Journal of Service Research* (not a part of the dissertation). Some of its findings might explain how a two-day training unfolded into the effects that we measured in our quasi-experimental study. As I saw, participants did not start to apply service design tools right after the training; instead, they used their newly acquired knowledge of service design tools to assign new labels to existing practices. For example, many used the term "customer journey mapping" while actually referring to service blueprinting—a technique focusing on the backstage process and without requirements to observe or interact with customers. The daily tasks and existing projects simply dominated the newly learned techniques. After some time, however, when the service design terms had become a part of the organizational vocabulary, the participating managers decided to apply some of the service design tools in their original form, but only to increase the chances of communicating their ideas to relevant stakeholders more successfully. The participants themselves were rather skeptical about the "playful" tools, but they saw it as a chance to demonstrate their new expertise. To their surprise, many discovered that the tools allowed them to get closer to customer problems and needs, develop more innovative solutions, and communicate their ideas more easily. For example, one manager reported that when his team contacted a random customer to map her experience with the company's

broadband service, he was shocked to hear that the customer had recently called customer service about 30 times to get one of her problems fixed. The team did not have a protocol in place to identify the frequency of calls from a particular customer, but this customer counted diligently for herself. In many teams, such shocks resulted in the introduction of formal functions related to service design, such as being required to map customer journeys in all new projects. Yet, not all of the participants fully understood the principles of service design, even if they saw the value of service design tools. This, in my opinion, may explain the differences in the direct and indirect effects of the program on the teams' operational capability.

PRESENTATION OF ARTICLES

Article 1. The kaleidoscope of service innovation: A perspective on perspectives

The purpose of Article 1 was to understand what service innovation was. Through the literature search, we identified 578 articles on service innovation published from 1981–2015. Combining an exploratory content analysis with a thorough examination of each article, we came to understand that service innovation was neither a well-established concept nor a commonly understood phenomenon. In fact, authors described a particular phenomenon with different terms or used the same term to refer to different phenomena.

Similar to Menor et al. (2002), we recognized the necessity of an a priori specification of the meaning of service, as the latter clearly affected studies' design and implications. Thus, to develop a precise classification of service innovation, we began with the notion of "service"—instead of "innovation"—as a common denominator. Our first classification criterion was authors' perspectives on service with respect to service providers. Following the results of the text search query, we distinguished between studies that treated service as an output (e.g., "service offering," "service product," and "service experience"), as a process (e.g., "service activity," "service process," "service delivery," and "service provision"), and as a strategic intent (e.g., "service orientation," "service strategy," and "service business model"). The second classification criterion was authors' explicit or implicit assumption of the place of service in an economy. In other words, it reflected authors' opinions of whether the notion of service contrasted with the notion of good or described a phenomenon for which industry affiliation is irrelevant.

The juxtaposition of these two classification criteria resulted in six perspectives on service innovation: NSD, service engineering, service infusion, service design, service reconfiguration, and service integration as autonomous perspectives. We have outlined each

with its own research focus, logic, and vocabulary. Within the NSD perspective, authors treat service as an intangible product and new services as distinct innovation outputs, thus focusing on the context of development and commercialization. Within the service engineering perspective, authors see service as a company's acts and processes that compose service delivery; hence, they focus on devising an efficient and reliable service delivery process. Within the service infusion perspective, service implies a firm's strategic intent to serve its customers, while service innovation consists of the transition from a pure manufacturing firm to a service or "cross-sectoral" firm. Within the service design perspective, service is a customer experience, whereas service innovation is about the creation of unique, memorable, and pleasurable service settings. Within the service reconfiguration perspective, authors view service as actors' economic activities and service innovation as the process of reconfiguring service ecosystems to enable actors' value co-creation in a new way. Finally, within service integration, service means the actors' economic roles, while service innovation covers the change of actors' roles.

We found that the main obstacles to the current and future progress of service innovation research are lexical cross-contamination, parallelism in approaches, the gravity of the NSD perspective, and the shadow of new product development. This means that many articles that inherently belong to one perspective use the vocabulary of another perspective without "translating" it into their own terms, investigate similar—at the abstract level—issues without building upon each other's findings, and are immensely influenced by the vocabularies and research traditions of the NSD and new product development perspectives. To overcome these challenges, we encourage a more distinct pluralism of perspectives, but we argue that meaningful conversations across them are possible.

Article 2. Explaining dynamic capabilities and explaining with dynamic capabilities: A necessary step further

The purpose of Article 2 was to understand what dynamic capabilities were. The dynamic capabilities framework is very popular, but it builds upon two conflicting approaches to defining dynamic capabilities. In the ability-based approach, researchers circularly define dynamic capabilities as abilities (capabilities, capacities, competences), treat dynamic capabilities essentially as compositional variables, and tend to include explanandum in the explanans. In the routine-based approach, researchers portray certain organizational routines as dynamic capabilities, creating a superfluous hierarchy of organizational capabilities and accepting a blurry line between dynamic capabilities and ordinary capabilities. As a result, the field faces fierce criticism.

The root of the problem lies in the views on the nature of dynamic capabilities and the issue of agency. Neither of the current approaches alone offers a satisfactory solution, but the idea of regularity emphasized by the routine-based approach and the notion of managerial dynamic capabilities seem to be the key to addressing the critical issues surrounding the framework. In an attempt to avoid circular and overlapping definitions, I explicate dynamic capabilities as the regular actions of creating, extending, and modifying an organizational resource base. By "organizations," I mean assemblages of interacting individuals, and by "organizational resource base," I refer to their resources and routines. Since my definition includes regular action, it implies an individual's regularly emerging intentions to change the status quo. Since changes in the routines and resources of organizational members require their intention to accept the changes that regularly emanate from a particular individual, the definition implies the high level of the individual's influence. Thus, my approach allows me to define dynamic capabilities precisely (i.e., through necessary and sufficient conditions, which are the individual's intention to change the status quo in the organization and the individual's

level of influence in the organization). Correspondingly, by explaining each of these two conditions, I can explain dynamic capabilities. In turn, dynamic capabilities, as a particular type of individual action, may explain organizational-level outcomes, which is consistent with the scientific practice of searching for explanantia at a lower level than the explanandum. In explaining with dynamic capabilities, I join the consensus in the field and view dynamic capabilities as shaping a firm's bundle of organizational competences and resource positions, further affecting firm performance.

Article 3. Measuring managerial dynamic capabilities: Construct development and measurement validation

The purpose of Article 3 was to operationalize dynamic capabilities, or more specifically, the sensing, seizing, and transforming framework that Teece (2007) suggested. First, we defined sensing as a regular action of recognizing opportunities, seizing as a regular action of taking advantage of opportunities, and transforming as a regular action of modifying existing organizational routines. Next, we conducted an extensive literature review on constructs related to sensing, seizing, and transforming and created an initial pool of items. After four rounds of item-sorting iterations and discussions in a focus group as well as with independent raters, we ended up with 11 items. These items were pretested on 66 employees and team leaders working on teams in a large telecommunications company. Based on the results of the confirmatory factor analysis and feedback, we slightly modified the items and further validated them on a sample of 197 team leaders. The empirical tests provided clear evidence for the validity and reliability of the three constructs.

In addition, we used structural equation modeling to test Teece's (2007) theoretical model, finding support for the argument that transforming was dependent on seizing, and in turn, that seizing was dependent on sensing. Moreover, seizing capability completely mediated the relationship between sensing and transforming, suggesting that at least at the individual level, the ambidexterity of balancing exploration and exploitation was inherent to managers. Further, we assessed the nomological validity of constructs by focusing on two sources of competitive advantage: innovation and cost reduction. We found that managerial seizing capability was positively related to innovation, whereas managerial transforming capability was positively related to cost reduction.

Article 4. Developing managerial dynamic capabilities: A quasi-experimental field study of the effects of a design thinking training program

The purpose of Article 4 was to understand how dynamic capabilities could be developed. Managerial education traditionally relies on a rational–analytical perspective that is rarely adequate for complex everyday reality where well-defined problems are exceptions. As one solution, some researchers and educators suggested that the knowledge of design thinking could make managers more innovative, human-centered, and skillful in dealing with ill-defined problems. Conducting empirical research on the effects of design thinking required applying theoretical frameworks outside the design field, and we choose the dynamic capabilities framework as the most suitable of these.

We theorized that training team leaders in design thinking techniques would develop their managerial sensing, seizing, and transforming capabilities, which would then influence their teams' innovation and operational capability. Thus, the article had three research questions: 1) Could design thinking training make managers more capable of sensing, seizing, and transforming? 2) Could design thinking training of team leaders increase the innovative output of their teams? 3) Could design thinking training of team leaders improve their teams' operational capability?

We tested the model using a quasi-experimental field study with a control group and a four-month time lag. The intervention was a design thinking training program presented randomly over time in six geographically isolated business units of a large multinational telecommunications company. Our analysis of 423 responses showed that the training program had a positive effect on the participants' managerial sensing and seizing capabilities. In turn, sensing capability had a significant positive effect on seizing capability, and seizing capability had a significant positive effect on transforming capability. Seizing capability also had a significant positive effect on teams' innovation and operational capability. As a result,

we found significant and positive indirect effects of the design thinking training program on seizing, transforming, teams' innovation, and teams' operational capability.

These positive effects were paralleled by a direct negative effect of the program on the operational capability of the participants' teams. The direct effects of the intervention on transforming capability and innovation were not significant—neither was the effect of transforming capability on the teams' operational capability.

DISCUSSION

The overall purpose of my dissertation was to investigate the role of dynamic capabilities in service innovation. The answer is that dynamic capabilities of managers, or more specifically, the combination of sensing and seizing, are indeed crucial for service innovation. This finding is consistently present in both Article 3 and Article 4. In addition, the combination of managerial sensing and seizing are important for the service organization's operational capability, which is one of the findings of Article 4. In other words, having a manager with sensing and seizing capabilities in a service organization increases the chances for innovation and good service. I found that training managers in service design might induce their sensing and seizing capabilities, which means that managers with knowledge of service design positively affect service innovation in their organizations. However, this effect occurs only if managers understand service design properly. If this understanding is absent, and the application of service design tools is mechanistic, the service organization's operational capability deteriorates.

To get these answers, I took a long, twisted path that started with a critical assessment of the notions of service innovation (Article 1) and dynamic capabilities (Article 2). Although questioning these seemingly established terms seemed to be an ambitious enterprise, it has been fruitful and brought results with the potential to advance research fields that build on these notions.

Especially noteworthy is the link between the dynamic capabilities framework and service innovation that is relevant not only for the NSD perspective, but also for other perspectives on service innovation. Thus, the notion of core competences, which covers the organizational activities that define a firm's business (Teece et al., 1997), is strikingly close to Vargo and Lusch's (2004) definition of service as an application of specialized competences

for the benefit of another and to Shostack's (1982) view of services as consisting of acts or processes. Since the notion of dynamic capabilities, according to Teece et al. (1997, p. 516), is namely about changing firms' competences, it aligns almost seamlessly with the service reconfiguration and service engineering perspectives that originate from Vargo and Lusch's (2004) and Shostack's (1982) works, respectively. Since dynamic capabilities are about changes in *core* competences, they fit perfectly with the service infusion perspective and its focus on "the innovation of an organization's capabilities" (Baines et al., 2009, p. 2008). Similarly relevant are dynamic capabilities for the service integration perspective with its focus on the changes of economic players' roles and logics that may either stimulate or follow the development of new competences (Prahalad, 2004; Karpen et al., 2012). The dynamic capabilities framework has much in common with the service design perspective, as both focus on sensing latent customer needs, developing new radical solutions (Ojasalo et al., 2015), and praise the same methods and tools, including environmental scanning, the use of real-time information, prototyping, experimentation, cross-functional collaboration, and brainstorming (Eisenhardt and Martin, 2000).

These apparent similarities are one of the main reasons why I explained services as "the core activities a team performed" in the questionnaire. This gave me an opportunity to avoid justifications of my choice of service innovation as a context, irrelevant to my main messages and potentially handicapping for publishing in top journals (see Biemans et al., 2015). At the same time, it allowed me to remain faithful to the overall purpose of my dissertation and to place our studies firmly at the intersection between the dynamic capabilities framework and service innovation. With my new review article, I see that the way we explained service to our respondents is close to the definition of service within the service reconfiguration perspective. As I argue in the review, however, not all studies of changes in economic activities automatically belong to the service reconfiguration perspective. There are no ecosystems,

value constellations, value-in-context, client competences, or effects at the customer or system level in our empirical studies. Instead, the logic of these studies is typical for the NSD perspective: a factor (dynamic capabilities) leads to a new intangible offering (new service) that has an effect on a "strategic" advantage (operational capability)—all for a particular organization. Nevertheless, as with the construct of dynamic capabilities, my results should not be viewed as pertinent only to the NSD perspective. From the service reconfiguration perspective, for example, NSD is indeed just a stage in a much broader creation of value-in-exchange, but it often plays an important role as a trigger of changes in value networks (Vargo and Lusch, 2016).

I am now convinced that the NSD perspective in its current form inhibits the development of service innovation research. Finding that certain factors are more (or less) important for the innovation success of service companies than for manufacturing companies is hardly enough to triumphantly declare that service innovation is different from product innovation. In fact, the differences are typically marginal, occasional, or sampling-dependent. Even in Storey et al.'s (2015) meta-review, which unambiguously concludes that service innovation and product innovation are different, manufacturing companies constitute up to 73% of the sample in 25% of the articles, where there should be none of them. It is certainly possible to view this as an additional support for the authors' conclusions because it could mean that the rest of the sample was specific enough to ensure the differences with product innovation. However, it can also support the conclusion that there are more differences within service and manufacturing sectors than between them (Forsman, 2011), or it can simply reflect bias in the article selection.

I used the NSD perspective in a somewhat unconventional way. As in NSD studies, "service" in my empirical studies still denotes an intangible offering as well as the outcome of the NSD process. In contrast to NSD studies, it does not mean an intangible product, but

instead the core activities that an organization performs. As a result, I did not compete with the new product development research in the "whose-factor-is-more-important" race. Neither did I focus on how to make the NSD process more similar to the product development process by, for example, examining the issues of formalization or intellectual property rights protection. Instead, I tried to explore the unique opportunities that the notions of service and service innovation offer, exploiting them for advancing the dynamic capabilities framework, which makes it relevant for all perspectives on innovation. I believe that such an application of the NSD perspective is more sustainable and has more potential to enrich our general knowledge than its conventional use.

Theoretical implications

This dissertation outlines six autonomous perspectives on service innovation in which "service" and "service innovation" have different interpretations and require unique research approaches. This implies that before conducting a study, service innovation researchers should specify what they mean by new service, which would help in identifying a relevant research focus, selecting a relevant design, and framing a relevant discussion. The logic and research focuses of each perspective are sufficiently distinct to avoid parallelism and yet allow for meaningful conversations between them given the necessary translation of terms. This, I believe, will help in making future service innovation studies more coherent, precise, and hopefully, revelatory. By throwing off the shackles of new product development and product innovation, service innovation researchers will be able to make unique contributions to our knowledge of economic change. As this dissertation demonstrates, even taking the NSD perspective that has traditionally been under the constant influence of product innovation research can result in novel contributions to not only service innovation, but also other research fields. The exploration, however, has to start with turning away from the

competition with product innovation research and focusing on the unique research opportunities associated with services.

The definition of dynamic capabilities that this dissertation suggests is not only more precise than ever before because it outlines the necessary and sufficient conditions, but it also allows for conducting multi-level studies. It shows that the explanation of dynamic capabilities should address, in one form or another, both the individual's regularly emerging intention to change the status quo and the individual's level of influence. Although I focus on managerial dynamic capabilities in my dissertation, the definition is broad enough to include other actors who might exercise dynamic capabilities as well. This contributes to both the dynamic capabilities framework and to the microfoundations movement in strategy and organization theory. Moreover, the similar approach to definitions may be applied to other constructs in organizational research in which reification is a common issue (e.g., Lane et al., 2006). By explicating definitions in a way that explicitly takes into account actions and interactions of organizational members, researchers will be able to avoid obscure terms fraught with misinterpretations. By bringing down the constructs to the individual level—which does not imply individuals as hermits but individuals as constituents of organizations—researchers will be able to provide lower-level explanations of organizational-level outcomes (e.g., Elster, 1989; 2015; Abell et al., 2008).

The new measurement instrument that this dissertation presents is ready to be used for theory testing in most settings. Although its current version primarily targets service organizations, it only needs minor adjustments in wording with respect to manufacturing companies. The results of using the measurement instrument in this dissertation show the strong effect of decision-makers' sensing and seizing capabilities on innovation outputs and operational capability. This implies that the NSD perspective and innovation research in general need to account for dynamic capabilities in their studies of success factors. The strong

relationship between seizing and transforming capabilities and the lack of a direct association between sensing and transforming suggests that the ambidexterity of balancing exploration and exploitation might be inherent to managers (Raisch et al., 2009). On the other hand, the lack of a significant relationship between transforming capability and operational capability is somewhat inconsistent with the theoretical assumptions of the dynamic capabilities framework (Helfat and Peteraf, 2009; Teece, 2007). A possible explanation might be that organizations with efficient and effective operations might not need regular changes in their routines, whereas organizations without adequate routines need to develop them first. This makes sensing and seizing capabilities primary for both innovation and operational capability. Since there was a significant relationship between transforming and cost reduction, the effect of transforming on operational capability is presumably cumulative, and its detection might require longitudinal research approaches.

The positive effect of the design thinking training program on sensing, seizing, and indirectly, transforming capabilities is consistent with the interpretation of dynamic capabilities as patterned activities and not innate talent (Helfat et al., 2007). Thus, training in design thinking is at least one possible way to develop or improve dynamic capabilities. Yet, not all managers developed their dynamic capabilities following the program, and as a result, not all managers positively affected the innovation and operational capability of their teams. A direct, strongly negative effect of the design thinking training program on operational capability shows the danger of applying iterative and "playful" approaches mindlessly and uncontrollably (Kolko, 2015; Norman, 2013). According to the qualitative data, many managers started to refer to service design tools and even introduced them as a formal practice without actually understanding their meaning and purpose. The implication is clear: the knowledge *about* design thinking tools can sometimes be more detrimental for stable operations than the knowledge *of* design thinking tools can be beneficial.

Practical implications

For innovating practitioners, this dissertation shows that it is possible to interpret "service" in various ways—each interpretation requires a unique approach to innovation. Thus, some practitioners might find it easier or more appealing to imagine new service concepts as new intangible products, new service operations, or even as a company's new orientation. To realize these ideas in the best possible way, they may find support in NSD, service engineering, or service infusion studies, respectively. In turn, those who are interested in innovating customer experiences, creating a new way to orchestrate service systems, or re-interpreting their own economic role may turn to service design, service reconfiguration, or service integration studies, respectively.

The new instrument for measuring dynamic capabilities may become a handy tool for evaluating managers' sensing, seizing, and transforming capabilities. If these capabilities are weak, then as this dissertation shows, the stumbling block should lie in either the lack of the manager's intention to change the status quo or the lack of the manager's influence in the organization. If this constitutes a problem, it is feasible to address each of these issues. Thus, the manager's intention to change the status quo regularly may be shaped by influencing the manager's beliefs, desires, and emotions. The manager's influence in the organization may be gained by affecting the beliefs, desires, and emotions of organizational members in a way that readies them for changes that regularly emanate from the manager.

This dissertation demonstrates that training in design thinking, or more precisely, service design principles and tools, is an effective way to strengthen managerial dynamic capabilities by influencing the manager's intention to change the status quo. In contrast to the conventional (formal and rational–analytical) approach, a playful style of design thinking contributes to solving business problems by fostering motivation, engagement, and creativity. Combined with integrative thinking and cross-functional collaboration, design thinking tools

assist in delineating customer solutions and business models, managing complements and platforms, and building loyalty and commitment. Managers with knowledge of design thinking tools are indeed better in their sensing, seizing, and indirectly, transforming capabilities. This makes them better at stimulating innovation and strengthening the operational capability of their organizations. However, introducing design thinking training requires caution: it is of crucial importance to ensure the correct understanding of the design thinking principles and tools as well as of their possibilities and limitations. An ignorant use of the design thinking tools may result in a disruption of established routines and procedures, hindering business from functioning efficiently. In any case, this might be worth the risk for companies that already operate in highly competitive environments with high expectations for innovation.

Limitations

To realize this research project, I had to make certain trade-offs, which in turn implied several limitations. First, in Article 1, I used the term "actor" when describing the service reconfiguration and service integration perspectives as being consistent with Vargo and Lusch's (2011) vocabulary, where "actor" means all parties engaged in economic exchange (e.g., business, individual customers, and households). This, however, is in direct contradiction to the traditional view of actors as necessarily individuals (Elster, 2015), which I share and use in the latter three articles. Although I regard my concession in Article 1 as a personal limitation, it was an unavoidable consequence of taking those particular perspectives.

Second, I followed Teece's (2007) tripartite framework of sensing–seizing–transforming, which may raise the question of why I have chosen exactly this framework to operationalize when there are plenty of other capabilities defined in the literature. In fact, one of the reviewers of Article 3 wrote the following: "No studies have measured dynamic capabilities according to Teece's (2007) typology. Perhaps that is true, but so what? Given the

various understandings regarding what exactly a dynamic capability is, why should we assume that Teece (2007) got it right?" The answer is that we should not, but if we want to test it, we have to operationalize it. It is natural to assume that, as a founder of the dynamic capabilities notion, Teece had a better chance to "get it right"; further, a framework with more than 4,500 citations deserves testing. Moreover, in my opinion, the combination of sensing and seizing and the combination of sensing, seizing, and transforming fit with the overall definition of dynamic capabilities that addresses the creation, extension, and modification of an organizational resource base. In addition, other suggested capabilities either represent the less abstract version of this framework or are dangerously close to the notion of ordinary capabilities.

Third, we used managers rather than senior executives as respondents in Article 3 and Article 4, which was somewhat different from Teece's (2014) view. In addition, we used respondents from the same firm rather than from a cross-section of organizations. Yet, I believe that neither of these two limitations poses serious threats to the validity of our conclusions. On the one hand, the managers we chose worked in a centralized organization and had full decision-making authority in their teams, which means that they were "little CEOs" in their teams. On the other hand, having respondents from the same organization allowed us to control for organizational-level factors in a reliable way.

Fourth, we used self-report measures for all of our constructs. We tried to address the issue of common method biases both theoretically and statistically and concluded that common method bias most likely did not threaten the validity of our conclusions. However, we cannot completely exclude the possibility of common method biases. A possible solution could be to triangulate data by asking other team members to rate their leader; this was, however, beyond our authority. On the other hand, co-workers' reports often provide the same results as self-reports, and for that matter, might also contain a similar degree of self-report

and common method biases (Donaldson and Grant-Vallone, 2002; Goffin and Gellatly, 2001). Thus, like the predominant majority of other researchers, we had to rely on respondents' honesty and attention. Since our items did not include socially undesirable behavior, were not sensitive, and conveyed no situational pressures, they were unlikely to provoke motivation to significantly bias responses (Donaldson and Grant-Vallone, 2002).

Fifth, we used single-item measures for innovation (Articles 3 and 4) and cost reduction (Article 3), which in certain situations might be considered as unreliable. Nevertheless, the measure of innovation was directly adopted from the very well-established CIS, whereas the measure of cost reduction was created as its counterpart. Moreover, it would not make sense to consider innovation or cost reduction as classical latent variables unless the intended meanings were "innovativeness" or "frugality." Neither of these were the case because we were interested in the concrete outcomes. Ideally, the measures would be more precise if we could get teams' reports and code their outcomes. Unfortunately, this was not possible due to the company's confidentiality policy. Although we cannot exclude the possibility of these two variables suffering from measurement error, they are the least abstract in our questionnaire; thus, they are easier to answer. I believe that the measurement error is minimal enough to be negligible in this case.

Sixth, the factor loadings in our measurement instrument are relatively low compared to the corresponding measurement instruments in psychology and marketing. As Hair et al. (2010) note, factor loadings exceeding 0.70 indicate a well-defined structure and are the aim of any factor analysis. In our case, only two variables were slightly below 0.70, and the final measurement instrument did not pose validity concerns. However, in an ideal situation, one would want factor loadings of 0.80 or higher for all factors, but this is rarely the case in organizational research (see Govindarajan and Kopalle, 2006; Menor and Roth, 2007). This is the price that organizational researchers have to pay for the complexity of their constructs and

formulations. Compare, for example, the item "I respect others" (agreeableness, NEO Personality Inventory) with "our firm emphasizes its human resources and places a premium on high cohesion and morale in its new service development activities" (Menor and Roth, 2007, p. 836).

Seventh, in Article 3 and Article 4, I use structural equation modeling with reflectively measured latent variables. This choice implies some sort of a realist standpoint in these studies (Borsboom et al., 2003). However, as it follows from my discussion of the capability notion in Article 2, I take the realist standpoint with caution. Particularly, I do not view capabilities as entities that exist on their own and causally influence the observed variables used to measure them. This does not mean that I automatically follow operationalism, which implies "that different sets of items must necessarily measure different latent variables" (Borsboom et al., 2003, p. 207). Clearly, one may use other items to measure the same capabilities in addition to or instead of the variables that we chose. The only requirement is that all of the observed variables for the same latent variable have to be logically equivalent to each other and to the latent variable itself. This requirement is namely what the terms "item homogeneity," "interchangeability," "conceptual redundancy," and "unidimensionality" describe (Bollen and Lennox, 1991; McGrath, 2005; Hair et al., 2010). Logical equivalence is the reason we expect that the latent variable and all of its observed variables should behave in a similar fashion. However, in my opinion, logical equivalence makes it impossible to make statements about whether a latent variable truly exists, or whether it is still our mental abstraction of the commonly observed characteristics modeled statistically through the shared variance. With respect to Article 2's vocabulary, such characteristics represent commonly and/or regularly observed beliefs, desires, emotions, actions, and the outcomes of actions. Thus, my realist standpoint consists of asserting that these characteristics exist independently of my mind or the way I label them. By using structural equation modeling, I remove unique and error

variance due to semantics and measurement. By equating latent variables with connotations of shared variances, I avoid reification and tautology.

Future research opportunities

The results of the work on this dissertation offer numerous opportunities for future research. Instead of trivially speculating about opportunities as ways to avoid the limitations listed in the previous section (which is certainly still an option), I would like to mention four general research directions that may emerge from this dissertation.

First, future studies on service innovation may benefit from using our classification of service innovation perspectives. It will make decisions about selecting a relevant research focus, a relevant research design, and a relevant positioning much easier and the research contributions clearer. Currently, the perspectives that do not recognize product/service distinction do not fully stand on their own and need to escape from the gravity of the NSD perspective and the shadow of new product development. I truly hope that the ideas expressed in Article 1 will help in this quest while still preserving the richness and authenticity of service innovation research.

Second, the dynamic capabilities framework, as well as a large part of organizational research, currently swarm with vague and reified concepts that build upon circular definitions and circular reasoning. I hope the approach that I used in Article 2 may become a source of inspiration for more sober views on the meaning of notions that describe organizational phenomena and on the ways of using them in organizational research beyond correlational studies.

Third, the instrument for measuring dynamic capabilities coupled with the idea of using trainings as manipulations opens up endless opportunities for testing the effectiveness of training programs with respect to managerial dynamic capabilities. Although design thinking

and service design fit particularly well with the development of dynamic capabilities, this does not mean that there are no other possible ways of achieving similar effects. Moreover, it is equally exciting to examine whether some types of trainings, especially within rational–analytical education, can actually inhibit dynamic capabilities.

Finally, the empirical studies in this dissertation address managerial beliefs (knowledge), which implies potential for future studies on the role of the individual's desires and emotions in influencing the individual's dynamic capabilities. The studies also presume the common belief in the manager's superior formal position. This leaves room for studies that address the role of beliefs, desires, and emotions of organizational members in shaping their intention to accept changes that regularly emanate from a specific individual. Possible negative effects and "backfires" of dynamic capabilities on organizational members may also be of considerable research interest.

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ARTICLE 1

The Kaleidoscope of Service Innovation: A Perspective on Perspectives

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ABSTRACT

With hundreds of articles, including numerous reviews, one might think that service innovation is a well-established concept that defines a commonly understood phenomenon. On closer inspection, however, this is far from true. As a particular phenomenon, service innovation is often described by different terms. As a particular concept, it often refers to different phenomena. Not surprisingly, there have been calls to develop a precise classification of service innovation, which could assist in designing relevant studies and framing the implications of research findings.

Combining an exploratory content analysis with a thorough examination of 578 articles on service innovation published from 1981–2015, we suggest a novel classification of the multiple interpretations of service innovation. We outline new service development, service engineering, service infusion, service design, service reconfiguration, and service integration as autonomous perspectives, each with its own research focus, logic, and vocabulary. We also reveal that the main obstacles to the current and future progress of service innovation research are lexical cross-contamination, parallelism in approaches, the gravity of the new service development perspective, and the shadow of new product development. To overcome these challenges, we encourage a more distinct pluralism of perspectives and demonstrate possibilities for meaningful conversations across them.

Keywords

Service innovation, new service development, service engineering, service infusion, service design, service reconfiguration, service integration

INTRODUCTION

Recent years have been prolific for numerous scholars interested in service innovation. Hundreds of articles, including a dozen literature reviews, are now available on the topic. At least four of these literature reviews or review-like articles have appeared within the last two and a half years (Carlborg, Kindstrom, and Kowalkowski 2014; Biemans, Griffin, and Moenaert 2015; Storey et al. 2015; Witell et al. 2016). Is the field of service innovation really so fertile, or are we witnesses to a hasty picking of low-hanging fruits?

Success factors, innovation process characteristics, the historical development of the field, and mapping existing studies onto the framework by Coombs and Miles (2000) are recurring themes both in recent and earlier reviews (e.g., Johne and Storey 1998; Droege, Hildebrand, and Forcada 2009; Papastathopoulou and Hultink 2012). In addition, many might find valuable the overviews of the methods used, units of analysis, number of citations, key researchers, and journals publishing service innovation research. Most of these categorization principles are standard and are common in the reviews of other research fields, including, naturally, the literature on new product development (e.g., Page and Schirr 2008). Some may argue that the repeated use of existing frameworks is tedious, but this is hardly the main drawback of the available reviews of service innovation. While fairly informational and often methodologically sound, these reviews have a far more serious problem: they steadily overlook a large variation in the meaning of the word “service” in the phrases “service innovation” and “new service development” that are used across the reviewed studies. Without acknowledging the diversity of perspectives on service, any attempt to classify

service innovation studies is incomplete and indeed may be misleading. Drawing an analogy with quantitative methodology, it might be unreliable to address the diversity of independent, moderating, and mediating variables without taking into consideration multiple operationalizations and, more importantly, conceptualizations of the dependent variable—in this case, service innovation.

The tripartite division of service innovation research into assimilation, demarcation, and synthesis suggested by Coombs and Miles (2000) has become almost paradigmatic. It differentiates between perspectives on service innovation, but not on service itself. Instead, it is rooted in early writings where the word "services" meant "intangible outputs." Thus, assimilation studies treat innovation in services as fundamentally similar to product innovation; they see no need to develop special methods and concepts. The demarcation studies, on the contrary, examine the differences between innovation in services and manufacturing, substantiating the necessity of distinct theories and instruments specific to the service sector. Finally, synthesis studies argue that the specifics of innovation in service industries are relevant or will be relevant for manufacturing companies that increasingly compete on intangible elements surrounding their tangible goods or even begin regarding their goods as embodiments of the services they deliver (Coombs and Miles 2000).

Two decades ago, the view of services as intangible, heterogeneous, inseparable, and perishable outputs was a common denominator for most studies (Johne and Storey 1998), serving as the basis for Coombs and Miles' (2000) classification. With the growing critique of the "uniqueness" of service characteristics and the emergence of other understandings of service (e.g., Lovelock and Gummesson 2004; Edvardsson, Gustafsson, and Roos 2005; Vargo and Lusch 2004), the tripartite framework has started to lose its original clarity. The synthesis perspective has become particularly heterogeneous, embracing studies with conflicting interpretations of service.

In this article, we carefully undertake a systematic literature review, but not to create yet another review of the service innovation literature. Instead, we intend to illustrate how different conceptualizations of "service" influence the interpretation of "service innovation," often resulting in incompatible operationalizations of the same terms and thus threatening the validity of the research findings. This, in turn, renders the direct comparison of studies unreliable and, in our opinion, keeps the academic community working in the service innovation field disintegrated (Biemans, Griffin, and Moenaert 2015). Over a decade ago, Menor, Tatikonda, and Sampson (2002) stressed the necessity of an a priori specification of what is meant by new service in order to design a relevant innovation study with relevantly framed implications. Essentially, we provide a tool for addressing this research challenge. We consider the concept of service innovation to belong to a higher taxonomic rank that covers several understandings of how new service comes into being. We offer a classification of these multiple interpretations into six perspectives and outline the main characteristics of each category. Such a perspective on perspectives allows us to identify challenges and opportunities related to conversations in studies that do and do not share the same perspective.

METHOD

We used the terms "service innovation," "new service development," "innovation in services," and "service design" as the constructs of our search (e.g., Biemans, Griffin, and Moenaert 2015; Menor, Tatikonda, and Sampson 2002; Witell et al. 2016). Since the first articles on the topic appeared in the early 1980s (Papastathopoulou and Hultink 2012), we covered the period of 1980–2015. We searched one of the world's leading scholarly databases, EBSCO Business Source Complete, for peer-reviewed articles written in English and published in academic journals. To be selected for analysis, an article had to be published in one of the 3-, 4-, or 4*-level journals from the *Association of Business Schools Journal*

Guide 2015. We also included articles from the 1- and 2-level journals specializing in service management and service marketing, such as the *Journal of Service Management* (formerly the *International Journal of Service Industry Management*), the *Journal of Services Marketing*, the *Service Industries Journal*, and *Managing Service Quality* (Carlborg, Kindström, and Kowalkowski 2014). Moreover, we included articles from the *International Journal of Innovation Management*, considering that the initial search in EBSCO identified it as the journal with the third-largest amount of articles on service innovation after the *Service Industries Journal* and the *Journal of Product Innovation Management*. In addition, we used reference lists from previous service innovation reviews (Johne and Storey 1998; Menor, Tatikonda, and Sampson 2002; Droege et al. 2009; Papastathopoulou and Hultink 2012; Carlborg, Kindström, and Kowalkowski 2014; Biemans, Griffin, and Moenaert 2015; Storey et al. 2015; Witell et al. 2016) to detect articles that did not appear in the initial search.

As a result of this search strategy, we identified 578 articles published from 1981–2015. This number is about four times higher than the number of articles identified in Papastathopoulou and Hultink's (2012) review. For descriptive statistics, we used the generic classification suggested by Page and Schirr (2008), who outlined four types of research design by dividing articles into conceptual or empirical and qualitative or quantitative studies. To reflect the distribution of articles over time, we followed the logic of Biemans, Griffin, and Moenaert (2015) by using the three periods suggested by Papastathopoulou and Hultink (2012) and adding a fourth period covering recent years.

Beyond that, we did not use other pre-defined categorizations and instead conducted an exploratory content analysis in NVivo 11 to avoid the limitations of existing frameworks. To gain an overview of the structure of our sample for the initial thematic understanding, we started with clustering abstracts by word similarity using Pearson's correlation coefficient. This technique allowed us to assess whether studies could form clusters based on the

vocabulary that authors used in covering the topics of interest (Bazeley and Jackson 2013). Next, we turned to a "text search query" technique, which allowed us to explore verbal contexts, recurring themes, and phrases that were associated with a particular word and thus reflected its meaning (Bazeley and Jackson 2013). Our initial search words included "service," "innovation," "development," "design," and "new," from which we obtained information about the contextual relations of these words by building word trees via the stemmed search option. We also applied this procedure to the most frequently occurring terms identified through a word frequency query. As a "robustness check," we employed automatic coding to ensure objectivity in identifying themes in our sample. This exploratory analysis facilitated the emergence of initial categories and was followed by the individual examination of each article with respect to its content (i.e., focus, interpretation of service and service innovation, relationships between variables, sample, measures) and vocabulary (i.e., positioning, concepts).

We deliberately avoided commenting on the articles' empirical results: our primary purpose was to examine research perspectives, not their findings. Making empirical conclusions on such a wide selection of diverse articles from sources of varying quality without discrimination between studies would have been unreliable. Finally, in some cases, we had to resort to foundational papers that did not comply with our search criteria but that we needed to support our arguments (e.g., general marketing papers).

RESULTS

Table 1 provides the descriptive statistics of our sample. The amount of articles grows almost exponentially, more than doubling in each period. Regarding research design, the shares of conceptual–qualitative, empirical–qualitative, and empirical–quantitative studies have remained relatively stable during the last two decades, with empirical–quantitative

studies dominating the sample. The majority of articles (79.6%) appear in 14 journals, among which the *Service Industries Journal*, the *Journal of Service Management*, the *Journal of Product Innovation Management*, *Research Policy*, and the *International Journal of Innovation Management* are the top five most prolific outlets.

Table 1. The descriptive characteristics of the sample

			Time periods			
		Total (n = 578)	1981–1995 (n = 36)	1996–2001 (n = 59)	2002–2008 (n = 150)	2009–2015 (n = 333)
Research design	Conceptual–qualitative	98 (16.9%)	8 (23.5%)	9 (15.3%)	31 (20.5%)	50 (15.0%)
	Conceptual–quantitative	5 (.9%)	-	2 (3.4%)	-	3 (.9%)
	Empirical–qualitative	162 (28.0%)	3 (5.9%)	14 (23.7%)	52 (34.4%)	93 (27.9%)
	Empirical–quantitative	313 (54.2%)	25 (70.6%)	34 (57.6%)	67 (45.0%)	187 (56.2%)
Journals with more than 10 articles	*Decision Sciences*	12 (2.1%)	-	2 (3.4%)	1 (.7%)	9 (2.7%)
	European Journal of Marketing	13 (2.2%)	3 (5.9%)	2 (3.4%)	3 (2.6%)	5 (1.5%)
	Industrial Marketing Management	14 (2.4%)	1 (2.9%)	2 (3.4%)	2 (1.3%)	9 (2.7%)
	International Journal of Innovation Management	34 (5.9%)	-	5 (8.5%)	8 (5.3%)	21 (6.3%)
	Journal of Business Research	25 (4.3%)	1 (2.9%)	3 (5.1%)	3 (2.0%)	18 (5.4%)
	Journal of Operations Management	12 (2.1%)	-	1 (1.7%)	8 (5.3%)	3 (.9%)
	Journal of Product Innovation Management	47 (8.1%)	7 (20.6%)	9 (15.3%)	8 (5.3%)	23 (6.9%)
	Journal of Service Management	59 (10.2%)	6 (17.6%)	8 (13.6%)	10 (6.6%)	35 (10.5%)
	Journal of Service Research	28 (4.8%)	-	5 (8.5%)	6 (4.0%)	17 (5.1%)
	Journal of Services Marketing	30 (5.2%)	7 (20.6%)	-	9 (6.0%)	14 (4.2%)
	Managing Service Quality	18 (3.1%)	-	-	7 (4.6%)	11 (3.3%)
	Research Policy	43 (7.4%)	2 (5.9%)	5 (8.5%)	18 (11.9%)	18 (5.4%)
	Service Industries Journal	102 (17.6%)	2 (5.9%)	5 (8.5%)	25 (16.6%)	70 (21.0%)
	Technovation	23 (4.0%)	-	1 (1.7%)	7 (4.6%)	15 (4.5%)

Automatic clustering of the abstracts yielded a surprising result: the vocabulary of studies within the clusters was often not coherent with their content (i.e., studies that are similar in word usage do not necessarily deal with similar issues and vice versa). Thus, we

relied on another approach to identify classification criteria. The analysis of the phrases and sentences based on the text search query shows that authors tend to use several phrases to describe both service and service innovation. This diversity has become a basis for our categorization of the perspectives on service innovation.

Instead of "innovation," we begin with the notion of "service" as a common denominator. Our first classification criterion is authors' perspectives on service with respect to service providers. Following the results of the text search query, we distinguish between studies that treat service as an output (e.g., "service offering," "service product," and "service experience"), as a process (e.g., "service activity," "service process," "service delivery," and "service provision"), and as a strategic intent (e.g., "service orientation," "service strategy," and "service business model"). The third interpretation of service is simply a sophisticated equivalent of the colloquial "at someone's service." In some sense, this division corresponds to the traditional tripartite framework of outcome, action, and intention used to explain human behavior as well as to Goldstein's (2002) separation of a service concept into service outputs, service delivery, and service strategy.

In addition, the articles in our sample vary along a dimension that we interpret as authors' explicit or implicit assumption of the place of service in an economy. This is reflected in the continuous discussion of whether the notion of service contrasts with the notion of good or describes a phenomenon for which industry affiliation is irrelevant (e.g., Edvardsson, Gustafsson, and Roos 2005). We use it as our second classification criterion, which divides perspectives into two groups: perspectives that keep the conceptual distinction between services and products, and perspectives that reject it in favor of a holistic notion of value propositions.

The juxtaposition of the two classification criteria results in six categories (presented in Figure 1). To finalize our classification, we have matched each of these categories with the

most characteristic word used to describe service innovation by studies within the corresponding perspective. Table 2 provides an overview of the characteristics of all six perspectives.

The interpretation of service	Product/service distinction: Yes	Product/service distinction: No
Strategic intent	Service orientation *Service infusion*	Economic role *Service integration*
Process	Operation *Service engineering*	Economic activity *Service reconfiguration*
Output	Intangible offering *New service development*	Customer experience *Service design*

Note. The first line in each cell represents perspectives on service. The corresponding perspectives on service innovation are in italics.

Figure 1. A framework for defining perspectives on service and service innovation

When discussing each perspective, we accept its premises and do not make any judgments about the superiority of one perspective over another. In fact, we have conceived this article to demonstrate the richness of the service innovation field. However, taking a particular perspective has imposed a duty on us to evaluate the advances and challenges of the corresponding studies. We have attempted to fulfill this duty by following the scientific imperative of critical thinking.

Table 2. The characteristics of the perspectives on service innovation

Interpretation of the service	Output		Process		Strategic intent	
	Intangible product	Customer experience	Operation	Economic activity	Service orientation	Economic role
Perspective on service innovation	New service development	Service design	Service engineering	Service reconfiguration	Service infusion	Service integration
Viewpoint on the innovation process	The development of a new intangible product	The design of a new experience	The engineering of a new back-office operation	The reconfiguration of a service (eco)system/value network	The infusion of services in manufacturing companies	The integration of resources and competences into value constellations
Main question for innovators	What market opportunity should be addressed?	How should interaction with customers be designed?	How should operations be performed?	How can the reconfiguration of a service ecosystem be facilitated?	How can a product firm be turned into a service company?	How can the role of an economic agent be changed?
Main research questions in studies	What factors influence the success of new outputs?	What tools can be used to design memorable experiences? How does design affect customer emotions, cognitions, and behavior?	What tools can be used to engineer an efficient and reliable process? Are these tools useful?	How do service ecosystems emerge and change? What are the challenges and benefits of a new ecosystem?	What are the challenges and benefits of becoming a service company? How does the transition take place?	What are the challenges and benefits of changing an economic role? How do changes in roles take place?
Conceptual studies (examples)	den Hertog et al. (2010), Lyons et al. (2007), Scheuing and Johnson (1989)	Bitner et al. (2008), Bolton et al. (2014), Cook et al. (2002)	Chai et al. (2005), Hill et al. (2002), Shostack (1982)	Lusch and Nambisan (2015), Michel et al. (2008), Vargo et al. (2015)	Vandermerwe and Rada (1988)	Prahalad and Ramaswany (2003), Prahalad (2004), Karpen et al. (2012)
Qualitative studies (examples)	Edvardsson et al. (1995), Kindström and Kowalkowski (2009), Sundbo (1997)	Patricio et al. (2011), Teixeira et al. (2012), Zomerdijk and Voss (2010)	An et al. (2008), Yang et al. (2007)	Consoli (2005), De Vries (2006), Norman and Ramírez (1993), Windrum and García-Goñi (2008)	Kowalkowski et al. (2012), Nordin et al. (2011), Oliva and Kallenberg (2003)	Fisher and Smith (2011), Ordanini et al. (2011)

Interpretation of the service	Output		Process		Strategic intent	
	Intangible product	Customer experience	Operation	Economic activity	Service orientation	Economic role
Quantitative studies (examples)	Atauhene-Gima (1996), Avlonitis et al. (2001), Frambach et al. (1998), Hipp and Grupp (2005)	Dixon and Verma (2013), Pullman and Gross (2004), Williams and Anderson (2005)	Chuang (2007), Ding (2015)	-	Gebauer et al. (2011), Visnjic and Van Looy (2013)	-
Logic of a study	Factors => new intangible product => commercial success/strategic advantage	Design tool => new service attraction => customer reaction	Engineering tool => new back-office process => operational effectiveness	Factors => new value constellation => co-created value/system effects	Factors => new service company => strategic advantage	Factors => new economic role => effects on actors
Typical journals	*Journal of Product Innovation Management*, *Service Industries Journal*	*Journal of Service Research*, *Managing Service Quality*	*International Journal of Production Economics*, *Journal of Operations Management*	*Research Policy*, *Journal of Service Research*	*Industrial Marketing Management*, *Journal of Business Research*	*Journal of Service Research*, *Marketing Theory*

Note. We by no means assert that the articles we used as examples here are the best within each group; in fact, many articles deserve mentioning. We chose the examples based on two criteria only: they should be sufficiently representative of a corresponding group and, if possible, have a relatively high number of citations. Some other examples may be found in our article's main text.

Perspectives that Recognize the Product/Service Distinction

Service industries have long been defined as a residual sector covering everything that is excluded from the primary and secondary sectors (Mansury and Love 2008). This thinking, reinforced by the notion of intangibility, is still prevalent in the industry classifications used by governments. In the 1980s, however, the differentiation between goods and services began to play an important role in the formation of service innovation research as a separate field. Adopted from the then recently emerged services marketing literature, the idea of services possessing unique characteristics has become the main argument in the search for service-specific innovation concepts and theories. In addition to the widely mentioned intangibility, such characteristics as heterogeneity, inseparability, and perishability became common in the early literature on services (Zeithaml, Parasuraman, and Berry 1985; Johne and Storey 1998). Later, arguing that services represent marketing transactions without a transfer of ownership, Lovelock and Gummeson (2004) suggested a characteristic of non-ownership. Regardless of which characteristic is stressed and whether goods and services are viewed as two discrete categories or as a continuum, the differentiation between them is an integral part of the following three perspectives on service innovation.

New service development (NSD). Shared by most studies, the view of service innovation as NSD is arguably the most established. Guided by this perspective, authors describe services as outputs, often using such expressions as "service product" and "service offering." Correspondingly, NSD is the process of creating intangible products to gain certain advantages in the existing or potential markets (Johne and Storey 1988). This usually requires some form of the search, development, and launch of ideas to satisfy a particular customer need (Scheuing and Johnson 1989).

To fall within the NSD perspective, a study does not have to contain the explicit definition of a new service as an intangible product; for example, many authors use the

combination “product or process.” The sufficient conditions are the treatment of new solutions as distinct innovation outputs and the focus on the context of development and commercialization. This manifests itself in the search for so-called “success factors” (i.e., factors that ensure the success of the outputs of the NSD process) (e.g., Storey et al. 2015). Three topics of interest guide this quest.

The first topic is what makes the creation of new services more effective and efficient. This implies the examination of internal and external environmental factors and the characteristics of the NSD process. Common examples of the discussed internal environmental factors are strategy and culture, especially market orientation, as well as resources and capabilities (e.g., Atauhene-Gima 1996; den Hertog, van der Aa, and de Jong 2010; Froehle and Roth 2007; Hull 2004; Lyons, Chatman, and Joyce 2007). Market characteristics, including technological infrastructure, market turbulence, and governmental policies, may serve as an illustration of external environmental factors (e.g., Corrocher and Zirulia 2010). Finally, the characteristics of the NSD process cover the various aspects of the process and project management. The focus is, however, mainly on the formalization of the NSD process and the collaboration with internal and external parties, especially with customers (e.g., Dolfsma 2004; Mention 2011; Carbonell, Rodríguez-Escudero, and Pujari 2009).

The second topic within the NSD perspective is what stimulates the diffusion of new services and their adoption by customers. This implies the examination of how the characteristics of final service offerings and the characteristics of adopters influence the intention to adopt. Thus, it is essentially about two specific success factors: new services per se and their users. Traditionally, the former has been addressed using the diffusion of innovation model (e.g., Frambach et al. 1998), while the explanation of the latter has relied on behavioral models such as the theory of planned behavior, the technology acceptance model,

and the behavioral reasoning theory (e.g., Claudy, Garcia, and O'Driscoll 2015). In addition, some authors touch upon the issue of adoption implicitly by examining how some of the characteristics of new services, typically, the degree of novelty, influence innovation performance (e.g., Ettlie and Rosenthal 2011).

Driven by its search for success factors in service innovation, the NSD perspective requires proof that this labor is not in vain. Thus, the third topic is whether innovation itself is a success factor, but now with respect to performance and growth. The examination of the firm-level effects, typically related to financial or market performance, attracts an almost exclusive interest (e.g., Aas and Pedersen 2011). The only noteworthy exception is the studies of service innovation effects at the regional level, but these focus predominantly on the role of knowledge-intensive business services in regional development (e.g., Muller and Zenker 2001).

Service engineering. Almost simultaneously with the emergence of the NSD perspective, Lynn Shostack began a different research tradition. Her articles on service blueprinting represent an attempt to organize service operations in a manner analogous to the engineering of products (Shostack 1982; Shostack 1987). The author takes the view of services as consisting solely of acts or processes as her starting point, and since services are delivered but not possessed, the creation of new services implies devising a service delivery process. The main question thus becomes how to organize service operations in a way that ensures uniformity, quality, performance measurement, and the rational organization of the process (Shostack 1982). Traditionally, this perspective was known as service design; however, over the last decade, the research interest in the field of service design has turned away from the architecture of the back-office toward the staging of memorable customer experiences (Stuart and Tax 2004). For the sake of precision, and based on its original research objectives, we label the "old school" of service design as service engineering.

Thus, in contrast to the NSD perspective that is preoccupied with the context of the development and commercialization of new services, service engineering concerns the efficiency and reliability of service delivery. To ensure these qualities, various authors have suggested other techniques in addition to blueprinting, mainly adopting them from the engineering literature. The examples are methods based on the theory of inventive problem solving (Chai, Zhang, and Tan 2005), design for X (Yang, Chen, and Shiau 2007), quality function deployment (An, Lee, and Park 2008; Lee and Chen 2009), and failure mode and effects analysis (Geum, Shin, and Park 2011).

Driven by its pragmatic interest in the optimization of service operations, the service engineering perspective requires a demonstration of the effectiveness of newly developed tools. Although these tools' practicality should be appealing to managers, the empirical examination of the effects resulting from their implementation is currently limited, taking the forms of observations and interviews (e.g., Aas 2010; Rapaccini et al. 2013; Yang, Chen, and Shiau 2007).

Service infusion studies. The focus of the third perspective that recognizes the product/service distinction is on manufacturing companies that have decided to build their competitive advantage on providing services. Such firms expect to break out from the vicious circle of competition on easily commoditized products by adding intangible services to their tangible goods. In contrast to previous perspectives, however, the subject is not products and processes, but the organizational innovation itself (i.e., the transition from a pure manufacturing firm to a service or "cross-sectoral" firm). This phenomenon has been called "servitization," "servuction," "service differentiation," and "service infusion" (Gebauer, Gustafsson, and Witell 2011; Vandermerwe and Rada 1988). We adopt the latter term for describing this perspective in order to maintain coherence with the labeling of other perspectives.

Whereas the service engineering perspective represents an attempt to make operations in service companies more manufacturing-like, the service infusion perspective addresses the process of manufacturing companies becoming more service-like. This process does not imply merely adding services to a market offer—the cornerstone of service infusion is a strategic shift toward customer centricity (Baines et al. 2009). We view such a strategic shift as "service innovation" because service as a strategic intent within this perspective essentially means a company's employment as a customers' servant. This type of innovation requires the introduction of new organizational structures, routines, metrics, and incentives as well as a change from transaction- to relationship-based business models (Oliva and Kallenberg 2003). Intuitively, such a transition is neither easily performed nor unambiguously beneficial. Correspondingly, this perspective implies the search for answers to such questions as how the process of transition takes place (e.g., Kowalkowski et al. 2012; Peillon, Pellegrin, and Burlat 2015; Witell and Löfgren 2013) and what are the benefits and challenges associated with the transition (e.g., Eggert, Thiesbrummel, and Deutscher 2015; Nordin et al. 2011; Visnjic Kastalli and Van Looy 2013).

Perspectives that Do Not Recognize the Product/Service Distinction

Several authors have argued that "unique" service characteristics such as intangibility, heterogeneity, inseparability, and perishability are relevant for many products and are completely absent in certain services (e.g., Lovelock and Gummesson 2004; Edvardsson, Gustafsson, and Roos 2005). Interestingly, even non-ownership is not a unique characteristic. For example, it is possible to view the price paid for a physical good as a payment for hiring people to produce that good. Renting a car is a service because it does not involve a change in vehicle ownership, but a car purchase is essentially a payment for hiring an automobile manufacturer to produce that car; in this case, there is no change in the ownership of the production facilities. One might surely suggest other service characteristics to justify the

existing distinction between goods and services, but the problem will likely persist. The complex reality that includes intangible goods (e.g., electronic books), homogeneous services (e.g., internet banking), and product–service systems poses increasing challenges to the existing industry classifications. As a reaction, research perspectives that avoid or disregard the traditional distinction between goods and services have emerged. Nevertheless, they continue to use the term "service," or at least, they heavily rely on the advances of service research. We have identified three such perspectives on service innovation.

Service design. The idea of companies influencing customers has always been a foundation for marketing research. At the intersection of innovation and marketing, NSD studies on the diffusion and adoption of innovations have long addressed the effects that the characteristics of new services have on customers, but obviously, they have focused on adoption intention and adoption behavior.

Pine and Gilmore (1998) provide an alternative perspective on the effects that companies may induce in customers. Inspired by what is called "experiential services" or "entertainment business" (e.g., theaters and amusement parks), the authors suggest applying the notion of experience to all types of business. They argue that companies should turn their attention away from creating tangible or intangible products and toward staging memorable events that engage customers in a personal way on an emotional, physical, or intellectual level. Thus, the major business output becomes not a product registered in corporate reports, but an experience that resides in customer perception and memory. Since experiences are personal, companies cannot create and deliver them as pre-defined commoditized products; instead, they can design and orchestrate service settings that ensure rich interaction with customers (Patrício, Fisk, and Cunha 2008).

We regard studies focusing on the design for experience as representing the service design perspective. They have evolved from service engineering and now represent the

"modern school" of service design. Instead of searching for methods to standardize a process, they explore techniques for creating unique service settings. Instead of striving for the increased efficiency and reliability of the service delivery process, they examine the process of ensuring a holistic service experience. This evolution represents a shift from the "back stage" to the "front stage" of service. Despite being two sides of the same coin, these stages have different objectives and characteristics and thus are investigated as two distinct phenomena (Menor, Tatikonda, and Sampson 2002). With the necessary adjustments for customer experience, few of the original service engineering tools have nevertheless found their place within the new school. For example, the technique of service blueprinting has made a comeback in articles by Bitner, Ostrom, and Morgan (2008) and Patrício, Fisk, and Cunha (2008), who argue for taking the customer perspective and beginning with customer actions when drawing a blueprint. Other service design techniques, such as participant observation, customer journey mapping, or experience prototyping, are even more customer-focused and aimed at the direct exploration, understanding, and interpretation of customer experiences. The comparison of modern service blueprinting and customer journey techniques is arguably the best illustration of the shift from the service engineering perspective to the service design perspective. While both tools present a sequence of customer actions, the core of service blueprints still captures firms' actions and processes. In contrast, in customer journeys, the attention is predominantly on customer emotions, thoughts, attitudes, and motivations, whereas firms' internal processes receive less attention, if any (Zomerdijk and Voss 2010).

Experiences' prominent place in the service design perspective necessarily entails the examination of whether design actually induces the intended or side effects in customers. Surprisingly, studies of this type are scarce and normally take the form of investigating attitudes toward an offering, purchase intention, or purchase behavior as customer reactions to

design elements embedded in the service (e.g., Baltas et al. 2012; Dixon and Verma 2013; Pullman and Gross 2004; Williams and Anderson 2005).

Service reconfiguration. Paralleling in many aspects the ideas of Grönroos (2000) and Normann (2001), Vargo and Lusch (2004) suggest "service-dominant logic," in which service gets an interpretation that corresponds to literally any economic activity. As an application of competences for the benefit of a party, service emanates from any economic actor (e.g., firm, customer, government agency) that integrates resources and thus co-creates value together with other actors (Vargo and Lusch 2016). Therefore, new service is a new way of conducting economic activities, and it requires the rebundling of the diverse resources within and across value networks, or service ecosystems (Michael, Brown, and Gallan 2008; Lusch and Nambisan 2015). Service innovation thus becomes the process of reconfiguring service ecosystems and service platforms to enable actors' value co-creation in a new way (Lusch and Nambisan 2015; Normann and Ramírez 1993); hence, we label this perspective "service reconfiguration."

One might think that, since any economic activity is a service, all studies of changes in economic activities—including those within the new product development and NSD perspectives—could belong to the service reconfiguratiosn perspective. The challenge in such thinking is the notion of value co-creation, central to the service-dominant logic. Given that value "is co-created by multiple actors, always including the beneficiary" and "always uniquely and phenomenologically determined by the beneficiary" (Vargo and Lusch 2016, p.8), the conventional firm-centered performance metrics alone are insufficient. Although one might argue that they indirectly reflect customer appreciation of a firm's service, these metrics convey no information about the actual scope of co-created value. Moreover, including the customer perspective (e.g., by measuring customer satisfaction) is not enough—value co-creation is not the result of a dyadic interaction, but of a wider configuration of

actors, each being both a resource integrator and a beneficiary. Thus, the conventional studies of innovation are relevant as far as one regards them as an examination of a particular stage in the creation of value-in-exchange. This alone, however, is hardly enough to classify any of them as service reconfiguration studies.

Thus, instead of being about firms and customers, services and products, and profits and satisfaction, the service-dominant logic is about actors, their operant resources, and value-in-(cultural) context. This requires a more holistic perspective than that which a study of the development of value propositions by a firm or a value chain may offer. In fact, structural/institutional changes that result in the new configurations of service ecosystems seem to be the most appropriate candidate for studies within the service reconfiguration perspective (e.g., Ramos et al. 2013). This is the reason why service-dominant logic is moving toward applied sociology and economics in its theoretical advancement (e.g., Vargo and Lusch 2016; Vargo, Wieland, and Akaka 2015).

The service reconfiguration perspective does not exclusively cover innovation studies within the service-dominant logic. For example, Consoli's (2005) paper on the structural change of a banking industry is sufficiently close to the service reconfiguration perspective. Another parallel approach—with articles unifying the ideas of Schumpeter and Lancaster—emerged from the conceptual article by Gallouj and Weinstein (1997). Here, the authors describe service as a system consisting of not only the sets of final service and technical characteristics, but also of the sets of provider and customer competences. The relevance of this stream of research to service reconfiguration studies has become particularly evident with its application to a larger network of actors who recombine their competencies and technological characteristics to jointly create value (De Vries 2006; Windrum and García-Goñi 2008).

Service integration. Due to its attention to the activities of generic actors, service-dominant logic becomes an inspiration source for another emerging perspective, which we describe as "service integration." In contrast to the service reconfiguration perspective that focuses on new configurations of a service ecosystem, which may or may not involve changes *in* actors' roles, the service integration addresses the change *of* actors' roles. This entails the examination of how the dominant logic, or worldview, of actors transforms as they grow into their new roles while integrating their own service into an ecosystem in a new way (Prahalad 2004). In some sense, this is a counterpart of the service infusion perspective, but it renounces product/service distinction and substitutes firms with generic actors.

In the context of the shift toward service-dominant logic, the service integration perspective covers the transformation of product- or service-focused economic agents into actors that consciously reject the notion of the value chain in favor of value/experience co-creation within and across value networks (Prahalad and Ramaswany 2003; Karpen, Bove, and Lukas 2012).[1] Theoretically, any given actor already integrates resources and contributes to the value co-creation of other actors. Still, deliberately becoming an actor within a service ecosystem that jointly contributes to the holistic experience of others seems to be a challenging task. Thus, for a company that operates based on linear staged processes and is comfortable with control over its supply chain, outputs, and customers, accepting the role of a co-creator and an orchestrator of customer experiences may require considerable change efforts (Prahalad 2004; Karpen, Bove, and Lukas 2012). We see the process of such a transformation as different from service infusion. When a product company becomes a service company, it essentially breaks with the traditions associated with manufacturing operations management. It remains a firm with clear boundaries that tries to maintain control over its

[1] Here, as in the service reconfiguration perspective, "value co-creation" does not mean "open innovation" or the collaboration with external partners during the new service or product development process. Instead, it refers to the collective contribution of resources and competences to a service ecosystem by multiple actors.

suppliers and customers, beat its competitors, and minimize exposure to government interventions. In contrast, the role of an actor that deliberately integrates its own resources into a service ecosystem requires abandoning these attempts, loosening firm boundaries, and shifting focus from the firm's or customer benefits to the benefits of the ecosystem.

Most importantly, service integration studies should not focus exclusively on changes in firms' business models because, within this perspective, service innovation essentially means a change of any actor's economic role. The emergence of consumers from initially self-sufficient individuals and households in the past and their current transformation from mere consumers to prosumers and investors—as through selling self-made applications for smartphones, renting out their own apartments, and crowd funding—may serve as examples (e.g., Fisher and Smith 2011; Ordanini et al. 2011).

ANALYSIS AND DISCUSSION

The unique holistic perspective presented in this paper does more than just demonstrate the diversity of service innovation research. By delineating each of the six service innovation perspectives with respect to their focus, logic, and vocabulary, it identifies challenges and opportunities that are overlooked in traditional reviews. We encountered four main challenges while elaborating our classification: lexical cross-contamination, parallelism in approaches, the gravity of the new service development perspective, and the shadow of new product development. These explain why the service innovation field may seem disintegrated and lacking both impact and a generally accepted body of knowledge (Biemans, Griffin, and Moenaert 2015). However, instead of traditionally suggesting some sort of a unified research agenda, we see opportunities in embracing the pluralism of perspectives. We also show possibilities for meaningful conversations across the perspectives, but we argue that they should be carefully constructed and necessarily involve the translation of concepts.

Challenges in the Existing Service Innovation Research

Lexical cross-contamination without appropriate translation. By this phrase, we refer to the phenomenon in which studies that inherently belong to one perspective use the vocabulary of another perspective without "translating" it into their own terms. This usually happens due to the literal (mis)interpretation of terms, often because authors are inspired by current trends or guided by journal traditions. Arguably, most confusion comes from the ideas of experience economy and service-dominant logic. Many understand Pine and Gilmore's (1998) notion of experiences exclusively as experiential services despite their arguments that both manufacturing and service companies can stage experiences, whereas "experiential services" may fail to deliver them. For many, Vargo and Lusch's service-dominant logic means something related to the dominant share of services in economies or to the service orientation of employees, and the notion of customer co-creation means the same as customer involvement in the NSD process—both of which are far from their original meanings (Vargo and Lusch 2016). Sometimes, mixing the conflicting definitions of the word "service" results in the grotesque, creating such phrases as a "new service that delivers new or existing customer service with new services" and a "new service that delivers new customer service with existing services" (Chen, Tsou, and Huang 2009, p.44).

The role of current trends in lexical cross-contamination is apparent in, for example, the studies by Hsieh and Hsieh (2015), Melton and Hartline (2013), Ordanini and Maglio (2009), Ordanini and Parasuraman (2011), and Witell et al. (2011), who employ the service-dominant logic's vocabulary. In these articles, however, service innovation is still a new offering that contributes to a firm's performance, the service innovation process is the development of new services that is different from product development, and co-creation is the involvement of customers and external organizations in the process of developing new offerings—all of which are characteristics of the NSD perspective.

The best way to trace the influence of journal traditions is to look at articles that are based on the same data but published in different journals. Ideally, they would follow the same line of arguments and have similar vocabulary; however, that is not the case. For example, in the *Journal of Service Research* and the *Journal of Product Innovation Management*, respectively, Zomerdijk and Voss (2010) and Zomerdijk and Voss (2011) present the results of the same qualitative study of 17 companies that provide customer experiences. In the first article, the authors use the term "experience-centric services" and do not pay much attention to positioning with respect to the traditional product/service distinction. Experience-centric services have customer experience at the core; they are "designed to engage customers," and this design "involves orchestrating the 'clues' that are emitted by products, services, and the environment" (Zomerdijk and Voss 2010, p.68). This view is close to Pine and Gilmore's (1998) interpretation of experiences; they see them as offerings beyond goods and services. One the other hand, in the article published in the *Journal of Product Innovation Management*—a journal that focuses on the product/service distinction—Zomerdijk and Voss (2011, pp.63–64) describe experiential services as a "highly intangible type of services" that represent "an extreme end of the service spectrum," or "a subset of services that is quite far from tangible products." Correspondingly, the notion of NSD is central in the *Journal of Product Innovation Management* article, whereas it is totally absent from the *Journal of Service Research* article, being substituted by the notion of service design.

Existing parallelism in approaches. Maintaining conceptual clarity is paramount in science, but linguistic purism without a fundamental shift in traditional thinking may give rise to parallelism in approaches. The comparison of service design studies that focus on inducement with NSD studies that focus on adoption offers one of the most noteworthy examples. This type of service design study addresses the question of how various service

attributes such as food range, assortment, or visual elements induce user reactions (e.g., Baltas et al. 2012; Pullman and Gross 2004; Williams and Anderson 2005). Such service attributes are essentially less abstract alternatives to the elements of Rogers' (1962) diffusion of innovation model (i.e., relative advantage, complexity, compatibility, trialability, and observability). In turn, the user reactions under study typically take the form of intention to repurchase and recommend (Pullman and Gross 2004) or intention to buy (Baltas et al. 2012), the latter of which closely corresponds to adoption intention.

Parallelism is even more striking within the service reconfiguration perspective, where competences and networks of actors are not the only shared themes in studies guided by the service-dominant logic and the neo-Schumpeterian–Lancasterian approach. For example, "translating" de Vries' (2006) terms into the language of service-dominant logic reveals that the author does not view customer co-creation as mere customer involvement in the creation of value propositions. Instead, he interprets it as the integration of actors' resources by customers in the process of interacting with network components, which corresponds to Vargo and Lusch's (2016) view. Another example is the notion of a service platform (i.e., a modular structure that consists of tangible and intangible components used to facilitate interactions) (Lusch and Nambisan 2015). This corresponds to Gallouj and Weinstein's (1997) idea of the vector of technical characteristics that comprises tangible and intangible elements embodied in a system in order to provide a service.

Although parallel literature streams do not refer to or build upon one other, this is not a challenge in itself, at least not of the same sort as lexical cross-contamination, because maintaining conceptual purity may still lead to an evolution, no matter whether divergent, parallel, or convergent.

The gravity of the NSD perspective. Despite the diversity of approaches in service innovation research, the group of NSD studies is clearly the largest and most established. In

fact, these studies are central to most reviews of service innovation literature, beginning with Johne and Storey (1998) and ending with Storey et al. (2015), whereas studies with other perspectives receive a rather arbitrary treatment. The only exception is arguably service infusion studies (e.g., Baines et al. 2009). Ironically, a considerable portion of the works inspired by the idea of servitization actually take the NSD perspective due to their focus on the development and launch of product-related services and product–service systems (e.g., Neu and Brown 2005; Kindstrom and Kowalkowski 2009).

The dominance of the NSD perspective is hardly constructive because it creates a strong gravitational field that decelerates the real advancement of other perspectives. This gravity is especially evident in the detours that some studies take when planning to address problems relevant for other perspectives but end up examining the problems typical for the NSD perspective, often due to lexical cross-contamination. According to Occam's law of parsimony, such detours become needlessly complex.

The shadow of new product development. The above-mentioned phenomena are direct consequences of a bigger challenge. The relative straightforwardness of examining innovation in manufacturing has set a "gold standard" that most NSD studies have tried to match. This contest requires comparability and stimulates isomorphism, prompting the oxymoron "service product," whose caricatured nature becomes evident when one tries to find an analogous term for manufactured goods. The expression "good product" describes the quality of a product, not a tangible commodity.[2] Hence, it is common for both new product development studies and NSD studies to search for success factors that affect the performance of the development process (Menor, Tatikonda, and Sampson 2002). In fact, the similarity in topic of both research traditions is what makes their direct comparison possible (e.g., Ettlie and Rosenthal 2011; Schleimer and Shulman 2011; Storey et al. 2015).

[2] We also encourage reflecting on what "product" in "product–service system" means and why "NSD" is typically contrasted with "new product development" and not "new goods development."

The shadow of new product development is the reason why many authors had and still have a tendency to fault services, explicitly or implicitly, for not being a "good" good. This is particularly evident in the raison d'etre of service engineering studies, that is, the development of techniques for "tangibilizing" service concepts more effectively and efficiently (Menor, Tatikonda, and Sampson 2002); essentially, it is about making services better goods. Through service engineering, the shadow of new product development slipped into the service design perspective, manifesting itself in, for example, service attributes—the "tangibilized" characteristics of service offerings—and in customer satisfaction and customer loyalty as proxies for customer experience. Due to the lexical cross-contamination of some NSD studies, this shadow is falling on the service reconfiguration perspective as well.

We by no means claim that comparing and contrasting service innovation and product innovation is unnecessary or vain; on the contrary, it is natural when one uses the product/service distinction. A serious problem arises when this thinking is readily applied in perspectives that do not recognize the product/service distinction. Here, maintaining the established vocabulary and firm-centered approaches obstructs researchers from making novel contributions to the relevant perspective.

Possibilities for Future Service Innovation Research

Pluralism as the future of service innovation research. We see the four above-mentioned phenomena as the main reasons for skepticism toward service innovation as a separately established research field (e.g., Biemans, Griffin, and Moenaert 2015; Drejer 2004). Particularly inhibitory is the influence of new product development, both direct and through the NSD perspective. Not surprisingly, there have been calls for a synthetic approach to studying innovation in services and goods, most notably under the Schumpeterian framework (Drejer 2004). We totally agree with the general idea of such calls, but realize that in the light of our discussion, a myopic attempt at synthesis may result in a return to new

product development. This would be unfortunate because we believe that all six perspectives presented here have the potential to contribute to service innovation research equally and substantially.

A solution, as we see it, lies in the integration of perspectives without assimilation. In some sense, our framework of output, process, and strategic intent resonates with three of Schumpeter's five types of innovation, namely, product, process, and organizational innovations (Schumpeter 1934).[3] By providing an integrative framework for service innovation research, we believe that our effort is in line with Drejer's (2004) call for synthesis. However, we insist on preserving the pluralism rather than substituting it with a fusion. The latter, in fact, is already present in the perspectives that do not recognize the product/service distinction.

The following example illustrates how a more distinct pluralism may help in dealing with the gravity of the NSD perspective and the shadow of new product development. The parallelism in the studies that focus on innovation adoption and the inducement of experiences is a result of the shared view of service as embodied in measurable attributes and of (re)purchase intention as a sufficient performance metric. Instead, service design studies might start looking at the elements of user experience. That is, researchers' attention might turn to how having certain emotions and taking certain actions at a certain time and place influence the memorability and pleasantness of the overall experience. This may involve the assessment of customer emotions and thoughts across touch points of a customer journey. Although from a different field, a paper by Redelmeier and Kahneman (1996) provides an inspiration for such studies. The authors find that people evaluate the overall experience based on how they feel at its peak and at its end (the peak–end rule), while its duration has no effect.

[3] The two other types are, in fact, just special cases of these three. The opening of new markets represents the introduction of a product to a different audience, and the conquest of a new source of supply represents a process innovation for an adopter and a product innovation for a supplier.

Thriving in the fields of psychology and behavioral economics, such discussions are only nascent in the field of service design (Dixon and Verma 2013; Das Gupta, Karmarkar, and Roels 2015). In fact, new product development overshadows the only empirical study of this type in our sample—it still focuses on offerings' attributes and employs firm-centered measures rather than a customer-level measure of experience (Dixon and Verma 2013).

Thus, the integration of perspectives without assimilation requires at least two actions. The first is to increase awareness among researchers of the perspectives' autonomy with respect to research focus and vocabulary; the research focuses of all six perspectives as we have outlined them are sufficiently distinct to avoid parallelism. The second is to embrace, as a research community, the diversity of perspectives without imposing the imperative of conversations across perspectives. The absence of this imperative, however, does not imply the inappropriateness or impossibility of such conversations with some reservations, which brings us to the final issue.

Possibilities for discussions across the perspectives. It is obviously easier to have conversations across studies that share a view on product/service distinction because they address different aspects of the same phenomena and use a similar vocabulary. Although this has long been evident for NSD and service engineering, a similar tradition emerges for service design and service reconfiguration. For example, the article by Patrício et al. (2011) is a service design study that suggests a blueprinting technique similar to Bitner, Ostrom, and Morgan (2008) and Patrício, Fisk, and Cunha (2008). What is different, however, is that the authors show how service blueprints can be applied to value constellations (or joint offerings by the network of actors), potentially providing a practical tool for reconfiguring the network of actors beyond the firm and its customers.

Meaningful discussions between studies that do not share a view on product/service distinction are also possible as long as authors are explicit about the terms they use and aware

of their own perspective's focus and logic. Thus, some may have an interest in investigating how service design tools affect the success of innovation outputs (e.g., Candi 2010; Candi and Saemundsson 2011). This will correspond to the focus of the NSD perspective. Others may find inspiration in certain firms' competences, as identified in NSD studies, and regard them as operant resources while investigating the role of actors in reconfiguring ecosystems. Given that such research attempts include actors other than firms, this will correspond to applying the service reconfiguration perspective.

CONCLUSION

We do not assert that all articles can be easily classified based on our criteria: as the above examples illustrate, there are many studies whose vocabulary and content belong to different perspectives. We nevertheless acknowledge the imperative of content over vocabulary in the categorization, and we hope that our classification can inspire a more coherent use of vocabulary in further studies. Until then, we strongly encourage the research community to pay attention to the conformity of arguments, data, and measures in papers instead of simply assuming their relevance for their own studies. Our most important recommendation, however, is in line with Menor, Tatikonda, and Sampson (2002): before conducting a study, service innovation researchers need to specify what they mean by new service, which should help in identifying a relevant research focus, selecting a relevant design, and framing a relevant discussion. We hope that our paper will be a useful tool in making these decisions and thus assist in preserving the richness and authenticity of service innovation research.

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ARTICLE 2

Explaining Dynamic Capabilities and Explaining with Dynamic Capabilities: A Necessary Step Further

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Abstract

Despite its immense popularity, the dynamic capabilities framework faces fierce criticism because of the ambiguous and contradictory interpretations of dynamic capabilities. Especially challenging are the aspects related to the nature of dynamic capabilities and the issue of agency. In an attempt to avoid circular and overlapping definitions, I explicate dynamic capabilities as the regular actions of creating, extending, and modifying an organizational resource base. This implies that the individual's intention to change the status quo in the organization and the individual's high level of influence in the organization are necessary and sufficient conditions for dynamic capabilities. This approach overcomes challenges associated with current interpretations of dynamic capabilities, necessarily focusing on the actions and interactions of individuals in organizations. Following the micro-foundations movement, I present a multi-level approach for studying the individual-level causes and the firm-level effects of dynamic capabilities.

Keywords: dynamic capabilities, individuals, micro-foundations, explanation, capabilities

Introduction

The idea of the dynamic capabilities framework offers attractive research opportunities, and the interest in advancing and applying it has grown rapidly. A Google Scholar search revealed that Teece et al.'s (1997) founding article receives about 2,000 citations annually (since 2010), garnering more than 24,300 citations as of May 2016. This framework "was created with an ambitious agenda in mind, namely to provide a general framework to help scholars and practitioners understand the foundations of firm-level competitive advantage and associated enterprise value creation and maintenance" (Teece, 2014, p. 328). However, currently, the framework is a target for continuous criticism (e.g., Arend and Bromiley, 2009; Collis, 1994; Giudici and Reinmoeller, 2012; Williamson, 1999), particularly because of confusion around the construct of dynamic capabilities (Di Stefano et al., 2014).

In this paper, I recognize the immense potential of the dynamic capabilities framework to integrate various perspectives and provide a general understanding of organizational processes. At the same time, I argue that the source of the critical attitude toward the framework lies in the current definitions and the attribution of dynamic capabilities to any level above individuals. Nowadays, there are two main approaches to conceptualizing dynamic capabilities (Di Stefano et al., 2014; Peteraf et al., 2013; Schreyögg and Kliesch-Eberl, 2007). In the ability-based approach, researchers define dynamic capabilities in a circular way as abilities (capabilities, capacities, competences), treat dynamic capabilities essentially as compositional variables, and tend to include explanandum in the explanans. In the routine-based approach, researchers portray certain organizational routines as dynamic capabilities, creating a superfluous hierarchy of organizational capabilities and accepting a blurry line between dynamic capabilities and ordinary capabilities. Without addressing these challenges associated with the current approaches, the framework is handicapped in accomplishing its ambitious goal.

I argue that the definition of dynamic capabilities should include neither notions synonymous to ability, capability, capacity, or competence; nor attributes and resources that provide the basis for dynamic capabilities; nor organizational routines that support the execution of dynamic capabilities. By refining Helfat et al.'s (2007) definition, I conceptualize dynamic capabilities as the regular actions of creating, extending, and modifying the organizational resource base. By "organizations," I refer to assemblages of interacting individuals (March and Simon, 1958), whereas the "organizational resource base" characterizes their resources and routines (Helfat et al., 2007). Furthermore, I argue that the notion of dynamic capabilities is a construct that applies to specific individuals in organizations. In this sense, this paper takes the last step in the gradual movement of the dynamic capabilities framework toward individuals who act and interact in organizations. This movement becomes evident through comparing the original view of dynamic capabilities as "being resident in the firm's organizational processes" (Teece et al., 1997, p. 524), with the more recent view of dynamic capabilities as residing "in part, with individual managers and the top management team" (Teece, 2014, p. 332). This movement is also stimulated by the increasing attention to the notion of managerial dynamic capabilities, although the latter currently occupies a modest position in the field (Adner and Helfat, 2003; Helfat and Martin, 2015b) and is somewhat restrictive with respect to other individuals in organizations besides managers.

The paper begins by critically assessing the current interpretations of dynamic capabilities, outlining the main challenges associated with the existing approaches. It then offers solutions to two main problematic aspects of the dynamic capabilities framework: the definition of dynamic capabilities and the issue of agency. The paper then builds on Abel et al.'s (2008), Coleman's (1990), and Elster's (2015) ideas and presents an action-based approach for studying

the causes and effects of dynamic capabilities. I believe this approach overcomes the existing challenges and may unite perspectives within strategy and strategic management with perspectives within other disciplines, including management, leadership, entrepreneurship, and psychology. Thus, this paper can be seen as a contribution to both the dynamic capabilities framework and to the literature on the micro-foundations of routines and capabilities (Abel et al., 2008; Felin and Foss, 2005; Felin et al., 2012; Felin et al., 2015).

Existing Interpretations of Dynamic Capabilities: Problematic Issues

The dynamic capabilities framework appeared in the early 1990s in an attempt to explain the source of competitive advantage of firms that operate in changing environments (Teece and Pisano, 1994). One of the earliest and most popular conceptualizations comes from a paper by Teece et al. (1997). The authors define dynamic capabilities as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments," or "the organization's ability to achieve new and innovative forms of competitive advantage given path dependencies and market positions" (p. 516). The second influential conceptualization originates from a paper by Eisenhardt and Martin (2000). These authors define dynamic capabilities as "the firm's processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change," or "the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die" (p. 1107). Although further developments in the field have prompted numerous and various definitions of dynamic capabilities (Table I), they follow these two seminal papers and can be grouped into two contradictory approaches (Barreto, 2010; Peteraf et al., 2013; Di Stefano et al., 2014).

Table I Definitions of dynamic capabilities: some examples

Source	Definition
Teece and Pisano (1994, p. 541)	*Dynamic capabilities* are the subset of the competences/capabilities which allow the firm to create new products and processes and respond to changing market circumstances.
Teece et al. (1997, p. 516)	*Dynamic capabilities* are the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments.
Eisenhardt and Martin (2000, p. 1107)	*Dynamic capabilities* are the firm's processes that use resources—specifically, the processes to integrate, reconfigure, gain, and release resources—to match and even create market change; the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die.
Zollo and Winter (2002, p. 340)	*Dynamic capability* is a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.
Benner and Tushman (2003, p. 238)	*Dynamic capabilities* are anchored in a firm's ability to both exploit and explore.
Adner and Helfat (2003, p. 1012)	*Dynamic managerial capabilities* are the capabilities with which managers build, integrate, and reconfigure organizational resources and competences.
Winter (2003, p. 991)	*Dynamic capabilities* are high-level routines (or collection of routines) that operate to extend, modify, or create ordinary capabilities.
Zahra et al. (2006, p. 918)	*Dynamic capabilities* are the abilities to reconfigure a firm's resources and routines in the manner envisioned and deemed appropriate by its principal decision-maker(s).
Helfat et al. (2007, p. 4)	*Dynamic capabilities* are the capacity of an organization to purposefully create, extend, or modify its resource base.
Harreld et al. (2007, p. 24)	*Dynamic capabilities* are the firm's ability to leverage and reconfigure its existing competencies and assets in ways that are valuable to the customer but difficult for competitors to imitate.
Teece (2007, pp. 1319-1320)	*Dynamic capabilities* are difficult-to-replicate enterprise capabilities required to adapt to changing customer and technological opportunities as well as the enterprise's capacity to shape the ecosystem it occupies, develop new products and processes, and design and implement viable business models. Dynamic capabilities can be disaggregated into the capacity 1) to sense and shape opportunities and threats, 2) to seize opportunities, and 3) to maintain competitiveness through enhancing, combining, protecting, and when necessary, reconfiguring the business enterprise's intangible and tangible assets.
Wang and Ahmed (2007)	*Dynamic capabilities* are a firm's behavioral orientation constantly to integrate, reconfigure, renew and recreate its resources and capabilities, and most importantly, upgrade and reconstruct its core capabilities in response to the changing environment to attain and sustain competitive advantage.
Ambrosini and Bowman (2009, p. 33)	*Dynamic capabilities* are intentional efforts to change the firm's resource base.
Augier and Teece (2009, p. 412)	*Dynamic capabilities* are the ability to sense and then seize new opportunities, and to reconfigure and protect knowledge assets, competencies, and complementary assets with the aim of achieving a sustained competitive advantage.

Source	Definition
Easterby-Smith et al. (2009, p. S4)	*Dynamic capabilities* are responses to the need for change or new opportunities, and the changes can take many forms: they involve the transformation of organizational processes, allocations of resources, and operations.
Ellonen et al. (2009, p. 755)	*Dynamic capabilities* are higher-order organizational capabilities that make it possible to learn about new domains, create new asset combinations, and build new capabilities in order to match market (perceptible and latent) needs.
Pavlou and El Sawy (2011, p. 242)	*Dynamic capabilities* are capabilities that help units to extend, modify, and reconfigure their existing operational capabilities into new ones that better match the changing environment.
Kindström et al. (2013, p. 1064)	*Dynamic capabilities* are routines within the firm's managerial and organizational processes that aim to gain, release, integrate, and reconfigure resources and are therefore change-oriented.
Teece (2012, pp. 1395-1396)	*Dynamic capabilities* are higher-level competences that determine the firm's ability to integrate, build, and reconfigure internal and external resources/competences to address, and possibly shape, rapidly changing business environments. Dynamic capabilities can usefully be thought of as falling into three clusters of activities and adjustments: 1) identification and assessment of an opportunity (sensing), 2) mobilization of resources to address an opportunity and to capture value from doing so (seizing), and 3) continued renewal (transforming).
Teece (2014, p. 328)	*Dynamic capabilities* are the set of current or potential higher-level activities that can enable an enterprise to direct its ordinary activities toward high-payoff endeavors.
Helfat and Martin (2015a, p. 423)	*Dynamic capability* is a capability that focuses on altering the way in which an organization earns a living. *Dynamic managerial capabilities* are capabilities that emphasize managerial activities, individually and in concert with others, to alter the means by which an organization earns a living in the present.

The first approach describes dynamic capabilities as a firm's ability, capability, capacity, or competence. In this ability-based approach, dynamic capabilities are abstract firm characteristics that are resident in organizational processes and management teams, depend on organizational history and culture, govern organizational activities, and allow firms to pursue a differentiation and growth strategy (Teece et al., 1997; Augier and Teece, 2009; Teece, 2007; Teece, 2014). As such, they are unique and inimitable. In the routine-based approach, dynamic capabilities are characterized as complex, multidimensional, yet concrete organizational routines that create variation necessary for changes in other organizational

routines (Zollo and Winter, 2002; Winter, 2003). As such, dynamic capabilities may become "best practices" (Eisenhardt and Martin, 2000).

According to Peteraf et al. (2013), there are three main differences between these conceptualizations that make them contradictory. Thus, in Teece et al.'s (1997) view, dynamic capabilities specifically address rapidly changing environments, they are a source of competitive advantage, and they can be a source of sustainable advantage. In Eisenhardt and Martin's (2000) view, dynamic capabilities can potentially collapse in high-velocity markets; they are necessary, but not sufficient, for competitive advantage; and they cannot be a source of sustainable advantage. Later, Di Stefano et al. (2014) recognize that the contradiction has much deeper roots. The authors' observations of the differences in the views on the nature of dynamic capabilities (the definition) and on the issue of agency are particularly noteworthy. I will focus on these two challenging aspects in my argument, showing that both approaches are problematic upon closer inspection.

The Nature of Dynamic Capabilities

Regarding the ability-based approach, several critics have expressed concern about defining dynamic capabilities as a certain ability, capability, capacity, or competence (e.g., Arend and Bromiley, 2009; Williamson, 1999; Zollo and Winter, 2002). Although definitions by synonym, or circular definitions, are often found in dictionaries, they are not adequate without a prior understanding of the synonym. Merriam-Webster Dictionary offers one seemingly non-circular definition of the word "capable": "having attributes required for performance or accomplishment". If one accepts this, then the term "capability" can mean the quality or state of having attributes required for performing or accomplishing a particular task—in the case of dynamic capabilities, for addressing rapidly changing environments. Dynamic capabilities, or

any organizational capability for that matter, are necessarily the result of a particular combination of such attributes. Teece et al. (1997) and Teece (2014) stress this combinative nature. This solution is unsustainable, though—it is essentially a conceptualization of dynamic capabilities based on their antecedents. Empirically, it implies modeling the dynamic capabilities construct as an endogenous formative variable. A parallel example would be socioeconomic status, measured by the presumable causal effect of income, education, and occupation. Formative modeling does not provide a solid ground for empirical testing, as it is subject to misspecification, interpretational confounding, and numerous statistical confusions (e.g., Cadogan and Lee, 2013; Edwards, 2011; Howell et al., 2007). If one, instead of defining capability as a quality of having a combination of attributes, simply equates it with the combination of attributes, dynamic capabilities become composite variables. Such an instrumentalist solution is fraught with infinite combinations of factors, subjectivity, and lost information; thus, it has no theoretical value considering the ambitions of the framework.

Another problem often associated with the ability-based approach is the inclusion of explanandum—typically, some sort of superior performance—in the definition of dynamic capabilities (Arend and Bromiley, 2009). In such definitions, dynamic capabilities are generally portrayed as the firm's ability that allows the firm to create and manipulate its competences better than its competitors create and manipulate their own competences. If a company succeeds and has competences relevant for the current business environment, it must have dynamic capabilities; thus, this success must be due to dynamic capabilities. Akin to circular definition but far more dangerous, this practice represents circular reasoning. Although Zahra et al. (2006), Helfat et al. (2007), and Ambrosini and Bowman (2009) explicitly address this issue and provide definitions without assumptions about superior performance, the fallacious practice has yet to disappear (Table I).

In turn, the routine-based approach to defining dynamic capabilities stems from Nelson and Winter's (1982) and Winter's (2000, 2003) views on organizational capabilities as complex collections of organizational routines, the latter being learned, highly patterned, and repetitious activities. This approach's particular contribution to the framework is a hierarchy of organizational routines based on the distinction between ordinary, or operational, capabilities and dynamic capabilities (Collis, 1994; Winter, 2003). Ordinary capabilities are at the "zero level" and involve stable patterns of operational functioning, such as the production process. In contrast, dynamic capabilities are highly patterned "higher-level" activities that bring about changes in ordinary capabilities. Examples include market research and new product development. The distinction between ordinary capabilities and dynamic capabilities has become popular within the ability-based approach as well, although the notion of ordinary capabilities has been modified accordingly to mean a quality that is embedded in a particular combination of skilled personnel, facilities and equipment, processes and routines, and administrative coordination (Teece, 2014).

The routine-based approach is reasonable if one treats organization as "a set of interdependent operational and administrative routines which slowly evolve on the basis of performance feedbacks" (Zollo and Winter, 2002, p. 340). Nevertheless, it results in several inconvenient nuances, which researchers try to bypass theoretically or simply accept as a necessary evil. One of the most notorious examples of this is the possibility for infinite regress due to the distinction between levels of capabilities (Collis, 1994). If there are capabilities at the first level (dynamic capabilities) that change capabilities at the zero level (ordinary capabilities), there might be capabilities at the second level that change capabilities at the first level and so on ad infinitum. For Winter (2003), this is unlikely because processes higher than the first

level might not be patterned enough to view them as capabilities, whereas Teece (2014) includes the ability to build dynamic capabilities in the bundle of dynamic capabilities. Nevertheless, the search for dynamic capabilities higher than the first level continues (e.g., Schilke, 2014). Other examples include accepting the blurry line between dynamic and ordinary capabilities in general (Helfat and Winter, 2011), and that the same patterned activity may be either a dynamic or ordinary capability depending on the type of firm. For example, R&D activity is usually viewed as a dynamic capability, but for independent R&D firms, it is an ordinary capability (Winter, 2003).

The Level of Analysis (The Issue of Agency)

Although the differentiation between dynamic and ordinary capabilities is reasonable, the attribution of both dynamic and ordinary capabilities to the organizational level is logically inconsistent. The exercise of existing organizational practices is always a stationary process regardless of whether it is the production process or the new product development routine (Zahra et al., 2006). Clearly, there are differences in the uniformity of outputs, but not in the uniformity of the process; the latter is the traditional focus of research on capabilities. Any organizational routine has ostensive and performative aspects (Feldman and Pentland, 2003). Whenever an organizational routine is codified as a standard operating procedure or exists as a taken-for-granted form (the ostensive aspect), the main task of organizational members is "doing it right" (the performative aspect). Although performance may vary, typically because of performers' individual characteristics, this variation does not go beyond an occasional deviation from the norm until a particular decision-maker intentionally changes the organizational routine (Howard-Grenville, 2005; Salvato, 2009). Due to this ostensive aspect, all organizational capabilities are ordinary capabilities (or "substantive capabilities," Zahra et al., 2006). The ostensive aspect of organizational capabilities is also the reason why new

product and process development capabilities may inhibit the creation of new capabilities (Leonard-Barton, 1992), which is contrary to the very idea of them being dynamic capabilities.

In fact, it is impossible to separate organizational capabilities into dynamic capabilities and ordinary capabilities whilst maintaining the assumption of clear differences in the purpose, effect, and status of these two groups (Schreyögg and Kliesch-Eberl, 2007). The most compelling empirical evidence against this practice comes from the meta-analysis by Karna et al. (2016). In their study, the authors identify several categories of ordinary capabilities (e.g., operations/processes, resources/assets, organization/structure) and dynamic capabilities (e.g., R&D/innovation/technology, strategic decision making/market research, cooperation/alliance/external relations, knowledge management). Next, they compare the performance effects of both types of capabilities, finding no difference in their direction and magnitude regardless of the dynamism of environment. In addition, the authors find that the two groups are closely associated. Karna et al.'s (2016) conclusion is to moderate the capability-based view of the firm by abandoning the idea of dynamic capabilities' superior status and causal role and instead viewing them as complementary to ordinary capabilities. An alternative conclusion may be that all of the categories used in the study represent ordinary capabilities. Dynamic capabilities, in turn, need a definition that avoids overlap with ordinary capabilities.

The Nature of Dynamic Capabilities: Clarifying the Definition

Despite the outlined difficulties and challenges, the existing approaches undoubtedly have their own merits. The idea of regularity emphasized by the routine-based approach and the notion of managerial dynamic capabilities (Adner and Helfat, 2003) seem to be the keys to

addressing the critical issues surrounding the framework. The solution I suggest relies on these insights, but it is not a reconciliation attempt akin to Peteraf et al. (2013) or Di Stefano et al. (2014). The two current approaches are fundamentally different, and as long as one maintains that both of them address dynamic capabilities, any reconciliation is unlikely (e.g., Teece, 2007; Teece, 2014). Instead, I begin by refining the notion of dynamic capabilities in a way that avoids circular and overlapping definitions, showing how this new approach can help in investigating the phenomenon of interest.

Dictionaries provide unclear definitions of capability, and it is common to interpret this notion as a kind of metaphysical property. This is clearly challenging with respect to both explanation and testing. A more reasonable approach is to interpret the word "capability" only as an abstract notion that denotes a specific empirical phenomenon. Consider the following hypothetical, yet realistic, example: A university is hiring for a new research position and is interested in applicants who are capable of publishing in high-level journals. For hiring managers, this publishing capability is a track record of publishing (i.e., applicants have already published papers in leading journals). Saying that applicants manage to publish papers because they have publishing capability would be providing a dormitive explanation[1]. A particular applicant can regularly publish papers due to, for example, profound theoretical knowledge, access to a unique dataset, considerable social capital, or some other factor or combination of factors. However, none of these per se equal publishing capability. Publishing capability is simply the regular action of publishing papers. In fact, various applicants may exhibit similar publishing capability for a number of reasons, while applicants with the same attributes may not have similar track records.

[1] The expression "dormitive explanation" originates in Molière's comédie-ballet "The Imaginary Invalid," where physicians explain that opium induces sleep because it has "virtus dormitiva," or dormitive virtue. It is an example of circular reasoning.

As this example shows, equating capability with regular action maintains clarity and avoids dormitive explanations. As Schreyögg and Kliesch-Eberl (2007) note, it is impossible to conceptually separate capabilities from acting or practicing. Encountering the same problem of circular dictionary definitions with respect to the notion of ability, psychological research and educational research have a long tradition of defining and measuring abilities through the performance of actions (Carroll, 1993). The difference between abilities and capabilities, though, lies in the potentiality and the actuality of action. Whereas an ability implies having the proven potential to perform an action if conditions are favorable to it (Carroll, 1993), a capability means actually doing it regularly, particularly because conditions are favorable to it. Such conditions may include intention and the duty or right to act, while the regularity of action excludes chance events and spontaneous reactions (Winter, 2003; Helfat et al., 2007). As a term for a "habitualized action pattern" (Schreyögg and Kliesch-Eberl, 2007, p. 915), capability becomes a mental construct of the type that Peirce (1933) calls "a hypostatic abstraction," which scholars necessarily create as a subject of thought[2]. Substituting a capability construct for a particular regular action allows to theorize about its causes or to use it to explain the effects caused by the actions that this capability denotes.

Helfat et al. (2007, p. 4) define dynamic capabilities as the "capacity of an organization to purposefully create, extend, or modify its resource base," where the term "resource base" covers organizational assets and capabilities. This definition has received considerable attention due to its meaningfulness, breadth, and few a priori assumptions (Easterby-Smith et

[2] In the case of opium, its "virtus dormitiva," or soporific quality, is a mental abstraction that may be useful for investigating what its causes are (e.g., chemical composition) or for comparing it with other soporific drugs. However, it cannot explain the fact that opium induces sleep in drug-takers. For similar reasoning with respect to publishing capability, see Mindruta (2013) and Hanssen and Jørgensen (2015). In the second example, the authors refer to publishing capability somewhat too broadly as "human capital."

al., 2009), but it is still circular. One solution might be to refine it by characterizing dynamic capabilities as the regular actions of creating, extending, and modifying an organizational resource base. Particularly, Teece (2007, 2012, 2014) suggests dividing dynamic capabilities into three clusters of actions: sensing opportunities, seizing opportunities, and transforming organizations (continued renewal).

Interpreting capabilities as regular actions certainly has much in common with the routine-based approach. Organizational routines are recurrent interaction patterns between members of a certain collective (Becker, 2004), and approximating organizational capabilities with a highly structured set of organizational routines (Winter, 2003) is logical for the purpose of economic analysis. In addition to the ostensive aspect, organizational capabilities depend on the performative aspect of organizational routines: by regularly practicing established rules, procedures, and conventions, ordinary capabilities are enacted and sustained. Nevertheless, it is important to avoid equating the regular actions of creating, extending, and modifying an organizational resource base with concrete organizational resources, routines, or rules that may or may not support these actions. For example, sensing opportunities may rely on information generated by such organizational capabilities as market research and R&D. In other cases, sensing may be triggered by informal practices that are applicable only within a given context, such as personal trips and accidental conversations.

The Level of Analysis: the Need to Focus on Individuals

Initially, the dynamic capabilities concept referred solely to firm-level phenomena. The earliest papers describe dynamic capabilities as "rooted in high performance routines operating inside the firm, embedded in the firm's processes, and conditioned by its history" (Teece and Pisano, 1994, p. 553) as well as "being resident in the firm's organizational

processes" (Teece et al., 1997, p. 524). The routine-based approach has also placed dynamic capabilities exclusively at the organizational level (Winter, 2003; Zollo and Winter, 2002).

However, problems with the original conceptualization have stimulated interest within the ability-based approach in assigning more agency to individual decision-makers. Adner and Helfat's (2003) concept of dynamic managerial capabilities represents one of the earliest efforts. The authors stress that managers are in the unique position to influence changes in organizational resources and competences. With the further development of the dynamic capabilities framework, attention to the role of managers, leaders, and entrepreneurs has increased considerably (e.g., Augier and Teece, 2009; Danneels, 2011; Kor and Mesko, 2013; Helfat and Martin, 2015a; Helfat and Peteraf, 2015; Martin, 2011; Sirmon and Hitt, 2009; Zahra et al., 2006). Now, scholars recognize that "certain dynamic capabilities may be based on the skills and knowledge of one or a few executives rather than on organizational routines" (Teece, 2012, p. 1395)—they are "partly resident in the leadership team itself" (Teece, 2014, p. 347). Teece (2014) even suggests including non-routine managerial action as a type of dynamic capability. Despite this increased interest, the role of managers is clearly still undermined and always mentioned with reservations. As before, the attribution of agency to the organizational level is prevalent in the dynamic capabilities literature (Di Stefano et al., 2014).

The following hypothetical example illustrates the main challenge associated with the current practice. Consider a futuristic firm in which all processes are fully automated; instead of humans, robots receive and make orders, produce, deliver, and engage in all other routines along the whole value chain of a product. These processes may be as structured, complex, and multidimensional as they are in firms with humans, but interactions would happen only

between machines. One might even include an analog of dynamic capability by creating an algorithm that responds to reduced demand by inducing random variations in the products until demand starts growing again. In addition to the processes, scholars may even talk about this firm's positions (assets) and paths (Teece et al., 1997). This type of firm corresponds to Hodgson's (2003), Pentland et al.'s (2012), and partially, Nelson and Winter's (1982) views. However, such smart firms are no more than tools, although they are certainly more complex and technologically advanced compared to Stone Age chisels or modern equipment. Fortunately or not, this image of the future is already approaching with the rapid development of digital and self-service technologies. Unless scholars clearly specify what kind of regular actions they study and who undertakes them, continuing to stress that explanations should concern the firm level or that non-intelligent bodies may take actions is unlikely to be viable in social science. It is very probable that at some point, scholars will have to abandon such views of organization as a bundle of resources (Penrose, 1959) or a bundle of routines (Zollo and Winter, 2002, p. 340) and return to understanding organizations as "assemblages of interacting human beings" (March and Simon, 1958, p. 4).

In strategic management literature, discussions of the micro-foundations of routines, capabilities, and organizations have focused on this issue by calling for a more human-centered approach (e.g., Abell et al., 2008; Felin and Foss, 2005; Felin and Hesterly, 2007; Felin et al., 2012; Felin et al., 2015). The proponents particularly favor Coleman's (1990) model in their arguments for lower-level explanations. In essence, Coleman (1990) suggests explaining the observed relations between macro-level phenomena by describing how they both ignite and result from individual behavior (Figure 1). He argues that too often, researchers tend to base their explanations of social phenomena on mere associations between system-level facts (macro-level proposition 1) and events (macro-level proposition 2) by, for

example, correlating the characteristics of a system with the observed behavior of the system. However, all social systems, including organizations, consist of people and exist because of people (Felin and Foss, 2005). The link between macro-level proposition 1 and macro-level proposition 2 is not and cannot be causal (Abell et al., 2008). Thus, any explanation of social systems without considering the individual level is incomplete. As Elster (1989, p. 13) states, "the elementary unit of social life is the individual human action. To explain social institutions and social change is to show how they arise as the result of the action and interaction of individuals." Coleman suggests including an explanation of how social facts influence individuals' conditions of action (micro-proposition 1), which in turn lead to purposive action (micro-proposition 2). The actions of individuals then aggregate into a social outcome.

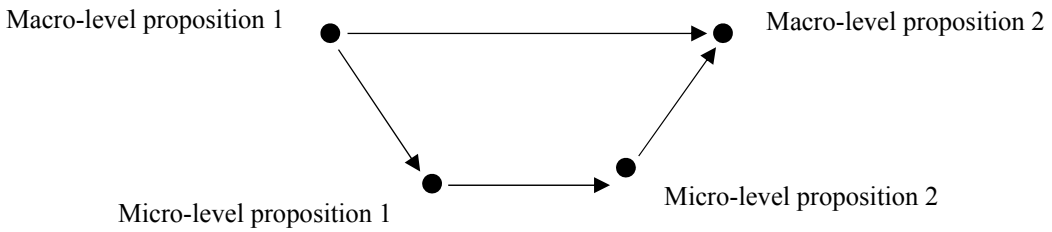

Figure 1. Explaining social phenomena through individual action (adapted from Coleman, 1990).

Abell et al. (2008) propose using Coleman's model in the context of routines and capabilities. The authors position routines as another macro-proposition between macro-antecedents and macro-outcomes (i.e., at the firm level). They stress that it is necessary to analyze why and how the actions of various individuals result in the formation of routines as well as why the enactment of certain routines or capabilities becomes a source of superior performance. A more specific example of this logic is Eggers and Kaplan's (2013) recursive model of how

managers use cognition to select and encode experiences into routines, assemble routines into capabilities, and evaluate the match between capabilities and environment[3].

Even after Abell et al.'s (2008) adjustment, Coleman's framework does not sufficiently incorporate interaction between individuals; thus, it inadequately addresses questions related to routines and capabilities (Hodgson, 2012). In my opinion, the solution to this problem is straightforward and lies in envisioning Coleman's original "two-dimensional" model as three-dimensional (Figure 2).

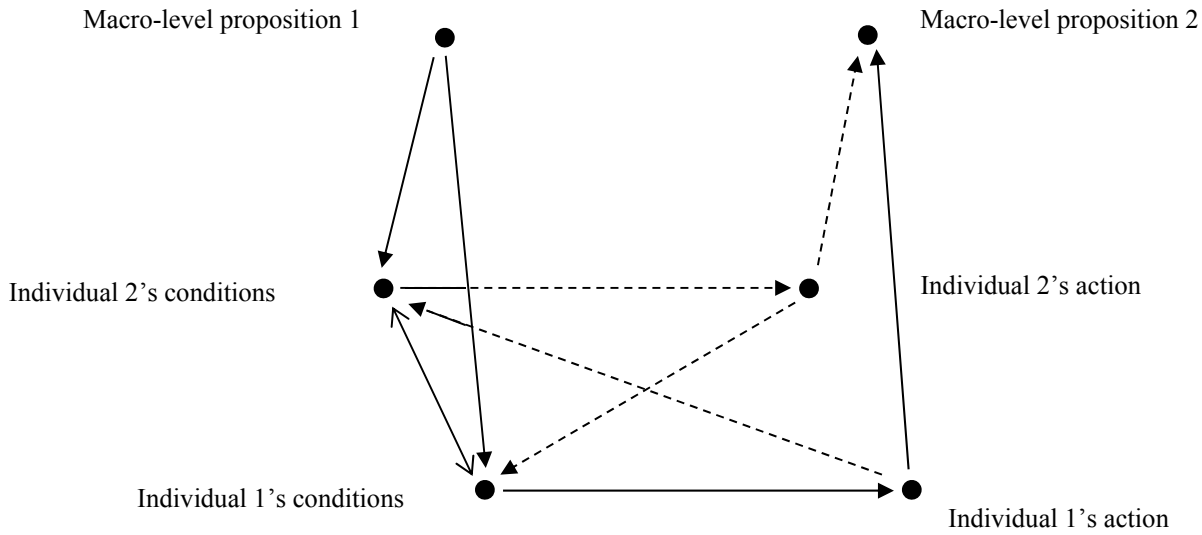

Figure 2. Re-visualization of Coleman's framework.

For the sake of simplicity and clarity, Figure 2 includes only two individuals in an organization and uses Abel et al.'s (2008) terms to describe the individual level. In compliance with Elster (1989), it depicts both individual actions and interactions between

[3] Pentland et al. (2012) offer a cardinally different model that builds on action, but it explicitly excludes the characteristics of individual human actors. They explain changes in routines by random variations that arise during the enactment of routines. Their model represents an attempt to explain the emergence of routines in terms of other routines (Winter, 2012).

individuals in an organization. Macro-level proposition 1 is an aggregation of macro-level stimuli for both individuals. The double arrow between individual conditions represents individuals' beliefs about each other's conditions of action. The double arrow and the arrows from individual actions to individual conditions represent possible social interactions, which result in macro-level proposition 2[4]. Due to this interaction, the causal link between two macro-propositions is redundant. Finally, the figure may be expanded in both directions to encompass a more long-term process or to be viewed as a recursive model.

Clearly, Figure 2 is still an oversimplification. The number of interactions between individuals is much higher than Figure 2 depicts, especially in and between large organizations. It may also create an illusion of all interacting individuals having the same macro-propositions, which is unrealistic in many cases (although much less so in the case of individuals who interact within the same organization). As an illustrative model, however, Figure 2 conveys two messages that are important for the discussion on dynamic capabilities. First, the exposition to the same macro-level stimuli does not necessarily result in the same conditions for action, and subsequently, reactions in various individuals. The very fact that individuals exhibit various behaviors in similar environments has given rise to the resource-based view and the dynamic capabilities framework. Second, the interactions of individuals consist of influencing each other's individual conditions for action; thus, the dynamic capabilities framework requires consideration of both individuals' conditions for action and individuals' level of influence in the organization.

[4] The direct link between the two individuals' actions has no meaning, unless one of the individuals is controlled by the other individual in a zombie-like fashion. In this case, there is no reason to consider them as two separate individuals.

Since action is, by definition, intentional behavior (Elster, 2015), for simplicity of exposition with respect to Figure 2, I refer to individuals' condition for dynamic capabilities as the intention to change the status quo in the organization. Assume that both individuals in Figure 2 have no such intention. They perform ordinary tasks, reproducing existing organizational routines and thus enacting ordinary capabilities. Teece (2014) distinguishes between three types of ordinary capabilities: operational capabilities, administrative capabilities, and governance capabilities. If I assume that the individuals in Figure 2 differ in their level of influence in the organization, for example, one being an employee and another being a manager, I may say that they reinforce operational capabilities and administrative capabilities, respectively. If one of them is an owner, I may speak of governance capabilities. Individuals' performance may vary occasionally, but on average, it is within the established order. Ordinary capabilities—aggregated as the macro-level propositions—contain necessary information about the organization's conditions and functioning. In this case, it might be pragmatic to discard the individual level in analysis. In fact, many of the actions of the individual with a higher level of influence consist of enforcing the existing routines.

The phenomenon of interest for the dynamic capabilities framework and the need for the individual level of analysis arise when the intention to change the status quo in the organization emerges. This intention has been stressed as one of the foundational elements of the dynamic capabilities concept (e.g., Ambrosini and Bowman, 2009; Augier and Teece, 2009; Helfat et al., 2007; Salvato, 2003). If the intended change is within the scope of the individual's influence, one might observe dynamic capabilities; however, if the intended change is beyond the scope of the individual's influence, one might observe strategic role conflict (e.g., Floyd and Lane, 2000). The role conflict may resolve in the situation when speaking of dynamic capabilities is appropriate, but in this case, it implies either the growth of

the individual's own level of influence or the involvement of other individuals with a level of influence that is high enough. Figure 3 illustrates the relationship between the individual's intention to change the status quo and the individual's level of influence.

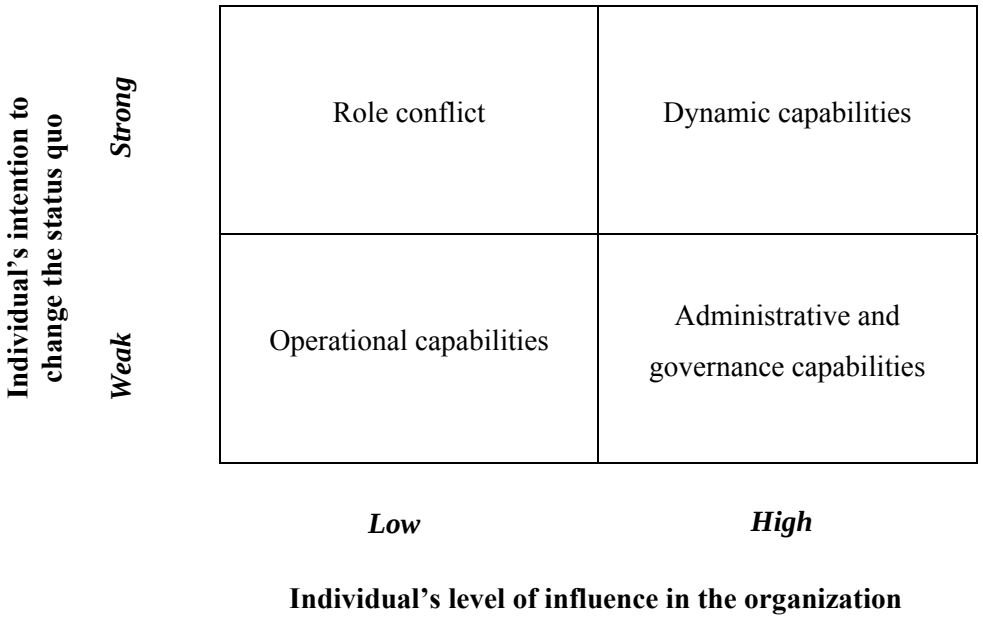

Figure 3. Dynamic and ordinary capabilities: the case of an organizational member.

The Antecedents and Outcomes of Dynamic Capabilities

In this paper, I define dynamic capabilities as the regular actions of creating, extending, and modifying an organizational resource base. Referring to regular action, this definition includes an individual's regularly emerging intentions to change the status quo. Referring to organizational resource base, it implies an individual's influence over resources and routines of other organizational members. Thus, Figure 3 does not explain dynamic capabilities—it only paraphrases their definition in terms of equivalence. In other words, individuals' intentions to change the status quo in the organization and their high level of influence in the organization are necessary and sufficient conditions for dynamic capabilities. This means that the explanation of dynamic capabilities requires explanations of each of these conditions.

Individuals' Intentions to Change the Status Quo

One of the main drawbacks of Coleman's original framework is the assumption that individual behavior is based on utility maximization, which leaves little room for individual differences. Such a literal interpretation of Coleman's model is clearly too restrictive with respect to individual characteristics and resources (Felin et al., 2012; Helfat and Peteraf, 2015). Instead of relying on the assumption of utility maximization, the analysis of beliefs, desires, and emotions may provide a better explanation of individual actions (Elster, 2009, 2015).

Little research explicitly focuses on how beliefs, desires, and emotions determine dynamic capabilities (Helfat and Martin, 2015b). There are several theoretical speculations about cognitive skills and processes, such as memory (Argote and Ren, 2012), mindfulness (Gärtner, 2011), experience (Eggers and Kaplan, 2013), and mental abilities (Helfat and Peteraf, 2015). Adner and Helfat's (2003) framework theoretically integrates these and other similar factors into three groups: managerial cognition (mental models and knowledge), managerial human capital (learned skills), and managerial social capital (social ties). In the most general sense, these groups correspond to propositional knowledge, procedural knowledge, and knowledge by acquaintance, respectively. Given that knowledge is a justified true belief (Elster, 2015), these three types of managerial resources represent individuals' beliefs. In turn, virtually no research within the dynamic capabilities framework exists on individuals' desires and emotions. Although there have already been some calls to include less deliberative forms of cognition and emotions (Hodgkinson and Healey, 2011), the main theoretical interest currently lies in "cold" calculative managerial cognition.

Managerial cognition is also of interest for empirical studies, and there is a growing body of evidence of its crucial role in both building and destroying organizational capabilities. For example, managerial attention and knowledge can compensate for the lack of organizational capabilities (Eggers and Kaplan, 2009; Kaplan, 2008; McGee et al., 1995), whereas firms with advanced ordinary capabilities but without open-minded top management often face a considerable decline (Tripsas and Gavetti, 2000). When ordinary capabilities turn into rigidities (Leonard-Barton, 1992), new and cognitively uninhibited leaders might save an incumbent firm from an acute crisis (Rosenbloom, 2000).

The dynamic capabilities framework has close links to many research fields that already address individual differences in the contexts relevant for the creation, extension, and modification of an organizational resource base. Such links become especially clear with the application of Teece's (2007) tripartite framework of sensing, seizing, and transforming managers (Helfat and Martin, 2015a; O'Reilly and Tushman, 2008); this may become a source of inspiration. Thus, research on entrepreneurial alertness (e.g., Gaglio and Katz, 2001), creativity (e.g., Amabile, 1985; Mumford, 2011), and individual search (e.g., Dahlander et al., 2016) may be relevant for sensing capability. Corporate entrepreneurship (e.g., Hornsby et al., 2009; van Doorn et al., 2013), innovation championship (e.g., Hayton and Kelley, 2006; Howell et al., 2005), transformational leadership (e.g., Bommer et al., 2004; Rubin et al., 2005), and leading creative groups (e.g., Mumford et al., 2002; Mumford et al., 2003) indirectly address seizing capability. Research on change agency, change management, and sense-making and sense-giving apply to transforming capability (e.g., Barr et al., 1992; Gioia and Chittipdeddi, 1991; Hodgkinson, 1997; Huy, 2002; Tripsas and Gavetti, 2000; Wiersema and Bantel, 1992).

However, applying the findings from these related research fields to dynamic capabilities is not straightforward due to the interdependence of sensing, seizing, and transforming. Obviously, addressing an opportunity presupposes prior identification of that opportunity. In the case of existing organizations, changing existing routines and structures must rely on viable alternative solutions that an individual sees as opportunities. This reasoning implies that transforming depends on seizing, which in turn depends on sensing (Teece, 2007). Thus, to examine the role of individuals' beliefs, desires, and emotions in dynamic capabilities, it is necessary to design studies that include both sensing capability and seizing capability or all three capabilities of sensing, seizing, and transforming. Currently, there is lack of empirical testing of this framework in its entirety.

Individuals' Level of Influence

Influence usually means the alteration of an attitude or behavior by one individual in response to another individual, or more specifically, to information about the behavior or attitudes of another individual (Battilana and Casciaro, 2012; Marsden and Friedkin, 1993). Thus, this part of the explanation of dynamic capabilities focuses on the intention of organizational members to accept changes induced by a specific individual. This intention can also be described as organizational members' readiness for changes that regularly emanate from a specific individual.

The concept of managerial dynamic capabilities partially addresses the notion of influence by tacitly assuming that there is a common belief in an individual's superior formal position. That is, the universal practice within the dynamic capabilities framework is to presume that managers and owners are the only people within organizations who possess the right to affect organizational routines. Under this presumption, employees may identify opportunities as

well, but unless a manager sees an opportunity in what was identified by others, the opportunities will likely remain unaddressed by a social group (Gavetti, 2005). Thus, an employee without sufficient influence may intend to change the status quo, but is not a sufficient condition to make such a change happen. Although this presumption is undoubtedly true in the case of centralized organizations, from a wider perspective, it is limiting to consider managers, or as it is often the case, top managers, as the only exhibitors of dynamic capabilities. In fact, organizational change and innovation are more often observed in decentralized organizations with flatter structures than in centralized organizations (e.g., Damanpour, 1991; Nahm et al., 2003). Since more individuals get the chance to build up their influence in such organizations, the probability that some of them will have the intention to change is higher than if all control belonged to only few individuals at the top of the hierarchy (e.g., Martin, 2011; Gibson and Birkinshaw, 2004). In decentralized organizations, informal leaders are likely to substitute formal managers in initiating and implementing change. Indeed, the process of social influence is the essence of both leadership (Chemers, 1997) and change implementation (Battilana and Casciaro, 2012). Thus, the belief in an individual's superior formal position might be a sufficient condition for falling under the individual's influence, but it is not a necessary one.

As with research on intention to change the status quo, research on readiness for change favors beliefs, whereas desires and emotions toward an individual who conducts change have not received enough attention (Rafferty et al., 2013). Individuals in subordinate positions may build up their influence by using norms of reciprocity, liking, and social consensus (Wade et al., 1990). They have to form and sustain others' beliefs about their trustworthiness and expertise, beliefs in their message for change, ensure mass communication, and use influence strategies (Armenakis et al., 1993). Failure to meet and sustain recipients' beliefs may result

in resistance to change (Ford et al., 2008), thus rendering an exercise of social influence, and with it, one of dynamic capabilities, impossible. Even when an individual has enough authority, changes that entail shifts in employees' cognitive frames require sense-giving efforts from the individual to ensure a smoother transition (Gioia and Chittipeddi, 1991; Tripsas, 2009). On a larger scale, such as networks of organizations, the high level of influence of a particular individual may come from the collective belief in a superior status, from the similarity of the individual's organization, or from adopters' personal evaluations of the individual (Davis and Greve, 1997).

Finally, a collective might be ready for change due to factors that are not related to a specific individual, such as members' attitudes and preferences about change in general, work group, and job attitudes (Eby et al., 2000); perceptions of open organizational culture (Jones et al., 2005); or occupational stress (Vakola and Nikolaou, 2005). These factors are not directly relevant to the explanation of dynamic capabilities as defined in this paper, although they may certainly act as moderators. When individuals regularly change their own attitudes or behavior in response to information that does not relate to a specific individual, it is more correct to refer to this phenomenon as flexibility. Although contemporary strategic management research sometimes refers to this notion as a type of dynamic capability (e.g., Zhou and Wu, 2010), this practice represents conflation, since flexibility is not a sufficient condition for dynamic capabilities[5]. It can nevertheless increase the likelihood of dynamic capabilities and make the execution itself easier.

[5] In contrast, Nelson and Winter's (1982) view of flexibility does not conflate with the notion of dynamic capabilities. For the authors, flexibility is "variation of the organizational performance in response to variation in the environment" (p. 106), and it implies having a broad repertoire of routines that allows actors to respond to various configurations of the environment by switching between routines. The article by Zhang et al. (2003) is an example of an empirical study with similar logic.

The Outcomes of Dynamic Capabilities

The scientific practice for explaining phenomena relies on the search for explanantia at a lower level than the explanandum (Elster, 1983; Felin et al., 2012). To explain dynamic capabilities, it is necessary to address intentions. In turn, dynamic capabilities may explain phenomena at the level above individuals (i.e., social group). Particularly, the dynamic capabilities framework has the potential to explain enterprise performance and position (Augier and Teece, 2009). According to Teece (2014, p. 348), the framework has an ambitious goal of bringing us closer to "a truly fundamental understanding of the origins of firm-level heterogeneity and the sources of enterprise-level value creation, capture, and growth."

Researchers across the field seem to agree upon the theoretical link between dynamic capabilities and organizational performance, even if their interpretations of dynamic capabilities as a construct differ. The consensus is that dynamic capabilities shape a firm's bundle of organizational competences, operational routines, and resource positions, affecting firm performance (Zott, 2003). Eisenhardt and Martin (2000) and Easterby-Smith and Prieto (2008) see the effect of dynamic capabilities in creating competitive advantage through new resource configurations. Helfat et al. (2007) propose examining the effects of dynamic capabilities on firm's survival, growth, profits, value creation, and competitive and sustained advantage. The combinations of sensing and seizing capabilities or of all three capabilities of sensing, seizing, and transforming may sustain firm growth, profits, and competitive advantage (Teece, 2007); but they may do so by invoking different mechanisms (Helfat and Peteraf, 2009). Sensing and seizing may result in launching enterprises and innovations, creating new paths and asset bases (Helfat and Peteraf, 2009; Teece, 2007). Sensing, seizing,

and transforming may ensure the efficiency, cost effectiveness, and the state of the art of the existing resource base necessary for competing in established markets (Teece, 2007; Tushman and O'Reilly, 1996; Jansen et al., 2006). Other authors suggest similar relationships between dynamic capabilities and firm strategy, organizational capability development, market-based performance, financial performance (Wang and Ahmed, 2007), innovation output (Rothaermel and Hess, 2007), operational capabilities, new product development performance (Pavlou and El Sawy, 2011), substantive capabilities (Zahra et al., 2006), and profitability (Adner and Helfat, 2003).

Experimental studies by Glaub et al. (2014) and Bloom et al. (2013) vividly illustrate how the effects of dynamic capabilities may differ from the effects of ordinary capabilities. Thus, learning how to regularly apply abstract "action principles" akin to intentions in dynamic capabilities, such as "introduce something new," "change your environment," or "anticipate potential barriers," increases personal initiative behavior, and in turn, entrepreneurial success (Glaub et al., 2014). In contrast, learning concrete management practices that constitute ordinary capabilities, such as "the shop floor should be clear of waste and obstacles," "there should be a regular meeting between sales and operational management," or "top performers among factory staff are publicly identified each month," leads to increased productivity by improving quality and efficiency and reducing inventory (Bloom et al., 2013).

When hypothesizing about such effects, it is common to assume that dynamic capabilities have positive outcomes. However, as both common sense and organizational change literature suggest, changes in organizational routines are not always beneficial (Rajagopalan and Spreitzer, 1997). Correspondingly, there is no reason to assume that dynamic capabilities as the regular modification of an organizational resource base should produce only positive

results (Arend and Bromiley, 2009). For example, dynamic capabilities can entail an immediate increase in the failure rate of organizations, with this effect diminishing over time (e.g., Amburgey et al., 1993; Guth and Ginsberg, 1990). Dynamic capabilities can have negative effects on some organizational members in the form of job dissatisfaction, intent to quit, or health deterioration (e.g., Begley and Czajka, 1993), which can further negatively influence organizational performance (e.g., Judge et al., 2001). Some of the methods used in exercising dynamic capabilities at one point may hamper the execution of dynamic capabilities later on (e.g., Cloodt et al., 2006). It is therefore important to avoid a priori assumptions about the unidirectionality of dynamic capabilities, which otherwise may lead to tautology and confirmation bias (Easterby-Smith et al., 2009; Helfat and Peteraf, 2009).

Conclusion and Future Research Opportunities

Two decades of research on dynamic capabilities has resulted in thousands of papers, but the field still faces criticism about its ambiguous definitions, tautology, reification, and lack of adequate empirical studies and non-trivial refutable predictions (e.g., Arend and Bromiley, 2009; Collis, 1994; Giudici and Reinmoeller, 2012; Williamson, 1999; Zahra et al., 2006). As I have shown, the root of this criticism lies primarily in two debatable aspects: the nature of dynamic capabilities and the issue of agency. To address this criticism, I refine Helfat et al.'s (2007) definition and conceptualize dynamic capabilities as the regular actions of creating, extending, and modifying an organizational resource base. This definition does not include attributes and resources that provide the basis for the regularity of action (Helfat and Martin, 2015b). Further, neither mechanisms nor methods that support dynamic capabilities constitute a part of the dynamic capabilities definition (Lavie, 2006).

Regarding the issue of agency, where the discussion unfolds between adherents of organizational-level and individual-level agency, I side with the latter group of researchers. The explanation of organizational-level phenomena beyond correlations requires that scholars examine individuals' actions and interactions (Abell et al., 2008; Felin and Foss, 2005; Felin and Hesterly, 2007; Felin et al., 2012; Felin et al., 2015). Whereas most, if not all, ordinary capabilities may eventually be automatized, the actions of sensing opportunities, seizing opportunities, and transforming an organizational resource base necessarily involve decision-makers with a high level of influence. This is the main reason why theoretical discussions of dynamic capabilities have recently begun to favor individual decision-makers (Adner and Helfat, 2003; Augier and Teece, 2009; Teece, 2007; Teece, 2012; Teece, 2014).

The dynamic capabilities framework rests upon the ideas of the behavioral theory of the firm, evolutionary economics, and the resource-based view (Augier and Teece, 2009). Contrary to the existing approaches that generally incline toward the resource-based view or evolutionary economics, this paper takes the framework closer to the behavioral theory of the firm, where firms are coalitions of individuals (Cyert and March, 1992). Placing dynamic capabilities in individuals does not mean that they necessarily "reside" in only one person. This interpretation would clearly be a naïve oversimplification. Individuals differ in their cognition and emotions, receive different information, and thus might be superior in one capability and inferior in another (Helfat and Peteraf, 2015). There is no requirement that a particular individual must be equally proficient in all three capabilities of sensing, seizing, and transforming (Teece, 2007). In a social group, however, the dynamic capabilities of an individual with a higher level of influence will be more efficacious (Helfat and Peteraf, 2003), and hence stronger, even if the solutions are objectively inferior to the solutions of other individuals in the group.

The most important consequence of placing dynamic capabilities in individuals is the necessity of addressing individual intentions of both individuals with dynamic capabilities and individuals responding to dynamic capabilities. Individuals play a unique dual role in organizations. On the one hand, they are a resource, and in this case, they meet all the requirements of being a valuable, rare, inimitable, and non-substitutable resource (Wright et al., 1994). On the other hand, humans are designers and managers of organizational resources and routines. This unique position renders studies using large cross-sectional samples, multiple industries, and secondary sources unreliable—a common challenge for all studies of valuable, rare, inimitable, and non-substitutable resources (Rouse and Daellenbach, 1999). This has resulted in calls for more qualitative approaches to empirical examinations of the resource-based view, the dynamic capabilities framework, and organizational change (e.g., Gibbert, 2006; Pettigrew et al., 2001; Rouse and Daellenbach, 1999).

In many cases, individuals' behavior is a reaction to a specific situation (Elster, 2015). This is particularly true in organizations, where formal and informal patterns of communication ensure continuous information flows about internal and external environments (Katz and Kahn, 1978). Although information indirectly influences action through beliefs, emotions, and desires (Elster, 2009, 2015), it is the only way to externally affect action in almost all situations[6]. This may inspire studies on how external and internal information shape individuals' beliefs, desires, and emotions; what kind of actions these individual conditions bring; and how the actions further unfold into firm-level outcomes. The most exciting aspect of this is that it provides an excellent starting point for experimental studies on dynamic capabilities that will eliminate problems with external and internal validity. By manipulating

[6] One exception is involuntary medical treatments, which are fortunately not a part of a normal life in most organizations.

information content (e.g., through training), scholars may examine how different beliefs, desires, and emotions bring about dynamic capabilities ceteris paribus.

Many of the findings within the existing research are relevant for the dynamic capabilities framework; in fact, the framework relies on summarizing organizational studies from various research traditions (Easterby-Smith and Prieto, 2008). In turn, the dynamic capabilities framework needs researchers from multiple fields, since it aims to become a general framework for understanding the foundations of firms' competitive advantage, value creation, and maintenance (Teece, 2014). However, when scholars from different research schools discover aspects emanating from their own fields, they tend to interpret dynamic capabilities in ways that are often conflicting (Easterby-Smith et al., 2009). This is hardly constructive, as discussions where the same term is used for distinct phenomena are rarely meaningful. The action-based approach presented in this paper may assist in stimulating coherent multidisciplinary research. Particularly, it establishes much clearer links between strategy, management, leadership, entrepreneurship, and psychology. By focusing on specific individual actions, the dynamic capabilities framework has the potential to explain firm-level heterogeneity and shed light on competitive advantage—or disadvantage—in firms. No study, however, should assume that dynamic capabilities are extraordinary powers that always ensure the success of their possessors.

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ARTICLE 3

Measuring Managerial Dynamic Capabilities: Construct Development and Measurement Validation

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ABSTRACT The dynamic capabilities framework has provided a rich grounding for theoretical development, but it still lacks a specific operationalization of its main constructs. This paper develops a brief measure of managerial sensing, seizing, and transforming capabilities and empirically validates it using a set of 197 team leaders working in a large multinational telecommunications company. Testing the structural equation model of the relationships between the three constructs reveals that transforming is dependent on seizing, and in turn, that seizing is dependent on sensing. In assessing the nomological validity, we focus on two sources of competitive advantage: innovation and cost reduction. We find that managerial seizing capability is positively related to innovation, while managerial transforming capability is positively related to cost reduction.

Keywords: managerial dynamic capabilities, measures, seizing, sensing, transforming

INTRODUCTION

The idea of dynamic capabilities has attracted a lot of attention from organizational researchers. The founding article by Teece et al. (1997) garnered an impressive 23,500 citations on Google Scholar as of February 2016. Arguing that having specific assets is not enough to ensure a firm's survival and renewal in changing environments, the authors suggest

that the source of competitive advantage lies in a firm's unique ability to create and modify organizational routines and resources. However, two decades later, and with thousands of papers written on the topic, the field still faces criticism about its lack of precision in definitions, adequate empirical studies, and non-trivial refutable predictions (e.g., Arend and Bromiley, 2009; Collis, 1994; Zahra et al., 2006).

Multiple understandings of what constitutes the dynamic capabilities construct inevitably result in a problem of its operationalization, which in turn keeps the vast literature on dynamic capabilities disconnected and fragmentary (Peteraf et al. 2013). Not surprisingly, Karna et al. (2015) did not find any differences in the effects of ordinary capabilities and dynamic capabilities in their meta-analysis. Most empirical studies use existing constructs from organizational theories as proxies, trying to classify them as dynamic capabilities (e.g., Helfat, 1997; Marsh and Stock, 2006; Menguc and Auh, 2006). Far fewer studies try to suggest a specific measurement of certain dynamic capabilities (e.g., Pavlou and El Sawy, 2011; Schilke and Goerzen, 2010) or a general dynamic capability (Marcus and Anderson, 2006). Remarkably, almost none of these studies operationalize the original sensing, seizing, and transforming framework that Teece (2007, 2012) created, excluding some purely qualitative attempts (Ellonen et al., 2009; Kindstrom et al., 2013). One exception is Wilden et al.'s (2013) study, which nevertheless largely uses proxies such as knowledge utilization for seizing capability or organizational and marketing innovations from the Community Innovation Survey for reconfiguring capability.

With theoretical advancements in the research field, the notion of managerial dynamic capabilities has signified the recognition of the key role of managers in building, integrating, and reconfiguring the organizational resource base (Adner and Helfat, 2003; Helfat and Martin, 2015; Helfat and Peteraf, 2014; Teece, 2012). Essentially, this concept represents a "microfoundational approach" to explaining the differences in the behavior and performance

of firms (Felin et al., 2012). However, in contrast to the firm-level constructs (albeit proximal), the operationalization of managerial dynamic capabilities is essentially absent from the literature. This is unfortunate because it may advance and unite the literature on dynamic capabilities by providing a measurement instrument for conducting multi-level studies.

In this paper, we seek to address this gap by following Felin and Foss (2005) and Felin et al. (2012) in their search for the microfoundations of routines and capabilities. We begin with individuals as central actors when explaining organizational behavior, and we regard organizational routines and outcomes as functions of individuals' actions (Abell et al., 2008; Felin and Foss, 2005; Felin and Hesterly, 2007; Felin et al., 2012). More precisely, we view managerial dynamic capabilities as regular managerial actions of creating and manipulating organizational resources and competences. Following Helfat and Peteraf (2014) and Helfat and Martin (2015), we apply Teece's (2007, 2012) original disaggregation of dynamic capabilities to individual managers and clarify the notions of managerial sensing, seizing, and transforming capabilities by delineating what they are and what they are not. We then operationalize these capabilities based on the extensive literature. We conduct a pretest of the three constructs of managerial dynamic capabilities on a set of 66 employees and further empirically validate the constructs using a set of 197 team leaders working in a large multinational telecommunications company.

DYNAMIC CAPABILITIES AS MANAGERIAL ROUTINES

Initially, dynamic capabilities were viewed solely as "being resident in the firm's organizational processes" (Teece et al., 1997, p. 524). The gradual movement toward individuals within the dynamic capabilities framework began with the introduction of the concept of dynamic managerial capabilities by Adner and Helfat (2003). Now, it is recognized that dynamic capabilities "may be based on the skills and knowledge of one or a few

executives rather than on organizational routines" (Teece, 2012, p. 1395), and that they are resident "in part, with individual managers and the top management team" (Teece, 2014, p. 332). This very residence in certain individuals rather than organizational routines is one of the features that distinguishes dynamic capabilities from ordinary capabilities (Teece, 2012). Moreover, acknowledging managers' roles in enterprise development and growth becomes one of the distinctive features of the dynamic capabilities framework itself (Augier and Teece, 2009; Kor and Mesko, 2013; Martin, 2011; Sirmon and Hitt, 2009).

Adner and Helfat (2003, p. 1020) define managerial dynamic capabilities as "the capabilities with which managers build, integrate, and reconfigure organizational resources and competences." The term "dynamic" covers the aspects of building, integrating, and reconfiguring, while the notion of any capability implies patterned and practiced activity with reliable performance (Helfat and Winter, 2011). Managerial dynamic capabilities is a particular type of repeated human action, and in this sense, it is distinct from inherent qualities such as "innate talent" (Helfat et al., 2007).

Two cautions are worthy of attention. First, applying the notion of capability to the individual level brings up the question of differences between abilities and capabilities. Although dictionaries generally treat these two terms as synonymous, by "being capable," we mean doing something regularly, supported by necessary facilities, resources, or the right to actually do it (*Merriam-Webster Collegiate Dictionary; Oxford English Dictionary*). Second, we avoid defining dynamic capabilities via "capabilities with which" and regard the regularly practiced creation and manipulation of organizational resources and competences per se as dynamic capabilities. The phrase "with which" refers to skills and resources such as managerial human capital, managerial social capital, and managerial cognition (Adner and Helfat, 2003; Helfat and Martin, 2014; Helfat and Peteraf, 2014) or transactive memory systems (Argote and Ren, 2012), which underlie dynamic capabilities. These nuances are

essential, as the word "capability" characterizes a set of regular actions with consistent performance, and not a driver of such actions. Equating capability with the very set of regular actions is the only way to avoid the classic fallacy of explaining by "dormitive virtue." In an academic environment, for example, "capable of publishing" simply means having already published papers, or in other words, regularly publishing papers—it is not about education, motivation, or communication skills, however relevant for publishing they may be.

Individual-level factors (e.g., knowledge, personality, desires, and beliefs) explain an individual's actions (Elster, 1989), while actions explain the behavior of social systems, including organizations (Coleman, 1990; Felin and Foss, 2005; Pentland et al., 2012). Since individual human action (and, derivatively, interaction between individuals) is "the elementary unit of social life" (Elster, 1989, p. 13), managerial dynamic capabilities as a particular type of human action is an inherent part of organizational research.

Managerial Sensing Capability

In organizations, sensing opportunities and threats rests upon a set of resources and routines for scanning, searching, and exploring environments (O'Reilly and Tushman, 2008). A number of concepts describe this firm-level search, including environmental scanning (Hambrick, 1982), absorptive capacity (Cohen and Levinthal, 1990), R&D intensity (Helfat, 1994), boundary spanning (Rosenkopf and Nerkar, 2001), market orientation (Slater and Narver, 1998), and search scope/breadth and depth (Katila and Ahuja, 2002; Laursen and Salter, 2006). As the vast search literature shows, balancing local and non-local searches is important for innovation, and in a broader perspective, for firms' evolution and survival (Laursen, 2012). Particularly beneficial is the search guided by the commitment to understanding customers' expressed wants and latent needs (e.g., Lukas and Ferrell, 2000; Narver et al., 2004). By ensuring information flows, organizational search processes provide

input for discoveries within firms (Teece, 2007). However, it is individuals who eventually make sense of information and identify opportunities (Dahlander et al., 2014; Gioia and Chittipeddi, 1991; Grant, 1996; Nonaka, 1994).

Opportunity identification lies at the core of entrepreneurial behavior (Shane and Venkatamaran, 2000), and Schumpeter's innovator is indeed an entrepreneur, engaging in "creative destruction" by introducing "new combinations" (Schumpeter, 1934). For Kirzner (1973), opportunity discovery is the only function of entrepreneurs, which they perform by being alert to possibilities unseen by others on the market. Although Schumpeterian and Kirznerian entrepreneurs may have different impacts on market equilibrium, they both share the "alertness" element.

Entrepreneurial alertness and managerial sensing capability are nevertheless different constructs. Entrepreneurial alertness is a motivated propensity to be watchful of market situations and events (Gaglio and Katz, 2001)—it is a state of mind. On the other hand, sensing capability is a regular action of interpreting non-obvious information, discovering opportunities, identifying customers' latent needs, and understanding how things are and how they can be—it is regularly performed opportunity recognition.

Managerial sensing capability is also related to creativity, defined as generating high-quality, original solutions (Mumford et al., 2011). Although both creativity and sensing capability include action and performance in their respective definitions and precede further innovation efforts, they are different constructs. For creativity, the outcome is new and useful ideas, while for sensing capability, it is identified opportunities (including those that require creative solutions).

Managerial Seizing Capability

Companies address opportunities through innovations by investing in the development and

commercialization of new solutions (Teece, 2007). Most firms organize these activities as a formal new product/service development process (Barczak et al., 2009). However, no formal innovation practice per se—which other firms can copy—can bring a competitive advantage without individuals regularly supporting their creative colleagues (Amabile et al., 2004) and championing innovation projects (Chakrabarti, 1974) (i.e., re-enacting the organizational climate for innovation). In many cases, the introduction of new solutions even requires bypassing or overriding formal practices (Teece, 2007).

The role of innovation champion includes several types of behavior such as taking responsibility for new ideas and pursuing them, network building, persisting under adversity, expressing enthusiasm, and helping with gaining access to necessary resources and people (Hayton and Kelley, 2006; Howell et al., 2005; Walter et al., 2011). While innovation champions informally emerge in organizations (Howell et al., 2005), such entrepreneurial behavior may also be characteristic of managers (Hornsby et al., 2009; Pearce et al., 1997).

Many aspects of champion behavior and managers' entrepreneurial behavior are consistent with the definition of seizing capability as a resource mobilization for addressing needs and opportunities with the goal of capturing value (Teece, 2014). Moreover, one might find overlaps between these three notions and some leadership styles, particularly charismatic leadership (Trice and Beyer, 1991); however, there are some important differences. First, we do not distinguish between formal and informal role assignments, acknowledging that the notion of seizing capability is relevant for both informal leaders and formal managers. Second, and more importantly, seizing capability is not a particular way of leading and motivating, but it is a regular action of taking advantage of opportunities. In organizations, it manifests itself in supporting the implementation of innovative solutions, getting funding for new ideas, selecting business model elements, and advocating other strategic decisions (Teece, 2007).

Transaction cost economics and game theory use a notion of opportunism, which is somewhat related to seizing capability. Both concepts are about seizing opportunities, but the term "opportunism" has a negative connotation and describes "self-interest seeking with guile" (Williamson, 1975, p. 26). The notion of seizing capability is broader, and although it may include opportunistic behavior, it describes a regular action of addressing opportunities in general without referencing motivation or morals. The specifics of managerial seizing capability are in ensuring that the group of people that the person is responsible (or feels responsible) for take advantage of opportunities.

Managerial Transforming Capability

The dynamic capabilities framework covers not only creation of new organizational routines, assets, and structures, but also various changes to the existing ones. In the simplest case, it may be an alteration of an existing process to refine a good or service, or a reconfiguration of existing linkages between product and service components (Henderson and Clark, 1990). In a wider scope, transformation includes redesigning the whole business model and organizational culture (Leih et al., 2015). These changes can occur in several ways, ranging from a drastic and immediate substitution by acquiring new "ready-made" solutions from an external environment to a continuous experimentation and variation over time (Lavie, 2006).

Whether it is a "byproduct" of introducing innovations or a primary change, transformation plays a central role in maintaining an organization's evolutionary fitness (Teece, 2007). Rapidly changing environments require timely responsiveness, flexibility, and continuous innovation, all of which are necessary for an organization to stay afloat (Teece et al., 1997). Otherwise, bound by its path dependence, beliefs in once-successful routines (Tripsas and Gavetti, 2000), and current identity (Tripsas, 2009), an organization would be doomed to inertia, with its core capabilities turning into core rigidities and inhibiting new

projects (Leonard-Barton, 1992).

Organizational flexibility (Volberda, 1996), adaptability (Gibson and Birkinshaw, 2004), adaptive capability (Zhou and Li, 2010), reshaping capabilities (Jones et al., 2005), and organizational capacity for change (Judge and Elenkov, 2005) are examples of terms used to describe the effect of the interaction between managerial change efforts and employees' readiness for change. Although types of organizational resources, structure, and culture affect the extent and ease of their change, the ultimate origin of change lies in individuals' actions (Pentland et al., 2012). Continuing to distinguish between underpinnings and capabilities, we define transformative capability as a regular action of modifying existing organizational routines, assets, and business model elements per se.

The emergence and change of the routines are conceptually different (Felin et al., 2012), and so are seizing and transforming capabilities. The former brings innovation and internal venturing, while the latter often results in organizational renewal (Guth and Ginsberg, 1990). For leaders, one of the core problems in seizing is attracting and inspiring new followers, while in transforming, it is discrediting existing organizational elements (Trice and Beyer, 1991) and reconstructing meanings (Gioia and Chiittipeddi, 1991). Transforming is also more susceptible to external influences such as changes in formal requirements, changes in professional practices, or the success of other organizations (DiMaggio and Powell, 1983).

METHOD AND MEASURES

In developing a measure of managerial dynamic capabilities, we followed the steps outlined by MacKenzie et al. (2011) and Venkatraman and Grant (1986). To create an initial pool of items, we conducted an extensive literature review on constructs related to seizing, sensing, and transforming. The reviewed articles represented various research areas, including strategy, management, leadership, entrepreneurship, and marketing, and they covered topics at

both the individual and firm level. All three capabilities were specified as unidimensional constructs with reflective indicators. We adapted 47 items to describe a regular individual action that contained the first person pronoun and one of the following words (synonymously denoting routine): "regularly," "routinely," "frequently," and "systematically" (*Oxford Thesaurus*).

In many settings, researchers are encouraged to avoid using too many redundant and difficult items, because long scales increase the load on respondents, their fatigue, frustration, and boredom (e.g., Drolet and Morrison, 2001; Gosling et al., 2003). Since managers have limited time, attention, and patience for answering questionnaires, shorter and more focused measures of three to four items often reach maximum criterion-related validity (McGrath, 2005). We followed this rationale in developing our brief measure of three capabilities. After four rounds of item-sorting iterations, we chose 19 items and discussed them in a focus group with four expert practitioners with innovation experience in a large multinational telecommunications company operating in Europe and Asia (192 million mobile customers, headquarters in Scandinavia). Finally, we selected 12 items that were best suited for reflecting the constructs of interest and were meaningful to ask managers about. As a robustness check, we asked two independent raters outside of the innovation research field—a marketing scholar with a PhD and a director of a large shopping center—to categorize the items into three groups based on the definitions of the capabilities. They could also place an item into the fourth group, which was labeled "other." The raters showed almost perfect agreement ($k = 0.88$, 95% CI 0.67–1.00, $p < .001$), except on one item; after discussion, this item was eliminated.

We conducted the test of the remaining 11 items on two sets of respondents from both Europe and Asia who were working on teams in the same telecommunications company. The teams performed different functions, providing business-to-consumer and business-to-

business services as well as department-to-department and team-to-team services within the company. To ensure a common understanding, we described "team" as a unit or a group of people whom a respondent managed or had responsibility for. We also explained and illustrated via examples that the word "service" that we used in the survey meant "the core activities a team performed." In this sense, we implicitly referred to service as a set of operational capabilities. The items were presented as personal routines (i.e., actions a respondent performed regularly), and the responses were provided on a five-point Likert scale that ranged from "strongly disagree" to "strongly agree." The company's R&D department, which used internal lists to identify potential respondents, collected all the data, combining e-mail and an online survey software. Responses were anonymous and voluntary, and participants were further encouraged by a reminder email sent five days after the initial invitation to complete the questionnaire.

The first of the two sets consisted of employees and team leaders working with product/service development, marketing, and customer interface management in a Scandinavian country. The initial questionnaire was sent to 307 respondents. Participants had an opportunity to provide feedback about items they would find confusing and difficult to answer. We received 70 responses within the requested time (the low response rate of 23% might be explained by the inclusion of regular employees, many of whom, in contrast to team leaders, found the questionnaire irrelevant), 66 of which were valid. Based on the results from an initial confirmatory factor analysis as well as the feedback from respondents, we made minor changes to formulations of some cross-loading items.[1]

The modified questionnaire was sent to 529 team leaders in two European (67%) and three Asian countries (33%) who also worked with product/service development, marketing, and customer interface management. A total of 211 responses (72% from Europe, 28% from

[1] The details from this stage of the analysis are available upon request.

Asia) were received within the requested time, representing a 40 percent response rate, which is well within one standard deviation of the mean response rate for such studies (Baruch and Holtom, 2008). After removing carelessly completed questionnaires, the final pool consisted of 197 responses, which we used to assess the validity and reliability of our constructs.[2]

Assessing Construct Validity and Reliability

We applied confirmatory factor analysis using LISREL 9.2 to test the hypothesized relationships between the proposed measures and their respective latent constructs. Since all of the indicators were ordinals, we used robust maximum likelihood estimation based on polychoric correlations (Table I) and their asymptotic covariance matrix (Flora and Curran, 2004; Joreskog, 2002; Yang-Wallentin et al., 2010).

Table I**.** Polychoric correlations for construct indicators (n = 197)

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1	1.000										
2	0.632	1.000									
3	0.517	0.451	1.000								
4	0.332	0.316	0.307	1.000							
5	0.346	0.440	0.166	0.158	1.000						
6	0.308	0.363	0.221	0.214	0.604	1.000					
7	0.384	0.454	0.338	0.180	0.429	0.478	1.000				
8	0.369	0.346	0.229	0.076	0.466	0.485	0.611	1.000			
9	0.396	0.391	0.373	0.210	0.361	0.395	0.285	0.421	1.000		
10	0.272	0.293	0.295	0.137	0.469	0.424	0.336	0.422	0.629	1.000	
11	0.308	0.291	0.339	0.182	0.445	0.399	0.325	0.329	0.441	0.590	1.000

Note: Variable numbers correspond to sequence numbers in Table II

Table II (Model 1) demonstrates the results of the analysis of the original model. Both the absolute and relative fit indices indicate a good fit. Chi-square statistics in the analyses involving polychoric correlations are approximate and tend to be somewhat inflated (Flora and Curran, 2004). Of the two relevant chi-squares available, the Satorra-Bentler mean and

[2] We applied the procedure created by Marjanovic et al. (2015) to identify careless respondents, who constituted 6.6 percent of our sample; this is within the 5–10 percent range usually found in survey studies (e.g., Meade and Craig, 2012) and around the value identified by Marjanovic et al. (2015).

the variance-adjusted chi-square provides a better approximation and is more suitable for analysis with ordinals (Satorra and Bentler, 1994). Our model was significant at the 5 percent level. Other absolute fit indices, the root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR), are below the thresholds of 0.05 and 0.08, respectively. A good fit is also indicated by a relative fit index, the non-normed fit index (NNFI), which has a value greater than 0.95 (Hair et al., 2010). Appendix presents the results of the confirmatory factor analysis of competing models with one-factor and two-factor solutions; the original model with three factors clearly has the best (and the only acceptable) fit, indicating discriminant validity.

Table II. Measures and confirmatory factor analysis results (n = 197)

Construct and indicators	*Sources (excerpt)*	*Model 1*		*Model 2*[*]	
		Loading (t-value)	*CR (AVE)*	*Loading (t-value)*	*CR (AVE)*
Managerial sensing capability			0.76 (0.46)		0.78 (0.55)
1. I systematically identify opportunities from changes in customer needs, new technologies, and the activities of other companies.	Pavlou and El Sawy (2011); Teece (2007); Wilden et al. (2013)	0.81 (16.58)		0.80 (15.83)	
2. I regularly discover the additional needs of our customers of which they are unaware.	Narver et al. (2004)	0.78 (14.35)		0.79 (14.51)	
3. I frequently imagine how things look from the customer's perspective.	Narver et al. (2004); O'Connor and Rice (2001)	0.62 (9.60)		0.61 (9.12)	
4. I routinely observe or interact directly with customers in order to understand them.[*]	Kohli et al. (1993); Lukas and Ferrell (2000); Narver et al. (2004)	0.42 (5.81)		-	
Managerial seizing capability			0.81 (0.51)		0.81 (0.52)
5. I routinely ensure that potentially good ideas do not get lost, but instead are developed and actioned.	Teece (2007)	0.72 (13.99)		0.72 (14.05)	
6. I regularly support employees when they come up with innovative service ideas.	Hornsby et al. (2002); Pearce et al. (1997)	0.73 (14.16)		0.73 (14.16)	
7. I frequently take the risk of championing investments in new service solutions.	Hornsby et al. (2002); Wilden et al. (2013)	0.69 (11.36)		0.70 (11.39)	
8. I systematically push new service ideas through bureaucracy and into practice.	Pearce et al. (1997)	0.72 (13.30)		0.72 (13.35)	
Managerial transforming capability			0.80 (0.57)		0.80 (0.57)
9. I regularly modify our existing services to ensure that they are in line with market changes.	Kohli et al. (1993); Pavlou and El Sawy (2011)	0.73 (11.35)		0.73 (11.28)	
10. I systematically introduce changes in the ways of delivering services (i.e., in existing routines and structures).	Teece (2007)	0.84 (16.16)		0.84 (16.14)	
11. I frequently share knowledge that has the potential to influence changes in existing services or organizational routines/structures.	Pavlou and El Sawy (2011)	0.68 (9.64)		0.68 (9.62)	
Correlations among constructs		*Correlation (SE)*		*Correlation (SE)*	
Sensing-seizing		0.63 (0.08)		0.64 (0.08)	
Sensing-transforming		0.54 (0.07)		0.54 (0.07)	
Seizing-transforming		0.71 (0.06)		0.71 (0.06)	
		χ^2 = 37.08 (df = 29.65), p = 0.16; RMSEA = 0.036, SRMR = 0.05, NNFI = 0.98		χ^2 = 34.51 (df = 24.19), p = 0.08, RMSEA = 0.047, SRMR = 0.06, NNFI = 0.97	
[*]*Item with asterisk was removed in Model 2*					

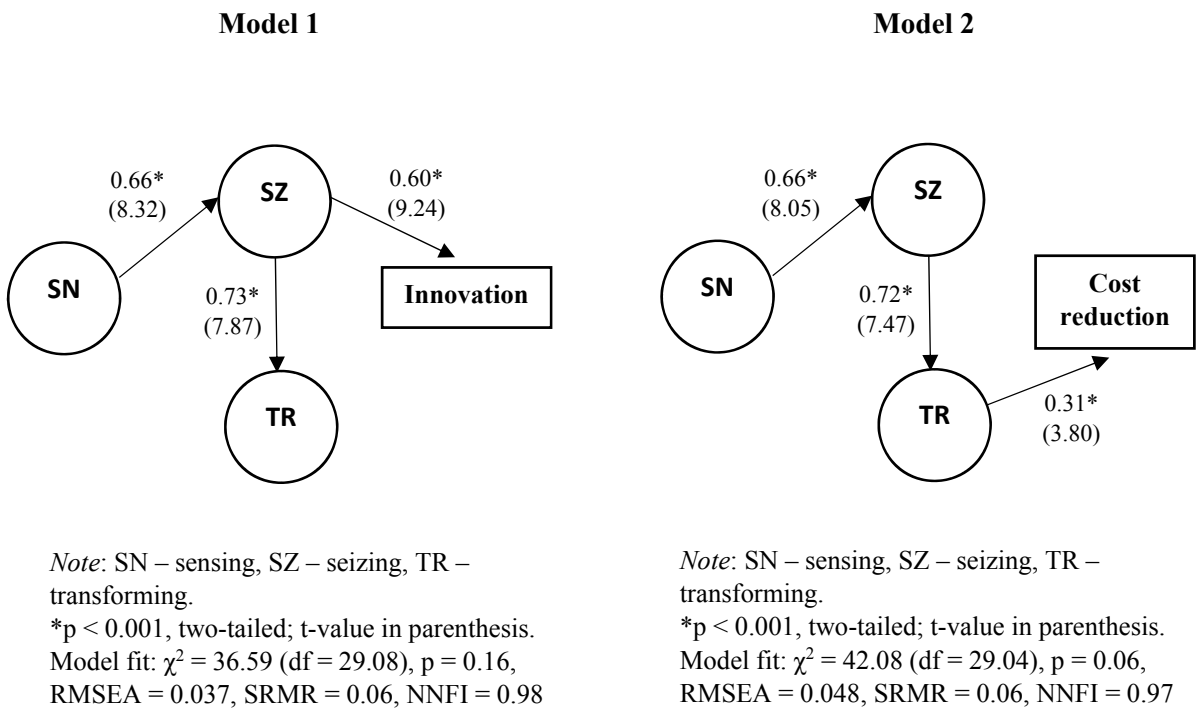
Note: CR—composite reliability, AVE—average variance extracted, SE—standard error, χ^2 —Satorra-Bentler adjusted chi-square (with associated fractional degrees of freedom), RMSEA—root mean square error of approximation, SRMR—standardized root mean square residual, NNFI—non-normed fit index (Tucker-Lewis index)

As Table II further shows, all of the factor loadings are statistically significant ($p < 0.001$) and reasonably high (ranging from 0.62 to 0.84), except on one item for sensing (0.42). Consequently, in contrast to other constructs, the average variance extracted (AVE) for sensing is below the threshold of 0.50. To solve the problem, we removed this item, which, as a post hoc speculation, has a flavor of an operational capability. This alternative solution is presented in Table II as Model 2. This model still demonstrates a good fit, although it is inevitably somewhat worse due to the reduced number of parameters. It poses no convergent or discriminant validity concerns, with a composite reliability (CR) for all constructs higher than the recommended value of 0.70, an AVE greater than 0.50, a maximum shared variance (MSV) lower than the AVE, and the square root of AVE greater than the inter-construct correlations (Hair et al., 2010).

Furthermore, we used the factor solution from Model 2 to test a causal model of the relationships between sensing and seizing, sensing and transforming, and seizing and transforming. We got a model with the fit statistics of Model 2 (Table II) and significant paths from sensing to seizing ($\gamma = 0.64$, SE = 0.09, $t = 7.42$, $p < 0.001$) and from seizing to transforming ($\beta = 0.61$, SE = 0.11, $t = 5.41$, $p < 0.001$). The path from sensing to transforming was not significant ($\gamma = 0.15$, SE = 0.12, $t = 1.20$), and fixing it to 0 did not result in a significant worsening of the model fit, suggesting a complete mediation by seizing ($\chi^2 = 34.99$, df = 24.54, $p = 0.08$, RMSEA = 0.046, SRMR = 0.06, NNFI = 0.97). A careful follower of the advances in the dynamic capabilities research field might recognize that this final causal model is, in fact, an exact representation of the model that Teece suggested (2007, p. 1342).

To assess the nomological validity, we modified the final causal model of dynamic capabilities by adding another dependent variable: innovation. This was measured by a single question of whether a respondent's "team introduced new or significantly improved team's

service during the last three months" (a variation of the standard definition of innovation used in the Community Innovation Survey). Thus, the hypotheses regarding the positive relationships between seizing and innovation and transforming and innovation were tested. The paths from sensing to seizing, seizing to transforming, seizing to innovation, and transforming to innovation were allowed. This model exhibited an excellent fit: $\chi^2 = 36.14$ (df = 28.41), p = 0.15, RMSEA = 0.037, SRMR = 0.06, NNFI = 0.98. The relationship between seizing capability and innovation was positive and significant (β = 0.54, SE = 0.13, t = 4.28, p < 0.001), with a coefficient of determination of 0.36. Surprisingly, transforming capability was not significantly related to innovation (β = 0.08, SE = 0.13, t = 0.60). Fixing the latter path to 0 did not worsen the model fit (Figure 1, Model 1).



Note: SN – sensing, SZ – seizing, TR – transforming.
*p < 0.001, two-tailed; t-value in parenthesis.
Model fit: $\chi^2 = 36.59$ (df = 29.08), p = 0.16, RMSEA = 0.037, SRMR = 0.06, NNFI = 0.98

Note: SN – sensing, SZ – seizing, TR – transforming.
*p < 0.001, two-tailed; t-value in parenthesis.
Model fit: $\chi^2 = 42.08$ (df = 29.04), p = 0.06, RMSEA = 0.048, SRMR = 0.06, NNFI = 0.97

Figure 1**.** Structural equation model of the relationships between dynamic capabilities and innovation (Model 1) and between dynamic capabilities and cost reduction (Model 2) (n = 197)

Finally, we tested our hypothesis that transforming capability would be significantly related to a change in existing routines. We focused on cost reduction, measured by a single question of whether a respondent's "team significantly reduced the costs of providing the team's services during the last three months." The paths from sensing to seizing, seizing to transforming, and from transforming to cost reduction were allowed. The model had an acceptable fit. The path from transforming capability to cost reduction was positive and significant ($\beta = 0.31$, SE = 0.08, $t = 3.80$, $p < 0.001$), with a coefficient of determination of 0.10 (Figure 1, Model 2).

Addressing Common Method Bias

Cross-sectional data, especially involving questions with a common scale format and the potential to invoke social desirability, are generally susceptible to common method bias. To reduce its effects, we ensured the respondents' anonymity and common understanding of terms, such as "team" and "service," and we explained the importance of providing motivated and conscientious answers. After obtaining the data, we performed several statistical procedures for detecting common method bias. First, we conducted Harman's single-factor test, loading all 11 variables on one factor using an exploratory principal axis factoring without rotation. One factor explained only 31.4 percent of variance, hence not indicating potential common method bias (Podsakoff et al., 2003). Second, we examined the fit of the single-factor model based on confirmatory factor analysis. The model had a much poorer fit (see Appendix). Finally, we ran the original model with an additional single, unmeasured latent method factor using all of the observed variables as its indicators (Podsakoff et al., 2003). This model resulted in a Heywood case, indicating a potentially serious misfit.[3] Although no statistical test can completely exclude the possibility of common method bias,

[3] We nevertheless fixed the negative error variance to 0 and got a solution with the factor loadings that was little affected by the presence of the unmeasured latent method factor (except for 2 items with the lowest loading on sensing).

the procedures we applied provide evidence that common method bias most likely does not threaten the validity of our conclusions.[4]

DISCUSSION

About a decade has passed since Teece (2007) separated dynamic capabilities into sensing, seizing, and transforming (initially, reconfiguring). Even more time has passed since Adner and Helfat (2003) introduced the notion of managerial dynamic capabilities. However, a measure of managerial sensing, seizing, and transforming has been completely missing from the research on dynamic capabilities.

Based on the extensive literature review and taking regular individual action as a starting point, this paper refines the concepts of managerial sensing, seizing, and transforming capabilities. It operationalizes and validates them on a sample of team leaders who are all working in the same company to control for organizational-level factors. The empirical tests provide clear evidence for the validity and reliability of the three constructs. Since the concept of managerial dynamic capabilities is intended to explain outcomes on the levels above individuals (e.g., team or firm), we have also assed the nomological validity by focusing on two sources of competitive advantage: innovation and cost reduction.

Tests of Models 1 and 2 (Figure 1) support many of Teece's (2007, p. 1343–1344) theoretical arguments; thus, transforming is dependent on seizing, and in turn, seizing is dependent on sensing. In our context, it means that those who manage to regularly change existing routines and structures are those who regularly nourish new ideas, and the latter rests

[4] In addition, we ran our model on the original "contaminated" sample to assess the effect of the exclusion of 14 careless respondents from the main analysis. Constituting error variance, random responses worsened the model fit statistics (Meade and Craig, 2012): $\chi 2 = 43.23$ (df = 26.78), p = 0.02, RMSEA = 0.05, SRMR = 0.06, NNFI = 0.95, which might be regarded as still acceptable (e.g., Govindarajan and Kopalle, 2006). However, the factor structure was largely unaffected: on average, the factor loadings and covariances differed from the main analysis by only 0.01 (SD = 0.03). Thus, we conclude that the exclusion of careless respondents does not constitute any serious threat to the validity of our main results.

upon a habitual opportunity recognition.

We anticipated a strong relationship between sensing and seizing, as addressing an opportunity requires first identifying the opportunity. The dependence of transforming capability on learning and sensemaking gave us a reason to expect a significant positive relationship between sensing and transforming capabilities. Although it is indeed a case, our data show that seizing capability completely mediates the relationship between sensing and transforming. The latter links our findings to the discussion on achieving an ambidexterity in organizations through balancing exploration and exploitation. Our empirical evidence suggests that, at least on the individual level, this ambidexterity is inherent to managers who tend to engage in both exploration and exploitation activities (Raisch et al., 2009). An alternative explanation for the lack of a direct link between sensing and transforming capabilities might be our focus on the external aspect of sensing, due to its importance for survival in a dynamic environment (Teece, 2007). However, sensing internal opportunities plays an important role in the sensemaking process during strategic changes (Gioia and Chittipeddi, 1991); hence, future research on the intersection of dynamic capabilities and organizational change might require a specific construct of internal sensing.

In contrast to seizing, transforming capability is not related to innovation, which makes sensing and seizing essential for the implementation of new solutions. Partly, it might be due to the managerial perception of innovation as not resulting from the reconfiguration of existing alternatives. Transforming capability is nevertheless significantly related to cost reduction.

We hope the measure developed in this paper will assist in advancing and uniting the literature on dynamic capabilities. Particularly, it may be useful for conducting multi-level studies aimed at explaining firms' heterogeneity; their survival; and their sources of competitive advantage, value creation, capture, and growth (Teece, 2014). In this quest, the

operationalized managerial dynamic capabilities have the potential to stimulate multidisciplinary research, bringing together strategy, management, leadership, entrepreneurship, marketing, and psychology.

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APPENDIX

Summary results of confirmatory factor analysis of competing models (n = 197)

Models	χ^2	*df*	*p-value*	*RMSEA*	*SRMR*	*NNFI*
1 dimension	77.74	25.61	0.00	0.102	0.09	0.84
2 dimensions (SN-SZ) TR	60.56	26.04	0.00	0.082	0.08	0.89
2 dimensions (SN-TR) SZ	65.27	26.65	0.00	0.086	0.08	0.88
2 dimensions (SZ-TR) SN	54.53	28.42	0.00	0.068	0.07	0.93
3 dimensions SN SZ TR	37.08	29.65	0.16	0.036	0.05	0.98

Note: χ^2—Satorra-Bentler adjusted chi-square (with associated fractional degrees of freedom), RMSEA—root mean square error of approximation, SRMR—standardized root mean square residual, NNFI—non-normed fit index (Tucker-Lewis index)

ARTICLE 4

Developing Managerial Dynamic Capabilities: A Quasi-Experimental Field Study of the Effects of a Design Thinking Training Program

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ABSTRACT

Deeply rooted in practice, design thinking lacks empirical studies on its effects based on theories outside the design field. Conversely, the dynamic capabilities framework has a long theoretical tradition. We combine the practical experience of design thinking with the theoretical advances of the dynamic capabilities framework. We theorize on how training team leaders in design thinking techniques leads to the development of their managerial sensing, seizing, and transforming capabilities, which then influences their teams' innovation and operational capability. We test the model using a quasi-experimental field study with a control group and a four-month time lag. The intervention is a design thinking training program presented randomly over time in six geographically isolated business units of a large multinational telecommunications company. We find that the training program has a positive effect on the participants' managerial sensing and seizing capabilities, which, in turn, have a positive effect on managerial transforming capability, the teams' innovation, and the teams' operational capability. These positive effects are paralleled by a direct negative effect of the program on the operational capability of the participants' teams. In addition, we find the effect of managerial transforming capability on the teams' operational capability to be non-significant.

INTRODUCTION

Management education has long been criticized for its excessive reliance on a rational–analytical perspective, which is often lacking in practical relevance (Lester, Piore, & Malek, 1998; Bennis & O'Toole, 2005; Ghoshal, 2005; Waddock & Lozano, 2013). The critique builds on the observation that a traditional business approach is suitable for stable environments, rationally behaving agents, and well-defined problems, none of which provide an adequate representation of complex everyday reality. As one solution, some researchers and educators suggest introducing design thinking to education curricula (Dunne & Martin, 2006; Glen, Suciu, & Baughn, 2014). They hope that design methods can make students more innovative, human-centered, and skillful in dealing with ill-defined problems. Although some business schools have responded to these calls by incorporating design into their educational programs, empirical research on the effects of teaching design thinking is virtually non-existent (Glen et al., 2014).

On the other hand, an increasing number of companies are hiring designers or retraining in-house developers and engineers in an attempt to create design-centric cultures (Karjalainen & Snelders, 2009; Kolko, 2015; Yoo & Kim, 2015). Managers expect that this will result in the new offerings that better meet consumers' needs and provide uniquely pleasurable experiences (Brown, 2008). Paradoxically, designers often face internal resistance emanating from efficiency-focused management – a direct consequence of rational–analytical management education – and have to constantly persuade their managers of the meaningfulness of design activities (Yoo & Kim, 2015). Considering also that design thinking is a complex practice based on an iterative process involving diverse tools, it comes as no surprise that empirical studies on the effects of design thinking remain scarce, contradictory, and mainly anecdotal (Liedtka, 2014).

Deeply rooted in practice, design thinking has often been described as "what designers do," referring primarily to design methods and tools (Kimbell, 2012, p. 134). The challenging task of conducting empirical research on the effects of design thinking requires applying theoretical frameworks stretching beyond the design field, but such attempts have so far been very limited (Liedtka, 2014; Glen et al., 2014). One can hardly blame the research community for this inertia; after all, most management and organizational theories are based on principles foreign to design thinking (Goshal, 2005). Ideally, empirical research would require a theoretical approach that, similar to design thinking, is multidisciplinary, acknowledges the instability of environments, and focuses on opportunity identification, innovation, and renewal.

The cornucopia of business research offers one such approach, namely, "the dynamic capabilities framework," which has a long history of theoretical development (Teece, Pisano, & Shuen, 1997; Teece, 2014). The concept of dynamic capabilities refers to practiced and patterned activities of creating and modifying organizational resources, routines, and competences (Helfat et al., 2007). Although originally developed for describing organizational behavior, the concept also covers the analogous activities on the level of individual managers (Adner & Helfat, 2003). These activities often rely on environmental scanning and the use of real-time information, prototyping, experimentation, cross-functional collaboration, and brainstorming (Eisenhardt & Martin, 2000) – the very same methods and tools that constitute the core of design thinking. Nevertheless, empirical research on managerial dynamic capabilities is nascent, and many questions, particularly about how managerial dynamic capabilities can be developed and how they contribute to innovation within organizations, remain unanswered (Helfat & Martin, 2015). As design thinking shifts from being a prerogative of designers and spreads as a common problem-solving approach, excellent research opportunities arise for addressing these questions. If a training program in

design thinking can improve managerial dynamic capabilities and, through this improvement, contribute to organizational development, incorporating design thinking into educational curricula may indeed be beneficial for business and society (Brown and Katz, 2011).

The underlying assumption of our study is that learning action techniques for addressing uncertainty and finding new solutions (design thinking techniques) will affect the regular managerial actions of creating and modifying organizational routines and competences (dynamic capabilities). Thus, our paper contributes to the areas of design thinking and dynamic capabilities by studying the effects of a design thinking training program on the dynamic capabilities of team leaders, and consequently, on the innovation and operational capability of the participants' teams. We follow Teece's (2007, 2012) tripartite division of dynamic capabilities into sensing, seizing, and transforming and aim to answer the following questions: 1) Can design thinking training make managers more capable of sensing business opportunities, taking advantage of opportunities, and changing existing operations? 2) Can the design thinking training of team leaders increase the innovative output of their teams? 3) Can design thinking training of team leaders improve their teams' operational capability?

The study is conducted in a natural setting – a large multinational telecommunications company headquartered in Scandinavia. Aiming to stimulate innovation and improve the quality of its offerings through the use of design, the company hired designers, but quickly came to understand that bureaucracy and inertia were still hindering innovation. Instead of letting the designers continuously deal with the established mental models or waiting until a younger generation of innovative managers gradually replace the existing cohort, the company decided to train its managers in design thinking.

The program is targeted at team leaders and has been introduced over time on a random basis to the company's six business units located in Europe and Asia. Using a quasi-

experimental design with a control group and a four-month time lag, we test the effects of this intervention.

THEORY AND HYPOTHESES

Design Thinking

Design thinking is an iterative problem-solving approach, characterized by an emphasis on empathy, user-centricity, integrative thinking, collaboration, and the active use of ideation and visualization tools (Brown, 2008; Liedtka, 2014). It has emerged as a set of formal methods for addressing uncertain and ill-defined (so-called "wicked") problems. In the search for solutions, design thinking recommends resorting to abductive reasoning by looking for "what might be" rather than "what must be" or "what is" (Dunne & Martin, 2006). Close attention to humans, their actions, worldviews, desires, and emotions in problem solving – anchored in the emphasis on empathy – makes design thinking inherently human-centered (Norman, 2013). It is also practical and requires solutions that are technologically and economically feasible (Brown, 2008).

Design thinking is not an orderly process with pre-defined stages, but includes various techniques and activities that are used throughout the whole design process iteratively. The overall goal is to create a new emotionally and functionally appealing experience (Seidel & Fixson, 2013, Liedtka, 2014). Activities for identifying problems or opportunities rely on ethnography and include, for example, observing and interviewing customers, photography, videography, informant diaries, virtual ethnography, and personas (fictional, but representative customers) (Beckman & Barry, 2007; Veryzer & Borja de Mozota, 2005). In contrast to academic research with the goal of theory building and testing, designers use ethnographic methods to gain insights and inspiration (Brown & Katz, 2011). The main argument is that these techniques enable learning about customers' latent needs, as opposed to traditional market research, which collects data on customers' expressed needs (Leonard &

Rayport, 1997). Problems and opportunities are addressed through ideation and prototyping activities, where design thinking gives importance to generating, developing, and testing ideas collectively (Seidel & Fixson, 2013). This follows from the overall emphasis of design thinking on collaboration and rests on working with cross-functional teams and co-designing with customers. A variety of visualization and prototyping techniques are available for translating abstract ideas into a tangible form and for their further refinement. Some examples include drawing and sketching, customer journey mapping (visualizing customer interaction through time and space, often with customer emotions), service blueprinting (visualizing both front- and back-stage processes), storyboarding (visualizing through drawings and pictures), field experiments (testing prototypes in context), scenarios and storytelling (creating hypothetical stories and narratives), roleplaying, and business model canvas (Liedtka, 2014).

Although for many companies the approach to design is still to a large extent based on the development of physical goods, there is growing interest in more complex experiences and systems, such as services, business models, business strategies, and social policies (Brown & Martin, 2015; Kolko, 2015; Glen et al., 2014). Especially in such cases, integrative thinking ensures a holistic perspective on the meaning and functions of system elements, actors, and their relations in a wider societal context.

Dynamic and Ordinary Capabilities

The dynamic capabilities framework has emerged from the resource-based view as an attempt to explain the source of competitive advantage of firms operating in changing environments. Arguing that having specific assets and efficient processes is not enough to ensure a firm's survival and renewal, Teece et al. (1997) suggest the notion of dynamic capabilities – a firm's unique ability to create and modify organizational routines, resources, and external environments. Dynamic capabilities are distinct from ordinary capabilities, which include best practices for performing administrative, operational, and governance-related functions (Teece,

2014). A prominent example of ordinary capabilities is operational capability, that is, the organizational routines and procedures needed for performing day-to-day operations efficiently and effectively (Helfat & Winter, 2011). While ordinary capabilities maintain stability and continuity in organizations, dynamic capabilities generate the innovations and modifications necessary for establishing new markets or adapting to environmental demands (Helfat & Winter, 2011). In other words, dynamic capabilities create new capabilities or induce changes in existing ordinary capabilities, ensuring organizations' strategic fit and evolutionary fitness.

With the theoretical development of the dynamic capabilities framework, the key role of managers in building, integrating, and reconfiguring the organizational resource base has been emphasized by the notion of managerial dynamic capabilities (Adner & Helfat, 2003; Teece, 2012). Just as any capability describes a patterned and practiced activity with reliable performance (Helfat & Winter, 2011), managerial dynamic capabilities represent regular managerial actions of creating and manipulating organizational resources and competences.

Teece (2007) categorizes dynamic capabilities into three groups: sensing and shaping opportunities and threats, seizing opportunities, and managing threats and reconfiguration (or transforming, according to Teece, 2014). The same categorization is also relevant for the dynamic capabilities of individual managers, regardless of their position in the organizational hierarchy (Helfat & Martin, 2015). Managerial sensing capability refers to the regular action of recognizing opportunities and identifying customers' latent needs, which is often based on interpreting information from various sources. Managerial seizing capability refers to addressing and taking advantage of opportunities. Finally, managerial transformation capability is a regular action of changing existing organizational routines and structures to keep pace with the internal and external dynamism.

Since addressing an opportunity presupposes prior identification of that opportunity, sensing capability is crucial to seizing capability (Teece, 2007). Even in firms where these activities may be divided between individuals, the relationship is so tight that both the discovery and realization of opportunities rely on the same organizational designs (Foss, Lyngsie, & Zahra, 2015). Similarly, sensing capability is necessary for transforming capability because the latter relies on detecting problems with the status quo and making sense of the change context (Gioia & Chittipeddi, 1991).

Theoretically, sensing and seizing are the only necessary capabilities in a static environment, while transforming is required when the business ecosystem is dynamic (Teece, 2007). Obviously, business model elements should be established before someone starts changing them. Moreover, one must offer viable alternative solutions to the problems with the existing routines and structures. This reasoning implies that transforming depends on seizing, and seizing, in turn, depends on sensing (Teece, 2007; Reference withheld).

The notion of managerial dynamic capabilities accentuates the role of specific individuals, such as managers, leaders, and board members, in making strategic decisions either solely or as a part of a team in a company. Extensive empirical research shows that not only new business creation (addressed within the field of entrepreneurship), but also strategic change is indeed a function of the actions of such individuals (Gioia & Chittipedi, 1991; Boecker, 1997; Westphal & Fredrickson, 2001; Simons, 2003; Song, Almeida, & Wu, 2003; Vaccaro et al., 2012). In contrast, ordinary capabilities are embedded in formalized and codified routines. Employees enact these routines, either performing them in a stable way or inducing spontaneous variations in their performance (Feldman & Pentland, 2003; Pentland, Hærem, & Hillison, 2010). As Felin and Foss (2005) note, this might be envisioned as a process where managers first create and specify rules and procedures, which are then enacted and improved by employees.

Focusing on regular action thus allows starting with individuals when explaining organizational behavior: organizational routines and outcomes become functions of their actions (Felin & Foss, 2005; Felin & Hesterly, 2007; Abell, Felin & Foss, 2008; Felin et al., 2012). This perspective provides a theoretical foundation for studying how management training affects organizational-level outcomes and routines, such as innovation and operational capability, by influencing regular managerial actions.

Hypotheses

Managerial dynamic capabilities are neither dormitive virtues nor inherent qualities such as innate talent (Helfat et al., 2007). As individual actions, they depend on individual-level factors such as desires and knowledge (Coleman, 1990). In complex tasks demanding competences, knowledge is indispensable, and we hypothesize that the knowledge of design thinking techniques will have a positive effect on managerial dynamic capabilities (Table 1 provides a summary of the design thinking techniques taught in the program and describes their relevance for managerial dynamic capabilities).

Identifying opportunities presupposes understanding and interpreting the business ecosystem, particularly user needs (Teece, 2007). Therefore, sensing capability relies on a set of resources and routines for scanning, searching, and exploring environments (O'Reilly & Tushman, 2008). In firms, information about technological and market changes may arrive through the whole spectrum of market research types (e.g., customer, analysis, competitor analysis, and market trends). However, it typically elucidates customers' expressed needs and already available ideas, often inspiring incremental improvements or unoriginal solutions (Narver, Slater, & MacLachlan, 2004). Design thinking may assist in overcoming this barrier to radical innovation by offering data collection methods, aimed specifically at discovering customers' latent needs (Leonard & Rayport, 1997; Lester et al., 1998). The emphasis of

design thinking on empathy, user-centricity, collaboration, and the use of ethnographic methods has a direct relevance to sensing capability.

TABLE 1

Training Program Content, Goals, and Relevance for Dynamic Capabilities

Training Program content / Design thinking tools	Goals / Learning how to	Relevance for dynamic capabilities (see Teece, 2007)
Customer journey maps, touchpoint cards, and emotion cards	Create a holistic overview over customer experiences along a time axis, map touchpoints and emotions they invoke in customers	Sensing opportunities for transforming existing offerings; learning to seize opportunities by managing complements and platforms
Personas	Imagine what a fictional customer may need; understand limits of working with hypothetical cases	Sensing opportunities by identifying target market segments
Co-design with real customers	Observe and interact directly with customers in order to understand them and their needs; empathize; create their customer journey	Sensing customers' latent needs and tapping customer innovation; seizing by delineating customer solutions
Visual communication	Convey messages in a simple, clear, and creative way that may assist in decision-making and inspiring others	Seizing and transforming by communicating effectively
Design facilitation	Manage design thinking workshops that involve cross-functional teams	Seizing and transforming by demonstrating leadership, coordinating cross-functional collaboration, and creating climate supportive of creativity
Brand and service personality	Create experiences where all elements fit together and are consistent with the overall brand, including employees' behavior, tone of voice, and language use	Seizing and transforming by emphasizing fit among strategy, structure, and processes
Wow-experience and experience prototyping	Use the design tools learnt to create a radically new wow-experience, and rapidly prototype it through staging	Seizing by delineating new customer solutions and experiential learning

Understanding the limitations of the local "myopic" search embodied by specialized R&D departments has led many companies to engage in exploration activities with various collaborators, including customers, suppliers, research institutions, competitors, and consultants (Chesbrough, 2003). Nevertheless, overly broad and deep distant search is costly, which calls for a balance between local and non-local searches as an optimal exploration strategy (Laursen & Salter, 2006). Cross-functional collaboration and co-design with

customers accentuated by design thinking may facilitate such a balance by capitalizing on both the variety among organizational members (Laursen, 2012) and the creativity of users (Oliveira & von Hippel, 2011) in developing new solutions. Particularly, they may help to generate a superior offering by ensuring internal integrity (consistency among the structures and functions of the offering) and external integrity (match between the offering and intended users), resulting in faster adoption and higher satisfaction (Veryzer & Borja de Mozota, 2005).

Learning how to facilitate cross-functional collaboration and co-design with customers is directly relevant to seizing capability. Combined with visualization and prototyping tools, these practices stimulate the development and launch of solutions that enable opening new markets and capturing more added value (Eisenhardt & Martin, 2000; Teece, 2007). Similarly relevant is integrative thinking, with its emphasis on a holistic perspective. For example, a visualization tool like customer journey mapping provides a structured overview of users' experiences over time and space across all touchpoints (contact points between users and service providers), often including customers' thoughts and feelings (Stickdorn & Schneider, 2012). Understanding the functional interdependence among the components of such a complex system and the end user demand for a holistic experience lies at the core of managing complements and platforms successfully – one of the microfoundations of seizing (Teece, 2007).

Design thinking primarily aims at creating radically new ideas rather than upgrading already developed solutions (Dunne & Martin, 2006; Brown, 2008). Nevertheless, its techniques are relevant for reconfiguring existing knowledge and routines (Martin, 2009) and thus for transforming capability. Changing organizational processes and structures with the help of design may be viewed as design-driven renewal (Ravasi & Lojacono, 2005). One of the key tasks of such renewal is ensuring consistency between offerings, processes, and

overall strategy (Karjalainen & Snelders, 2010). Beverland, Wilner, and Micheli (2015) argue that design thinking enables the integration of brand consistency and relevance by reinterpreting existing assumptions without ignoring original meanings. They find that the process of brand transformation based on design thinking involves three main stages. First, managers start by identifying problems and raising awareness about the issues within their organization. Then, they define and develop alternative perspectives, and finally, implement changes by formally mapping the innovation and stabilizing the outcome. The tools and techniques for conducting such a process are clearly pertinent to sensing, seizing, and transforming capabilities.

Since design thinking is a professional technique, the use of its tools requires vocational training. Research shows that individuals can become more creative (Amabile, 1988), more skillful in identifying business opportunities (DeTienne & Chandler, 2004; Gielnik et al., 2015), more charismatic (Antonakis, Fenley, & Liechti, 2011), and more entrepreneurial (Glaub et al., 2014; Rauch & Hulsink, 2015) when they receive education and training in relevant action principles and techniques. In a similar vein, we expect that training in design thinking tools – specific tools for identifying problems and developing novel solutions – will make participating managers more capable of sensing and seizing opportunities as well as transforming existing organizational routines.

Hypothesis 1: The design thinking training program will have a positive effect on (a) managerial sensing capability, (b) managerial seizing capability, and (c) managerial transforming capability

Naturally, we hypothesize that a design thinking training program will lead to innovation. The interest in difficult, ill-formulated problems, customers' latent needs, and the use of abductive reasoning implies the development of radically new solutions. However, to become innovations, new ideas and solutions must be implemented, or commercialized

(Schumpeter, 1934). The proponents of design thinking advocate applying its tools during the implementation process. Empathy, visualization, and prototyping help in persuading decision makers and other stakeholders to support new ideas in their original form (Ravasi & Lojacono, 2005; Yoo & Kim, 2015). Developing business plans and assisting in the creation of an effective advertising and communication strategy play a significant role in the successful commercialization of newly designed solutions (Brown, 2008). In turn, the success of new offerings reinforces the status of designers in organizations and clears the way for subsequent innovations (Ravasi & Lojacono, 2005).

In organizations, however, innovation is not the result of one individual's activity, regardless of whether that individual is a top manager or a regular employee. Although individuals recognize opportunities and ensure taking advantage of them, developing and launching new solutions requires joint efforts by teams of professionals (Amabile et al., 2004). Managers do not even have to be directly involved in the generation and technical development of new ideas (Ravasi & Lojacono, 2005). Since team leaders influence a team's creativity and innovation (Mumford & Licuanan, 2004), we expect that training managers in design thinking techniques will stimulate innovation in their respective teams (Helfat & Martin, 2015).

Hypothesis 2. The design thinking training program will have a positive effect on the introduction of innovation by the teams of participating managers.

The emphasis of design thinking on people, their needs, and experiences does not pertain to end users only. All stakeholders are humans, and they all have limited information processing capacity and cognitive biases (e.g., Tversky & Kahneman, 1974). Design thinking techniques may assist in reducing the cognitive biases of decision-makers and their partners during the development of new products and services, thus making the innovation process more effective and efficient (Liedtka, 2014).

Moreover, design thinking may increase the efficiency of other organizational processes. A designed process by definition requires accurate execution. To ensure the achievement of desired outcomes, design thinking encourages the creation of detailed but user-friendly plans, manuals, road maps, and blueprints for employees. By promoting simplicity, comfort, and intuitiveness, and through the use of visualization and prototyping, design thinking facilitates faster and easier adoption of new backstage processes by employees (Kolko, 2015; Yoo & Kim, 2015). A clear understanding of how a new process works ensures accurate functioning, but it also evokes stronger positive feelings towards innovation among employees, motivating them for better execution (Cadwallader et al, 2010).

The design thinking training program may inspire participating managers to improve the efficiency of the day-to-day operations performed by their teams. By learning how to address "wicked" problems through observation, visualization, and prototyping, managers may start organizing their teams' complex operational routines in a more efficient way. The focus of the program on effective communication, mutual understanding, and cooperation between all actors may further ensure the seamless orchestration of the teams' development and execution activities.

Hypothesis 3. The design thinking training program will have a positive effect on a team's operational capability.

The long-term effects of the design thinking training program depend on whether the participating managers start to practice the newly acquired techniques and thus develop their capabilities. Such improvement in their dynamic capabilities will reflect the persistence of the trainings' effects on the managers' skills in terms of identifying opportunities, addressing opportunities, and modifying existing routines and structures within the organization. Team level effects of the training program will arise when managers return to their teams following

the training. Managers will affect the teams' innovation and operational capability through actions shaped by their knowledge of the design thinking principles and tools.

Given that business opportunities are identified, managers create routines for the efficient functioning of an organization through seizing. Through transforming, they ensure that the existing operational capability meets the requirements of organizational growth or the dynamics of the business environment (Teece, 2007). Considering that seizing depends on sensing – and transforming depends on seizing – we assume that these dynamic capabilities will mediate the effect of the design thinking training program on a team's operational capability.

Hypothesis 4. The effect of the design thinking training program on a team's operational capability is mediated by managerial dynamic capabilities.

In building operational capability, managers may take advantage of recognized opportunities by expanding the resource base (Brush, Greene, & Hart, 2001), attracting new people, and motivating employees (Coff & Kryscynski, 2011). In most cases, however, creating superior operational capability depends on innovations, such as new business models and new technologies (Teece, 2007; Helfat & Peteraf, 2015). Considering that seizing is dependent on sensing, we expect that these two capabilities will mediate the effect of the design thinking training program on the introduction of innovation by the teams of the participating managers. In turn, innovation will mediate the effect of the program on a team's operational capability.

Hypothesis 5. The effect of the design thinking program on introducing innovation by a team is mediated by managerial sensing and seizing capabilities.

Hypothesis 6. The effect of the design thinking training program on a team's operational capability is mediated by a team's innovation.

Figure 1 illustrates the research model of our study.

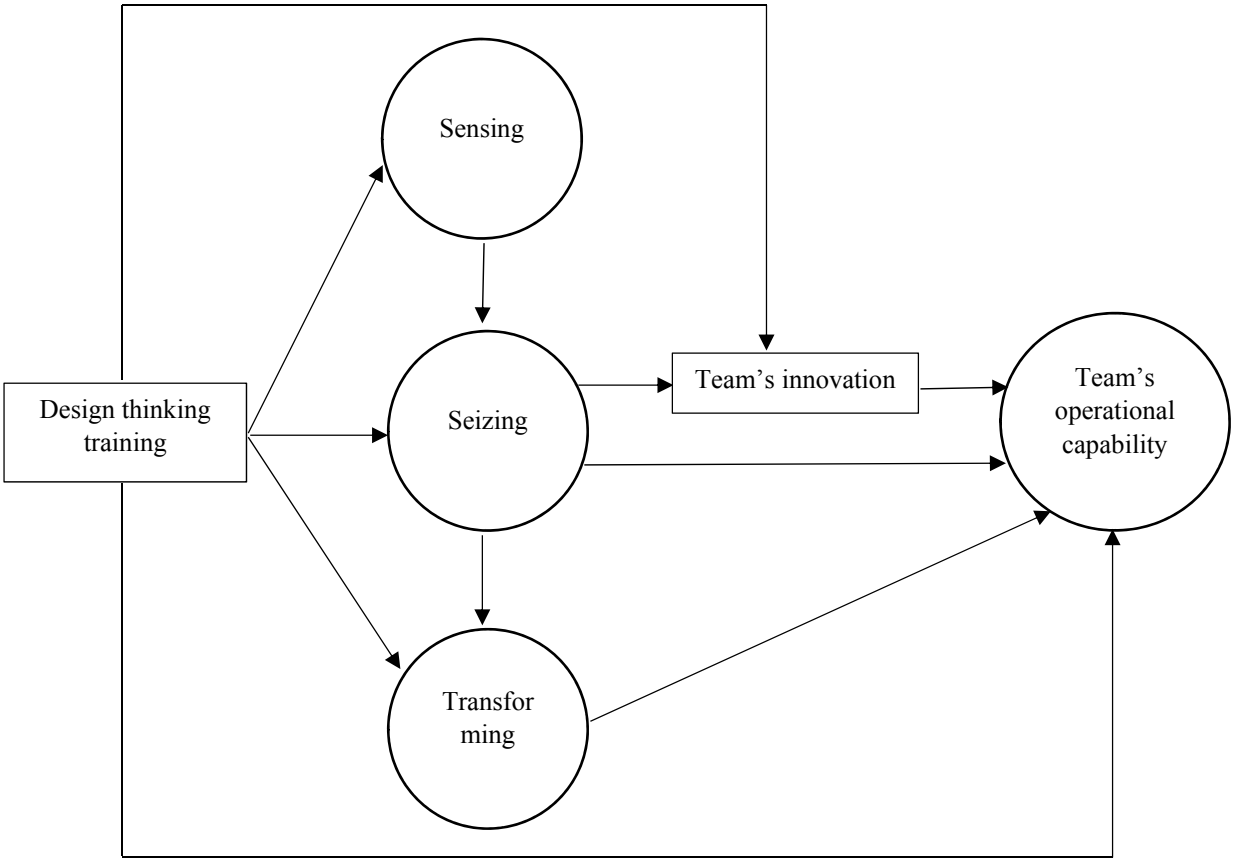

FIGURE 1
Research Model

METHOD

Design and treatment

This study employs a field intervention with a pretest–posttest design. The treatment was a two-day design thinking training program, which was introduced in six business units of a large multinational telecommunications company during 2014–2015. The overall purpose of the program was teaching techniques to design offerings that provide a unique and appealing customer experience. Thus, it aimed for two main learning outcomes: 1) shifting the focus of participants from functional to customer-centric and experiential thinking in designing services, and 2) providing participants with the practical tools for doing so. The program followed exactly the same procedure in all six countries, starting with a plenary lecture on

design thinking and service design, followed by a practical training in the design thinking tools (Table 1), and finishing with a graduation ceremony. Participants worked mainly in cross-functional teams, trained and facilitated by two experienced professionals specializing in service design.

Sample

The participants were 318 team leaders working in product/service development, marketing, and customer interface management. Since the business units were geographically isolated from each other (being in three European and three Asian countries), and as the treatment was presented randomly over time, we used measurements from the participants in business units where the treatment had not yet been presented to form a pretest group (Shadish, Cook, & Campbell, 2002). Moreover, to increase external validity, we formed a control group of 319 team leaders, who worked in the same business units and performed similar functions (related to technology or customers). The control group was measured before and after the training program, at the same time as the participating managers from the respective business units. The company's R&D department, which used internal lists to identify potential respondents, collected all the data through online survey software. Responses were anonymous and voluntary, and participants were further encouraged to respond by a reminder email, which was sent five days after the initial invitation.

As a pre-study, we used the pretest responses from the first European country for pilot testing of the questionnaire. Some of the original items were refined, and consequently, these pretest data were excluded from further analysis. The refined pretest questionnaire was sent to 529 respondents (277 in the treatment group, 252 in the control group; 67% from Europe, 33% from Asia), and 211 responses (125 from the treatment group, 86 from the control group; 72% from Europe, 28% from Asia) were obtained, representing a 40% response rate. Four months after the training session in each business unit, the post-test questionnaire was sent to

all 637 respondents, which resulted in 124 responses from the treatment group and 135 responses from the control group, representing a 41% response rate. Our response rates were close to the average response rates for surveys used in organizational research (Baruch & Holtom, 2008). The time lag of four months was chosen to allow an intersection between the period needed for habit formation (about two months; Lally et al., 2010) and the average time needed for project implementation in the company under study (about three months). Using the procedure from Marjanovic et al. (2015), we removed carelessly completed questionnaires and finally got 197 responses in the pretest group (122 from the treatment group, 75 from the control group), 108 responses from the participants after the training program, and 118 responses from the control group after the training program. Thus, the whole sample consisted of 423 responses, with 315 respondents from the pretest and posttest control groups and 108 respondents from the posttest treatment group. This allowed us to minimize possible selection, maturation, and history threats (Grant & Wall, 2009).

Measures

To ensure common understanding, we described "team" as a unit or group of people whom a respondent managed or had responsibility for. We also explained and demonstrated via examples that, when the word "service" was used in the survey, it referred to "the core activities a team performed." In the questionnaires, we used a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." All variables were measured in both the pretest and posttest.

Managerial dynamic capabilities

Managerial sensing, seizing, and transforming capabilities were measured using nine items from the scale developed by *Reference withheld* based on Hornsby, Kuratko, and Zahra (2002), Kohli, Jaworski, and Kumar (1993), Narver et al. (2004), Pavlou and El Sawy (2011),

Pearce, Kramer, and Robbins (1997), Teece (2007), and Wilden et al. (2013). The items for sensing capability were: "I systematically identify opportunities from changes in customer needs, new technologies, and the activities of other companies"; "I regularly discover the additional needs of our customers of which they are unaware"; and "I frequently imagine how things look from the customers' perspective" (composite reliability = .80). Seizing capability was measured by three items: "I routinely ensure that potentially good ideas do not get lost, but instead are developed and actioned" ; "I frequently take the risk of championing investments in new service solutions"; and "I systematically push new service ideas through bureaucracy and into practice" (composite reliability = .76). Items for measuring transforming capability were: "I regularly modify our existing services to ensure that they are in line with market changes"; "I systematically introduce changes in the ways of delivering services (i.e., in existing routines and structures); and "I frequently share knowledge that has the potential to influence changes in existing services or organizational routines/structures" (composite reliability = .78).

Team-level outcomes

Since the construct of managerial dynamic capabilities is intended for explaining outcomes on the levels above individuals (Helfat & Martin, 2015), other variables were related to the team level. Due to the discrepancies in accounting practices across teams (as a result of the differences between projects and functions), and because of the company's confidentiality policy, we relied on the respondents' judgment in measuring innovation and the operational capability of teams. As team leaders, the respondents had the best overview of their teams' activities. Innovation was measured by a single question of whether a respondent's "team introduced new or significantly improved the team's services during the last three months" (a slight modification of the standard definition of innovation used in the Community Innovation Survey). Four items measured a team's operational capability. These items reflected the

availability of important routines and procedures to ensure effective and efficient team operations and were based on Henderson and Lee (1992) and Hoegl and Gemuenden (2001). All beginning with "In my team, we have important routines and procedures to ensure," the items were: "that our daily service operations provide a good service experience"; "that we continuously produce service of high quality"; "that services are delivered efficiently"; and "that our day-to-day service operations are reliable and accurate" (composite reliability = .90).

RESULTS

Manipulation check. To ascertain the participants' knowledge of design thinking tools, we conducted a manipulation check. During both the pretest and posttest, the respondents were presented with a list of seven design thinking tools, an option of "other," and an option of "none." The respondents were asked to choose the tools they were familiar with. The answers were added up so that respondents received a score of 0 if they had chosen none of the tools and 8 if they had indicated all of the seven tools plus "other." A one-way analysis of variance showed that the observed means of the pretest, posttest treatment, and posttest control groups differed statistically on this variable: $F(2,420) = 15.27$, $p < 0.01$. A post hoc Tukey's honestly significant difference test revealed that the posttest treatment group differed significantly from the pretest and posttest control groups ($p < 0.01$), whereas the latter two groups were statistically equal.

Test of hypotheses. To analyze the effects of the intervention program, we applied a latent variable structural equation modeling approach. This statistical technique provides more accurate estimates of the effectiveness of experimental interventions than parametric and non-parametric tests, because it removes both random and correlated measurement errors and allows a more reliable examination of mediating processes (Russell et al., 1998). Since all the variables were ordinals, we consistently applied robust maximum likelihood estimation based on polychoric correlations (Table 2) and their asymptotic covariance matrix in LISREL 9.2

(Joreskog, 2002; Flora & Curran, 2004; Yang-Wallentin, Joreskog, & Luo, 2010). Chi-square statistics (χ^2) in the analyses involving polychoric correlations are approximate and tend to be somewhat inflated (Flora & Curran, 2004). Thus, we used the Satorra–Bentler mean and the variance-adjusted chi-square, which provides a better approximation and is more suitable for analysis with ordinals (Satorra & Bentler, 1994). The chi-square test is a test of exact fit. Acknowledging the fact that all models are imperfect, to ensure a reasonable assessment of model fit, we also used two other absolute fit indices: the root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR), with upper threshold values of .05 and .08, respectively. In addition, we used a relative fit index, the non-normed fit index (NNFI), with the lower threshold value of .95 (Hair et al., 2010).

TABLE 2

Polychoric correlations for construct indicators

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Training (0=No, 1=Yes)														
2. SN1	.11													
3. SN2	.12	.64												
4. SN3	.11	.56	.50											
5. SZ1	.10	.35	.46	.25										
6. SZ2	.26	.38	.43	.29	.41									
7. SZ3	.22	.41	.41	.31	.51	.58								
8. TR1	.12	.38	.40	.34	.38	.34	.36							
9. TR2	.19	.27	.34	.32	.50	.36	.38	.59						
10. TR3	.12	.31	.37	.31	.40	.32	.29	.45	.56					
11. INNO	.21	.29	.35	.22	.43	.40	.38	.39	.39	.30				
12. OP1	-.07	.33	.38	.22	.38	.25	.33	.22	.33	.30	.39			
13. OP2	-.10	.21	.31	.21	.35	.18	.24	.26	.24	.20	.38	.71		
14. OP3	-.15	.20	.28	.14	.33	.12	.26	.21	.20	.26	.38	.66	.75	
15. OP4	-.13	.23	.27	.15	.29	.19	.24	.21	.21	.25	.35	.64	.66	.73

First, we applied confirmatory factor analysis to test our measurement model. The model demonstrated an excellent fit: $\chi^2 = 69.00$, df = 52.51, $p > .05$, RMSEA = .03, SRMR = .05, NNFI = .98. All the factor loadings were statistically significant ($p < .001$) and reasonably high, ranging from .65 to .86. The model posed no convergent or discriminant validity concerns, with a composite reliability higher than the recommended value of .70, an

average variance extracted (AVE) greater than .50, a maximum shared variance lower than the AVE, and the square root of AVE greater than the inter-construct correlations (Table 3; Hair et al., 2010) for all constructs measured.

TABLE 3

Confirmatory Factor Analysis: Construct Correlations

Variable	1	2	3	4	5	6
1. Training (0=No, 1=Yes)	1	.02	.08	.04	.04	.02
2. Sensing	.15*	.57	.48	.34	.15	.15
3. Seizing	.28**	.69**	.51	.49	.31	.18
4. Transforming	.21**	.58**	.70**	.55	.24	.14
5. Innovation	.21**	.39**	.56**	.49**	1	.20
6. Operational capability	-.14*	.39**	.43**	.38**	.45**	.69

Note. Values below the diagonal are correlation estimates among constructs, diagonal elements are average variance extracted, and values above the diagonal are squared correlations.
* $p < .05$, ** $p < .01$.

Next, we tested our research model (Figure 1). Both the chi-square test and the alternative fit-indices demonstrated an excellent fit (Table 4, "Original model"): $\chi^2 = 72.51$, df = 54.55, p > .05, RMSEA = .03, SRMR = .05, NNFI = .98.

TABLE 4

Structural Parameter Estimates

Model element	Original model	Final model
Model fit		
$\chi 2$	72.51	72.50
Degrees of freedom	54.55	56.32
Probability	> .05	> .05
RMSEA	.03	.03
SRMR	.05	.05
NNFI	.98	.99
Standardized parameter estimates		
Group → Sensing	.15*	.15*
Group → Seizing	.17*	.18**
Group → Transforming	.00	
Group → Innovation	.05	
Group → Operational capability	-.31**	-.31**
Sensing → Seizing	.70**	.69**
Seizing → Transforming	.75**	.75**
Seizing → Innovation	.57**	.59**
Seizing → Operational capability	.37*	.39**
Transforming → Operational capability	.02	
Innovation → Operational capability	.29**	.29**

* $p < .05$, ** $p < .01$

As Table 4 demonstrates, the direct effects of the intervention on transforming capability (γ = .00, SE = .08, t = .00) and innovation (γ = .05, SE = .07, t =.68) were not significant. Thus, Hypotheses 1c and 2 were not supported. Interestingly, the direct effect of transforming on operational capability was not significant either (β = .02, SE = .12, t = .19). Fixing these three paths to 0 did not result in a significant worsening of the model fit. In fact, the model fit slightly improved: χ^2 = 72.50, df = 56.32, p > .05, RMSEA = .03, SRMR = .05, NNFI = .99. Thus, this improved model is reported as "Final model" in Table 4 and is used for reporting further results.

The positive and significant effects of the design thinking training program on sensing capability (γ = .15, SE = .07 t = 2.09, p < .05) and seizing capability (γ = .18, SE = .07, t = 2.70, p < .01) provide support for Hypotheses 1a and 1b. As concerns Hypothesis 3, the effect of the training program on operational capability is significant, but surprisingly, it is negative (γ = -.31, SE = .07, t = -4.62, p < .01), which is the opposite of what we initially hypothesized.

In accordance with the dynamic capabilities framework and the model suggested by Teece (2007), sensing capability had a significant positive effect on seizing capability (β = .69, SE = .08, t = 9.22, p < .01), and seizing capability had a significant positive effect on transforming capability (β = .75, SE = .07, t = 11.03, p < .01). Seizing capability also had a significant positive effect on team's innovation (β = .75, SE = .07, t = 11.03, p < .01) and team's operational capability (β = .75, SE = .07, t = 11.03, p < .01).

To test for mediation effects, we followed the procedure described by Hair et al. (2010), while the calculation of mediated effects was based on MacKinnon (2008). We found significant and positive indirect effects of the design thinking training program on seizing (β = .10, SE = .05, t = 2.09, p < .05), transforming (β = .21, SE = .06, t = 3.68, p < .01), team's innovation (β = .17, SE = .05, t = 3.71, p < .01), and team's operational capability (β = .16, SE

= .05, t = 3.21, p < .01). Table 3 shows that the variable "Training" is significantly related to all other constructs. Since the training program did not have a direct significant effect on transforming capability and transforming capability was not significantly related to team's operational capability, Hypothesis 4 was only partially supported with respect to sensing and seizing capabilities. This mediation is partial, due to the significant direct effect of the training program on operational capability.

The insignificance of the direct path from the program to innovation implies that the development of sensing and seizing capabilities fully mediates the effect of the training on the introduction of innovations by the participants' teams. Thus, Hypothesis 5 was supported.

Finally, the significant relationships between the program, sensing and seizing capabilities, innovation, and operational capability provide support for Hypothesis 6. This mediation is partial, due to the significant direct effects of the training program and seizing capability on operational capability.

DISCUSSION

Various educators, researchers, and practitioners have argued for training business students and managers in design thinking (e.g., Dunne & Martin, 2005; Brown & Katz, 2011; Glen et al., 2014). Suggesting that design thinking may be a better solution than the traditional rational–analytical management education for dealing with dynamic environments, human irrationality, and ill-defined problems, they have assumed that design methods can promote skill development and innovation.

However, these arguments have remained mainly theoretical or anecdotal. Our study aimed to answer three research questions. The first question was whether design thinking education could improve the managerial dynamic capabilities of sensing business opportunities, taking advantage of opportunities, and changing existing operations. We hypothesized that a training in design thinking tools would improve managers' dynamic

capabilities by providing them with knowledge of the techniques specifically devised for understanding and solving "wicked" problems. We have found that training in design thinking indeed makes managers more capable of sensing, seizing, and transforming. However, the effect of the training program on transforming capability is fully mediated by sensing and seizing capabilities.

The second research question was whether the design thinking training of team leaders could increase the innovative output of their teams. Since the proponents of design thinking actively emphasize its relevance, particularly for searching for latent customer needs and developing new radical solutions, we hypothesized that learning about design thinking tools and techniques would inspire the participants to boost innovation activities in their teams. Our results show that the teams of participating managers introduced more innovations than the teams of the managers in the control group. Moreover, we found that this effect happens due to improvements in the participants' sensing and seizing capabilities (i.e., these dynamic capabilities fully mediate the effect of the design thinking training program on teams' innovation output).

Finally, we raised the question of whether the training could have an effect on the operational capability of the participants' teams. We hypothesized that learning how to organize services in a simple, comfortable, and intuitive way might inspire the participants to improve the efficiency of their teams' day-to-day operations. Surprisingly, we found this effect to be strongly negative instead.

This negative effect, however, is suppressed by another, indirect effect. Our results suggest that by improving the participants' sensing and seizing capabilities and by stimulating the launch of innovations, the training program indirectly resulted in an improved operational capability. While this positive indirect effect (.16) is not large enough to outweigh the negative direct effect (-.31), it reduces the total negative impact of the program on operational

capability. Interestingly, we have not found a significant effect of managerial transforming capability on teams' operational capability. This means that making regular changes in existing activities does not necessarily result in better operations.

Theoretical Implications

This study presents a unique perspective by combining the two previously unconnected fields of design thinking and managerial dynamic capabilities. While the former lacked a theoretical foundation for examining its effects, the latter was searching for an empirical context to test its theories. With both fields addressing similar phenomena of opportunity identification, innovation, and transformation in unstable environments, their integration was a natural choice for our empirical research.

There are many ways to develop dynamic capabilities. As the regular actions of creating and manipulating organizational routines and competences, dynamic capabilities require a certain amount of knowledge of the tools and techniques relevant for these actions. Our findings provide evidence that for managers, one way to improve the dynamic capabilities of sensing, seizing, and, indirectly, transforming is to learn about and utilize design thinking tools and techniques.

The search for information and inspiration forms the basis for sensing capability. In companies, scanning and exploring across environments is usually reliant on internal R&D and formal market research with a focus on customers' expressed needs. However, gaining insight into latent demand is no less beneficial for opportunity identification (Leonard & Rayport, 1997; Teece, 2007). Several design thinking principles and techniques, such as empathy and applied ethnography, aim precisely at discovering the latent needs of customers. In fact, finding the right problems and opportunities – preferably different from those formulated by others – is an initial task for anyone applying design thinking (Brown, 2008; Norman, 2013).

Finding the right problems prepares the foundation for addressing those problems through the development and commercialization of new solutions. Many design thinking tools, including co-design with customers, visualization, experimenting, and experience prototyping, are used to facilitate the discovery of new solutions. In contrast to the conventional – more formal – approach, a somewhat playful style of design thinking may contribute to solving business problems by fostering motivation, engagement, and creativity (Mainemelis & Ronson, 2006). Combined with integrative thinking and cross-functional collaboration, design thinking tools are relevant for delineating customer solutions and business models, managing complements and platforms, and building loyalty and commitment – all of which are microfoundations of seizing capability (Teece, 2007). As our results show, training managers in design thinking indeed improves both their sensing and seizing capabilities.

Although we do find a positive impact of design thinking training on transformative capability, the effect is not direct. We partly anticipated this finding, considering the focus of design thinking on abductive reasoning, with its emphasis on potentialities rather than actualities (Dunne & Martin, 2005; Beverland et al., 2015). Focusing on creating new knowledge, design thinking tools contribute to transforming capability only through the development of sensing and seizing capabilities. In many senses, this finding is logical because changing existing routines and structures requires both detecting the problems with the status quo and finding alternative solutions first.

Our results show that training in design thinking increased the innovative output of the participants' teams. Design thinking is a problem-solving methodology with a focus on new ideas and solutions, and it was reasonable to expect that the training program would trigger innovation in the organization. Notably, we found that the participants' sensing and seizing capabilities completely mediate this effect. Instead of being directly involved in the

generation and technical development of new ideas, it is necessary and sufficient for a team leader to sense opportunities for innovation and ensure that the team takes advantage of them. As Ravasi and Lojacono (2005) argue, a manager may do this by creating a favorable context for designers and legitimizing their role, by accentuating the strategic importance of design, and by ensuring sufficient funding.

By developing sensing and seizing capabilities and thus fostering innovation, the participants have improved the operational capability of their teams. On the other hand, the program has had a direct negative effect on the operational capability. Had the participants not developed the dynamic capabilities, the effect of the training program on operational capability would actually have been more negative for the organization. This negative effect of the design thinking training program on operational capability is intriguing. Partly, it might have occurred because design thinking is an iterative and "playful" approach that may result in an expansive, lingering, chaotic, and ill-structured process, if applied clumsily and uncontrollably (Norman, 2013). Our findings thus echo the arguments of Kolko (2015: 71), who acknowledges the particular usefulness of design thinking tools for innovation and imagining the future, but stresses that they are "not the right set of tools for optimizing, streamlining, or otherwise operating a stable business." Another explanation of the negative effect might be that in our study teams' operational capability is reported by team leaders and thus is inevitably affected by their perception. Participation in the program that focused on designing "ideal" offerings could have influenced the team leaders' perception of their teams' actual operational capability.

As for the theoretical contribution to the dynamic capabilities framework, our results provide evidence for the crucial role of managerial sensing and seizing capabilities in fostering innovation and increasing operational capability in firms. By identifying and taking advantage of opportunities, managers may affect operational capability in many ways, and we

find that innovation is one of those ways. However, the lack of a significant relationship between managerial transforming capability and a team's operational capability is puzzling. As a matter of speculation, teams with efficient and effective operations might not need regular changes in their routines, while teams without adequate routines and procedures for operating efficiently need to develop them first. Correspondingly, sensing and seizing capabilities are primary for operational capability (and that is what we find), while the role of transforming capability is presumably more complex.

Practical Implications

When the telecommunications company decided to launch a training program in design thinking for its team leaders, it pursued several objectives. The company aimed to achieve a common understanding and appreciation of design work, create a shared language, and most importantly, improve the skills of managers and stimulate innovation to gain a competitive advantage. However, design thinking is a problem solving approach often contrasted with the traditional rational–analytical perspective that is dominant among business people (e.g., Dunne & Martin, 2005; Glen et al., 2014). Despite the active promotion of its inclusion in educational curricula, little has been known about the effects of training managers in design thinking.

The results of our study show that the training program has actually resulted in the development of managerial capabilities of sensing and seizing opportunities, and, indirectly, transforming existing organizational routines and structures. Theoretical research that builds on the traditions of the resource-based view has long recognized these capabilities as essential for firms' emergence, evolution, and survival, outlining them as the sources of competitive advantage, value creation, capture, and growth (e.g., Teece et al., 1997; Teece, 2007; Teece, 2014). Our study demonstrates that learning about design thinking tools and techniques is one

way to develop these capabilities. In turn, this leads the teams of the participants to generate more innovations and create better operations.

However, the effects of the program were not all positive. A worsening of existing operational routines and procedures paralleled the improvements in operations caused by the development in the managerial capabilities. Our findings thus justify the challenges outlined by Kolko (2015) and call for a careful approach to introducing design thinking in companies. When making a decision about training their employees in design thinking, corporate leaders should evaluate whether the benefits of improving managerial dynamic capabilities and stimulating innovation outweigh the risks associated with unpredictability and instability, which are destructive for existing routinized operations. Experimenting with vague opportunities for creating a better customer experience or opening new markets may be detrimental for those who prefer continuity and stability. For companies facing intense competition in environments characterized by constant change, whose stability of operational routines becomes more of a burden than an advantage, the choice is more obvious.

Limitations

We conducted our research in an ecologically valid, real-world setting using an experimental design. In such field experiments, random assignment is rarely feasible and often may negatively affect the authenticity of a social situation (Grant & Wall, 2009). Although we could not randomly assign participants to the treatment group, we took several steps to ensure internal validity. First, the company's decision to conduct the training program randomly over time in several business units that were geographically isolated from each other provided us with a unique opportunity to use pretests of experimental groups as controls (Shadish et al., 2002). The spread in time and space allowed us to minimize possible selection, maturation, and history threats while ensuring cultural diversity, whereas having respondents from the same company allowed us to control for organizational-level factors. Second, we created an

additional control group of managers working in the same business units and performing similar functions, and we measured them before and after the training program, at the same time as the participating managers from the respective business units. Neither the difference between the pretests of the experimental and control groups nor the difference between the pretest of the experimental and control groups and the posttest of the control group were statistically significant. Considering the significance of the results from the posttest of the experimental group, this strengthens the internal validity of our results.

Another limitation of our study is that, due to discrepancies in the accounting practices across teams and the company's confidentiality policy, we had to resort to self-reported questionnaires for data collection. Although regularly used in business research, self-reported measures with a common scale format and the potential to invoke social desirability are generally susceptible to common method bias. To reduce this effect, we ensured the respondents' anonymity and common understanding of terms and explained the importance of providing motivated and conscientious answers. After obtaining the data, we performed several statistical procedures for detecting common method bias. First, we conducted Harman's single-factor test, loading 14 self-reported variables on one factor using exploratory principal axis factoring without rotation. One factor explained only 29.9 percent of variance, hence not indicating potential common method bias (Podsakoff et al., 2003). Next, we ran a single-factor model based on confirmatory factor analysis. The model had an unacceptable fit: $\chi^2 = 291.89$, df = 35.16, $p < .05$, RMSEA = .13, SRMR = .12, NNFI = .71. Finally, we tested a measurement model with the addition of a single, unmeasured latent method factor using all the observed variables as its indicators (Podsakoff et al., 2003). This model yielded an improper solution, indicating a potentially serious misfit. Although no statistical test can completely exclude the possibility of common method bias, the results provide evidence that it most likely does not threaten the validity of our findings.

Future Research

Our study shows that managerial dynamic capabilities can be developed through learning and education and that training in design thinking is one of the ways of doing so. While we focused on the very core of the dynamic capabilities framework – sensing, seizing, and transforming capabilities as well as their outcomes (innovation and operational capability) – future research may aim for a more nuanced understanding of the processes underlying capability development. Managerial dynamic capabilities depend on many individual-level factors, including beliefs, desires, and emotions. Thus, future research may investigate what role such individual-level factors play in the relationship between education and the development of managerial sensing, seizing, and transforming capabilities. One of many opportunities is to combine the dynamic capabilities framework with the theory of planned behavior (e.g., Rauch & Hulsink, 2015), studying how intentions, attitudes, subjective norms, and perceived behavioral control mediate the effect of education on dynamic capabilities. Motivation, engagement, creativity, and self-efficacy are examples of other constructs of possible interest that may mediate the effect of design thinking education on dynamic capabilities.

The design of our study allowed us to control for organizational-level factors, and thus, to isolate the effects of the design thinking training program on both individual and team levels. However, both organizational and institutional factors may play a decisive role as moderating variables in the process of development and exercise of managerial dynamic capabilities. Consequently, studies conducted in different settings and taking into account various contextual factors may provide a more complete picture of the relationship between individual-level factors, individual capabilities, and outcomes on the levels above individuals.

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