THESIS / THÈSE

DOCTOR OF ECONOMICS AND BUSINESS MANAGEMENT

Social media for innovation management

Organizational capabilities and key success factors"

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Award date:
2020

Awarding institution:
University of Namur

Link to publication

University of Namur
Faculty of Economics, Social Sciences and Business Administration
Department of Management

Social media and innovation: Empirical exploration and conceptualization of underlying capabilities

A thesis submitted by

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in fulfillment of the requirements for the degree of Doctor in Economics and Business Management of the University of Namur

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September 2020

A centipede was happy – quite!

Until a toad in fun

Said, "Pray, which leg moves after which?"

This raised her doubts to such a pitch,

She fell exhausted in the ditch

Not knowing how to run.

(Mrs. Edward Craster, 1871)

Acknowledgments

When I was about to start my PhD journey, a colleague of mine compared her doctoral project to a rollercoaster. Writing these lines, this metaphor keeps coming to my mind. My dissertation felt like climbing and descending rollercoasters with ups and downs. This emotional thrill ride will remain carved in my heart forever. The constant support received from my two supervisors, Wafa Hammedi and Dominik Mahr, has given me the wings I needed to fly. I feel extremely grateful to them for being so supportive and attentive. I would like to thank them both for helping me reach this important milestone of my life and for giving me the energy to overcome all the hurdles encountered along the road to this PhD.

I wish to acknowledge the help provided by Bas Hillebrand. His considerable knowledge in marketing and organizational theory enabled me to sharpen my third manuscript. I want to thank all the other members of my doctoral jury to whom I'm more than grateful. Thanks, Gloria Barczak, Annick Castiaux, Jean-Yves Gnabo, and Annouk Lievens, for the time dedicated to review and provide valuable feedback on my work.

Next, I would like to express my gratitude to ICHEC Brussels Management School. A big thank you to Brigitte Chanoine, my dean, who has always supported me in all my professional projects. I want to thank Christel Dumas, our research center director, for her involvement and commitment along this journey. If I stand here today, it is also thanks to the fantastic colleagues and friends surrounding me. First, my ICHEC teammates, in particular: Julie De Foor, Gisèle Paquet, Vladia Schrooten, Catherine Dal Fior, Marie Garcia, Stephanie Kempeners, Alain Ejzyn, Line Didelot, Marine Falize, Coline Ruwet, Laurent Lahaye, Isabelle Choquet, Caroline Laloux, Mohamed Selmouni, Fathi Tlatli, Nathalie Van Droogenbroeck, Martine Osterrieth, Marie Ferauche, Carine Vankeerberghen, Vincent Huart, Valérie Kinon, Geraldine Thiry, Jacques Folon, Sylvie Wattier, Gregory Schmidt, and Yamina Hammas. Spending a lot of time focusing on this dissertation has not kept me from wandering into my colleagues' offices many times, either for a chat or a cup of tea.

Then, there are all the other friends, the ones that never let me down and never hesitated to pick up their phone to check how I was doing. Thank you, Katinka, Enza, Joan, Pauline, Caroline, Céline, Julie, Veronique, Nancy, Caro, Elodie, Virginie, Marjorie, and all the other friends that are in my life.

I wish to express my deepest gratitude to all the firms that contributed to this work by sharing their insights and experience with me.

Moreover, I would have not been here without the support of my parents, brother and sister, in-laws, and whole family. Thank you for making me the person I am. Mom, no matter the trials you faced in your life, you have always been a prime example of courage and tenacity. Thank you for being a caring mom and making me the woman I am today. Papa, tu as toujours cru en mes capacités à me réaliser tant sur le plan professionnel que privé. Merci pour les valeurs que tu m'as transmises et la confiance que tu as fait jaillir en moi. Fabien et Florence, dans les bons et mauvais moments, j'ai toujours pu compter sur vous. Merci d'être là. Un grand merci aussi à mes beaux-parents pour leur soutien tout au long de ce parcours. My special thanks are extended to all my family abroad.

Looking out on the garden while writing these last words before closing an important chapter of my life, and reflecting on the meaning of this doctoral project, I dedicate this work to my two daughters Manora and Giulia, and to my husband Stephane. My daughters have been a great source of inspiration throughout this hectic journey. Mes chères petites filles, vous avez fait preuve de beaucoup de patience et de compréhension au cours de ces dernières années. Vous êtes formidables et je vous souhaite de réaliser vos rêves les plus fous dans les années à venir. Je vous aime du plus profond de mon âme. Last, I owe an enormous debt of gratitude to my husband and soulmate Stephane. This thesis would not have been possible without him always standing by me. I would like to thank him for being the man, father, and husband he is. Mon chéri, je tiens à te remercier du fond du cœur pour le soutien indéfectible apporté au cours de ces dernières années. Love you.

"No one who achieves success does so without acknowledging the help of others.

The wise and confident acknowledge this help with gratitude."

–Alfred North Whitehead

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General Introduction

Research context and objectives

Social media such as Facebook, Twitter, YouTube, and WhatsApp have over 3.8 billion active users, a growth of 9.2% in comparison to last year (Chaffey, 2020). With almost half of the world's population using these platforms, social media have become essential tools for businesses across the globe. Their high reach and rich content allow firms to benefit from a tremendous source of business intelligence to conduct innovation activities (Candi, Roberts, Marion, & Barczak, 2018; Ooms, Bell, & Kok, 2015). LEGO®, for example, has continuously been using social media to capture consumer insights and cocreate and launch new products and services. The company's holistic approach to social media has allowed it to gain access to innovation ideas supported by thousands of fans (Waldron, 2020). This winning strategy is the result of huge engagement efforts on various social media platforms.

The innovation opportunities presented by these new communication tools also comes from the amount and types of user-generated content continuously posted and shared between users. Text, pictures, geolocation, and videos are just some of the forms of content circulating on social media. This diversity of mediums offers fine-grained insights and facilitates interactions between users, thereby triggering firms' interest in these social tools. However, social media content is only an important source of input for innovations if correctly leveraged (Leeflang, Verhoef, Dahlström, & Freundt, 2014). While executives usually see great opportunities in social media, many of them still question their return on investment. One of the major reasons for this is companies' inability to develop capabilities to use social media in a lucrative way (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011; Leeflang et al., 2014; Mention, Barlatier, & Josserand, 2019). This strategic challenge forms the anchor point of this doctoral project.

Academics have investigated the use of social media in different stages of the innovation process (Mention, Barlatier, & Josserand, 2019; Piller, Vossen, & Ihl, 2012; Roberts & Candi, 2014), such as the ideation stage (Brem & Bilgram, 2015; Luo & Toubia, 2015), development stage (Marion, Barczak, & Hultink, 2014), and launch stage (Divakaran, 2018; Gruner, Vomberg, Homburg, & Lukas, 2019). In the ideation stage, online user innovation communities are valuable for crowdsourcing activities because they enable firms to collect a large amount of user-generated content ideas (Bayus, 2013; Dong & Wu, 2015). Firms leverage social media for activities such as concept generation, product design, and prototype testing in the development stage (Marion et al., 2014; Piller et al., 2012). Social media platforms are used to

run word-of-mouth campaigns and gather consumer feedback in the commercialization stage (Gruner et al., 2019; Leeflang et al., 2014). Notwithstanding, social media use for innovation remains undertheorized (Rindfleisch, Mehta, Sachdev, & Danienta, 2020).

In addition, social media has received great attention from practitioners in recent years. Many managers are feeling the urge to improve their innovation performance with social media. Accordingly, an increasing number of firms have started experimenting with social media tools but are still looking for guidance to reap the expected benefits (Roberts, Piller, & Lüttgens, 2016). *Hence, a first aim of this dissertation is to better understand how firms use social media in the different stages of the innovation process and to identify the capabilities a focal firm needs to successfully use social media for innovation.*

The nature of social media requires a cross-disciplinary approach in order to be properly understood. Indeed, social media are characterized by some of the following elements: multiple interactions, online communities, velocity, variety, volume, and veracity (Hammedi, Kandampully, Zhang, & Bouquiaux, 2015; Hienerth, Lettl, & Keinz, 2014; Rapp, Beitelspacher, Grewal, & Hughes, 2013; Surbakti, Wang, Indulska, & Sadiq, 2020). Accordingly, the increasing importance of social media use in the various stages of the innovation process has led to a growing body of research dispersed across different literature streams. Such research diversity offers a vast array of focal points. In innovation and general management, scholars have mainly focused on capabilities, using the resource-based view of the firm and dynamic capabilities as the theoretical lens (Candi et al., 2018; Marion, Reid, Hultink, & Barczak, 2016; Mention et al., 2019; Roberts et al., 2016). Marketing scholars have adopted a more user centric approach by looking at engagement mechanics and relational aspects (Bianchi & Andrews, 2015; Hammedi et al., 2015; Labrecque, 2014; Wang & Kim, 2017). In information management, attention has been centered around IT capabilities (Asdemir, Banker, & Bardhan, 2006; Benitez, Castillo, Llorens, & Braojos, 2018) and more recently, big data and analytics (Akhtar, Frynas, Mellahi, & Ullah, 2019; Surbakti et al., 2020; Wamba et al., 2017). *Therefore, a second objective of this dissertation is to consolidate the existing findings by systematically reviewing social media use for new product development (NPD) in various streams of the literature and to build a research agenda that stimulates further research.*

The complex nature of social media not only requires a good understanding but also a good way for those benefits to be realized. In particular, managers need clear guidance on the tools and skills needed to reach positive NPD performance outcomes with the use of social media (Mention et al., 2019). Prior findings show fragmented and conflicting results, with positive and negative innovation outcomes associated with social media use (Gruner, Homburg, & Lukas, 2013; Lu, Singh, & Sun, 2017; Marion et al., 2014; Roberts & Candi, 2014). Conflicting outcomes also vary from one NPD stage to the other and within NPD stages (Chang & Taylor, 2016; Roberts & Candi, 2014). Conversely, scholars have started calling for more research on capabilities to capture and leverage knowledge from social media (Bhimani, Mention, & Barlatier, 2019). The contrasting results and growing body of academic literature urging more empirical research on how to leverage social media in NPD (Candi et al., 2018; Mention et al., 2019; Rindfleisch et al., 2020) have inspired our last research objective.

Thus, a third aim in this dissertation is to identify and empirically test two important social media capabilities on NPD performance across the stages of the NPD process.

Considering both the complexity and multidimensionality of social media use for innovation, we need to combine insights from different management disciplines to answer our research questions and reach our research goals. This will be achieved by examining various streams of the literature, which we introduce in section 2. The objective of this dissertation is to enrich these various research domains with our findings. We outline the conceptual foundations in the next section.

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Figure 1.1: Flow of chapters

Conceptual foundations

This doctoral project is nested within several overarching literature streams that are interrelated: (1) open innovation; (2) digital marketing; (3) and organizational capabilities. These conceptual foundations contribute to a better understanding of social media use during the innovation process. Accordingly, the different chapters of this dissertation will employ models and definitions pertaining to these theoretical perspectives that we briefly introduce in this section.

Opening up the innovation process to external sources of knowledge

More than a decade ago, Chesbrough (2003) introduced the term "open innovation" to depict innovation processes in which companies largely interact with their external environment in order to both explore and exploit outside knowledge (van de Vrande, Lemmens, & Vanhaverbeke, 2006). In their proposal of an open-innovation theory, Gassmann and Enkel (2004) suggested three types of core processes which either facilitate or drive the innovation process: the outside-in process; the inside-out process, and the coupled process, which combines the two previous ones. External knowledge related to innovation processes are generally classified as outside-in innovation processes (Vaisnore & Petraite, 2011).

The innovation process had to be accommodated to open innovation for different reasons, including to manage the flow of ideas, intellectual property, technology, and totally developed products into the company from external sources, as well as to manage the flow of these factors outward from the company (Cooper, 2008). Indeed, Cooper (2008) suggests that firms seek various types of external input in the different stages of the innovation process for several purposes. In the ideation stage, companies look outside their boundaries to understand how customers' problems can be solved, and how unmet needs can be satisfied. Across the development stage, firms seek help in solving technology problems by acquiring external innovations already produced, or by out-licensing internally developed IP that is not yet utilized. Lastly, in the launch stage, they sell or out-license already commercialized products or acquire already commercialized products. In the past, models have been introduced that take external involvement and fast changing environments into account. West and Bogers (2014) propose a four-phase model in which a linear process is combined with interactions between firms and collaborators. Similarly, Cooper (2016) suggests a new stage-gate process that introduces the notion of agility. More recently, various trends have enriched open innovation; specifically, business model innovation and the important shift to digital innovation involving

multiple stakeholders (Chesbrough, 2017). Another growing stream of research has focused on the key role of lead users, characterized by their ability to anticipate and to be at the leading edge of key market trends (Franke, von Hippel, & Schreier, 2006). Social media platforms are usually considered to be lead users' "natural habitat" because innovative ideas are shared by these users in virtual communities (Brem & Bilgram, 2015; Mahr & Lievens, 2012).

Outside sources of knowledge are often critical to the innovation process, no matter at what organizational level the innovation unit is defined (Cohen & Levinthal, 1990). The ability to exploit external knowledge is therefore critical to build innovative capabilities. Hence, the relative importance of the different open innovation processes depends on a firm's corporate strategy, reflected by their competencies, organizational culture, and organizational structure (Monsef, Khairuzaman, & Ismail, 2012; West & Bogers, 2014). Despite the increasing importance of open innovation, which recognizes that strong adoption mechanisms allow firms to profit from innovation, many organizations experience major challenges in actively managing these processes (Bogers & West, 2012). Only a few studies have looked at the underlying organizational mechanisms that facilitate customer involvement and considered how open innovation fits into a larger strategic scope (Candi et al., 2018; Foss, Laursen, & Pedersen, 2011; Mention et al., 2019). More research is necessary to help businesses on learning the ways they can influence output of open innovation activities; for instance, through design methods to attract the desired participants or to evoke the preferred behavior (Piller et al., 2012). Accordingly, more research is warranted on the way firms can integrate open innovation practices into a larger strategic management framework (Teece, 2020).

Social media use and innovation process

The exponential rise of the Internet and the convergence of social media like Facebook, Twitter, LinkedIn, and Instagram have contributed to the growing search of external sources of knowledge for innovation (Chesbrough, 2017; Roberts et al., 2016). In the first instance, the access to these rich sources of information has been facilitated by several factors, which include technology intelligence, online communities, crowdsourcing or broadcast search, and social platforms (e.g., blogs and virtual worlds; Dahlander & Wallin, 2006; Kaplan & Haenlein, 2010; Veugelers, Bury, & Viaene, 2010). More lately, artificial intelligence and social media analytics have started supporting the acquisition and exploitation of large social media data flows (Bharadwaj & Noble, 2017).

Social media are commonly referred to as "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and allow the creation and exchange of user-generated content (UGC)" (Kaplan & Haenlein, 2010). Yet, following the rapid evolution of these social tools, a more recent definition suggests social media represents the "online means of communication, conveyance, collaboration and cultivation among interconnected and interdependent networks of people, communities, and organizations enhanced by technological capabilities and mobility" (Tuten & Solomon, 2018, p. 4). This broader definition entails new aspects that reflect better the multifaceted nature of social media.

In an open innovation context, social media platforms can serve as tools facilitating intra- and interorganizational activities among different types of stakeholders (e.g., customers, peers, suppliers; Mangold & Faulds, 2009). Accordingly, social media represent a great input channel that allows firms to listen; to capture attitudes, perceptions, and behaviors; to get feedback; and to stimulate customer engagement (Lamberton & Stephen, 2016; Mangold & Faulds, 2009; Piller et al., 2012). Regardless of the numerous opportunities offered by social media, high reliance on external sources of input in NPD can also increase complexity, resulting in higher risks of failure (Heidenreich, Wittkowski, Handrich, & Falk, 2015). Likewise, the shift in power from firms to consumers has resulted in a potential lack of information control for organizations (Labrecque, vor dem Esche, Mathwick, Novak, & Hofacker, 2013; Leeflang et al., 2014; Mangold & Faulds, 2009). Additionally, social media can be distracting for teams (Marion et al., 2014) or lead to negative outcomes like a bad reputation and the spread of fake news (Baccarella, Wagner, Kietzmann, & McCarthy, 2018). Therefore, a social media strategy should intrinsically relate to the firm's corporate objectives (Candi et al., 2018; Effing & Spil, 2016; Kietzmann et al., 2011).

Existing findings suggest a need for guidance and careful selection of social media activities. Yet few studies have adopted an organizational perspective to examine social media use in innovation settings (Rindfleisch et al., 2020). A broad stream of research has focused on the consumer perspective, using social and behavioral theories (Felix, Rauschnabel, & Hinsch, 2017; Lamberton & Stephen, 2016). In contrast, more research is needed to complement current insights on resources, skills, and competences to manage social media efficiently (Aral, Dellarocas, & Godes, 2013; Felix et al., 2017; Mention et al., 2019; Roberts & Piller, 2016). This important gap has led us to our first research question.

The resource-based view of the firm and organizational capabilities

According to Wernerfelt (1984), resources and products are two sides of the same coin; products require the services of resources, and most resources can be used in products. The resource-based view (RBV) of the firm ties firm resources and capabilities to competitive advantage (Hart, 1995) and is rooted in the strategic management literature. Technological, human, financial, cultural, and structural resources are some examples of resources that can be considered firm specific (Chuang, 2004). A capability is the firm's capacity to perform a specific activity in a reliable and satisfactory manner. As such, it implies the following: (1) it is intended for a specific purpose (e.g., to manufacture computers); (2) it is performed through an activity (e.g., programming); and (3) the activity should produce a reliable and repeated performance (Helfat & Winter, 2011).

A firm's competitive advantage derives from the combination of resources and capabilities owned by the firm that are valuable, rare, imperfectly imitable, and not substitutable (Barney, Wright, & Ketchen, 2001). A common critique of the RBV is that it takes an internal perspective that assumes resources are heterogeneously distributed across firms, with resource differences persisting over time (Eisenhardt & Martin, 2000; Wernerfelt, 1984). Yet, in high velocity markets, few businesses meet all those criteria (Eisenhardt & Martin, 2000).

Similarly, the organizational capabilities' approach assumes that capabilities are a firm's ability to deploy its resources to sustain a competitive advantage (Grant, 1996). However, the average period in which firms are able to sustain their competitive advantage has decreased over time (Barreto, 2009). Hence, recent literature discussing dynamic capabilities has addressed this challenge by extending the RBV of the firm to dynamic markets, taking rapid and unpredictable change into account (Teece, Pisano & Shuen, 1997). A dynamic capability is defined as the "firm's potential to systematically solve problems formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base" (Barreto, 2009). Considering social media's intrinsic characteristics (i.e., high velocity and unpredictability), we employ a similar theoretical stance in our dissertation.

A nascent literature has started linking social media, open innovation, and organizational capabilities with some interesting observations. In highly turbulent environments, the effective use of information technology (IT) capabilities are found to be of the utmost importance for

supporting the use of social media by capturing real-time information (Pavlou & El Sawy, 2010). First, IT infrastructure, which is composed of computer hardware, software, and human resources, is considered to be a critical business resource (Barczak, Sultan, & Hultink, 2007). This IT infrastructure supports firms' exploration and exploitation activities when they innovate with social media (Benitez et al., 2018). Second, IT embeddedness, the "frequency to which IT has become an integral and assimilated part of the NPD process, is also a resource" (Reid, Hultink, Marion, & Barczak, 2016). IT-enabled platforms allow firms to involve multiple users in their NPD process (Zhang, Gupta, Sun, & Zou, 2019). As such, IT capabilities contribute to the creation of social media-based innovations through the harmonization of simultaneous collaborations (Saldanha, Mithas, & Krishnan, 2017).

Another capability perspective has gained attention in this context. Rooted in the knowledge-based view of the firm, knowledge capabilities have increasingly been employed by scholars to explain the acquisition, assimilation, and exploitation of external sources of information to create new sources of revenue (Grant, 1996; Rubera, Chandrasekaran, & Ordanini, 2016), and specifically the influence of social media use on absorptive capacity (ACAP) of NPD (Peltola & Mäkinen, 2014). It has been argued that social media have the potential to enhance absorptive capacity processes through a positive impact on socialization capability (i.e., connectedness and socialization tactics) and coordination capability (i.e., cross functionality and receptivity). These two capabilities are critical for the innovation process (Ooms et al., 2015).

At a lower level of analysis, microfoundations have received increasing attention in strategic management. One aim of microfoundations is to better understand the actions and interactions of lower level organizational members and their impact on firm-level performance (Foss & Lindenberg, 2013).

The microfoundations of routines and capabilities can also inform work on organizational and competitive heterogeneity, particularly by highlighting the connection between microlevel components such as individuals, social processes, and structure (Felin, Foss, Heimeriks, & Madsen, 2012). For instance, at the individual level, employees with analytical capabilities are valuable assets to manage social media platforms (Surbakti et al., 2020). The effects of such assets are amplified by social processes that encourage better internal cooperation between departments to improve firms' social media strategy (Leeflang et al., 2014). Connected to this,

a high level of process formalization facilitates decision-making related to both social media and NPD (Roberts et al., 2016).

In sum, the literature review offers insights regarding capabilities for the innovation process and social media management. However, current knowledge about capabilities for social media and NPD remains scarce and fragmented (Mention et al., 2019; Testa, Massa, Martini, & Appio, 2019). Our doctoral project aims to advance the research and enrich the theory in that management context.

Research philosophy: Epistemology

This dissertation follows a mixed method research design that combines different paradigms (Greene & Caracelli, 2003, p. 95). The chosen methodological approach stems from the complex nature of the studied phenomenon. In using this approach, we adopt a pragmatic stance to research endeavors by mixing qualitative and quantitative procedures. Pragmatism aims at understanding a research theme using all the methods at hand (Tillman, Clemence, & Stevens, 2011). In this perspective, greater understanding is gained by taking various paradigmatic approaches (Lewis & Grimes, 1999).

A pluralist posture rejects truth from one single reference. Human knowledge arises from different types of knowledge that are interrelated (Spender, 1998). Therefore, epistemological pluralism is recommended for interdisciplinary research where valuable knowledge sources coexist (Miller, Baird, Littlefield, & Kofinas, 2008).

In the first study, a qualitative inquiry is employed to explore social media use for NPD because little is known about the topic (Creswell, 1998). Following Gaston Bachelard's famous quote: "nothing is given, all is constructed," the first study uses a constructivist grounded theory. This standpoint is rooted in critical relativism that posits the existence of a "real" reality. In this ontological and epistemological view, the existence of an objective reality is rejected; instead, it is assumed that realities are socially constructed (Mills, Bonner, & Francis, 2006b). Based on this premise, the researcher is positioned centrally. Accordingly, they need to create a sense of reciprocity with participants and to clarify their position (Mills, Bonner, & Francis, 2006a).

The two following studies are anchored within (neo)positivism, a branch of positivism influenced by Popper's approach. Popper is known for the falsifiability principle, which implies that any scientific hypothesis should be inherently falsifiable. Hence in Popper's view, universal

truth does not exist, truth is only a conjecture called fallibilism. Consequently, theoretical pluralism is a necessity. It involves the coexistence of competitive theories that are *severely* tested empirically to let science evolve. As such, falsehoods get continuously challenged and eliminated (Maxwell, 2007).

The second study of this dissertation uses a deductive approach to systematically review the existing literature and build a research agenda. Accordingly, knowledge stemming from the study is the result of the application of methods that have not been refuted by repeated criticism or falsification (Popper, 1962). A focal goal of such a study is to advance science by paving the way for new research hypotheses. The third study aims at testing hypotheses empirically. This last study fits the positivist approach for several reasons. The relationships between respondents and the information they provide can be taken out of their natural context. Second, causality is inferred, as the causal hypotheses are derived from existing knowledge. Furthermore, Popper's falsifiability principle is followed by rejecting the null hypotheses.

The pluralist epistemological stance adopted throughout this dissertation has helped us to bridge the gap between theory and practice. This positioning is relevant in management contexts where organizations are viewed as the processes of value creation (Spender, 1998). Importantly, it has contributed to addressing our research questions. The constructivist stance taken in the first part of this dissertation has allowed us to understand social media use for innovation through a socially constructed approach. The deductive positivist part of the dissertation has enabled us to build a framework derived from multiple theoretical lenses and to test hypotheses empirically.

Dissertation outline and methods

The dissertation is based on three research projects that examine social media use for innovation with a focus on organizational capabilities. The methodological approach combines the use of different methods with an exploratory phase followed by a confirmatory one.

Chapter 2

The objective of our second chapter *is to investigate the use of social media for innovation in organizations and to delineate the specific capabilities required for social media use in the context of innovation*. Accordingly, we employ a discovery-oriented approach, which includes in-depth interviews with 26 experienced managers in western European countries and the United States to explore the topic. The outcomes of this first project are twofold. First, we

clarify the use of social media in the different stages of the innovation process. Second, we identify the specific capabilities related to social media in support of the innovation process. Lastly, we develop a maturity model based on the identified capabilities to assist firms in their deployment of social media capabilities for innovation.

Chapter 3

In the third chapter, *we seek to fill in a gap in the academic literature by critically synthesizing and conceptualizing current findings on social media use in an innovation context and by suggesting a research agenda for future research*. We draw on various streams of academic literature (general management, innovation management, marketing management, and information management) to capture all the relevant insights that have been published to date. Following a rigorous selection process, we systematically analyze 163 publications, from which we derive a conceptual framework that encompasses the external and internal factors, the contingencies, and the outcomes of social media use for innovation. A research agenda is derived from our findings.

Chapter 4

In the final project, we build on the previous findings by addressing two main research questions*: What are the capabilities through which social media use in NPD impacts NPD performance? How do these capabilities mediate the relationship between social media use and NPD performance?* We use the lens of dynamic capabilities to investigate these two research questions. We start by identifying and explaining two specific social media capabilities that address the complex nature of social media. The first one—social media analytical capability—extends findings from chapter 3 that shed light on the lack of research addressing big data management. Social media agility capability answers the need to continuously monitor and provide rapid feedback on social media, as underpinned in chapter 2. We posit that these two capabilities exert a mediating effect on the relationship between social media use and NPD performance. Next, a cross-sectional survey is conducted of 340 U.S. firms to test these hypotheses.

Table 1.1: Overview of Research Chapters

Project	Objective	Design	Level of analysis	Data	Research type
Study 1	*Investigate the use of social media for innovation within LSE's[1] and delineate the specific capabilities required for social media use in the context of innovation.*	Case studies	Firm level	26 in-depth interviews in 16 large-sized organizations, internal documents, and publicly accessible data (e.g., financial reports, social media platforms, etc.)	Abductive
Study 2	*Critically and systematically analyze existing research on social media and innovation. Set agenda for future research.*	Systematic literature review	Firm, project, and individual levels	163 academic papers from various research streams (innovation, marketing, general management, and information management)	Deductive
Study 3	*Identify and examine the mediating effects of two organizational capabilities on NPD performance.*	Cross-sectional survey	Firm and project levels	Cross-sectional survey conducted with 340 U.S. firms	Deductive

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[1] Large scale enterprise

Chapter 2

The value of social media for innovation:

A capability perspective

Conferences:

Muninger M. I., Hammedi W., Mahr D., (2016), Conceptualizing the Integration of Social Media in innovation. Talk presented at the 23rd Innovation and Product Management Conference, University of Strathclyde, Glasgow. June 12-14, 2016.

Muninger M. I., Hammedi W., Mahr D., (2016), The value of social media for innovation: A capability perspective. Talk presented at the 5th Belgian Service Research Day, University of Namur, Namur. April 27, 2018.

Publication:

Muninger, M. I., Hammedi, W., & Mahr, D. (2019). The value of social media for innovation: A capability perspective, *Journal of Business Research* 95 (2019) 116-127

Abstract

Firms increasingly employ social media for innovation, yet current literature offers little guidance for developing their strategic uses. This study applies a qualitative, theory-building approach to derive a conceptual framework of the capabilities that allow companies to benefit by using social media throughout their innovation processes. This framework, designed to support applications of social media for innovation, sheds light on three key capabilities and related resources: social media managers who orchestrate social media activities across the innovation process; top management that cultivates support, team empowerment, and test-and-learn cycles; and agile processes that facilitate rapid decision making and knowledge flows across teams. This article enriches organizational capability theory as it pertains to innovation, and it provides managers with guidance for implementing social media strategies in practice.

Keywords*: social media, innovation process, capabilities, value creation*

Introduction

The proliferation of social media platforms coincides with the expanding open innovation paradigm, in which firms integrate new ideas and feedback from various internal and external sources (Lee, Olson, & Trimi, 2012). In the quest to gain new insights and acquire additional knowledge, firms open their value creation processes and collaborate with various stakeholders, including customers, suppliers, and employees (Felix et al., 2017; Kazadi, Lievens, & Mahr, 2016). In addition, a recent survey confirms that 82% of companies use social media to enhance their innovation processes (Roberts & Piller, 2016), benefitting from user-generated content and social networks that reflect customers' preferences (Fjeldstad, Snow, Miles, & Lettl, 2012). As a good case in point, "Threadless.com" offers a full lineup of apparel, accessories, home decor, and footwear, based on thousands of designs submitted and voted on by its online community. Similarly, the My Starbucks idea platform has produced more than 300 ideas from the online community that the company subsequently has implemented.

Social media in turn might benefit the different stages of the innovation process uniquely. Firms might create crowdsourcing platforms to gather ideas in the ideation stage (e.g., Innocentive[2]), use toolkits to enhance product designs in the development stage (e.g., Nike[3]), or rely on virtual product testing (e.g., Ipsos[4]) in the launch phase (Dahlander & Wallin, 2006). Yet understanding of the best ways to leverage social media across these various stages remains limited, fragmented, and mostly anecdotal (Bashir, Papamichail, & Malik, 2017; Roberts & Piller, 2016). Systematic insights are needed to help organizations maneuver the shift toward individual and networked customers, which is inherent to social media (Labrecque et al., 2013). For example, companies must establish conditions and incentive schemes to empower customers to co-create products or help launch them as brand ambassadors. They also need to address the risks of proactive involvement through social media, including coordination mechanisms and control considerations, which becomes particularly difficult when we note the convoluted nature of both platforms and firms today.

In particular, social media platforms are highly interactive, with specific functionalities, and they evolve quickly and without control over their empowered users (Peters, Chen, Kaplan,

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[2] https://www.innocentive.com/

[3] https://www.nike.com/us/en_us/c/nikeid

[4] https://www.ipsos.com/en-us/product-testing

Ognibeni, & Pauwels, 2013). Firms require careful orchestration of their digital resources, processes, and competencies to guide social media practices (Fichman, Dos Santos, & Zheng, 2014), especially for the innovation process that demands a strict series of actions, including stage-by-stage approval, long development cycles, regular measures of key factors (e.g., money, time), and strong governance (Cooper, 2008). Each stage of the innovation process also pertains to different web techniques (e.g., online contests for idea generation, virtual product testing for development, user sponsorship for launch) and distinct stakeholders. Therefore, firms need different capabilities to cope with these particularities and ensure effective, efficient innovation processes.

Considering the lack of systematic, theoretically based explanations of which capabilities should be created and how they should be managed in the particular context of innovation processes (D. L. Roberts & Candi, 2014), research is needed to clarify the benefits sought by firms when they use social media in the different stages of their innovation processes and the organizational capabilities they need to achieve effective uses of this tool. Accordingly, this study complements previous investigations of social media management (Bianchi & Andrews, 2015; Felix et al., 2017; Kietzmann et al., 2011) by focusing on specific capabilities required by the innovation process. In turn, it contributes to marketing and innovation management literature in three main ways. First, this research delineates the objectives that firms pursue when they use social media in each step of the innovation process and thus identifies specific capabilities underpinning these goals, including key capabilities associated with social media and platforms' particularities. Second, to extend recent findings by Felix et al. (2017) that address strategic uses of social media, this study provides a rich, comprehensive framework of organizational capabilities at strategic and operational levels, applied specifically to the innovation process. Third, this research offers a nuanced picture of required social media capabilities and organizes them in a three-stage model of maturity levels. The associated comparison of firms with distinct social media and innovation proficiency provides managers with guides for assessing their own practices and prioritizing their social media investments. Taken together, these exploratory findings offer theoretical insights into the way firms should leverage social media tools throughout the innovation process, which in turn can help managers set up their own social media strategies to support innovation.

Theoretical framework

Social media in the innovation process

Social media are highly interactive platforms that allow individual users and communities to share, co-create, discuss, and modify user-generated content (Piller et al., 2012). Spanning channels such as blogs (e.g., Huffpost), microblogs (e.g., Twitter), social networking sites (e.g., Facebook, LinkedIn), and collaborative platforms (e.g., user forums, Wikipedia) (Roberts et al., 2016), social media have radically changed the way organizations and their employees interact, both within and outside company boundaries, by providing a wider range of interaction opportunities (Aral, Dellarocas, & Godes, 2013). They also represent a tremendous source of data and business intelligence, in the form of market insights and customer feedback, that can inform different stages of innovation processes (Roberts et al., 2016). In particular, social media use in innovation processes might be proactive (e.g., online contests, word-of-mouth campaigns) or reactive (e.g., monitoring, data mining), according to the stages to which it applies (Culnan, Mchugh, & Zubillaga, 2010).

Traditionally, the innovation process is driven by the firm and consists of different stages from ideation to product launch. In the ideation stage, firms leverage social media to increase inputs from consumers, with significantly less costs than are required by traditional methods (Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010). For example, netnography applies anthropological research to the Internet and can capture attitudes, perceptions, and behaviors (Kozinets, 2002; Piller et al., 2012), so it effectively gathers innovative ideas and solutions by listening in on users' conversations on social media. Using netnography, Beiersdorf gathered insights shared by online users to learn that they wanted an antiperspirant that would not leave stains on clothes, leading to the innovation of its Nivea Black & White deodorant (Bilgram, Bartl, & Biel, 2011). Text and data mining offer alternative means to collect market insights without actively involving users, because they extract innovation-related information from unstructured text or data (Christensen, Nørskov, Frederiksen, & Scholderer, 2017). These data are rich and often contain additional information, such as tags that indicate users' profiles and location (Moe & Schweidel, 2017).

In contrast, online contests and crowdsourcing involve active participation by stakeholders who offer innovative ideas in response to requests from the firm. Among its many online contests,

American Express launched the "YourBuzz[5]" application that consolidates customers' feedback from CitySearch, Yelp, Facebook, Twitter, and other popular websites. In crowdsourcing communities, multidirectional exchanges of comments include customers, their peers, and the firm (Chan, Li & Zhu, 2015). Although it initially was designed to be a contest platform just for students, the Dell Social Innovation Challenge has grown into one of the most famous crowdsourcing sites, with thousands of ideas submitted by members and non-members of the community each year. Such contests and crowdsourcing efforts also can be supplemented by monetary or non-monetary rewards.

During the development stage, project wikis and shared collaboration spaces also might encourage concepts, prototypes, and evaluations, because they facilitate interactions and information sharing across innovation teams (Marion et al., 2014). With these tools, firms can develop design toolkits and apply them creatively to product design (Cui & Wu, 2015). For example, BMW-Mini's website supports online customization, and then users' designs can be shared with peers through social media to gather feedback (Piller et al., 2012). However, few studies consider social media uses during the development phase; instead, it appears that many firms tend to rely more on internal platforms and closed networks for this stage (Marion et al., 2014).

In the launch stage, awareness is key (Hoyer et al., 2010); it might be created by releasing information to online communities to reach mass markets (Dahlander & Wallin, 2006). Kim and Hanssens (2017) suggest that investing in blogging activities during the pre-launch phase is more effective than traditional advertising in terms of prompting consumers to search for new products and evoking viral effects. After the launch, social media also grant companies access to further feedback, strengthening the sense of community and enhancing customer engagement with the brand or its products (Mangold & Faulds, 2009). For example, Audible[6] offers more than 180,000 audio books, and by employing word-of-mouth advertising and social media marketing campaigns, it created partnerships with influential YouTube contributors to increase other customers' awareness of and engagement with its offerings.

However, for these objectives to be realized, firms must use social media strategically, with the support of their unique capabilities. In particular, firms must acquire value-creation and value-

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[5] https://yourbuzz.com.cutestat.com/

[6] https://www.audible.com/

appropriation capabilities (Mizik & Jacobson, 2003). We argue that organizational capabilities, the cornerstone of any effective strategy, facilitate the creation and capture of value, as is central to strategic management (Bowman & Ambrosini, 2000).

Organizational capabilities for social media use in innovation processes

Marketing, innovation, and general management research identify key resources and capabilities that may help firms leverage social media during their innovation process, according to the specific features of social media and innovation. First, resources represent the firms' ability to conceive of and implement strategies (Porter, 1981). Tiago and Veríssimo (2014) argue that financial resources can facilitate interactions with customers, provided enough time and human capital are dedicated to developing web-based or mobile applications. Digital infrastructures that support the collection, processing, distribution, and use of information also allow for (re)combinations of digital and physical components to produce new products and services (Barrett, Davidson, Prabhu, & Vargo, 2015).

Second, knowledge capabilities are essential to support the innovation process and firm strategy. The way firms acquire, develop, and use new knowledge determines innovation outcomes, such as superior performance or cost efficiency (Grant, 1996). According to Nguyen, Yu, Melewar, and Chen (2015), knowledge gleaned from social media results from experience, which facilitates optimal learning behaviors. However, to leverage this accumulated experience, firms require organizational routines to support the development and dissemination of ideas.

Third, with innumerable platforms, social media create complexity for information gathering. Firms that seek to be market oriented and customer centric need market-based capabilities to capture customers' latent needs and improve their market learning (Day, 2011; Kazadi et al., 2016). In addition, technologies that support customer interactions through social networks can enhance firms' customer centricity (Westerman, Bonnet, & McAfee, 2014).

Fourth, both innovation and social media are characterized by networks of people who interact (Piller et al., 2012; Tushman, 1977). Network capabilities should produce innovation networks that connect resources, knowledge, and capabilities; these networks then can establish unique knowledge through collaborations with various stakeholders (Kazadi et al., 2016; Perks & Moxey, 2011). These network capabilities also can be used to frame inbound (e.g., combining marketing and innovation activities across functional units to match the firm's overarching

strategy) and outbound (e.g., reciprocal interactions of the firm and multiple stakeholders to mobilize skills) integration efforts (Felix et al., 2017; Westerman et al., 2014).

In summary, various capabilities may apply to the use of social media to support innovation processes. However, a holistic framework that specifies and details these various uses is missing. In particular, the shift by which users transformed from passive readers into active contributors (Labrecque et al., 2013) has disrupted their roles in every phase of the innovation process, creating both challenges and opportunities. Firms traditionally have sought to develop capabilities like sensing, learning, integration and coordinating (Pavlou & El Sawy, 2011) to capture customer preferences and thus create value (e.g., with market research). Through social media though, single users or communities can express their preferences in various ways (e.g., posting content as text, pictures, or videos). All these varied sources of value creation can benefit the innovation process, but firms need strong competences to be able to identify, interpret, and use the relevant information.

Method and procedure

The preceding literature review indicates the limited and fragmented state of knowledge about using social media in innovation processes. Therefore, this study adopts a discovery-oriented research approach to capture important meanings and motivations (Wells, 1993), pertaining to how the innovation process gets organized, how firms leverage social media in different stages of the innovation process, which benefits accrue from using social media in the innovation process, and what capabilities firms put in place to leverage social media for their innovation. Gathering such insights demands qualitative research, which can offer in-depth understanding of the subject, rather than a quantitative study focused on statistical generalizability (Patton, 1990).

Research design and data collection

This study features a three-stage process: (1) select large organizations active in innovation and with a social media presence, (2) interview experienced senior managers from different departments who are directly involved in the use of social media and/or the innovation process or who have a holistic perspective, and (3) collect extensive secondary data in the form of written documents and oral exchanges with internal and external sources of information to supplement the interviews. For the selection of both companies and managers, this study combines *purposeful sampling* (Patton, 1990) with *theoretical sampling* (Charmaz, 2006), to

test for boundary conditions and ensure the overall validity of the results (Busse, Kach, & Wagner, 2017). Purposeful sampling identifies respondents who can generate information-rich data and contribute to an in-depth understanding of current practices and major concerns related to using social media in the innovation process. Theoretical sampling, introduced in a later phase, supports theory development on the basis of the preliminary categories. It ensures the elaboration and refinement of the emerging categories, by moving back and forth between the categories and the data (Charmaz, 2006).

To start, the authors prioritized large companies, which tend to display more efficient processes (Ketchen, Ireland, & Snow, 2007), greater financial and organizational resources (van de Vrande, de Jong, Vanhaverbeke, & de Rochemont, 2009), and capabilities that do not rely on single individuals (Teece, 2012). Such companies should be more likely to identify social media integration as a business priority and commit resources to it. The chosen companies also exhibited both similarities (e.g., active in media and communication) and notable differences in their business activities and internal structures (e.g., audit and consulting vs. packaged goods vs. pharmaceutical vs. logistics). This sample ensures a more detailed identification of pertinent factors (Curtis, Gesler, Smith, & Washburn, 2000). To identify innovative organizations active on social media, the first screening focused on their innovation activity (e.g., number of launches, upcoming innovation projects, crowdsourcing initiatives) and innovation or R&D investments. The next step analyzed their social media presence on Facebook, LinkedIn, Twitter, YouTube, Instagram, Snapchat, WhatsApp, and Pinterest, measuring both the type and amount of content created and the number of followers on each platform.[7] The resulting representative, bounded sample, as detailed in Figure 2.1, provides generalizable results (Busse et al., 2017).

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[7] Details are available on request.

High

Social media activity

Fast Move

Best TV   Cool Drinks
                                 Everyday Snacks

News One
                        Easy Call

                                        3D Print

Miam
              Brains&More
                                Fast Post   **Innovation activity**

Low   *High*
                  Elec Supply

Crea Corp.   Connect & Co   X-Health

                                        Hygiene First

                  Coffe Co

Low
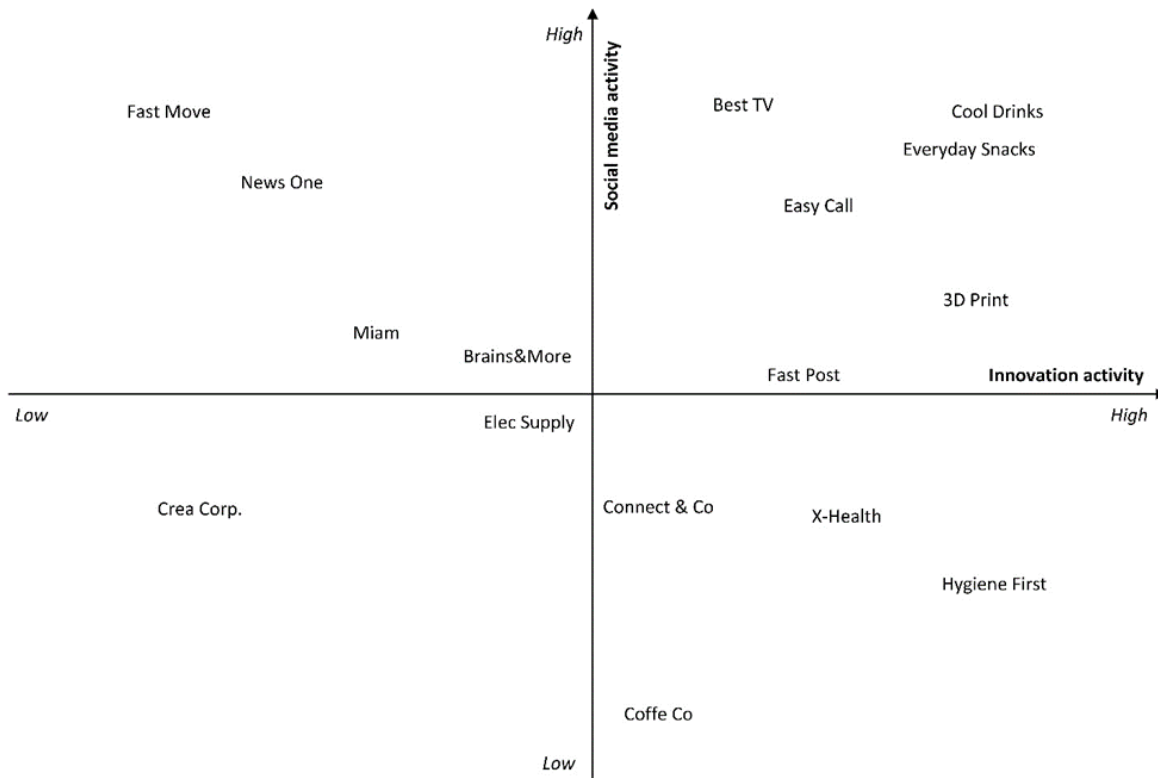
Figure 2.1: Typology of firms based on their innovation and social media activities

Within these relevant companies, experienced managers from various departments (e.g., digital, marketing, innovation, general management) participated in in-depth, face-to-face interviews. The selection criterion for these managers was their ability to take a holistic view of both internal innovation processes and social media activities. The data collection, which took place from January 2016 to December 2017, involved participants from Western Europe and the United States, as listed in Table 1 Semi-structured interview guides framed the data collection; the interviews thus included theory-driven, proposition-directed questions (Patton, 1990) and sought to make the respondents' implicit knowledge more explicit (Flick, 2009). The interviews started with general questions about the companies' innovation process and social media use (e.g., "What can you tell me about your innovation process? What are the different steps involved in your innovation process? Is there a step of the innovation process in which you use social media?"). Next, the interviewer zoomed in on specific social media uses and the capabilities needed to manage them (e.g., human and financial resources, CEO's actions, frequency of meetings, interactions of different teams). The interview questions also evolved with the progression of the research, according to informants' feedback (Gioia, Corley, & Hamilton, 2013). For example, the last round of interviews focused on capabilities mentioned by previous informants. The interviews lasted 60–120 minutes on average and were audio-

recorded for transcription (205 pages). When necessary, follow-up telephone calls and emails confirmed the interview information. Finally, the interviews reached saturation; additional data no longer sparked new theoretical insights that could lead to the creation of new categories (Charmaz, 2006).

As Eisenhardt and Graebner (2007) recommend, secondary data support the interview data, including internal reports related to social media and innovation, observations within the companies, information from the web and social media platforms, newspaper articles, and informal conversations with members of those companies. More than 100 documents complement and corroborate the information obtained through the interviews.

Table 2.1: Sample

	Company	Company Description and Turnover	Job Title	Function	Age (Gender)
1	Cool Drinks	Worldwide leader in beverage – $46 MM	Digital activation manager	Manager and owner of social media strategy. Coordinates social media activities with marketing & innovation departments.	30-35 (F)
2	Everyday snacks	Worldwide leader in snacks & beverage – €66,5MM	Senior digital manager	Manager of social media strategy. Coordinates social media activities with marketing & innovation departments.	30-35 (M)
			Marketing Manager	Manager of different brands' marketing mix (incl. innovation strategy)	25-30 (F)
3	Coffe Co	Global leader in hot beverage - €5MM	Marketing manager	Manager of different brands' marketing mix (incl. innovation strategy).	35-40 (M)
			Marketing manager	Manager of different brands' marketing mix (incl. innovation strategy).	30-35 (F)
4	Fast Post	Worldwide leader in logistics - €55 MM	Head of marketing	In charge of the division's marketing strategy (incl. innovations).	40-45 (M)
			Innovation manager	Innovation manager at HQ who also coordinates with marketing teams.	35-40 (F)
5	Best TV	National leader in telecommunications - 334M€	Digital manager	Works on web creation team in charge of innovative projects.	30-35 (F)
			Digital coordinator	Coordinates innovation projects from a digital perspective with different teams.	25-30 (F)
6	Hygiene First	Worldwide leader in health and hygiene products – £9MM	General manager	Head of the business; involved in all strategic meetings related to innovation and marketing strategies.	35-40 (M)
			Associate director innovation	Works on innovation plans at HQ and with local teams on marketing plans for introducing innovations	30-35 (M)
7	Brains & More	Global leader in audit, advisory and tax services – $25MM	Marketing and Brand manager	In charge of communication and social media management, including internal crowdsourcing projects.	30-35 (F)
			Partner & attorney	Head of indirect taxes department. In charge of department's strategy (incl. innovation plans).	45-50 (M)
8	Fast Move	National transportation leader - €267M	Social media editor	In charge of the communication on all social media platforms. Coordinates social media projects with other teams.	30-35 (F)
			Digital manager	Coordinates social media at the strategic level.	35-40 (M)
9	X-Health	Worldwide leader in pharmaceuticals - £23MM	Head of innovation	Responsible for strategic marketing: launch of new products; pipeline strategy; innovation management.	40-45 (M)
10	Crea Corp.	Subsidiary of worldwide communication agency - £12 MM	General manager	Responsible for the implementation of initiatives to drive the strategic direction of the agency. Strong focus on digital.	40-45 (F)
11	Easy call	Worldwide leader in logistics - €55 MM	Manager of service channel strategy & social business	In charge of the development and implementation of organization-wide omnichannel service strategy and of service transformation initiatives.	40-45 (M)

12	News One	National newsgroup leader - €59M	Product marketer & social media manager	In charge of the online visibility of the brand and responsible for all social media platforms.	30-35 (F)
			Brand Digital Strategy manager	Responsible for different digital fields such as online strategy, digital transformation, service design, and social media.	35-40 (M)
13	Elec supply	Global energy player - €75MM	Digital communication manager	In charge of digital communication: social media, digital campaigns, and content marketing.	40-45 (M)
			Head of innovation and business development	In charge of innovation projects and business development.	40-45 (M)
14	3D Print	Leader in 3D printing – €102M	Digital marketing manager	Responsible for digital strategy: marketing channels, content strategy and social media.	25-30 (M)
15	Connect & Co	Leader in telecommunications - €73MM	Head of innovation	In charge of seeking and developing innovative services that enable cloud delivery models for enterprises, carriers and content service providers,	35-40 (F)
16	Miam	Global leader in food - €30MM	Marketing manager	Manager of different brands' marketing mix (incl. Innovation strategy).	35-40 (M)
			Product owner & community manager	Responsible for internal governance, policy of customer communication; community engagement and innovation around social media channels.	35-40 (M)

Note: The firm names are disguised, to ensure the anonymity of the informants.

Data analysis, validity and reliability

Several steps ensure the trustworthiness of the analysis. First, a rigorous audit trail applied to the data. All material was carefully recorded, including interview transcripts, observations, analytical memos, and secondary data, to confirm the interpretations needed for the qualitative content analysis (Miles & Huberman, 1994). Second, all the material was entered into NVivo11 software that performed the systematic analysis (Bandara, Furtmueller, Gorbacheva, Miskon, & Beekhuyzen, 2015) to facilitate understanding of the findings

Table 2.2: Coding categories

Metacategory	Category	#Sources	#Quotations
Objectives	Active knowledge acquisition	23	67
	Passive knowledge acquisition	22	84
	Co-creation	12	32
	Test of concepts & prototypes	15	53
	Communication	26	208
	Engagement	20	87
	Feedback	19	60
Resources	Budget allocation	20	41
	Time allocation	19	47
	Digital infrastructure	21	59
	Social media manager	16	35
	Operational team	17	31
	Strategic team	22	42
Competences	Knowledge management	23	83
	Top management understanding	21	69
	Networking & collaboration	25	119
Processes	Flexible processes	25	115
	Structured processes	24	104

The NVivo database supported searches, improving the coding and classification of the data as themes and patterns emerged. Third, the author team adopted an insider/outsider coding method (Gioia et al., 2013). An "insider" author, who worked in the field, coded the data, then two other authors, who had not worked in the field, acted as "outsiders" by reviewing and criticizing the schema during the coding process. Collective discussions and weekly meetings ensured team alignment. The data analysis procedures also were based on grounded theory, which involves the simultaneous collection and analysis of data to facilitate comparisons of theory and data (Strauss & Corbin, 1994; Wünderlich, Wangenheim, & Bitner, 2013), together with systematic

combining, to enable the interpretation and theorization of the data (Dubois & Gadde, 2002). Table 2.2 summarizes these coding categories.

Starting with an inductive approach, the initial coding established codes on the basis of the information provided by informants (Strauss & Corbin, 1994). This open coding produced 122 first-order topics, addressing both social media use and the capabilities required for it. For example, a respondent's explanation that "being on LinkedIn was a way for me to find information and to know what was going to happen" prompted a "social listening" code, whereas "Our CEO was also into customer experience…. He's really in favor of social media, he's a big endorser" was coded as "top management endorsement." Then the theorizing evolved from inductive to abductive, with a cycle of iteration between the data and prior literature (Dubois & Gadde, 2002). The aim was to identify similarities and differences in the long list of first-order topics (Strauss & Corbin, 1994). Following several iterations, it was possible to combine the first-order topics into fewer, theoretically meaningful, second-order categories (e.g., social listening, look-alike searches, big data analysis, and data mining were grouped into a "passive knowledge acquisition" category). In total 1,336 quotations were related to 18 second-order categories. In a final step, we classified the latter into four metacategories: objectives, resources, competencies, and processes. For example, communication (208 quotations), co-creation (32 quotations), and passive knowledge acquisition (84 quotations) were classified under the meta-category "objectives."

Multiple assessments indicated the validity and reliability of the data. First, the face-to-face interviews, conducted in the respondents' own environment, produced meaningful, consistent perceptions of real-life situations (Wünderlich et al., 2013). Second, the secondary data provided triangulation (Decrop, 1999) and enhanced quality control by affirming the transparency, trustworthiness, and credibility of the interviews (Andrews, Higgins, Andrews, & Lalor, 2012). Third, debriefing sessions at each phase of the coding process involved two peers familiar with the phenomena being explored, who challenged assumptions and interpretations (Creswell & Miller, 2000). Moreover, the author who initially coded the data fully recoded them three months after the end of the research. The intra-rater reliability, calculated in NVivo using Cohen's (1960) Kappa coefficient, reached .887, above the cutoff point of 80% recommended by Neuendorf, (2016). Fourth, once the data had been recoded by one of the authors, we measured intercoder reliability by asking an independent researcher to code the data to categories and we obtained a high percent agreement of 0.94. This value can be considered as good because it's based on nominal variables (Lombard, Snyder-duch, &

Bracken, 2002) and it is higher than the suggested minimum of 0.8. Lastly, the use of multiple sources of information and interpreters increased the overall quality of the study (Strauss & Corbin, 1994).

Results

Objectives of social media use during the innovation process

Table 2.3 displays the seven main objectives that firms seek to achieve by using social media during their innovation processes. These objectives are categorized by their internal or external nature. For example, high-tech companies tend to rely on internal social media at the innovation front-end, with the justification that they cannot find highly specialized expertise outside their ranks. Low-tech companies instead show more openness to all types of social media throughout the innovation process.

Front-end

Two goals appear mainly in the front-end of the innovation process, related to knowledge acquisition. Veugelers, Bury, and Viaene (2010) find that social media facilitate crowdsourcing and searches for technological intelligence. Similarly, the current results indicate that firms seek knowledge actively from internal and external platforms, mainly in the form of new ideas. These ideas can be obtained through social listening or by explicitly involving users. Companies that deal with complex products and services tend to rely on internal platforms, especially in the front-end of the innovation process. Input from beyond company boundaries also can be sought; some managers reported that they seek external experts or universities through social media such as Facebook or LinkedIn, though they manage their input through internal social media platforms. They also report using social media as a secondary data source, to gather insights through data mining, look-alike searches, and profile hunting. The informants regard such techniques as significant opportunities to acquire deep knowledge about users, especially if the data come from external social media platforms like Facebook or LinkedIn. Still, most informants indicate that they use these data with caution, citing confidentiality and other potential ethical issues related to big data.

Development phase

Social media also enable brand or product co-creation in the development phase. Informants expressed enthusiasm about creating with customers in general or specific targets, such as experts with unique skills to act as co-creators. These companies also use contests and

gamification to encourage co-creation. Moreover, they rely on these sources to pretest their product prototypes, advertising boards, or television spots before launch, whether they turn to mass audiences through Facebook or blogs or targeted users in communities. For example, Cool Drinks targets designers and invites them to participate in internal prototype workshops. Hoyer et al. (2010) identify differences across consumer knowledge sources as input for innovation; the current findings similarly suggest that particular users, such as brand ambassadors active on social media, can enhance the innovation process because they understand the "brand DNA" better than other users and value consistency in innovation activities.

Commercialization phase

A critical goal, according to the respondents, is to communicate with target users, usually to announce new products or services. Managers prefer to communicate through social media to encourage innovation diffusion, because they can access masses of users at lower costs and potentially initiate viral marketing through word-of-mouth campaigns." Furthermore, managers frequently identified content as a key factor for effective communication, but for content to be noticed, firms had to adopt creative approaches (e.g., contests, videos, humor) that would lead to user engagement (Ashley & Tuten, 2015). The selection of an appropriate platform also helped firms position their content for targets. For example, Pinterest and Instagram often feature visual content that appeals to women and designers; videos on Snapchat, YouTube, and Periscope reach children and teens better. Finally, companies rely on external social media to obtain feedback about specific concerns at different stages of the innovation process (e.g., testing a prototype, after launch). Companies receive feedback in several forms: active listening, posting, and live conversations through various channels such as Facebook, blogs (post-launch), or internally managed social media platforms. Because post-launch feedback is useful for supporting future innovation initiatives, the implementation of iteration cycles appears critical.

Table 2.3: Objectives of social media use during the innovation process

Social Media Use	Exemplary Quotations	Stage of Innovation Process	Methods
1. Active knowledge acquisition	"To acquire knowledge in the frame of a new project, we organize hackathons with our beta testers, who in turn submit challenges and ideas to test amongst their own communities." Digital communication manager, Elec Supply "We have no idea about the type of 3D printing material that people really want, and so one thing is a survey to our existing clients, but we also did that on Facebook, asking people what type of material they wanted us to print." Digital marketing manager, 3D Print	Ideation	Hackathons Crowdsourcing Contests Lead-user method Gamification
2. Passive knowledge acquisition	"We have developed our own social network, which is a tool of collective intelligence. I use it as a tool of knowledge management within the company." Head of Innovation, X-Health "All these data, it is a goldmine, something incredible! There, we really see how a company like Facebook is powerful." General manager, Crea Corp.	Ideation	Netnography Data mining Text mining Social listening Profile hunting
3. Co-creation	"Because the external market is not inspired by topics revolving around energy, they created the 'go for service,' a type of start-up within the organization, where the aim is to co-create internally with the use of more agile processes." Digital communication manager, Elec Supply "We currently have co-creation projects: we recruit our consumers through social networks to create new designs that we then publish online." Digital activation manager, Cool Drinks	Ideation & Development	All methods of the table
4. Test of concepts & prototypes	"We started using customers to fine tune things and to test them, so we use customers in the test phase." Manager of service channel strategy & social business, Easy Call "We have a team in charge of innovation, it is a lab of innovation and creativity, and they use Facebook amongst others to make tests on things they are developing." General manager, Crea Corp.	Development	Design toolkits IT collaborative tools (cloud-based file sharing, wikis) Virtual product testing
5. Communication	"For one of our range, we have a new style; in a couple of days, we are going to use SM to spread the news." Digital activation manager, Cool Drinks	Launch	Blogging Vlogging Viral marketing User sponsorship Brand ambassadors
6. Engagement	"We also post communications and post blog posts. It is more about engagement, but the traffic is not mind blowing." Digital marketing manager, 3D Print	Post-launch	
7. Feedback	"We invited our customers to give their opinion." Manager of service channel strategy & social business, Easy Call "It is getting reactions from the consumers: see what they like, what they say and keep it at the top of our mind." Senior digital manager, Everyday Snacks	Throughout innovation process	Active listening Posting Live conversations +All methods of the table

Capabilities for social media use in the innovation process

Figure 2.2 illustrates the framework of the social media capabilities comprising resources, competencies, and processes. First, key resources are represented by the social media teams at both operational and strategic levels and by the social media manager, who coordinates communication and decisions across different teams within the company. Resources also encompass the digital infrastructure required for effective social media use by the different teams. Second, competencies entail a series of interrelated skills, namely, knowledge management, top management understanding, and networking and collaboration. Third, resources and competencies are embedded by two types of processes that constitute iterative cycles. Because the innovation process is complex, it requires both flexible processes such as a fast decision making and structured processes such as formal, regular meetings.
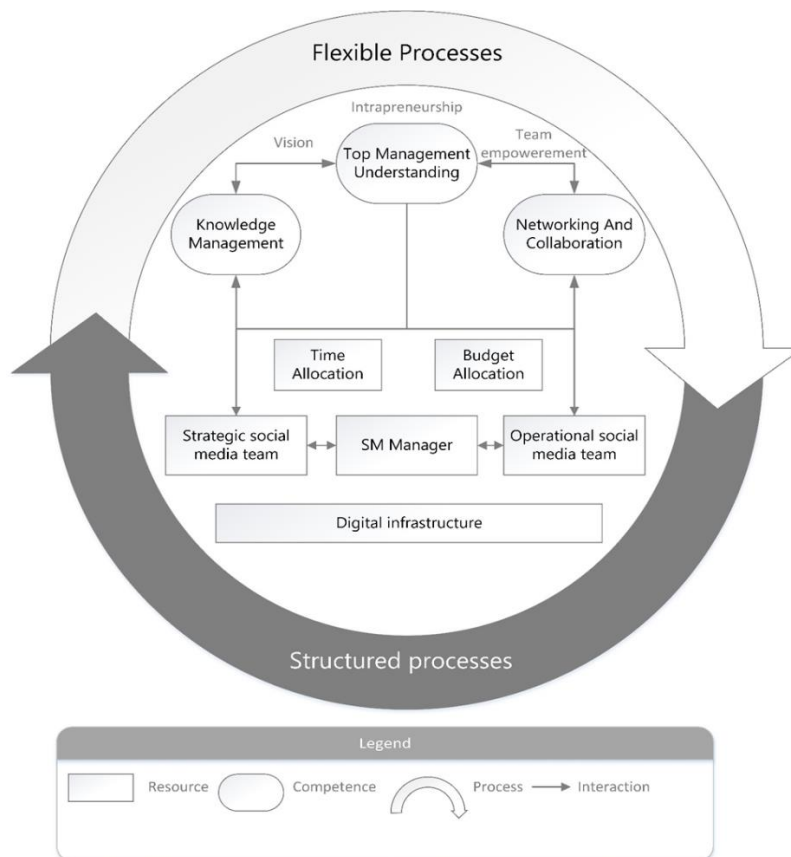
Figure 2.2: Framework of key capabilities for social media use in the innovation process

Resource combination for social media use in the innovation process

Operational and strategic social media teams

Skilled human resources dedicated to social media management are required to obtain positive outcomes from social media use (Effing & Spil, 2016). They involve both internal and external (e.g., media agencies) resources. Internal human resources refer to the operational or strategic level. At the operational level, informants cite "web-care teams" (or "consumer care teams") that take care of day-to-day interactions on social networking sites. They appear useful for gathering knowledge, insights, and feedback from social media users. Interactions between the operational team and social media users produce useful data that may be leveraged for innovation. As the social media editor at Fast Move states:

> *We receive complaints and suggestions every day through social media (e.g., Facebook or Twitter). I remember a suggestion that was reported by the web-care team. A guy had thought about a "beep system" that would make a different sound according to the number of fares left. It was something we had never thought about here internally, and we decided to implement the idea. The idea came through in September, and by December, it was implemented.*

At the strategic level, a social media team (which sometimes consists of one person) is in charge of creating annual plans and coordinating with other departments.

Social Media Manager with skills to orchestrate social media activities

The social media manager, often considered the point of contact between the social media team and other departments, is crucial for the deployment of social media activities and must exhibit certain traits. In particular, the social media manager's age appears related to her or his knowledge of existing platforms. Informants from Generation Y (born after 1981; Brosdahl & Carpenter, 2011) demonstrate deep understanding of the various platforms and their functionalities, as well as enthusiasm for testing and learning from them. Some are quite passionate about social media and use them for personal projects too:

> *All the collaborators here have been hired based on their dynamism, their capacity to surpass themselves and to suggest projects. For instance, we have this new podcast show called "All for women": it discusses all types of matters women are interested*

> *in…. This show comes from one of our collaborators who is passionate about podcasts and who creates them outside work. (digital coordinator, Best TV)*

They also act as consultants at several managerial levels within the firm, such as using cogent arguments to get top managers on board. Past professional experience in a media agency serves as another indicator of these managers' available resources. Informants with such a profile acknowledge that they leverage their past experiences in their new positions, and other respondents spontaneously cite those characteristics. This background appears to enhance social media practices in several ways, including more creative approaches and social media expertise, as well as stronger communication skills that facilitate collaboration with multiple stakeholders. These skills help build community engagement.

Digital infrastructure, time and budget allocation

According to the informants, the digital infrastructure also is a pre-condition of the effective use of social media for any innovation. The features and functionalities provided by innovation platforms are important elements. For example, X-Health created two internally managed innovation platforms to gather new ideas and knowledge: one shared with internal employees and a partner university, and another shared with internal employees only. These two platforms get continuously updated with renewed content to encourage participation, and employees receive continuous training to reflect any changes to the platforms. Time and budget allocations for social media activities instead pose major challenges for the surveyed firms. In many organizations, social media management gets allocated according to employees' own interests and other business priorities.

Despite the growing monetization of platforms such as Facebook, almost all the surveyed organizations spend less than 10% of their total marketing or innovation budget on social media. More than half of the informants indicated their willingness to intensify their social media activities at the moment they obtain accurate measurements about the returns on their investment.

Skills and competencies for social media use in the innovation process

Knowledge Management

The data reveal that for many organizations, knowledge about social media tools is spread across people and departments, so social media managers or external agencies still function as experts. All the surveyed organizations work with external agencies for their social media

projects, but only a few informants reported meeting with digital agencies regularly to discuss strategic guidelines, implementation, and follow-up. In addition, knowledge sharing enables collaboration for innovation (Satish Nambisan, Lyytinen, Majchrzak, & Song, 2017), which can occur through digital platforms. The head of innovation at X-Health explains:

> *I have managed to motivate my colleagues to participate and generate new ways of thinking inside my company. Employees had to access a platform created by my innovation team, for which they had received training. They were then asked generate innovative ideas regarding process improvements…This initiative was a real success, and we did it again with even more participants.*

This organization built knowledge sharing platforms and succeeded in leveraging its knowledge outside the platforms, in the form of process innovations. However, many other organizations struggle with knowledge transfer, or how people pass on messages reflecting their ideas and observations (Ringberg & Reihlen, 2008). This challenge is particularly acute for big data. Some informants reported that they wanted to increase their use of social media data in innovation processes, yet they remain underexploited, due to the firms' inability to filter and share the relevant information internally.

Top management understanding

Social media also need to be understood by top managers, who then support their use (Rydén, Ringberg, & Wilke, 2015). Top managers with a visionary innovation leadership style encourage connectivity and knowledge integration (Caridi-Zahavi, Carmeli, & Arazy, 2016). Accordingly, the firms that leverage social media most effectively for innovation have top managers who envision a future in which social media are fully integrated into their organization. These top managers seek to reduce hierarchical barriers, communicate extensively with teams to increase their knowledge about social media, and encourage intrapreneurship and internal knowledge sharing. To secure team empowerment, they explicitly flatten the hierarchical structure, as noted by the brand digital strategy manager at News One:

> *If we say, for instance, "Hey, we want to attempt something new with WhatsApp," the CEO will ask how much it costs, but eventually he'll let us attempt it. He trusts us. He has also changed the organizational structure to support us in what we do…We really feel that we are supported by our management!*

Top managers of innovative companies active in social media also understand that employees need to receive training and attend external meetings that cover topics such as digital transformation. These employees in turn tend to have more time and flexibility in their daily routines to achieve their targets. The senior digital manager at Everyday Snacks testifies:

> *I'm not the 9-to-5 type. I have a lot of flexibility, and my management believes in me. I attend many training sessions, and I go to meetings with other companies that face the same questions and issues regarding social media. All these opportunities are really insightful.*

In this same company, top managers pursue digitization of the company's business units and invest in innovation and social media, which helps it court millennial employees who use smartphones and social networking sites intensively. Intrapreneurship (entrepreneurship within existing organizations) in turn strongly characterizes new business venturing, together with innovativeness, self-renewal, and proactivity (Antoncic & Hisrich, 2001), as enabled through support of employees' personal projects, even if they have been developed outside working hours. In addition, a lean start-up mentality prompts the growing phenomenon associated with the incubation of internal or external start-ups. This process is partly supported by social media platforms. For example, Elec Supply uses a social media platform to gather innovative ideas. Within a week, ideas quickly advance, such that they are reworked, tested with a proof of concept, and then enter the incubation phase if they are sufficiently mature. This company also organizes "Entrepreneurial Deep Dives" with high-potential employees who have been identified as potential entrepreneurs and who might eventually initiate a related start-up.

Networking and collaboration

Similarly to Mallapragada, Grewal, & Lilien (2012), the findings further suggest that users' embeddedness and brokerage in both internal and external networks determine the time to product release. From an internal perspective, the connections that social media managers make with other departments are essential for implementing initiatives. Through such internal connections, managers obtain buy-in from top management and other departments to implement their innovations and social media activities. From an external perspective, companies that have digitized their products and services manage to create networks among users and suppliers, which is particularly useful when they want to spread information. Some organizations capitalize on networks of influencers to recruit crowdsourcing co-creators, spread

brand messages, or build brand images during and after innovation launches. Close collaboration between stakeholders in turn is an essential element for building internal expertise, in different forms, including the relationships that innovation and marketing teams form with external stakeholders such as digital experts, as well as cross-functional teams within a company that enhance the adoption of social media tools by more employees and increases their acumen with respect to these tools. Finally, firms with large communities benefit from the broader group involved in their innovation projects. For example, Cool Drink maintains a large community on Facebook, as well as a large network of designers through other platforms, such as Pinterest. These designers receive invitations from the company to work on prototypes. Similarly, Elec Supply invites its network of "geeks" to "hackathons," with the objective of finding innovative IT solutions.

Processes for social media use in the innovation process

Flexible processes

Organizations that have mastered social media tend to act quickly and flexibly. They anticipate and respond to market opportunities:

> *We have to anticipate, anticipate, anticipate; we need to be reactive, listen to conversations to know what is being discussed and how we can address the questions as quickly as possible ... it is really about that — anticipating and being hyper-active. (digital activation manager, Cool Drinks)*

Due to top management's trust, internal decision-making processes get shortened, which accelerates the firm's reactivity. Moreover, the decentralization of activities and local power to subsidiaries enables companies to remain relevant and in control of their social media. Local power appears to ensure proximity, speed of action, and adequate content. It also facilitates collaboration with other departments internally and with local agencies externally, which is key to implementing an effective innovation strategy.

Structured processes

Structure and organization affect collaborations with external counterparts, which companies need to gain knowledge, build partnerships, and obtain resources to support their social media activities. Those firms with structured processes appear more advanced in terms of leveraging social media for their innovation, especially through the synergistic effects that arise between

their innovation processes and their social media initiatives. Social media thus get integrated or at least considered in each step of their innovation process. For example, X-Health uses the information collected through social media to make decisions about future product and service launches. In the analyzed companies, all processes are embedded, which is facilitated by their implementation of various initiatives (e.g., weekly meetings, information sharing on dedicated platforms, data tools). They also assign employees to oversee all data transfers. This finding confirms the importance of evaluating and managing knowledge flows. As noted by Marion et al. (2014), vertical knowledge is key to the innovation process, because managers must make decisions about the new product portfolio, resource allocations, technology platforms for development and manufacturing, and product road maps.

Levels of maturity in using social media for innovation

Information systems literature proposes staged models to describe, predict, and control processes; such models also can categorize firms according to their level of new technology adoption (Mergel & Bretschneider, 2013). Introducing new technologies, such as social media, entails changes for organizations. Effing and Spil (2016) offer a maturity model based on firms' social media strategy; the current study similarly proposes three maturity levels (explorers, gold diggers, and trailblazers), reflecting the surveyed firms' increasing maturity in terms of implementing capabilities to support the use of social media for innovation (see Table 2.4).

Table 2.4 : Maturity in key capabilities for social media use in innovation processes

		Explorers (Coffe Co, Connect & Co, Hygiene First, Crea Corp.)	Gold Diggers (Elec Supply, Fast Post, Brains & More, X-Health, Easy Call, Miam, News One, 3D Print)	Trailblazers (Fast Move, Best TV, Cool Drinks, Everyday Snacks)
Resource	**Operational social media team**	+	+	+
	Strategic social media team	-	0	+
	Skilled social media manager	-	0	+
	Budget allocation	-	-	0
	Time allocation	-	0	+
	Digital infrastructure	0	+	+
Competence	**Top management understanding**	-	0	+
	Knowledge management	-	0	+
	Networking and collaboration	0	+	+
Process	**Structured processes**	0	0	+
	Flexible processes	-	-	+

Explorers

Four firms in the sample exhibit a low level of maturity. These *explorers* still question the value of social media for innovation. Top managers perceive some potential, but they express doubts about exactly how social media can serve their innovation objectives. In turn, they do not invest substantially in these tools, out of concern about the returns on their investment. Instead, they observe what other market actors do. The few employees working at a strategic level that use social media lack enough time resources to dedicate to integrating social media in the firms' innovation projects. Rather, they sporadically perform tests, without strategic guidelines, and do not systematically integrate the lessons into future initiatives. Explorers have no social media team at the strategic level but instead implement it only at the operational level. They gather feedback, questions, and complaints but leave that feedback inside the department. The resources allotted to social media for innovation are scant, and these organizations have not yet created value from their social media activities.

Gold diggers

Eight organizations at the medium maturity level can be categorized as *gold diggers*. They recognize that social media are important but still are working to understand how to leverage these tools for innovation. They possess some capabilities but are missing key elements at the strategic level. Along with web care teams, they create internal teams at the strategic level, then achieve some minimum knowledge transfer through training, meetings, and ad hoc collaborations. They gradually are increasing resource allocations, in terms of both time and money. Furthermore, they reflect on lessons from their social media tests. Gold diggers have started to create value from social media use; they are allocating resources and developing some important competencies.

Trailblazers

Trailblazers have a high maturity level and allocate all the required resources to successful social media use for their innovation goals. Few organizations have reached this level; they feature not just the two required social media teams but also a highly skilled social media manager who orchestrates innovation activities. The teams managing social media and innovation projects are recognized internally for their work and have significant freedom, as well as the support of top management, such that they are encouraged to test new ideas, learn from failures, and share their insights quickly. Their processes are flexible, and their decision making tends to be rapid. Furthermore, trailblazers create strong ties with internal and external

customers, experts, and fan communities that truly engage with the organizations. A strong intrapreneurial culture also surrounds these organizations. Thus, trailblazers exhibit high market reactivity, which translates into quick responses to feedback gathered from social media. They stand out by virtue of their resources, competencies, and processes, which they acquire, combine, and put to work over time.

Discussion and conclusion

To address the paucity of research into strategic approaches to social media for innovation, this study provides an in-depth understanding of key resources, competencies, and processes that are required to create and capture value during the different steps of the innovation process.

Theoretical implications

This study accordingly makes several important contributions to academic knowledge. First, it presents a typology of the objectives that firms pursue by using social media in different steps of the innovation process. This topic has been overlooked in both innovation and marketing literature, despite its vast importance, in that these objectives set the path for implementing skills and practices to reap benefits from social media (Satish Nambisan et al., 2017; Roberts & Piller, 2016). For example, creating customer engagement is a key objective, related to firms' focus on creating compelling content to reach customers who are prone to participate in new product or service development. Moreover, the different phases of the innovation process require different firm resources and capabilities. In this sense, the present findings build on work by Effing and Spil (2016), Felix et al. (2017), and Roberts and Candi (2014) that investigate capabilities associated with strategic social media marketing or specific phases of the innovation process. By addressing social media use across the entire innovation process, this study suggests a more strategic approach to the different phases.

Second, this study highlights the importance of complementary social media resources and capabilities. Firms that want to deploy a social media strategy clearly need budgets and human resources (Effing & Spil, 2016), but some resources, competencies, and processes apply specifically to unique innovation purposes. A social media manager who orchestrates all the activities and communication inside the company is key to the successful integration of social media platforms; her or his ability to develop strong ties and collaboration skills can support the creation of cross-functional teams and exert stronger influences. Such skills are critical to building and managing network relationships based on mutual trust, communication, and

commitment (Blomqvist & Levy, 2006). Similarly, the findings stress the critical role of top managers for ensuring that social media uses are a priority and empowering employees to engage in collaboration. Such collaboration then facilitates knowledge flows. These findings relate closely to recent stakeholder theory, which indicates that firms that actively integrate empowered stakeholders during innovation processes benefit from unique sources of knowledge (Kazadi et al., 2016). In the current results, this competence translates into an ability to transfer knowledge within and across different teams, such that knowledge flows improve with the development and updating of innovation and social media platforms, the production of relevant features, and training. This evidence can help explain why IT-literate organizations with knowledge skills tied to new technologies tend to leverage social media more effectively (Marion et al., 2014). Previous studies suggest the importance of a social media or digital culture (e.g., Felix et al., 2017; Westerman et al., 2014); the current study indicates that an entrepreneurial culture that encourages a start-up mentality, with short testing and learning cycles, may be even more beneficial in terms of innovation outcomes.

Third, managers who blend different organizational capabilities into interconnected, hierarchical processes embed capabilities that help sustain competitive advantages (Grewal & Slotegraaf, 2007). The present findings demonstrate that organizations that embed social media tools within their innovation processes achieve better outputs, because they take a holistic approach and experience more efficient project implementation, through better knowledge transfers and faster decision-making processes. Investigating the influence of collaborative tools in innovation, Marion, Reid, Hultink, and Barczak (2016) suggest that embedding collaborative tools into specific innovation activities may lead to better projects. The formalization of processes also enhances innovation performance (Roberts et al., 2016). Another essential consideration is the way organizations should be designed, in terms of their flexibility and autonomy. Firms working with a lean, start-up model adopt an agile innovation process with short, iterative loops, as predicted by the agile stage-gate process proposed by Cooper (2016). They are characterized by fixed time and budget allocations but a flexible scope of work. In addition, localized decision-making power facilitates social media initiatives by fostering a stronger market orientation, which is crucial to seizing the market (Day, 1994), as is required in innovation settings, given the high rate of innovation failures.

Fourth, few models evaluate business practices in relation to social media; this research offers a novel, staged model of maturity levels that can help managers understand their own resources and capabilities. Similar to Effing and Spil (2016), this study identifies a series of actions that

need to be implemented to reach the highest maturity level and capture full value from social media to fulfill innovation goals.

Managerial implications

The objective of this exploratory research has been to specify key capabilities that organizations need to create and capture value from social media. The results highlight the complexity of social media uses for innovation and the need for both strategic and operational capabilities, as well as involvement by people from various departments and levels of the organization, to acquire and diffuse knowledge from social media. In particular, social media managers must demonstrate sufficient proficiency to manipulate information, develop ideas, and achieve strategic goals supported by technology (Colbert, Yee, & George, 2016). Firms should prepare to hire such contributors by redesigning their functions (e.g., social media manager that is not solely related to one department) and implementing complementary capabilities and well-established processes (e.g., files that blend input from innovation, digital and marketing teams). Top managers in particular should work to build a strong intrapreneurial culture (i.e., less hierarchical barriers and more trainings) that empowers key stakeholders, encourages the pervasive use of social media tools, and establishes cross-functional teams to work quickly toward the same objective by using information sharing and fast decision-making processes. Finally, the three-stage maturity model can help managers interested in testing and increasing their use of social media for innovation; it contains a comprehensive set of capabilities to assist them in achieving these tasks. This model should inform self-assessments that then can help them prioritize investments.

Limitations and further research

In line with recent research in digital marketing (e.g., Felix et al., 2017), this study takes an organizational lens to investigate key capabilities needed to foster social media use in the different stages of the innovation process. Our conceptual framework intends to encourage scholars to empirically test, enrich and refine the present findings. At a micro-level, an in-depth analysis of organizational and managerial processes, procedures, systems, and structures undergirding each class of capability (Teece, 2007), would enhance understanding of the suggested capabilities. Longitudinal studies are also needed to examine variations over time, in terms of both the capabilities involved and the innovation outcomes. Lastly, for a better generalizability of the present findings, additional research could investigate capabilities associated with other contexts and firm profiles, such as SME's.

Chapter 3

Social media use: A review of innovation management practices

Conferences:

Muninger M., Mahr D., Hammedi W., Digital Co-Creation for Innovation: Critical Review and Research Agenda. Talk presented at the Frontiers in Service Conference, Hilton Austin, USA. September 6–9, 2018.

Muninger M., Mahr D., Hammedi W., Social Media for Innovation: A Critical Review and Research Agenda. Talk presented at the Global Innovation and Knowledge Academy, Universitad Catolica de Valencia, Spain. June 25–27, 2018.

Muninger M., Mahr D., Hammedi W., Social Media for Innovation: A Critical Review. Talk presented at the Innovation and Product Management Conference, Reykjavik University, Iceland. June 11–13, 2017.

Publication:

The paper is currently under review and has passed the first round.

Abstract

The use of social media for innovation requires firms to manage challenges such as the speed of information transfer, big data management, and multiway communication. However, managers lack clear insights about when and why they should use social media to innovate. To address this concern, the current article undergoes a systematic review of evidence from 163 scientific articles across four key management disciplines. It analyzes and synthesizes various theoretical perspectives published in top-tier journals. The findings advance the field's theoretical development by introducing a comprehensive framework of external and internal factors, contingencies, and types of innovation performance outcomes of social media use for innovation management practices. This framework also reveals major gaps in prior research, including a lack of research on capabilities to integrate and manage multiple stakeholders; ways to process and analyze social media data; and the creation of business models that capture the constraints of social media environments. The paper concludes with recommendations for future research.

KEYWORDS

Social media, innovation, systematic review, framework, and research agenda

Introduction

The use of social media has altered the way firms innovate and offers new opportunities during the innovation process. Social media, such as Facebook, Twitter, LinkedIn, YouTube and Instagram, are "online means of communication, conveyance, collaboration, and cultivation among interconnected and interdependent networks of people, communities, and organizations enhanced by technological capabilities and mobility" (Tuten & Solomon, 2018; p. 4).

The increasing popularity of social media has led to a power shift from firms to consumers, triggering big changes in firm–market dynamics (Labrecque, vor dem Esche, Mathwick, Novak, & Hofacker, 2013). In this context, social media users have a greater influence on the way products are peddled to them, as they produce a great amount of user-generated content (e.g., text, pictures, and videos). This data allows firms to gather customer feedback, monitor brands, gather competitive intelligence, identify risks, and find new product ideas. For example, after Netflix users shared their frustration on social media about falling asleep while watching TV-shows, Netflix launched smart socks that paused the show when users were dozing off.

Along with using social media to find new product ideas (Allen, Chandrasekaran, & Basuroy, 2018), firms use the platforms to facilitate collaboration and communication (Culnan, McHugh, & Zubillaga, 2010) and accelerate the launch of innovations through viral effects (Mallapragada, Grewal, & Lilien, 2012).

Despite implicit assumptions that social media benefit various steps of the innovation process, their ubiquity and inherent characteristics (e.g., amount of data, speed of information diffusion, level of interactions, and reach) make it difficult for firms to harness those benefits (Friend, 2012). Accordingly, companies seek advice on redesigning their functions and better orchestrating social media activities for innovation purposes (Allen et al., 2018; Aral, Dellarocas, & Godes, 2013).

The existing academic research offers fragmented findings regarding the expected outcomes of social media use for innovation. While scholars find that social media is an important source of information for the innovation process, others caution against an overreliance on such tools (He & Wang, 2016; Piller, Vossen, & Ihl, 2012). Social media arguably might not benefit firms, which need to acquire specific capabilities first to attain positive outcomes (Roberts, Piller, & Lüttgens, 2016). For example, firms must develop the absorptive capacity and knowledge coordination to transform big data into valuable input for innovation (Ooms, Bell, & Kok,

2015). Conversely, internal processes that contribute to the identification of the right partners or enable input integration are necessary. Without these elements, firms may suffer from higher innovation cycle times and development costs (Asdemir, Banker, & Bardhan, 2006; Brem & Bilgram, 2015).

In this paper, we analyze and synthesize prior research on the use of social media to support the innovation process. We undertake a systematic review that identifies, selects, and synthesizes high-quality evidence from research (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2006) across four literature streams—innovation, marketing, general management, and information management. This cross-disciplinary analysis offers a comprehensive overview of the literature pertaining to the topic. We use a framework synthesis approach for the organization of the findings and their analysis, thereby providing highly structured data (Barnett-Page & Thomas, 2009; Dixon-Woods, 2011). The resulting framework brings conceptual clarity to the findings by linking together the external, internal, and contingent factors and outcomes of social media use for innovation. In doing so, we highlight both the dilemmas faced by firms when using social media to innovate and the existing gaps in the literature.

The paper concludes by presenting the latest trends pertaining to our field of research and by introducing a research agenda that explores interesting areas of future inquiry for academics. This last section discusses broader gaps in the research—notably the paucity of research that tackles multiple stakeholders' involvement; develops the methods, skills, and procedures needed to leverage the large volume of social media data; and fills the gap caused by the absence of business models needed to manage social media complexity.

Our study should contribute to advancing the theoretical development of innovation management practices and guide managers in their decision-making processes.

Method and data collection

Sample selection

We conducted keyword searches on Scopus and ISI Web of Science (WoS), the two largest databases of peer-reviewed journals, to identify relevant articles (those with high managerial relevance) from leading journals based on SJR 2017 (SCImago impact factor), between the years 2000 and 2019. We excluded publications in magazines and books from the data set; Table 3.1 summarizes all the exclusion criteria we applied.

Table 3.1: Inclusion and exclusion criteria

Criteria	Inclusion Criteria	Exclusion Criteria
Keywords	<u>Search string iteration 1</u>: ("social media*" or "social networking*") and ("innovation" or "new product*" or "new service*" or " crowdsourcing" or "idea*" or "launch*"). <u>Search string iteration 2</u>: ("online communities" or "virtual communities" or "collaborati* platforms" or "collaborati* tools" or "blog*" or "wiki*" or "forum*") and ("innovation" or "new product*" or "new service*" or " crowdsourcing" or "idea*" or "launch*"). <u>Search string iteration 3</u>: ("Facebook" or "Twitter" or "LinkedIn" or "Yammer" or "Slack") and ("innovation" or "new product*" or "new service*" or " crowdsourcing"or "idea*" or "launch*").	
Type of journal	(1) Top-tier peer-reviewed journals from innovation, marketing, information systems, and general management. Examples of top journals screened for innovation: *Journal of Product Innovation Management, Research Policy, Strategic Management Journal, Academy of Management Journal, Academy of Management Review, Organization Science, Management Science, Journal of Management, Research-Technology Management, Technovation, Harvard Business Review,* and *Creativity and Innovation* (2) High-ranked peer-reviewed journals from business and management disciplines based on SCImago 2017 journal rank. (3) Peer-reviewed journals recognized for their proximity to the field: *MIT Sloan Management Review* and *California Management Review*.	Nonscientific journals, book chapters, magazines, peer-reviewed journals in business and management that are low ranked (<1 based on SCImago 2017 journal rank), conference papers.
Perspective	Focus on organizational implications	Focus on consumer implications
Type of content	Empirical and conceptual articles (qualitative and quantitative)	
Language	English	Other languages
Date	2000–2019	Before 2000, which is not relevant for digital use.
Relevance	Social media (or synonym) <u>and</u> innovation (or synonym).	Not directly related to the research questions (e.g., social media or innovation not the focus) OR not related to the private sector (e.g., government).

The journals publishing the focal articles reflect all business domains, including but not limited to innovation, marketing, information systems, and general management. Considering the relative novelty of our research topic, we included journals known for their proximity to the field (i.e., *MIT Sloan Management Review* and *California Management Review*), which tend to publish insights about new trends before top ranked journals (Randhawa, Wilden, & Hohberger, 2016).

To reach our final sample of focal articles, we followed a systematic four-step process, as depicted in Figure 3.1. We screened top tier peer-reviewed journals from innovation, marketing, information systems, and general management. Then, we examined the keyword and citation aggregations to capture subfields that have gained or lost attention. Because research about social media and innovation ranges across disciplines, with varying terminologies, we began the search with multiple keywords: "social media*" OR "social network* sites" AND "innovation" OR "new product*" OR "new service*" OR "crowdsourc*" OR "idea*" OR "launch*" OR "mining*". With these search terms, we obtained 696 articles in WoS and 526 articles in Scopus that had been published in business and management journals and had the respective terms in their title, abstract, or keywords. After we limited the scope to articles written in English and with SJR 2017 impact factors of greater than 1, we had a corpus of 326 articles. Excluding duplicates, conference papers and book reviews due to their limited content (van der Have & Rubalcaba, 2016) resulted in 232 articles in the sample.

Next, following Lamberton and Stephen (2016), we expanded our keyword search to integrate more specific terms, such as those pertaining to social media tools (Boyd & Ellison, 2008; Obar & Wildman, 2015), including "online communities" OR "collaborat* platform*" OR "blog*" OR "Facebook" OR "Twitter" OR "wikis" OR "Slack" OR "Yammer". After two additional searches, we cleaned the data to avoid duplicates, then continued with a snowball procedure by running searches in the Social Sciences Citation Index® to identify other pertinent articles published in the consulted journals. We included articles from journals with lower impact factors if their content is relevant to our study; though, to ensure the quality of our paper selection, we also checked citation numbers.
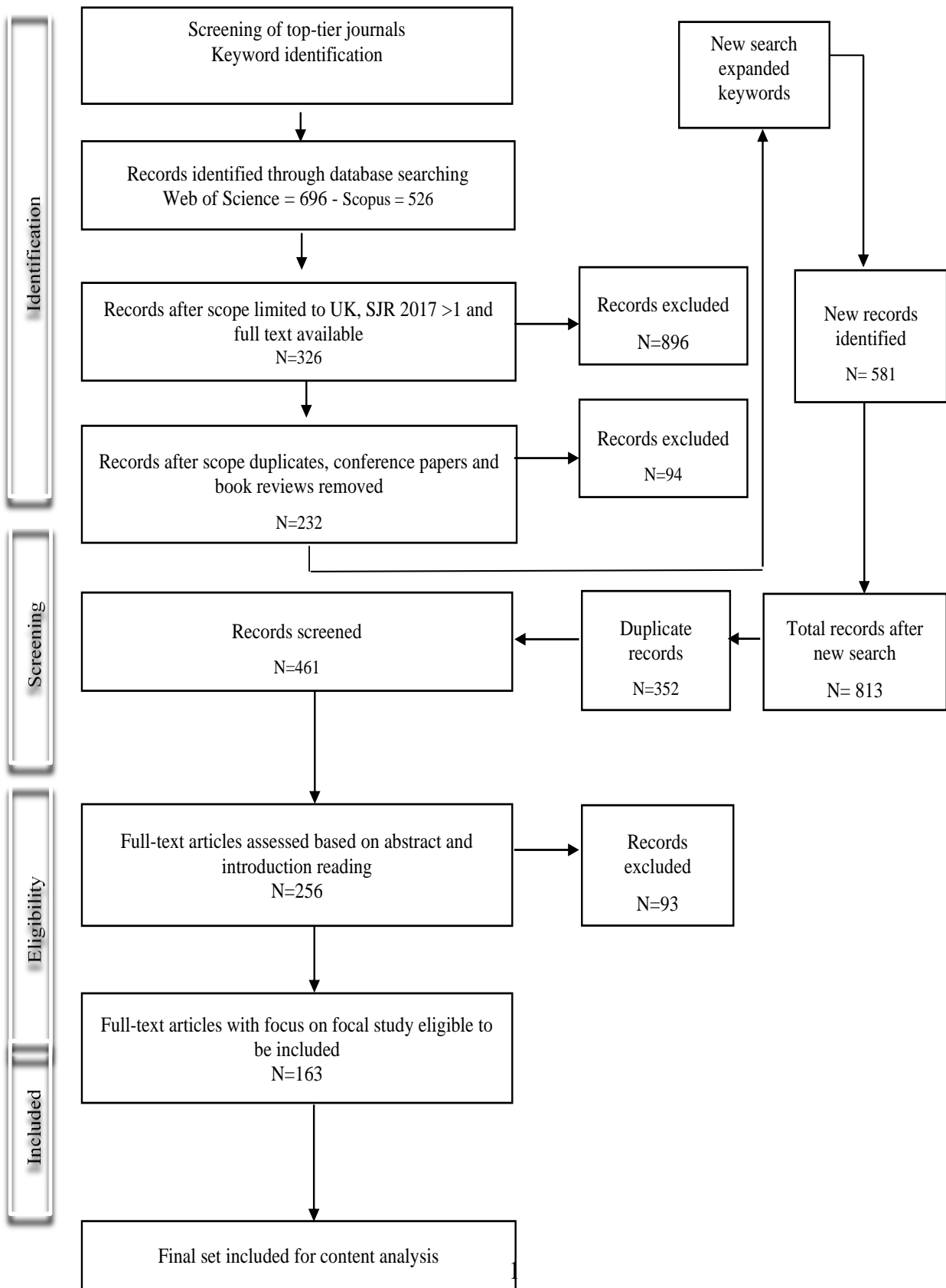
Figure 3.1: Article selection process

Considering the rapid evolution of the research topic, we requested forthcoming articles from scholars engaged in social media research for innovation. These new searches yielded full bibliographic records of 581 additional articles, from which we excluded 352 articles (as many articles were duplicates).

Finally, all three authors independently reviewed all the abstracts and introductions to assess the relevance of the articles. If our reading of the abstract and introduction was inconclusive, we examined the full paper with a particular focus on the discussion to determine if the focal study contributed to our research (West & Bogers, 2014). For example, many articles revolve around user innovation concepts and have a consumer or service perspective (e.g., Dahl et al., 2015). Other articles discuss crowdsourcing or cocreation but not specifically in relation to social media (e.g., Daly & Nataraajan, 2015; Flostrand, 2016). This iterative process of data reconciliation and validation lead to a final set of 163 articles.

Data analysis

Following a framework synthesis approach, the initial coding of our data aimed to structure the sheer wealth of information collected, refined in response to team discussions and iterative cycles of analysis. Toward that end, we entered all the selected papers into NVivo12 software (Bazeley & Jackson, 2013). We first structured the coding in accordance with Bandara, Furtmueller, Beekhuyzen, Gorbacheva, and Miskon's (2015) recommendation to identify relevant patterns. That is, one author started by coding key authors, year of publication, prevailing theories, definitions, methodologies, findings, and gaps. As each study contained relevant information about methods, theoretical frameworks, constructs, and outcomes, we created Table 3.2 to organize our data set.

Table 3.2: Literature pertaining to social media use for innovation

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
1	Allen, B. J., Chandrasekaran, D., & Basuroy, S. (2018).	Qualitative	Qualitative executive interviews and quantitative sample of 86 products	Individual (managers) and product sales	Decision to crowdsource a product concept	Idea quality of the initial product concept	Product performance: 1/unit sales, 2/reliability, technical complexity and usability.
2	Balka K., Raasch C., & Herstatt C. (2014).	Quantitative	Survey data (n = 309) from 20 online communities	Project	Openness of product design	Valuation of openness by users	User involvement and devotion effort
3	Banker, R. D., Bardhan, I., & Asdemir, O. (2006).	Quantitative	Cross-sectional survey; sample of 71 organizations	Organization	Collaborative product commerce (CPC)		Collaboration, product quality, product design and cycle time, product development costs
4	Barczak, G., Sultan, F., & Hultink, E. J. (2007).	Quantitative	Survey: online questionnaire; sample of 212 managers	Project (NPD)	IT usage (project risk, existence of champion, autonomy, innovative climate, IT infrastructure, and IT embeddedness)		NPD performance (speed to market and market performance)
5	Bartl, M., Füller, J., Mühlbacher, H., & Ernst, H. (2012).	Quantitative	Survey: online questionnaire; sample of 216 innovation managers	Individual (managers)	Managers' attitude towards VCI	Managers' cognition, attitude, subjective norms, and perceived behavioral control; hierarchical position of the innovation manager; manager's level of innovativeness; and market orientation of the company	Managers' behavioral intention to implement virtual customer integration (VCI)
6	Bashir, N., Papamichail, K. N., & Malik, K. (2017).	Qualitative	Qualitative research: Interview with several managers and observations at five companies	Individual (managers)	SM use		Source of information for NPD
7	Bayus, B. L. (2013).	Quantitative	Survey: IdeaStorm community; 2 year data	Individual	Number of proposed ideas not in already implemented categories, past success in generating implemented		Individual's likelihood of proposing an implemented idea and individual's likelihood of proposing diverse ideas

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
					ideas, and diversity of past commenting activity		
8	Benitez, J., Castillo, A., Llorens, J., & Braojos, J. (2018).	Quantitative	Survey: Sample of 100 small firms	Organization	IT Infrastructure	Social media capability	SM capability moderates positively the relationship between knowledge ambidexterity and innovation performance.
9	Bhimani, H., Mention, A. L., & Barlatier, P. J. (2018).	Conceptual	Conceptual	Organization			
10	Bilgram, V., Brem, A., & Voigt, K. I. (2008).	Conceptual	Conceptual	Individual (in online communities and weblogs)	Ahead of a market trend, high expected benefits, user expertise and motivation, extreme user needs, opinion leadership, and online commitment		Online identification of lead users
11	Bonabeau, E. (2009).	Conceptual					
12	Boudreau, K. (2010).	Quantitative	Survey: Data from 21 handheld computing systems (1990–2004)	Project (NPD introductions)	Open strategies for platforms : 1) granting complementary hardware designers access to the platform; 2) giving up some measure of control over the platform itself		New hardware device introductions
13	Braojos, J., Benitez, J., & Llorens, J. (2019).	Quantitative	Sample of 100 small firms included in the 2013 *Forbes* database	Organization	Social media and e-commerce capabilities		Online engagement of customers
14	Braojos-Gomez, J., Benitez-Amado, J., & Llorens-Montes, F. J. (2015).	Quantitative	Survey: Sample of 100 small firms from 30 industries	Organization	1) social competitor pressure, IT infrastructure capability, two organizational capabilities (marketing management and innovation management)		1) SM competence; 2) stock market performance

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
					and firm size ; 2) SM competence		
15	Brem, A. & Bilgram, V. (2015).	Qualitative	Exploratory research: single embedded case study of 24 project analyses and three expert interviews	Organization and Project	Netnography and crowdsourcing use for lead user search	Lead user characteristics and lead user search methods	Lead user identification and identification of needs and trends
16	Brynjolfsson, E., Geva, T., Reichman, S. (2016).	Quantitative	Crowd-squared method	Organization			
17	Byrum, J. & Bingham, A. (2016).	Conceptual	Conceptual	Organization			
18	Camacho, N., Nam, H., Kannan, P.K., & Stremersch, S (2019).	Quantitative	Large-scale survey	Individual	Participation intensity, number of participants and number of ideas	Negative and positive feedback	Idea quality
19	Candi, M., Roberts, D.L., Marion, T., & Barczak, G. (2018).	Quantitative	Sample of 350 responses; confirmatory factor analysis	Individual	Social strategy	Customer involvement in innovation on social media and new knowledge for innovation (mediator) and type of SM platform (moderator)	Knowledge for innovation gained from customers
20	Carlson, J., Rahman, M., Voola, R., & De Vries, N. (2018).	Quantitative	Survey: Data collected from 654 U.S. consumers of brand pages on Facebook	Individual	Online-service design characteristics	Value perception	Customer feedback and collaboration intentions
21	Chan, H. K., Wang, X., Lacka, E., & Zhang, M. (2016).	Qualitative	Literature review/content analysis: PWF & MCDA method and case study; Facebook page analysis	Project	SM Data		Key factors of New Product Performance: Strategy, development process, market environment, organizational, and product
22	Chan, K. W., Li, S. Y., & Zhu, J. J. (2015).	Quantitative	Four years of data from popular crowdsourcing site	Individual	Characteristics of online peer-to-peer and peer-to-firm interactions	Customers' past efforts to post ideas	Likelihood of generating ideas in an idea crowdsourcing community
23	Chan, K. W., Li, S. Y., & Zhu, J. J. (2018).	Quantitative	Sample: n=184. Data collected from a laboratory experiment and a firm-sponsored crowdsourcing community	Organization	Novelty of crowdsourced ideas	Idea feasibility	Firms' idea adoption

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
24	Chandra, Y. & Leenders, M. A. (2012).	Qualitative	Multiple case studies (4): direct participant observation and interviews in Second Life	Individual	Prior knowledge, collaborative networks in Second Life, Second Life infrastructure, type and scope of user innovation and entrepreneurship, entrepreneurial acts in real life and in virtual life		Entrepreneurial acts in Second Life and in the real world.
25	Chang, W. & Taylor, S. A. (2016).	Quantitative	Meta-analysis	Project	1) Customer participation in the ideation, development and launch stages of NPD.	Potential value of customer knowledge, difficulty of knowledge management, characteristics of actors in NPD knowledge management, and study of specific moderators	New product financial performance
26	Chen, P.T. & Kuo, S.C. (2017).	Quantitative	Sample : n=624. Descriptive statistics and exploratory factor analysis	Project			Seven dimensions of resistance
27	Chirumalla, K., Oghazi, P., & Parida, V (2018).	Qualitative	Case studies (two companies)	Organization	Social media strategy		Marketing and research and development (R&D) interface
28	Chou C., Yang K.-P., & Jhan J. (2015).	Quantitative	Experimentation: 2x2 design and three studies	Individual	Emotion	Positive/negative	Purchase Intention
29	Christensen, K., Nørskov, S., Frederiksen, L., & Scholderer, J. (2017).	Quantitative	Machine learning and text mining of 2803 texts	Project	Online texts		Idea identification
30	Chu, K.M. & Chan, H.C. (2017).	Quantitative	Survey: 143 participants from five online communities		Four factors (ADD)		Promotion of Community Based Innovations
31	Culnan, M. J., Mchugh, P. J., & Zubillaga, J. I. (2010).	Qualitative	Multiple case studies of three Fortune 100 corporations; website content and SM applications' analysis	Organization	Mindful implementation, community building, and absorptive capacity		Effective SM implementation
32	Dahan, E., & Hauser, J. R. (2002).	Conceptual	Analysis of six web-based	Project	Virtual customer methods		Capabilities of communication,

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
			methods of customer input				conceptualization, and computation
33	Dahlander, L., & Frederiksen, L. (2012).	Quantitative	36 interviews; 1,000 posts; 280 surveys among communities	Individual	Individuals at an intermediate position on a core/periphery continuum ; 2/external boundary spanning		Individual Innovation
34	Dahlander, L., & Wallin, M. W. (2006).	Qualitative	Case study; large community; observations	Project (initiatives)	Firm's sponsorship on individual		Ties with other community members and individuals; prestigious status in the community; ties with well-connected participants
35	Dahlander, L., & Piezunka, H. (2014).	Quantitative	Online survey : Data set of 23,809 organizations using an online tool.	Project	Reactive attention, proactive attention	Size of initiative	Suggestions elicited from external contributors
36	Dass, M. & Kumar, S. (2014).	Conceptual	Conceptual				
37	Di Gangi, P. M., & Wasko, M. (2009).	Quantitative	Online survey through Dell Ideastorm website; sample of 6,200 ideas and qualitative case study approach	Individual (idea)	Perceived attributes of innovations (relative advantage and compatibility). Change agents' promotion efforts		Adoption of user innovation
38	Di Gangi, P.M., Wasko, M.M., & Hooker, R.E.	Qualitative	Single case study	Project	Type of challenges for implementing UICS		Recommendations to overcome challenges
39	Dissanayake, I., Zhang, J., & Gu, B. (2015).	Quantitative	Data set of 732 teams in 52 contests from April 2010– July 2012; logistic regression	Project (team)	Social and intellectual capital		Team performance
40	Dissanayake, I., Zhang, J., Yasar, M., & Nerur, S.P. (2017).	Quantitative	Leaderboard data for 25 tournaments: dataset comprising >10k teams and >73k observations; zero-inflated binomial model	Project	Team rank, time elapsed	Team skill	Team score

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
41	Divakaran, P. K. P., Palmer, A., Søndergaard, H. A., & Matkovskyy, R. (2017).	Quantitative	Quantitative online survey with 373 movies (PLS-SEM)	Project	Community's pre-release (a) awareness level; (b) word-of-mouth; (c) expectation level; (d) adoption intention level for an upcoming product		Post-launch opening week sales
42	Djelassi, S. & Decoopman, I. (2013).	Qualitative	Five case studies; interviews (n=5+7); content analysis with coding.	Organization and individual	1) Offering and customers ; 2) infrastructure		Suggestion for an open business model on CS
43	Dobusch L., Dobusch L., & Müller-Seitz G. (2019).	Qualitative	Case study (Wikimedia); 38 interviews in 4 phases combined to observations and secondary data; content analysis	Organization	Task forces	Emerging strategic priority and five performance indicators	Strategic goals
44	Dong, J. Q. & Wu, W. (2015).	Quantitative	Event study; online survey; sample of 1676; four sources (Ideastorm, MyStarbucksIdea, CRSP database, and Lexis-Nexis database)	Organization	OUIC-enabled ideation capability and OUIC-enabled implementation capability		Business value
45	Dotsika, F. & Watkins, A. (2017).	Quantitative	Keyword network analysis and visualization approach; data analysis: clustering and sub-network metrics	Project			
46	Droge C., Stanko M.A., & Pollitte W.A. (2010).	Quantitative	Sample: n=70 blogs - regression - ANOVA	Organization	Blog content		Implication on NPD process
47	Du, S., Yalcinkaya, G., & Bstieler, L. (2016).	Quantitative	Survey (questionnaire): Sample of 453 respondents	Organization	Sustainability orientation	SMOI (social media driven inbound open innovation) , market, and SMOI-technology	NPD performance
48	Durmuşoğlu, S. S. & Barczak, G. (2011).	Quantitative	Survey: Sample of 212 managers	Individual	IT tools		NPD effectiveness (NPD performance, innovativeness and quality)

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
49	Ebner, W., Leimeister, J. M., & Krcmar, H. (2009).	Qualitative	Action research with SAPiens 2007 Software (tool for design, implementation and evaluation of an IT-supported ideas competition used by 60,000 people)	Project (competitions)	Idea competition in virtual communities		Find best profiles for idea competitions
50	Faraj, S., Jarvenpaa, S. L., & Majchrzak, A. (2011).	Conceptual	Conceptual	Organization	Fluidity	Tensions	Opportunity for knowledge collaboration
51	Faraj, S., Kudaravalli, S., & Wasko, M. (2015).	Quantitative	Social network, survey, and message-level content; zero inflated negative binomial models	Individual	Sociability, knowledge contribution behaviors, and structural social capital		Being identified as a leader by members of the online community
52	Faraj, S., von Krogh, G., Monteiro, E., & Lakhani, K.R. (2016).	Conceptual					
53	Feng, J. & Papatla, P. (2012).	Quantitative	Data from two online sites where consumers discuss automobiles; structural equation modelling	Organization (brand)	Primary interest in research, new and redesign, customer satisfaction, recency, expert opinions, sales, body styles, and model year		Volume of online WOM
54	Foss, N. J., Lyngsie J., & Zahra, S. A. (2013).	Quantitative	Double-respondent survey; 536 participants	Organization	Use of external knowledge sources		Opportunity exploitation
55	Franklin, M., Searle, N., Stoyanova, D., & Townley, B. (2013).	Qualitative	Exploratory research; multiple case studies (3); film industry; observation, e-mail correspondence, and social network analysis	Organization; project	SM adoption	Internal firm microprocess dynamics	Consumers' online engagement, reduction of demand uncertainty, and digital disruption
56	Frey, K., Luthje, C., & Haag, S. (2011).	Qualitative	Content analysis of postings and matched survey data from contributors	Individual	Motivation		Individual performance
57	Fuchs, C. & Schreier, M. (2011).	Quantitative	Experimentation: 2 studies. Study 1: Between subject experiment; study 2: Within-subject design	Individual	Customer empowerment to create ideas for new product design; customer empowerment to		Customer empowerment strategies

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
					select the product designs to be produced		
58	Füller, J., Jawecki, G., & Mühlbacher, H. (2007).	Qualitative	Qualitative research: netnography; observation of community behavior; qualitative analyses and interviews with online community	Individual	Consumer profile (driven by excitement)		Participation in innovation projects
59	Füller J., Matzler K., & Hoppe M. (2008).	Quantitative	Sample of 550 members of the Volkswagen Golf GTI car community. Structural equation modeling was used to test the relationship among the constructs	Individual	Personality traits		Contribution in online communities
60	Füller, J., Mühlbacher, H., Matzler, K., & Jawecki, G. (2009).	Quantitative	Online survey with a sample of 727 respondents	Individual	Consumers' experiences during virtual cocreation tasks	Creativity; lead user's characteristics	Consumers' perceived influence on product design and decision making (level of experienced empowerment)
61	Füller, J., Hutter, K., Hautz, J., & Matzler, K. (2014).	Qualitative	Exploratory research	Individual	User type		Behavioral contribution
62	Gatzweiler, A., Blazevic, V., & Piller, F.T. (2017).	Qualitative	Interviews (n=8+5+6) and netnography (n=77 contests and 66 recorded instances); data coding	Organization	Deviant content		Customer ideation
63	Ghose, A., Ipeirotis, P. G., & Li, B. (2012).	Quantitative	Dataset of 3-month period with Travelocity + data from SM sources	Individual	Impact of user-generated product reviews		New ranking systems
64	Gillier, T., Chaffois, C., Belkhouja, M., Roth, Y., & Bayus, B.L. (2018).	Quantitative	Field study involving 6406 ideas from eYeka	Individual	Unbounded, suggestive, and prohibitive task instructions		Ideas' originality, feasibility, and value
65	Gorry, G.A. & Westbrook, R.A. (2011).	Conceptual					

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
66	Gray, P. H., Parise, S., & Iyer, B. (2011).	Quantitative	Survey: Sample of 850 SBS users and 150 subset of 150, stratified across low, medium, and high usage levels; four models tested	Individual	Use of SBS		Level of personal innovativeness
67	Gruner, R. L., Homburg, C., & Lukas, B. A. (2014).	Quantitative	Survey of 170 community-hosting firms	Organization	Firm-hosted online brand communities	Product Innovativeness and product introduction timing	NPD success (market share and sales)
68	Gruner, R.L., Vomberg, A., Homburg, C., & Lukas, B.A. (2019).	Quantitative	Dyadic survey data: An analysis of new products launched by 122 consumer durable goods firms	Organization	Social media communication and online advertising	Product involvement and product superiority	Sales volumes and profits
69	Haavisto, P. (2014).	Qualitative	Discussions on 28 forums and content analysis	Individual	Discussion forums		Value creation in product innovation
70	Hajli, N., Shanmugam, M., Papagiannidis, S., Zahay, D., & Richard, M. O. (2017).	Qualitative	45 interviews and content analysis	Individual	Social media		Relationship quality and customer brand loyalty
71	Hannigan, T.R., Seidel, V.P., & Yakis-Douglas, B. (2018).	Qualitative	Sample of 30 interviews (single firm) with high-tech firms	Organization	Product innovation rumors		Effect on innovation process
72	Hautz, J., Füller, J., Hutter, K., & Thürridl, C. (2014).	Quantitative	Experimental design 2x2 between subjects		User-generated video/ agency-generated video	Source credibility (trustworthiness and expertise)	Intended behavior (intention to visit and willingness to share)
73	He & Wang (2015).	Qualitative	Two case studies	Organization	Motivational factors from participants and situational factors from organization		Social media use
74	Helfat, C. E. & Raubitschek, R. S. (2018).	Conceptual			Innovation capabilities, environmental scanning and sensing capabilities, and integrative capabilities for ecosystem orchestration		Value creation and value capture
75	Hienerth, C., Lettl, C., & Keinz, P. (2014).	Qualitative	Explorative and longitudinal multiple case study	Organization, individual and communities	User-to-producer interactions:		Risk reduction, extension of design space, and buzz creation
76	Hofstetter, R., Aryobsei, S., &	Quantitative	Data set of a 10 month period with	Individual	Social ties, number of votes,		Consumer voting behavior

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
	Herrmann, A. (2018).		99k of new votes + 2.7k new social ties		and intensity of competition		
77	Hoornaert, S., Ballings, M., Malthouse, E.C., & Van den Poel, D. (2017).	Quantitative	Quantitative: Online survey (ideas on Mendeley)	Individual	Content, contributor experience, crowd feedback		Idea implementation
78	Hoyer, W. D., Chandy, R., Dorotic, M., Krafft, M., & Singh, S. S. (2010).	Conceptual			Stimulators and impediments of customer cocreation		NPD process
79	Huang, Y., Singh, P.V., & Srinivasan, K. (2014).	Quantitative	Structural modeling; rich data set obtained from IdeaStorm.com; sample of 490 individuals	Individual	Number of ideas submitted	Average voting score	Ideas implementation
80	Jensen, M.B., Hienerth, C., & Lettl, C. (2014).	Conceptual					
81	Jeppesen, L.B. & Laursen, K. (2013).	Quantitative	Survey: Sample of 442 respondents, descriptive statistics, and regression.	Individual	Lead users characteristics, number of communities		"Knowledge give" (providing knowledge as an expert)
82	Kaplan, A.M. & Haenlein, M. (2012).	Conceptual					
83	Kawakami, T., Durmuşoğlu, S. S., & Barczak, G. (2011).	Quantitative	Survey through mailing (PDMA members); sample of 212 managers	Project (NPD)	Use of IT tools (emails, product design tools, web meetings, DSS project evaluation, idea generation tools, shared drivers / project rooms, secondary data tools, online needs survey tools, virtual prototyping and concept testing tools)		NPD effectiveness : Market performance, innovativeness, quality of a new product
84	Kietzmann, J.H., Hermkens, K., McCarthy, I.P., & Silvestre, B.S. (2011).	Conceptual					
85	Kim, H. & Hanssens, D. M. (2017).	Quantitative	Data set of 137 movies; 60 weeks of blog posts analyzed	Individual	Advertising and blog posts		Pre-launch consumer interest in NPD

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
86	Lee, H.C.B., Ba, S.L., Li, X.X., & Stallaert, J. (2018).	Quantitative	Predictive modeling: learning phase model and submission phase model; data set from Kaggle; sample: 695k observations; regression analysis	Individual	Salience bias	Number of contestants	Winners' solution
87	Leimeister, J.M., Huber, M., Bretschneider, U., & Krcmar, H. (2009).	Quantitative	Modeling; 61 ideas submitted, 39 active participants; descriptive statistics	Individual	Motives	Incentives (moderator) and activation (mediator)	Behavior
88	Leonardi, P.M. (2014).	Qualitative	Data from large financial services firm; sample for interviews: 16 employees from marketing and 18 from operations leadership program	Individual	(1) Message transparency and network translucence. (2) enhanced metaknowledge		(1) awareness, and (2) innovative products and services with less duplications
89	Leonardi, P.M. (2015).	Quantitative	Quasi natural field experiment; sample of 76 respondents; OLS regression and paired samples *t*-test	Individual	Use of social networking technology	Tenure, hierarchical level, number of intimate coworkers, number of team members, advice network centrality	Accuracy of metaknowledge
90	Levine, S.S. & Prietula, M.J. (2014).	Quantitative	Structural modeling and computational experiments; sample: 144 population compositions; descriptive statistics		Few cooperators, free riders' presence, lack of diversity or goods are rival		Online community performance
91	Lu, Y.D., Singh, P.V., & Sun, B.H. (2017).	Quantitative	Structural modeling: sample of 1,558 individuals' activities	Individual	Knowledge, social status, network position, constant cost for asking a question, constant cost for answering a question, AND impact of tenure on cost of asking question and impact of tenure on cost of	Knowledge splill overn aditional cost of answering a high quality question	Core periphery structure and knowledge level

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
					answering question		
92	Lukyanenko, R., Parsons, J., & Wiersma, Y.F. (2014).	Quantitative	Conceptual modeling and three experiments; sample: (1) 247; (2) 77; (3) 66; descriptive statistics	Individual	Class-Based Information Models		Information accuracy, information loss
93	Luo, L., & Toubia, O. (2015).	Quantitative	Experimentation: Two studies: between-subjects design (idea generation about one topic) and mixed design (complete four idea generation tasks)	Individual	Stimulus ideas and problem decomposition for idea generation	Consumers' domain-specific knowledge	Consumers' performance in online idea generation
94	Ma, J., Lu, Y., & Gupta, S. (2019).	Quantitative	Data set of 21,557 user innovations spanning five years collected from an online game UIC	Organization	Prior adoption experience of the innovator		Adoption of a user innovation by the firm
95	Mahr, D., & Lievens, A. (2012).	Qualitative	Netnography and Consensual Agreement Technique; large lead user community; extraction of contributions on six projects	Project	Focus, content, initiation, and codification of lead users' contributions		Innovation-related knowledge creation (value, novelty, and relevance)
96	Malhotra, A., Majchrzak, A., & Niemiec, R.M. (2017).	Qualitative	Action research	Individual	Framing the strategic challenge question, implementing a 2-phased guided crowdsourcing process to promote collaboration over contention, instructions explicitly discouraging self-promotion, and having the crowd post anonymously		Risk mitigation towards self-promotion and conflict

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
97	Mallapragada, G., Grewal, R., & Lilien, G. (2012).	Quantitative	Quantitative: Online data on the network structure of OSS; data retrieved from open source SourceForge	Project	Founder's social capital (embeddedness and brokerage)	(1) Founder's social capital (embeddedness and brokerage), (2) Interaction between developer users and end users (product's audience focus and degree of user engagement)	Time to product release
98	Marchand A., Hennig-Thurau T., & Wiertz C. (2017).	Quantitative	Longitudinal data set of video game sales and weekly information gathered from microblogs (i.e., over 13 million tweets from Twitter) and consumer reviews (i.e., more than 17,000 Amazon consumer reviews)	organization	Microblogs and consumer review		Pre-launch and after-launch sales
99	Marchi G., Giachetti C., & De Gennaro P. (2011).	Quantitative	Sample consists of 2071 messages posted by 572 Ducati Motor virtual community members in a specific blog developed by Ducati Motor. OLS with STATA.	Individual	Willingness to collaborate, product knowledge and strategic alignment with the brand identity		Lead user identification and identification
100	Marion, T. J., Barczak, G., & Hultink, E. J. (2014).	Qualitative	Exploratory research - online survey; sample of 644 NPD employees representing customers of PTC's products (software products)	Project	SM use	Knowledge	Development phase outcomes (management evaluation, NPD collaboration and concepts/prototypes generated)
101	Marion, T.J., Reid, M., Hultink, E.J.; & Barczak, G. (2016).	Quantitative	Sample: 443 firms; descriptive statistics and *t*-tests.	Project	Collaborative IT tools		NPD performance
102	Martinez, M.G. (2015).	Quantitative	Dataset from Kaggle.com; sample of 259 respondents; structural equation modeling	Individual	Competition autonomy, feedback, and task variety	Solver engagement (physical, cognitive, emotional)	Creativity

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
103	Martinez, M.G. (2017).	Quantitative	Dataset from Kaggle.com; sample of 222 respondents; survey and observed data; structural equation modeling and factor analysis	Individual	Task characteristics and knowledge characteristics	Intrinsic motivation, trust and participation intention	Quality of submission and number of competitions
104	Martinez, M.G. & Walton, B. (2014).	Qualitative	Exploratory case study design; Dunnhumby's innovation contest	Project	Data-mining competitions		Tool for data analysis
105	Martinez-Torres, R. & Olmedilla, M. (2011).	Quantitative	Particle swarm optimization	Individual	Characteristics of innovation solvers		Innovative solvers
106	Martini, A., Massa, S., & Testa, S. (2014).	Qualitative	Longitudinal case study (Barilla)	Project	Social media		Front-end innovation
107	Martini, A., Massa, S., & Testa, S. (2013).	Qualitative	Single longitudinal case study; semi-structured interviews and observations	Organization	Inner and outer entanglement		Firm's assessment of resistance and plans for future accommodation, firm's new/revised purposes/platform's new/revised features, firm's ongoing accommodation to resistance
108	Mention, A.-L., Barlatier, P.-J., & Josserand, E. (2019).	Conceptual					
109	Miller, K. D., Fabian, F., & Lin, S. J. (2009).	Quantitative	Modeling; population of 900 individuals participating in 9 communities of same size; use of MATLAB for the model		Entire community postings		Changing product preference
110	Miranda, S. M., Kim, I., & Summers, J. D. (2015).	Qualitative	Case study; quantitative grounded theory	Organization	Vision clarity and vision diversity	Vision diversity	Diffusion of the IT innovation
111	Moe, W. W., & Schweidel, D. A. (2017).	Conceptual					
112	Mollick, E. (2016).	Quantitative	(1) Quasi experiment - Sample: 88, logistic regression; and (2) longitudinal survey, sample 493 and 127.	Individual	Affiliation level, self-identity, and anticommercial attitude.		Level of commercialization

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
			Univariate testing and descriptive statistics.				
113	Mount, M., & Martinez, M. G. (2014).	Qualitative	Exploratory research; multiple case studies (3); in depth semi-structured interviews with senior managers involved with SM	Organization	SM use	Organizational and technology change	NPD process Outcomes (ideation, R&D, and commercialization)
114	Muninger, M. I., Hammedi, W., & Mahr, D. (2019).	Qualitative	Exploratory research; multiple case studies (16); grounded theory	Organization	SM use		NPD performance
115	Nambisan, S. (2002).	Conceptual	Conceptual	Project	Virtual customer environmental design parameters		Customer value creation during NPD
116	Nambisan, S., & Baron, R. A. (2010).	Quantitative	Survey: Online questionnaire; sample of 152 customers who had participated in an online product forum of the two analyzed firms	Individual	Sense of responsibility to the community, expectations of self-image, expectations of expertise enhancement, and sense of partnership with the company	Customers' identification with the community and with the company	Customer contributions in online customer forum: contribution to community and to company
117	Natalicchio, A., Petruzzelli, A.M., & Garavelli, A.C. (2017).	Quantitative	Modeling				
118	Nguyen, B., Yu, X., Melewar, T. C., & Chen, J. (2015).	Quantitative	Survey: Online questionnaire; sample of 357 respondents from online social networking sites and interviews of SMEs' managers	Organization	Knowledge acquisition from SM and market orientation	SM strategic capability	Brand innovation
119	Nursiam S., Handayani P.W., & Trisnanty, I.A.K. (2016).	Qualitative and quantitative	Qualitative: Case study interviews and online observations; quantitative: sample of 210 respondents; PLS-SEM data analysis technique	Organization	Use of Facebook AND Twitter to assist NPD activities		Speed to market, product quality, customer needs fulfillment, and product differentiation
120	Nylén, D. & Holmström, J. (2015).	Conceptual		Organization	User experience, value proposition,		Digital product/service innovation

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
					digital evolution scanning, skills, and improvisation		
121	Ogink, T. & Dong, J. Q. (2017).	Quantitative	Longitudinal study: Data set	Individual	Cognitive, integrative, and affective benefits		Idea contribution and comment contribution
122	Ooms, W., Bell, J., & Kok, R. A. (2015).	Qualitative	Multiple case studies (7); 2 large global high-tech companies; semi-structured interviews, observations, and policy documents.	Organization	SM use	Intellectual property protection, participant role and quality, and reciprocal interaction	Capabilities for absorptive capacity: socialization capability (connectedness and socialization tactics) and coordination capability (cross functional interaction and receptivity)
123	Palacios, M., Martinez-Corral, A., Nisar, A; & Grijalvo, M. (2016).	Conceptual					
124	Parise, S., Whelan, E., & Todd, S. (2015).	Conceptual					
125	Parmentier, G. & Mangematin, V. (2014).	Qualitative	Four case studies (four firms); 24 semi-structured interviews and secondary data; coding method.	Organization	Permeability of firm boundaries; opening of products and services to community input and reorganization of IP rights		Transformation of innovation management
126	Peltola, T., & Mäkinen, S. J. (2014).	Qualitative	Exploratory research: multiple case studies (3); online surveys; sample of 251 people of NPD related positions	Organization	SM adoption and use	Knowledge acquisition and assimilation	Increase of absorptive capacity and NPD performance
127	Peng, D. X., Heim, G. R., & Mallick, D. N. (2014).	Quantitative	Survey (high performance manufacturing)	Organization	IT tools (NPD, communication, project management and knowledge management IT tools)	Product size, project novelty, and task interdependence	NPD collaboration
128	Piezunka, H., & Dahlander, L. (2015).	Quantitative	Longitudinal dataset; how 922 organizations responded to 105,127 crowdsourced	Organization	Content, structural, and personal distance	Crowding	Organizations' attention

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
			suggestions from external contributors				
129	Piller, F. T., Vossen, A., & Ihl, C. (2012).	Conceptual	Conceptual	Organization	SM	Degrees of freedom, degrees of collaboration among customers, and the stage of the innovation process	Efficacy and effectiveness of customer co-creation and nature of social exchange
130	Poetz, M.K. & Schreier, M. (2012).	Quantitative	n=52 & n=51 descriptive statistics	Organization	Professional ideas and user ideas		Idea quality (novelty, customer benefit, feasibility, and three-way interaction)
131	Pollok, P; Luttgens, D; & Piller, F.T. (2019).	Quantitative	n= 637 crowdsourcing projects	Project	Problem articulation		Uncertainty and willingness to participate
132	Ponnamma Divakaran, P.K. (2018).	Quantitative	Data collected from 373 movies during 16 months from Sept. 2009 to Dec. 2010; descriptive statistics and linear regression.	Project	Pre-launch brand favorability	Pre-launch brand awareness level, brand favorability and brand strength	Post-launch purchase decisions
133	Qiu, L., Tang, Q., & Whinston, A.B. (2015).	Quantitative	Analytical model: Dataset from YouTube; N=302 new videos; one month data collection; OLS (regression) and auto-correlation	Project	Learning and network effects	Vide type	Diffusion of online videos
134	Riedl, C. & Seidel, V.P. (2018).	Quantitative	Design submission during 10 years, n=340 designs; equation and multilevel modeling	Project	Prior direct experience and votes		Performance of an individual i at time t
135	Rindfleisch, A., O'Hern, M., & Sachdev, V. (2017).	Conceptual					
136	Roberts, D. L. & Candi, M. (2014).	Quantitative	Online survey: Sample of 351 European high-level managers: 40% BtoC and 60% BtoB	Organization	Use of social network sites		NPD performance (innovativeness, market growth, and profitability)
137	Roberts, D.L. & Piller, F.T. (2016).	Conceptual					
138	Roberts, D. L., Piller, F. T., &	Quantitative	Survey; PDMA CPAS (2012);	Organization; project	SM use	NPD Process formalization	NPD performance

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
139	Lüttgens, D. (2016). Romero, D., & Molina, A. (2011).	Conceptual	Sample of 186 companies Conceptual	Organization			
140	Rullani, F. & Haefliger, S. (2017).	Conceptual					
141	Saldanha, T. J., Mithas, S., & Krishnan, M. S. (2017).	Quantitative	InformationWeek surveys; firm-level patent data from the U.S. Patent and Trademark Office; firm-level control variables from Standard & Poor's Compustat database; and U.S. Securities and Exchange Commission (SEC) filings	Organization	IT-enabled capabilities	Relational information processing capability and analytical information processing capability	Customer involvement and amount of innovation
142	Sawhney, M., Verona, G., & Prandelli, E. (2005).	Qualitative	Exploratory research: multiple-case studies (2); in-depth interviews with senior managers; and info from internal reports	Organization	Internet-based collaborative innovation initiatives		Content and process dimensions of knowledge to support NPD
143	Schröder, A., & Hölzle, K. (2010).	Conceptual	Conceptual				
144	Schweitzer, F.M., Buchinger, W., Gassmann, O., & Obrist, M. (2012).	Qualitative	Focus groups (4x5/6 individuals) that lasted 2,5 hour with 52 ideas and online contest with 226 ideas; content analysis	Organization	Ideas from contests and ideas from focus groups		Idea quality
145	Scuotto, V., Del Giudice, M., della Peruta, M. R., & Tarba, S. (2017).	Quantitative	Classification Regression Tree (CART) on a sample of 2548 SMEs	Organization	Structural dimension, relational behavior, cognitive dimension knowledge transfer, and legitimization		Innovation search process and ROI in innovation
146	Sethi, R., Pant, S., & Sethi, A. (2003).	Qualitative	Single case study: Observations and interviews	Strategic business unit	Web-based NPD system Integration	Strategic orientation, product-related factors, business environments, organizational factors, IT	NPD outcomes : Effectiveness and performance

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
						factors and partner factors	
147	Simula, H., & Ahola, T. (2014).	Conceptual					
148	Singaraju, S. P., Nguyen, Q. A., Niininen, O., & Sullivan-Mort, G. (2016).	Conceptual	Conceptual	Firm, customer, and platform	Interaction between firm and customer	SM platform	Resource integration
149	Standing, C., & Kiniti, S. (2011).	Qualitative	Exploratory research: Multiple case studies (4); desk research	Organization	Wiki innovation platform		Knowledge management and collaboration in different stages of innovation process
150	Stanko, M.A. (2016).	Quantitative	Regression analysis: n= 498 innovations.	Organization	Network positions		Remixing
151	Suseno, Y., Laurell, C., & Sick, N. (2018)	Qualitative	Dataset of 2633 UGC contents; social media analytics	Organization	Stakeholder domain		Value creating practices
152	Teigland, R., Di Gangi, P.M., Flaten, B.T., Giovacchini, E., & Pastorino, N. (2015)	Qualitative	Literature -driven thematic analysis, semi-structured interviews, n=19; codebook development AND secondary data.	Organization	Boundary management of a firm-sponsored OSS community		Community's innovation capacity, firm's absorptive capacity
153	Topaloglu, O., Dass, M., & Kumar, P. (2017)	Quantitative	Study 1) Online survey with M-turk,n= 123 -> 4 linear models ; study 2) content analysis, n=5038 microblogs; coding during 26 days-> modeling with regression analyses; study 3) Online survey M-Turk, n=201 > modeling and regression analysis; study 4) M-Turk, n=94 participants. One-way ANOVA.	Individual	Microblogging activities	Positive/negative valence	Microbloggers' behavior
154	van Eck, P., Jager, W., & Leeflang, P. (2011).	Quantitative	Empirical study on online applications: Sample of 136 children	Individual	Innovativeness of opinion leader, less extensive use of mass media from opinion leader, number of	Normative influence	Adoption percentage, information diffusion, and product diffusion

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
					opinion leaders in network		
155	Verona, G., Prandelli, E., & Sawhney, M. (2006).	Conceptual	Conceptual	Individual	Knowledge brokers, virtual customers' environments, and virtual knowledge brokers		Firm's innovation process
156	Wang, Y., Hsiao, S.H., Yang, Z., & Hajli, N. (2016).	Quantitative	Online survey from four online communities, n=190 business professionals. Structural equation modeling, descriptive statistics, and CFA.	Organization	Social comparison, social identity	Opening firm boundaries, identity convergence around product boundaries, opening product boundaries	Brand awareness
157	Wieneke, A. & Lehrer, C. (2016).	Qualitative	Multiple case studies -> n=7; semi-structured interviews-> n=19. Cross-case and within-case analysis.	Organization	Required processes and resources: ACAP, iterative customer insight generation, ICT, analytical skills, understanding of business context, customer insight governance, and customer oriented culture		Customer insights from SM data
158	Yan, J.K., Leidner, D.E., & Benbya, H. (2018).	Quantitative	Longitudinal data set of online idea exchange community.	Organization	1) Idea content diversity and idea content codifiedness ; 2) Idea promotion and Idea generation		1) Idea promotion and idea generation; 2) Idea implementation
159	Yang, M.H.; Weng, S.S.; & Hsiao, P.I. (2014).	Qualitative and quantitative	Scale development	Organization			
160	Yoo, Y., Boland, R. J., Lyytinen, K., & Majchrzak, A. (2012).	Conceptual	Conceptual	N/A			
161	Zahay, D., Hajli, N., & Sihi, D. (2018).	Qualitative	Exploratory study: Interviews. N=8. Content analysis.	Organization	Sources of CS ideas		NPD applications
162	Zhu, J.J., Li, S.Y., & Andrews, M. (2017).	Quantitative	Large-scale longitudinal survey; n=89 ideas; two-stage	individual	Ideators' engineering expertise and marketing expertise	Cocreators' marketing inputs and engineering inputs	Idea selection and product performance

	Source	Design	Research Method	Unit of analysis	Drivers= Antecedents	Contingency factors	Outcomes
163	Zwass, V. (2010).	Conceptual	sequential model-Tobit II model Conceptual	N/A			

After this first coding round, each author noted similarities, differences, and the evolution of arguments over time. We introduced new categories in the form of clusters (nodes and subnodes in NVivo12) to facilitate the data conceptualization. For example, three clusters illustrate uses of social media for innovation practices: (1) gathering knowledge, (2) identifying user profiles, and (3) management and collaboration. This process contributed to better conceptual insights, as well as a clearer identification of patterns and underlying properties. To conclude the data analysis, we connected our findings by delineating the factors that drive or restrain social media adoption and their effects in our study context, as we outline in Figure 3.4.

Results

We start by presenting statistics that describe the evolution of this research domain, in terms of disciplines and methods. Then we consolidate these insights to analyze the key dimensions of social media use for innovation. With an overview of theoretical perspectives applied to support research into social media and innovation over the two past decades, we shed light on three main research perspectives: organizational capabilities, social behavior, and individual behavior. We also identify the critical roles of interactions among stakeholders and between stakeholders and technological tools. Following our theoretical exploration, we present a conceptual framework of the external, internal, and contingency factors, and key outcomes for innovation performance related to social media use. With this framework, we can both integrate lessons from the existing literature and identify gaps to direct further research.

Descriptive statistics

Research streams, methods, and units of analysis

Research on social media use for innovation is scattered across several research streams, as revealed by Figure 3.2: (1) general management (34%) research with a strong focus on organizational behavior; (2) innovation management (23%) studies that mainly concentrate on innovative profiles and capabilities for input integration; (3) information management (21%) literature that considers means to improve collaboration through platforms; and (4) marketing (15%) studies that cover interactional behavior, such as customer participation, engagement, and cocreation. A few additional streams of research appear when their contributions are relevant and account for 7% of our total selection.

Split by stream of research

General Management | Innovation management | Information Management | Marketing | Other
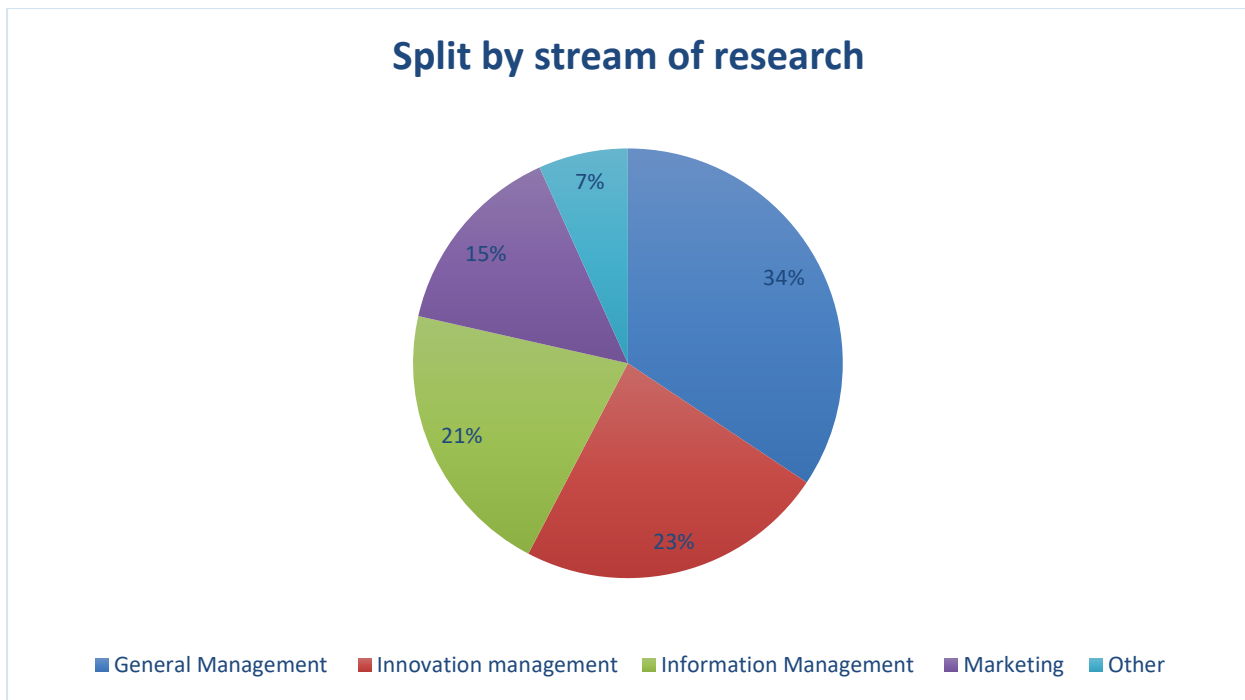
Figure 3.2: Domains of research on social media and innovation

In our sample, 81% of the papers are empirical. 55% of these papers are quantitative in nature, mainly use surveys with random samples, combined with regressions, factorial analyses, or structural equation modeling. The quantitative papers test the impacts of different variables on elements of new product development (NPD) performance (Asdemir et al., 2006), idea implementation (Bayus, 2013; Huang, Singh, & Srinivasan, 2014), or user behavior (Balka, Raasch, & Herstatt, 2014; Carlson, Rahman, Voola, & De Vries, 2018). It is also interesting to note that social media use is either used as a context, independent variable, or dependent variable.

In 26% of our total sample, authors adopt a qualitative approach, with a notable reliance on case studies. The relative newness of the phenomenon justifies the need to explore the domain to gain a better understanding of the context and related challenges. For example, qualitative studies seek to identify factors that might influence innovation outcomes such as idea quality (Allen et al., 2018; Schweitzer, Buchinger, Gassmann, & Obrist, 2012) or innovator profiles (Brem & Bilgram, 2015; Dahlander & Wallin, 2006; Füller, Hutter, Hautz, & Matzler, 2014). The complex nature of both social media, with their rapid evolution and array of functionalities, and organizations that differ in size, structure, and processes, also imply the presence of various dimensions that demand exploration. Therefore, qualitative studies investigate the

organizational capabilities that firms need to develop in order to leverage social media tools (Chan, Wang, Lacka, & Zhang, 2016; Muninger, Hammedi, & Mahr, 2019). As Figure 3.3 reveals, 19% of the papers are conceptual and were published prior to 2010, together with most of the qualitative studies (e.g., Nambisan, Prandelli, and their colleagues' work). After 2010, more survey and panel studies were conducted, showing the growing interest in the domain.
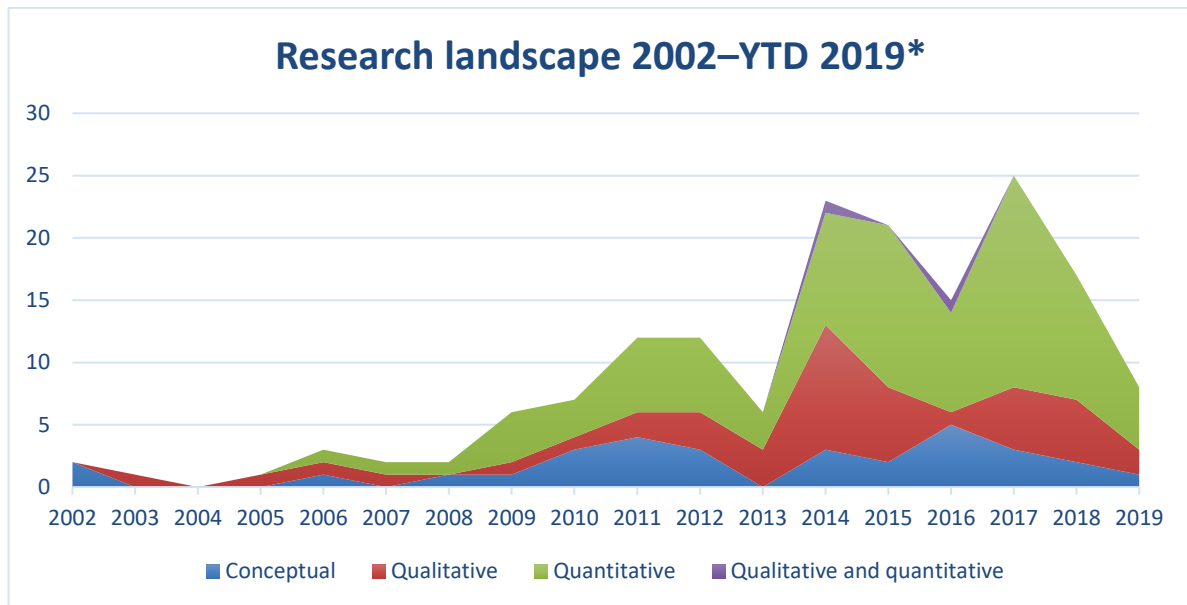
*YTD represents January to April 2019.

Figure 3.3 : Evolution of research on social media and innovation

Most empirical studies (53) use the organizational level to better understand social media strategy and capabilities. Other empirical studies (47) use the individual level to investigate managers' behavior toward social media adoption; idea or product quality and performance; and factors that impact the level of contribution in innovation projects. Empirical studies at the project level (28) focus on team dynamics and knowledge management with social media. The remaining studies combine different units of analysis.

Types of social media

To distinguish the different types of social media, Tuten and Solomon (2018, pp. 11–16) classify them into four main typologies: (1) Social communities (sharing, socializing, and conversing) that include social networking sites such as Facebook, Instagram, LinkedIn, and Snapchat; online communities; and wikis; (2) social publishing (editorial, commercial, and

user-generated) that include blogging platforms like Tumblr; video sharing sites such as YouTube; and photo sharing sites like Instagram; (3) social commerce (CRM/service, retail, human resources) with review sites (e.g., Yelp) deal sites (e.g., Groupon); Facebook Marketplace, etc.; and (4) social entertainment (games, music, and art).

Despite existing typologies, our review of the literature reveals that scholars use other language to denote social media, especially in the context of innovation (e.g., virtual lead user communities, internet-based cocreation, online collaborative platforms, collaborative online tools, etc.). A possible explanation is the breakdown across disciplines (i.e., information management, marketing, innovation, and general management). This large set of social media denominations shows the complex nature of social media, but it also creates confusion and difficulties in identifying prior studies.

The descriptive statistics shed light on some interesting insights. First, a large diversity in methods and measures exists. For example, authors use various units of analysis, but they rarely connect across units, such as by using a multilevel perspective. In addition, social media tend to hold different roles in studies (i.e., context, dependent variable, and independent variable). Second, the findings reveal a high level of heterogeneity when it comes to the analysis of social media characteristics. Yet three types of focuses emerge from the findings: collaboration features; type of content shared; and targeted users. Third, the results suggest that the amount of social media usage has been overlooked. The frequency of social media and the quality of various social media platforms have rarely been considered in the existing literature. However, these parameters may have an impact on innovation outcomes. Finally, we identify a lack of empirical studies that test the use of social media on innovation performance outcomes.

Research perspectives

Our systematic review reveals three major research perspectives have been used to study social media use in relation to innovation. As Table 3.3 indicates, we also find a great deal of conceptual overlap. This section presents the main research perspectives that have emerged from our review, together with the major gaps we identify.

Table 3.3: Research perspectives applied to study social media and innovation

Research lens	Central Concepts	Authors
Organizational capabilities		
Resource-based view and dynamic capabilities (strategy) for NPD process	IT capability	Barczak et al. (2007); Ebner, Leimeister, & Krcmar (2009); Kawakami et al. (2015); Marion et al. (2014).
	Analytics capabilities	Byrum & Bingham (2016).
	Community management	Culnan et al. (2010); Nambisan (2002).
	Ideation and implementation capabilities	Dong & Wu, (2015).
	Resource integration	Singaraju et al. (2016).
	Social media capability	Benitez et al. (2018); Nguyen, Yu, Melewar, & Chen, (2015).
	Knowledge based-view	Allen et al. (2018); Banker et al. (2006); Bashir et al. (2017); Candi et al. (2018); Chen & Kuo (2017); Du et al. (2016); Durmuşoğlu & Barczak (2011); Faraj et al. (2016); Hannigan, Seidel, & Yakis-Douglas, (2018); Marion et al. (2014); Nambisan (2002); Standing & Kiniti (2011).
	Absorptive capacity	Banker et al. (2006); Culnan et al. (2010); Ooms et al. (2015).
	Entrepreneurial orientation	Brooks et al. (2017).
	Organizational capabilities	Benitez et al. (2018); Chirumalla et al. (2017), Roberts & Candi (2014); Roberts et al. (2016).
Organizing vision theory	IT innovation diffusion, clarity, and diversity	Miranda et al. (2015).
Organizational information processing	Project novelty, product size, and task interdependence	Peng et al. (2014).
Web-based methods for innovation adoption	Open vs. closed systems	Boudreau (2010); Sethi et al. (2003).
	Collective intelligence	Bonabeau (2009).
Austrian economics theory of entrepreneurial discovery	Prior knowledge and entrepreneurial discovery	Chandra & Leenders (2012).
Social behavior		
Social capital theory, social exchange theory, involvement, and social identity theory	Sense of responsibility, self-image, expectations, and sense of partnership	Dissanayake, Zhang, & Gu (2015); Nambisan & Baron (2010).
Social comparison theory	Tournament and auction-related	Dissanayake, Zhang, Yasar, & Nerur (2018).
	Social support	Bugshan (2015).
	Deviant behavior	Gatzweiler, Blazevic, & Piller (2017).
Mangle's theory	Entanglement	Martini, Massa, & Testa, (2013).

Network theory	Structural holes	Gray (2011); Verona et al. (2006).
	Network position	Camacho et al. (2019); Dahlander & Frederiksen (2012); Rullani & Haefliger (2013); van Eck et al. (2011).
	Strategic networks and collaborative networked organizations	Romero & Molina (2011).
	Social interactions, social ties, and connectedness	Dahlander & Wallin (2006); Hienerth et al. (2014); Ooms et al. (2015); Singaraju et al. (2016).
	Fluidity	Faraj et al. (2011).
	Knowledge brokerage	Banker et al. (2006); Mallapragada et al. (2012); Verona et al. (2006).
Stakeholder theory	Sustainability and customer focus	Du et al. (2016).
	Acceleration	Jaring et al. (2015).
	Multistakeholder systems	Singaraju et al. (2016).
Individual behavior		
Theory of planned behavior	Attitude, cognition, subjective norms, and perceived behavioral control	Bartl et al. (2012).
Cognitive psychology	Cognitive fixation	Bayus (2013).
	Problem decomposition and stimulus ideas	Luo & Toubia (2015).
	Stimulus-organism-response paradigm	Carlson et al. (2018).
Consumer behavior	Brand passion and brand knowledge	Füller et al. (2009).
	Trust	Hautz, Füller, Hutter, & Thürridl (2014).
	Motivation	Camacho et al. (2019); Frey, Lüthje, & Haag (2011).
	Consumer Bayesian learning	Huang et al. (2014).
	Customer engagement	Franklin, Searle, Stoyanova, & Townley, (2013); Sawhney et al. (2005); Verona et al. (2006).
	Customer empowerment	Chou, Yang, & Jhan (2015); Fuchs & Schreier (2011).
	Customer involvement	Candi et al. (2018); Saldanha et al. (2017).
	Consumer cocreation	Hoyer, Chandy, Dorotic, Krafft, & Singh, (2010); Piller et al., (2012).
	Proactive and reactive attention	Dahlander & Piezunka (2014).
Lead user theory	User characteristics (e.g., expertise)	Bilgram et al. (2008); Brem & Bilgram (2015).
	Motivation	Nambisan (2002).
	Basic, excitement, and performance factors	Füller et al. (2007); Haavisto (2014).
	Traits, knowledge, and status	Hautz et al. (2014); Mahr & Lievens (2012).

Stream 1: Organizational capabilities

The resource-based view of the firm and organizational capabilities (Barney, Wright, & Ketchen, 2001) are primary theoretical angles adopted to investigate social media use and its impact on innovation. Leveraging specific resources and capabilities (tangible and intangible) in turn has been identified as essential for the creation of competitive advantages through social media (Roberts & Candi, 2014).

Two types of capabilities emerge as key determinants of social media use for innovation: IT capability and knowledge capability. First, IT infrastructure and IT embeddedness can support idea generation, product testing, and product design and development (Asdemir et al., 2006; Barczak, Sultan, & Hultink, 2007; Marion et al., 2014). The IT infrastructure is key for exploring and exploiting the vast amount of social media data (Benitez, Castillo, Llorens, & Braojos, 2018). Defined as the centrality of information systems for managing interdependence in the NPD process, IT embeddedness is an essential factor for successfully integrating web-based NPD systems too (Barczak et al., 2007; Sethi, Pant, & Sethi, 2003).

Second, knowledge capabilities enable the acquisition, transformation, and creation of knowledge from social media (Asdemir et al., 2006; Candi, Roberts, Marion, & Barczak, 2018; Nambisan, 2002). Prior research suggests that, by overcoming knowledge overload difficulties, market knowledge-processing and technological knowledge-processing capabilities enhance the effect of social media use on NPD performance (Cheng & Krumwiede, 2018). Research also shows the effect of social media on firms' absorptive capacity (Ooms et al., 2015; Peltola & Mäkinen, 2014). Few articles deal with other important capabilities such as big data management or analytical capabilities. Nonetheless, considering the growing volume and velocity of social media data production, firms need to process this continuous data flow quickly and accurately.

Stream 2: Social behavior

A second stream of research, mainly rooted in network theory (Hienerth, Lettl, & Keinz, 2014; Ooms et al., 2015) investigates social behavior on social media. Network theory focuses on social ties that form among different actors in virtual innovation communities. The influence exerted by these actors' position inside and outside these online communities is also examined. For example, Gray (2011) argues that members with easy access to other users' input in a network with greater reach are likely to be more innovative. In addition, structural holes in

online social networks facilitate access to new knowledge, which can lead to innovative outcomes (Nylen & Holmstrom, 2015). That is, structural holes enable firms to create technology brokering across industries through granting access to an extended network of groups that do not usually interact with one another (Sawhney, Verona, & Prandelli, 2005). In spite of these benefits, information (e.g., innovative ideas) shared on social media is also subject to conflicts resulting from potential loss of control or ownership issues (Bonabeau, 2009; Chou, Yang, & Jhan, 2015a; Fuchs & Schreier, 2011). Only a few papers tackle these problems.

Furthermore, dyadic relationships between firms seeking innovation partners and groups of users, mainly online communities, have been examined. Whereas social media allows for interactions between broad groups of participants, only one study dealt with multiple types of stakeholders (Singaraju, Nguyen, Niininen, & Sullivan-Mort, 2016). This is probably due to the relatively nascent body of research that has emerged on the topic. Finally, the analysis uncovers different types of user-generated content within networks—one created collaboratively and the other created independently (Ransbotham, Kane, & Lurie, 2012). The findings reveal a curvilinear relationship between the number of users and user-generated content. They suggest a stronger effect for newer sources of content than established ones.

Stream 3: Individual behavior

Individual behavior emerges as a last focal theme. Cognitive psychology theory provides insights into the individual behavior of internal and external users on social media, including their interactions and engagement with innovation activities. Three dimensions of individual behavior stem from our analysis: user motivation (Bilgram, Brem, & Voigt, 2008; Füller, Mühlbacher, Matzler, & Jawecki, 2009; Nambisan, 2002), user cognition (Miranda, Kim, & Summers, 2015), and manager cognition (Bartl, Füller, Mühlbacher, & Ernst, 2012; Bayus, 2013). First, the motivation to participate in innovation activities on social media depends on the user's perception that active participation will lead to greater product or service quality (Nambisan, 2002). The user's motivation should be stimulated by firms to encourage individual contributions in innovation projects facilitated through social media (Ogink & Dong, 2017). Monetary and nonmonetary rewards have been found to help firms achieve this purpose (West & Lakhani, 2008).

Second, cognition—which represents the perceived advantages and disadvantages when considering a certain behavior—influences engagement in innovation projects on social media

(Miranda et al., 2015). Cognition has been examined from both a user and a manager perspective. Cognition plays an important role in managers' decision to adopt virtual customer integration methods. Bartl et al. (2012) argue that the decision to implement innovation activities using social media stem from cognitive judgements of the potential advantages and disadvantages of such use. This finding is complemented by another study conducted by Miranda et al. (2015) that discusses the key determinant role of an organizing vision—cognitive structure—on the diffusion of an IT innovation on social media.

The discussion of user involvement is relatively more prominent in recent research. Specifically, user engagement in providing feedback and ideas for innovation projects on social media is discussed (e.g., Carlson et al., 2018; Chirumalla, Oghazi, & Parida, 2017). Studies reveal that a higher engagement in online innovation activities increases idea quality, business performance (Camacho, Nam, Kannan, & Stremersch, 2019), and creativity (Martinez, 2015). Yet research on the type of content and interactions that could drive these engagement behaviors remains sparse.

Conceptual framework of social media use for innovation management practices

The complex nature of social media and innovation has led to rich but disparate results (Table 3.2), suggesting the need for a synthesis that connects the mixed findings. Many questions persist regarding how specific innovation inputs interact with social media to deliver desired innovation outcomes. Figure 3.4 illustrates the overarching conceptual framework of social media use for innovation management practices. It presents the current knowledge about the main influential factors and outcomes of social media use for innovation. This framework emerged from our systematic review and considers the main topics discussed in the existing literature.
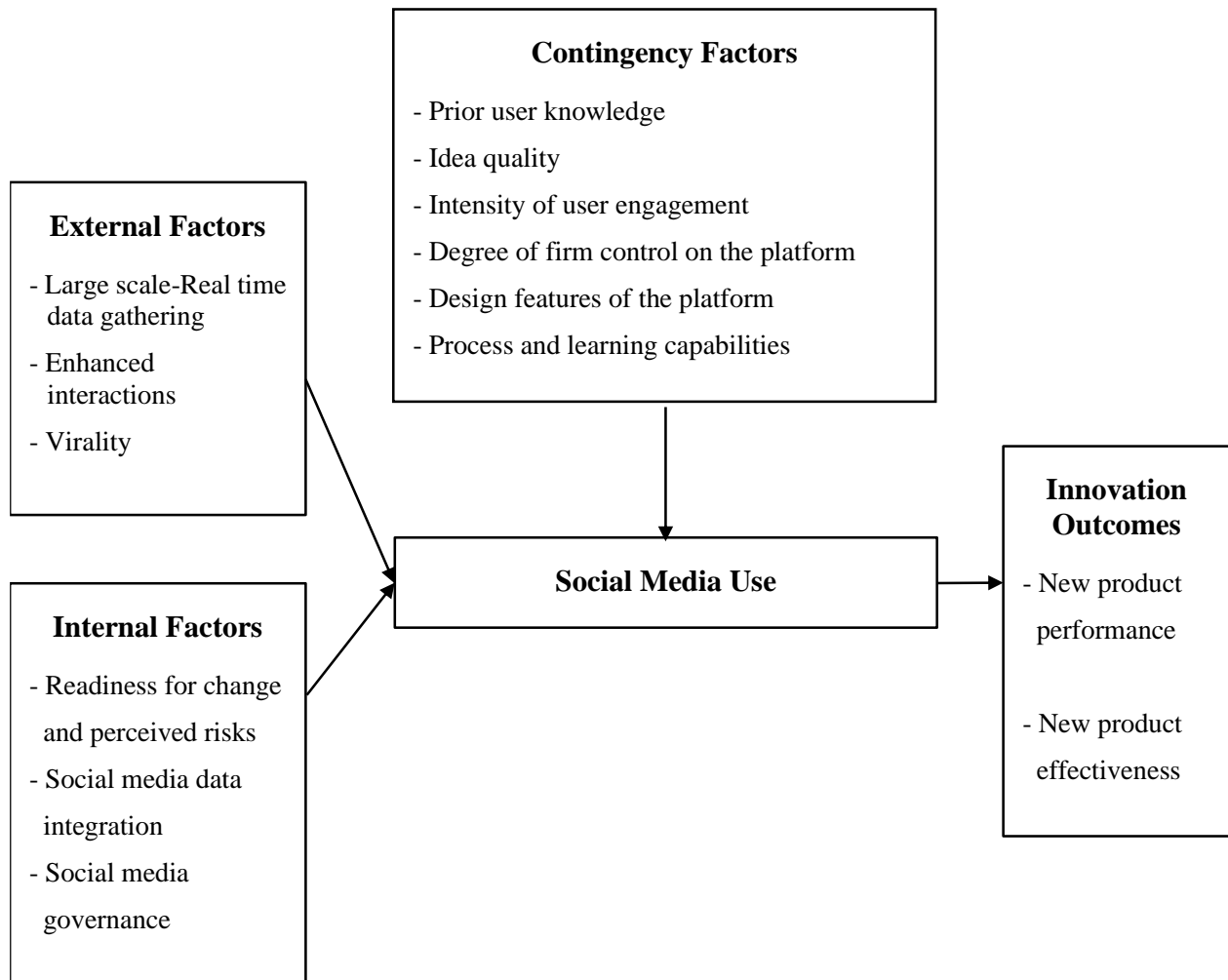
Figure 3.4: Framework of social media use for innovation management practices

External factors

Large-scale and real-time data gathering. The transparency provided by social media allows firms to act as boundary spanners and thus reduce the reluctance to search for external information (Candi et al., 2018; Ooms et al., 2015). Social media offer opportunities to gather customer data that can be digitally transformed into knowledge for innovation activities (Benitez et al., 2018). Hence, many companies leverage social media to gather rich, specific, and large-scale data in real time from external contributors, who represent tremendous sources of information and innovative ideas (Allen et al., 2018; Bashir, Papamichail, & Malik, 2017). For example, online communities offer rich and diverse sources of knowledge (Hajli, Shanmugam, Papagiannidis, Zahay, & Richard, 2017).

In addition, online communities are ideal for knowledge collaboration and innovation because they enhance tacit knowledge flows among participants (Faraj, von Krogh, Monteiro, & Lakhani, 2016). Tensions resulting from these resources (e.g., social disembodiment of ideas, time, and passion) stimulate knowledge collaboration on online platforms (Faraj, Jarvenpaa, & Majchrzak, 2011). One of the major challenges remaining is how to process the sheer volume of information generated in real time, which can accumulate quickly (Hoornaert, Ballings, Malthouse, & Van den Poel, 2017). Surprisingly, only two papers mentioned risks related to fake news (Roberts & Candi, 2014) or the veracity of information (Nambisan & Baron, 2010).

Enhanced interactions. Social media enable user-generated, interactive, and dynamic exchanges that build on collective community intelligence (Du, Yalcinkaya, & Bstieler, 2016). The substantial information and easy feedback available on social media platforms (e.g., tutorials on YouTube) enhance interactions among social media users, which strongly influence innovation success (Peng, Heim, & Mallick, 2014; Piller et al., 2012). On social media, knowledge collaboration occurs without pre-existing relationships. Faraj et al. (2011) argue that this shift from traditional collaborations to more open ones is eased by resource fluidity (i.e., the dynamic flow of resources such as time, passion, and identity) in and out of social media.

A high level of interactions on social media between firms and users, marked by frequent communication, mutual support, and peer recognition, increase value creation during the innovation process by enabling the application of new ideas and concepts (Bashir et al., 2017; Schröder & Hölzle, 2010; Singaraju et al., 2016). Yet these virtual interactions between firms and online users require the setting up of improved experience environments (Romero & Molina, 2011).

Virality. Even if some firms do not value social media in all the stages of NPD development, many invest in social media tools in the prelaunch and launch stages. In the prelaunch stage, such companies launch ad campaigns and post blogs on social media to increase consumers' interest in their offerings, which is particularly relevant for products with a short life cycle (Kim & Hanssens, 2017). During the launch stage, social media are leveraged to accelerate product and service diffusion and adoption through viral designs that are specifically engineered to increase sharing potential and communication campaigns (Aral et al., 2013). In this regard, online communities act as a diffusion channel and enable large-scale acceptance by targeting wide customer segments (Hienerth et al., 2014). Only two studies identify negative comments

and word of mouth as a potential risk for innovation (Di Gangi & Wasko, 2009; Hoyer, Chandy, Dorotic, Krafft, & Singh, 2010).

Influencers such as opinion leaders play a key role in the diffusion of innovations. Opinion leaders who exhibit innovative behavior and are less sensitive to normative influences have positive impacts on adoption rates (van Eck, Jager, & Leeflang, 2011). Despite the influential power owned by these specific users, most of the developed theories in the existing literature are intended focus on general consumers rather than subgroups that hold a central position in their network or have specific knowledge and expertise.

Internal factors

Readiness for change and perceived risks. Despite the advantages offered by customer involvement in the innovation process, social media data may appear to be subjective or be rejected by a firm's internal employees (Allen et al., 2018; Chan et al., 2016; Dahlander & Wallin, 2006). Some employees remain skeptical about users' ability to articulate their needs; they consider users' input to not be valuable or insightful, or they dismiss users' ideas as too narrow and insufficiently disruptive (Bartl et al., 2012; Bashir et al., 2017). Social media features exacerbate these negative perceptions. The openness and transparency that characterize social media and the sheer amount of content shared among external users engender negative attitudes in organizations. That is, this rich source of information is paramount for many firms (Ooms et al., 2015), but there is a paradoxical need for closure among other firms (Dobusch, Dobusch, & Müller-Seitz, 2019). This concern can be resolved by implementing rules and procedures to improve strategic decisions and achieve increased openness (Dobusch et al., 2019). Openness and transparency issues specifically resonate with industries that produce complex, information-sensitive products. In such environments, secrecy concerns constitute a major barrier to adopting social media for NPD (Muninger et al., 2019).

Social media data integration. Our review reveals that many firms struggle to absorb and leverage the valuable knowledge created on social media effectively (Teigland, Di, Flåten, Giovacchini, & Pastorino, 2014), mostly due to the large amount of unstructured social media data that is available and useful for innovation activities (Hoornaert et al., 2017). This huge amount of data has controversial validity and is collected from multiple platforms in different formats (Wieneke & Lehrer, 2016). Other studies stress the gap in analytical and computational skills that are needed to (1) analyze social media data with statistical methods, (2) create bug

reporting systems, and (3) improve social media experience through additional features that support innovation (Dahan & Hauser, 2002; Moe & Schweidel, 2017; Mount & Martinez, 2014; Teigland et al., 2014).

Social media governance. Roberts et al. (2016) suggest that a lack of formal processes to manage external input acts as an impediment to leveraging social media successfully. Specifically, a lack of coordination within the firm leads to time and budget alignment issues, resulting in a poor integration of valuable sources of information. The inherent nature of NPD— where tasks and components are interrelated—requires both excellent coordination and an ability to communicate the tacit information needed for problem solving (Allen et al., 2018; Chang & Taylor, 2016). Such effective coordination often is impeded by the absence of a single platform and clear policies to structure exchanges of data (Asdemir et al., 2006). While a governance structure inside firms can support internal cooperation and the responsible use of social media in new product development (Bashir et al., 2017), only a limited number of studies have investigated this facet of organizations.

Contingency factors

Prior user knowledge and idea quality. Contributors' levels of competence and experience determine the quality of their input. Prior experience with successful ideas may suggest enhanced expected output (Hoornaert et al., 2017). However, generating many ideas can be counterproductive if an ideator just repeats similar ideas that those that have already been implemented (Bayus, 2013). Creative and innovative forums can be a good source of insights, as long as they are hosted by an expert who can stimulate interesting discussions (Haavisto, 2014). Lead users are more likely to offer innovative solutions (Brem & Bilgram, 2015), so they are sought after by firms for their knowledge, status (Mahr & Lievens, 2012), and ability to come up with breakthrough innovations (Hienerth et al., 2014). Contributions from lead users, shared proactively, contain more novel insights than reactive contributions (Mahr & Lievens, 2012).

Intensity of user engagement. Virtual engagement behaviors depend on both environmental stimuli—e.g., content and contact quality, opportunities to interact, sociability—and the virtual experience—e.g., hedonic and learning value (Carlson et al., 2018). The level of engagement is reflected in interactions within an online community in the form of feedback and collaboration during product development (Carlson et al., 2018; Mallapragada et al., 2012).

Nonetheless, user engagement is not enough; direct engagement implies limited network access, with potentially negative impacts on innovation (Verona, Prandelli, & Sawhney, 2006).

Degree of firm control on the platform. The degree of control granted by the platform owner to communities may influence innovation outcomes. For example, in the software industry, providing access to foundational platform technologies can stimulate innovation (Boudreau, 2010). In another study, authors suggest firms should customize their platform's task structure based on users' specific knowledge, because high-knowledge users are better with abstract cues offered by problem decomposition (Luo & Toubia, 2015)

Design features of the platform. The selection of the right design features is critical. Design features include the means used to moderate interactions, and access restrictions and options for maintaining anonymity during interactions (Nambisan, 2002). They might take the form of toolkits that establish the development environment, guiding customers to transform their needs into concrete solutions with iteration loops. These toolkits also enhance social exchanges between a firm and a user during the product development phase (Piller et al., 2012). They might increase preference fit and willingness to pay, though with some limitations: toolkits tend to be costly, may reduce users' creativity, and can lead to marginal innovativeness (Hienerth et al., 2014). However, firms that carefully select features to incorporate in their social media platforms likely achieve greater success in their innovation efforts (Nambisan, 2002).

Process and learning capabilities. Organizational processes can enhance each step of the innovation process and promote network collaboration. Greater technology integration brings the innovation process into the firm by improved collaboration with social media users (Sethi et al., 2003). For example, IT capabilities facilitate communication and information sharing and dissemination (Kawakami, Barczak, & Durmuşoğlu, 2015). They lead to more efficient collaboration platforms for knowledge sharing with customers (Saldanha, Mithas, & Krishnan, 2017). IT capabilities also support knowledge acquisition from dispersed sources. In this regard, knowledge acquired from social media can facilitate optimized and optimal learning behavior by experience accumulation (Nguyen, Yu, Melewar, & Chen, 2015). In addition, Roberts et al. (2016) note a significant positive effect of social media use on product innovativeness when process formalization is high. Firms with higher levels of process maturity are more prone to adopt mature project management techniques and less likely to be exposed to disturbances of their internal processes while they are applying integration strategies (Asdemir et al., 2006).

Innovation outcomes

The use of social media during the innovation process influences innovation outcomes in different ways. For example, the success of social media use depends on NPD context. Cui and Wu (2017) argue that in an experimental NPD context, companies should rely on customers as sources of information, but when experimentation is lower, codevelopment with customers is preferable. This proposition relates to other findings that link the complementarity effects of social media to NPD performance and that highlight the benefit of using social media for gathering information about both needs and solutions (Roberts et al., 2016). Moreover, the use of social media seems relevant only for radically innovative products (Gruner et al., 2013), for technologically turbulent projects, for business customers, and for small firms (Chang & Taylor, 2016).

Considering the many outcomes associated with social media use, we focus on the two most discussed types of new product outcomes in the remaining part of this section: new product performance—i.e., financial performance—;profitability and market performance—i.e., market growth, sales, and market share of the new product—; and effectiveness—i.e., innovativeness, design, quality, and cycle time (Bashir et al., 2017; Cheng & Krumwiede, 2018; Roberts & Candi, 2014; Sethi et al., 2003).

New product performance. Economic returns on an innovation might be measured as returns on investment or profit. Social media that support peer learning might reduce firms' operational costs (Lu, Singh, & Sun, 2017), particularly in the launch stage of an NPD, when users raise questions about specific aspects of an innovation. Social platforms can also reduce product development costs by improving team collaboration, which lowers the downstream adjustment costs (Asdemir et al., 2006). Yet contributors' profiles also might increase costs. For example, involving lead users tends to increase costs, because they are difficult to identify and integrate (Mahr, Lievens, & Blazevic, 2014). The effects of social media use on financial performance are moderated by different elements of knowledge capabilities—e.g., market knowledge-processing and technological knowledge-processing capabilities; potential value of customer knowledge; difficulty of knowledge management; characteristics of actors involved in social media; and NPD knowledge management (Chang & Taylor, 2016; Cheng & Krumwiede, 2018). Empirical evidence linked to the impact of social media use on market performance is scarce and conflicting. Roberts and Candi (2014) test the relationship of social media use and market growth and find a negative effect; Cheng et al. (2018) instead note the significant positive

moderating effect of social media use on market performance. Another study with a different angle focuses on the use of online communities to predict prelaunch market performance for short life cycle products and reveals strong positive effects (Divakaran, Palmer, Søndergaard, & Matkovskyy, 2017).

New product effectiveness. Social media that are designed to improve communication and knowledge flows across team members can increase teamwork, which leads to enhanced product design and quality (Asdemir et al., 2006; Marion et al., 2014; Nursiam, Handayani, & Trisnanty, 2016). Design solutions are moderated by the initial product concept (Allen et al., 2018). Various studies suggest that creativity prompts searches for external sources of input, which may lead to enhanced product innovativeness (i.e., degree of product newness) stemming from knowledge diversity (Cui & Wu, 2017). Correspondingly, several authors indicate a positive effect of social media use on product innovativeness (Gruner et al., 2013; Roberts et al., 2016), especially when lead users are involved (Brem & Bilgram, 2015; Mahr & Lievens, 2012). Some studies suggest that the use of social media can lead to shorter time to market, because it enables real-time information acquisition and accelerates development speed (Roberts et al., 2016).

In the development stage, social media use encourages collaboration between team members, who share concepts and prototype updates, leading to faster feedback and review decisions from management (Marion et al., 2014). This process enables efficient data storage, product design reuse, and electronic retrieval, leading to compressed NPD time (Asdemir et al., 2006). Similar to this, the active integration of open source online communities in the development phase can reduce the time to product release if project founders possess both high brokerage and high embeddedness (Mallapragada et al., 2012). These cycle time reductions occur only if the firm maintains a strong knowledge of social media tools and has enough resources to interact with the platforms (Barczak et al., 2007; Mallapragada et al., 2012).

Discussion and research agenda

Based on a review of 163 publications, this study introduces a framework of social media for innovation. It was created and refined using a systematic review of recent research across four major disciplines that place innovation centrally. The present manuscript complements other reviews by focusing on key factors and outcomes of social media use for innovation. It outlines areas of convergence and divergence but also several research gaps that should be addressed in

future research. Table 3.4 presents the identified research opportunities and contains a sample of key questions to guide future research.

Table 3.4: Sample of questions to guide further research

Research Opportunities	Potential Research Questions
Multiple stakeholder involvement	•How can firms integrate multiple stakeholders concurrently (e.g., partners, users, suppliers) in the innovation process? •How can firms integrate users at each step of the innovation process, and which strategies should they implement? •What strategies should be implemented in terms of community management to engage stakeholders over time? •What are the trade-offs in incentivizing customers and other stakeholders to get involved on social media for innovation? •What individual routines determine creating, using, selecting, and communicating social media-based insights, and how should the proficiency of such routines be measured? •In which conditions can stakeholders produce substantial ideas for innovation? •Which engagement mechanisms can improve stakeholders' experience on social media platforms when they use such platforms to collaborate on innovation projects?
Processing and analysis of social media data	•What type of new methods could contribute to big data extraction? •What new methods address the constraints of data protection? •What data analytics are needed to extract and provide reliable and representative social media information? •How can we select clear and adequate sampling methods to extract social media data? •How can deep learning and artificial intelligence contribute to big data management? •What biases affect innovating firms' and individuals' social media information?
New business models and capabilities	•What distinctive social media creation and use strategies can firms use, and how does each of them enable incremental or radical innovation? •What managerial skills and practices foster teams' use of social media for innovation? •What managerial practices align diverse social media expertise levels in teams? •What kind of process formalizations are needed, and how can firms trade off among flexibility/creativity or procedures/policies? •What processes and actions are needed on the firm side to ensure privacy? •How can firms increase the speed of internal social media adoption, and which processes, training, and skills are needed?

Involvement and management of multiple stakeholders

A key insight revealed by our systematic literature review is the lack of variety in terms of stakeholder involvement through social media. The focus on consumers comes at the expense of other stakeholders who could also benefit from the innovation process. Whereas various backgrounds and experiences offer greater variety of ideas that firms can leverage, many studies revolve around the role of online consumer communities for generating feedback and providing new insights to the firm. They identify some meaningful traits and behaviors for contributors (e.g., Boudreau, 2010; Brem & Bilgram, 2015; Füller et al., 2009). Several psychology constructs, such as cognition, emotion, and engagement, are being increasingly applied in social media environments, along with stakeholder engagement in innovation (e.g., Watson, Wilson, Smart, & Macdonald, 2017). For instance, online design features influence the cognitive and emotional states of consumers and induce engagement in innovation initiatives (Carlson et al., 2018). Further research thus might consider new approaches such as gamification to motivate and engage multiple stakeholders. To this end, future studies could also look at the best ways to communicate with these stakeholders (e.g., social media corporate pages, project blogs, digital newsletters, etc.) to keep their level of interest in the innovation project high.

Processing and analysis of social media data

In the era of big data and artificial intelligence, the rich data supplied by social media platforms can be transformed into insights that support the different stages of the innovation process (e.g., by accelerating ideation and increasing the accuracy of sales predictions). However, social media data differ from other data sources due to their velocity, volume, and variety (Surbakti, Wang, Indulska, & Sadiq, 2020). Their unstructured and subjective nature impede their exploitation by firms that need to group them into huge databases (Chan et al., 2016). For example, it remains difficult to weight the importance of individual opinions in large data sets, because data extraction mainly relies on demographic variables (Rathore et al., 2016). Additionally, capturing the socio-cultural aspect of human interactions is complex. Saldanha et al. (2017) suggest that customer information flows should be processed and managed through the development of two capabilities: relational processing capability and analytical processing capability. However, the recent regulations on data protection and privacy (e.g., GDPR) may hinder expected outcomes by limiting firm possibilities in improving customer experience (Lăzăroiu et al., 2018).

Despite the challenges caused by data regulations, future studies will need to focus on new methods, including mixed method approaches, to leverage social media data at different stages of the innovation process. An example is the development of support systems that rank new ideas in real time and evaluate crowd-sourced ideas (Hoornaert et al., 2017). Furthermore, qualitative metrics, new statistical and econometrical models, fine-grained algorithms, and improved machine and deep learning techniques represent promising ways to address social media complexity, especially in the era of artificial intelligence.

New business models and capabilities

Few references to new business models were found in our systematic review. However, social media use implies a new customer-centric approach that needs to consider the increasing market dynamics, rapid evolution, and dissemination of information (Romero & Molina, 2011), together with a high level of interactions. Building on Teece's (2018) descriptions of how a firm's dynamic capabilities contribute to valuable digital platform-based ecosystems, Helfat and Raubitschek (2018) propose three key capabilities that platform leaders need to capture value: innovation capabilities, environmental scanning, and sensing capabilities. Moreover, organizations can build new capabilities by pursuing organizational innovations that help them exploit external resources (Zahay, Hajli, & Sihi, 2017). For instance, firms might introduce new agile decision-making processes to leverage social media, based on iterative cycles of testing and learning (Muninger et al., 2019). Instead of focusing on specific capabilities in isolation, increased attention should center on discovering an appropriate set of social media capabilities that firms can apply at each stage of the innovation process. To achieve this objective, researchers could conduct additional multilevel studies that detail the dynamics and interactions among internal and external stakeholders who contribute to the innovation process. By considering the critical role of microfoundations for dynamic capabilities and their impact on business performance (Teece, 2007), additional microlevel analyses of the distinct skills, processes, structures, and procedures that undergird firm' capabilities could provide new insights for firms and help them redefine their social media use for innovation.

Furthermore, interactions between social media users and firms require governance structures to align information processing and objectives (Schröder & Hölzle, 2010). Governance can be useful to review the large amount of ideas emerging from social media (Bayus, 2013), to clarify intellectual property rights (Boudreau, 2010), to choose a centralized or decentralized approach towards social media platforms (Culnan et al., 2010), and to avoid chaos in such a distributed

innovation system (Nambisan, 2002). Good social media governance will allow firms to interact more effectively with social media users.

Conclusion

Social media have been heralded as tools to support innovation, but many firms still struggle with their use, and many questions persist. In response to calls to flesh out our understanding of social media use in innovation contexts (Nambisan et al., 2017; Roberts & Candi, 2014), we undertook a systematic, in-depth analysis of the current literature pertaining to that research domain and thus identify several new research avenues. Seeking enhanced conceptual clarity, we provide a synthesis of current knowledge and a list of questions to stimulate novel research initiatives. The cross-disciplinary approach of this study suggests options for original research questions that combine different disciplines, thereby offering opportunities for new theory development.

In light of our findings and the rapid evolution of social media platforms, we advocate close collaborations between academics and managers, as complementary channels for input and comprehension of this fast-evolving practice. A continuous relationship will allow researchers to bridge boundaries by accessing practical insights that will feed their future research projects. It also will provide managers with new models and methods to apply to their businesses.

Despite the rigorous approach applied to our systematic review, some limitations remain. We conducted a thorough literature review and sought to include all relevant studies in the corpus, but the focus on high-ranking, peer-reviewed journals might have omitted some emerging research. Moreover, our review reveals that many studies have touted the advantages of social media use, regardless of potential risks for firms and users. Other still unexamined elements could provide additional interesting areas for research.

Chapter 4

The impact of social media use on NPD performance: The mediating role of agility and analytical capabilities

This chapter is based on a paper co-authored with my supervisors and Bas Hillebrand.

Abstract

In recent years, social media increasingly has been considered an important element for innovation. Yet success and failure in practice suggest that the distinct nature of social media demands specific organizational capabilities for its effective use. Therefore, this study explores how social media use in the different stages of the New Product Development (NPD) process can influence the process's performance. Drawing on dynamic capability literature, the authors argue that social media agility and social media analytical capabilities may play a pivotal role in the impact of social media use on NPD performance. Based on survey data collected from 340 firms, this paper demonstrates that social media agility and social media analytical capabilities mediate the relationship between social media use in NPD and NPD performance but in distinct ways. While social media agility capability has positive effects on NPD future business potential, social media analytical capability positively influences NPD market and financial performance. These findings are similar across the stages of NPD. Yet, social media analytical capability shows a greater impact on NPD market and financial performance than social media agility does on NPD future business potential; specifically in the launch stage of the NPD process. Thus, the results suggest that using social media in the different stages of NPD needs to be complemented by specific capabilities following the pursued aim. Trade-offs occur based on the expected NPD outcomes of such use.

Keywords*: Social media, NPD process, NPD performance, capabilities, strategy*

Introduction

The recent power shift from firms to users engendered by the ascent of social media platforms has reshaped the way firms manage new product development (NPD; Rindfleisch et al., 2020). This trend has led to increasing interactions between firms and users in the different stages of the NPD process (Roberts, Piller, & Lüttgens, 2016). With their billions of users worldwide, popular social media platforms (e.g., Facebook, Instagram, Twitter, and LinkedIn) are of particular interest for innovation, because they allow firms to gather rich information about potential end-users' preferences and needs, which are key to successful NPD (Nambisan, 2002; Ooms et al., 2015). In this regard, firms are increasingly using social listening and data mining to capture innovative ideas. The firm Danone, for example, has leveraged such techniques to predict ingredients that would become trendy for their future NPD projects (Chan, 2020).

Social media increases engagement and collaboration with users across the NPD process (Reid, Marion, Hultink, & Barczak, 2018). These behaviors lead to large volumes of user-generated content and feedback, thereby providing firms with diverse sets of knowledge and skills to find innovative solutions (Carlson, Rahman, Voola, & De Vries, 2018; Martinez, 2017). Recently, brands have started using disruptive technologies such as artificial intelligence (AI) or augmented reality (AR) in order to optimize user engagement and boost contributions on social media (Chuang, 2020; Rindfleisch & Sachdev, 2017). For example, L'Oréal has developed an AI-enabled skin diagnostic tool offering customized products that address specific consumer needs (Barba, 2019).

In the past years, research on social media use for NPD has been bourgeoning as academic scholars and practitioners have probed the secrets of its successful use (Rindfleisch et al., 2020; Roberts et al., 2016). Yet the existing research shows fragmented and divergent results on NPD with both positive and negative outcomes. The positive outcomes include effects on product characteristics such as innovativeness, product quality, and design (Marion, Barczak, & Hultink, 2014; Nursiam, Handayani, & Trisnanty, 2016). For example, product quality, which refers to customer perceptions of product superiority relative to competitors, can be enhanced by the evaluation and contribution of social media communities (Nursiam et al., 2016). The reported effects of social media use on NPD performance exhibit positive and negative impacts on NPD market and financial performance (Asdemir et al., 2006; Lu, Singh, & Sun, 2017; Roberts & Candi, 2014).

These contrasting results are expected to vary from one stage to the other or within stages (Chang & Taylor, 2016; Roberts & Candi, 2014). In the front end of NPD, the use of social media shortens new product development cycles through the early identification of broad product appeal (Mallapragada, Grewal, & Lilien, 2012). However, "over-search" negatively impacts innovation performance due to firms' inability to implement external knowledge (Roberts et al., 2016). Moreover, while the sharing of information on social media platforms in the development stage is valuable for NPD teams because it increases the number of design concepts and prototypes, it negatively affects management evaluation, market growth, and profitability (Marion et al., 2014; Roberts & Candi, 2014). In contrast, the use of social media in the launch stage shows a positive impact on market growth and profitability (Roberts & Candi, 2014). Nevertheless, studies discussing the use of social media across the three different stages of NPD and their impact on NPD performance remain limited (Bhimani et al., 2019; Muninger, Hammedi, & Mahr, 2019).

The authors argue that the contrasting results can be explained by the notion of social media capabilities. This notion stems from the growing body of literature that has started urging for more research on firms' capabilities to integrate, create, and process knowledge from social media in order to innovate (Candi et al., 2018; Mention et al., 2019; Rindfleisch et al., 2020). Despite the budding benefits offered by social media data, a number of firms are failing to reap these benefits because new knowledge and skills are needed to leverage the velocity, variety, and abundance of data (Johnson, Friend, & Lee, 2017). Moreover, as emphasized by Bharadwaj and Noble (2017), social media data are "too big, too unstructured, or too diverse to be stored and analyzed by conventional means." In this regard, social media monitoring and big data analytics allow firms to gather a rich data repository to optimize NPD (Rindfleisch & Sachdev, 2017). Accordingly, social media are considered to be enablers that need to be empowered with capabilities and assets (Troilo, De Luca, & Guenzi, 2017).

This research thus attempts to reconcile these conflicting results pertaining to social media use on NPD performance and address the calls for more research on social media capabilities. It focuses on two main research questions: *What are the capabilities through which social media can be used in NPD, and how do such capabilities impact NPD performance? How do these capabilities mediate the relationship between social media use and NPD performance?* We use the lens of dynamic capabilities to examine this question. Dynamic capabilities are defined as a "firm's ability to integrate, build, and reconfigure internal and external competences to

address rapidly changing environments" (Teece, Pisano, & Shuen 1997, p. 516). The unpredictability inherent in NPD and social media, both of which are evolving in uncertain and turbulent environments due to constant technological changes, justify the relevance of this perspective (Pavlou & El Sawy, 2011).

This study extends the existing literature in open innovation management by introducing and digging more deeply into the role of two social media capabilities: social media analytical and social media agility capabilities. The first capability relates to firms' ability to analyze social media data in order to provide complete and accurate information (Stieglitz, Mirbabaie, Ross, & Neuberger, 2018; Wixom & Todd, 2005). The second capability, social media agility, focuses on firms' ability to sense and respond quickly to social media information through strategic and competitive actions for NPD (Chuang, 2020; Roberts & Grover, 2012). Prior research linking together social media use and NPD has examined other capabilities such as IT and knowledge capabilities (Benitez, Castillo, Llorens, & Braojos, 2018; Ooms et al., 2015). The capabilities examined in this study are social media specific in that they address the multiplicity, velocity, and volume of data circulating on social media.

This research theorizes that social media use for NPD enables both social media agility and social media analytical capabilities to increase NPD performance. The discrepancy in prior findings linking social media to NPD may be due to the limited understanding of how social media use aligns with NPD performance. This issue, combined with the restricted number of studies addressing this topic, hampers managers in using social media to innovate. Relatedly, there has been a lack of attention devoted to variables that might mediate the relationship between social media use and NPD performance. This suggests the need for a more thorough examination into the process through which social media use leads to better product development performance.

Therefore, an investigation of the link connecting both can be useful. Using a mediation approach allows us to advance the understanding of how two distinct social media capabilities used jointly affect NPD market and financial performance, as well as NPD future business potential. In doing so, this study addresses calls for more empirical research assessing the relationship between social media use and NPD performance (Mention et al., 2019; Roberts et al., 2016). It also provides additional understanding to findings highlighted in past literature that have used other contexts or purposes to examine the role of these two capabilities (Chuang, 2020; Stieglitz et al., 2018). To our knowledge, this is the first empirical study that investigates

whether social media's agility capability and social media's analytical capability mediate the relationship between social media use in NPD and NPD performance outcomes, which would be consistent with dynamic capabilities. Furthermore, this study goes a step further by examining these relationships across all the stages of NPD process and their effects on different types of NPD performance outcomes. This study also offers more insights to assist practitioners in their decision-making process when considering the use of social media to reach specific NPD outcomes.

The remainder of the paper is organized as follows. First, we outline the theoretical foundations of the study. Hypotheses that aim to test: (1) the mediation of social media's analytical capability between social media use in NPD and the two NPD performance outcomes and (2) the mediation of social media's agility capability between social media use in NPD and the two NPD performance outcomes derived from our theoretical framework. Next, we present our method for data collection and describe the variables that are used in our model, together with the method for data analysis. Finally, the results, including limitations, areas to be addressed in future inquiry, and both theoretical and managerial implications, are discussed.

Theoretical background

Definition of NPD performance and social media

NPD performance is defined as "the success of new product development efforts"(Chang & Taylor 2016, p. 48). Practitioners and scholars generally agree on the importance of market and financial outcomes, measured, for example, by market share or profitability. In this study, NPD market and financial performance refers to the economic return realized by the NPD project in terms of cost reduction, market indicators, and revenue enhancement (Narver & Slater, 1990). However, firms may also conduct innovation activities to explore new opportunities (March, 1991). Therefore, we also introduce the concept of NPD future business potential, referring to the degree to which an NPD project rendered opportunities for gathering expertise, novel information, future product development, and/or new market entries (Cooper & Kleinschmidt, 1995; Martinsuo & Poskela, 2011).

Social media consist of "online means of communication, conveyance, collaboration, and cultivation among interconnected and interdependent networks of people, communities and organizations enhanced by technological capabilities and mobility" (Tuten & Solomon, 2018, p. 4). Social media feature elements such as user-generated content, content sharing and

collaboration, geolocalization, entertainment, and instant messaging. Content shared through social media offers a valuable alternative to standard research methods and is driven by impulse, the excitement of sharing, quests for advice, and similar interests (Patino, Pitta, & Quinones, 2012). This tremendous source of business intelligence allows firms to capture information and feedback about customer needs, preferences, and market trends (Brem & Bilgram, 2015). In this regard, firms can target their research to gather interesting insights for innovation.

Social media use in NPD

NPD is a knowledge-based process that has experienced radical shifts in recent years by increasingly integrating external input throughout the process. This external integration has been propelled by the ubiquitous presence of social media that support real-time, data-rich, customized information from highly distributed and heterogeneous users (Zhang et al., 2019). The remainder of this section describes social media use across NPD stages.

First, in the front end of the NPD process, social media enable numerous interaction opportunities and different creative options for *market research*. On social media, users can play a passive or active role in sharing their opinions with firms. While some firms such as LEGO, NASA, Porsche, Boeing, and Unilever use crowdsourcing platforms to invite social media users to proactively submit their product improvement ideas (Norton, 2019), others use netnography, a nonobstructive social listening method to collect market insights (Kozinets, 2002). Using netnography to access existing user content on social media platforms (i.e., Facebook, Twitter, and blogs), Nivea launched its Black and White deodorant (Bilgram et al., 2011). As illustrated by these examples, social media offer new ways to collect business intelligence with firm-specific platforms (e.g., Dell Idea Storm) or through the exploration of existing user-generated content (e.g., Nivea Black and White). Authors have argued that using customers to source information may lead to increased knowledge redundancy as well as opportunistic and deviant behaviors, thereby impeding NPD activities (Chen, Li, Evans, & Arnold, 2016; Gatzweiler, Blazevic, & Piller 2017). Therefore, managers need to develop skills to deal with the complexity of integrating and leveraging relevant information from social media for market research purposes.

Second, in the development stage of the NPD process, which involves cross-functional collaboration for designing, prototyping, and marketing new products, social media are of particular interest to enhance *collaboration* with internal or external partners (Marion, Barczak,

& Hultink, 2014; Roberts & Candi, 2014). In this stage, firms may target influential users to gather feedback and enhance firms' trial and error process (Piller et al., 2012). In an external context, social media facilitates collaboration between firms and users to refine product ideas and enhance product design. A good illustration is Vodafone, which has connected with online communities across different countries to test digital services before launching. These social-media-based interactions have evolved into a structural collaboration that combines discussions and blogs (Griffin, Noble, & Durmusoglu, 2014). Internally, social media support team collaboration by offering an access to a common platform where NPD project updates can be shared in real time (Marion et al., 2014).

Third, in the back end of the NPD process, social media support firms' efforts in *launching* their products. In this last stage, firms focus on guiding consumers in their purchasing decisions. Influencers play an active role in generating original social media content by blogging, publishing product reviews, and uploading videos (Gruner et al., 2019). Social media are powerful tools that enable communication to spread virally at an unprecedented velocity (Luo, Zhang, & Duan, 2013). Powerful viral campaigns generate product interest and trigger bloggers' word-of-mouth activities in a more efficient way than traditional advertising (Kim & Hanssens, 2017). Positive word-of-mouth about products will in turn influence attitudes and purchasing decisions (Roberts & Candi, 2014). The launch stage is critical for many firms because it often resonates with high investment, and it determines NPD success or failure (Hultink, Hart, Robben, & Griffin, 2000).

Dynamic capabilities

Prior research emphasizes the role of dynamic capabilities within the NPD context (Johnson et al., 2017; Stephan, Andries, & Daou, 2019). New products are directly dependent on NPD capabilities. Such capabilities are not product-specific, but are rather the platform for developing new products (Pavlou & El Sawy, 2011). Dynamic capabilities are defined as "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" (Helfat & Peteraf, 2003, p. 998). The dynamic capability approach has been increasingly adopted by scholars to emphasize the interplay between internal and external resources, and the effect they produce on NPD (Chuang, 2020; Teece, 2007). This view posits a constant need to adapt to market changes with resource renewal (Pavlou & El Sawy, 2011).

The unstructured nature of social media data has radically changed the type of consumer knowledge collected by firms (Erevelles, Fukawa, & Swayne, 2016). Social media data, often referred to as big data, differ from many other sources of data because they comprise a wide variety of content, including text, pictures, videos, sounds, and geolocations (Stieglitz, Mirbabaie, Ross, & Neuberger, 2018). This diversity allows firms to grasp fine-grained insights about customer needs and preferences. Accordingly, many organizations believe social media data represent a game changer that can transform businesses and deliver growth (Surbakti et al., 2020; Wamba et al., 2017). But as data become more abundant, complex, and inexplicable, human limited mental capacities start facing challenges in decoding and interpreting this massive load of information (Erevelles et al., 2016). Another hurdle is the subjective and qualitative nature of social media data (Chan, Wang, Lacka, & Zhang, 2016). These characteristics require an increase in firms' capacity to filter, absorb, and exploit external knowledge (Cohen & Levinthal, 1990).

The volume, variety, and velocity of social media data compel firms to process these continuous data flows with high efficiency and accuracy (Johnson et al., 2017). Unfortunately, many firms lack the organizational capabilities to acquire and assimilate this external knowledge (Chan et al., 2016; Peltola & Mäkinen, 2014). In this ever-changing environment, capabilities that address this challenge form the base of value-creating strategies (Grant, 1996).

Based on these premises, this inquiry posits that the effect of social media use in NPD on NPD performance is mediated by two social media capabilities (the agility and analytical capabilities) that are perceived as idiosyncratic in the way they are applied inside the firm (Teece, 2012). The agility capability involves sensing and quickly responding new knowledge from social media for improved NPD performance. The analytical capability makes it possible to refine knowledge from social media in order to gain efficiency with accuracy in the NPD process (Bharati, Zhang, & Chaudhury, 2015; Johnson et al., 2017). We posit that these two capabilities affect the relationship between social media use and NPD outcomes.

Social media agility is a concept that has emerged in recent studies and comprises high reactivity, appropriate content, and flexibility in daily operations (Chuang, 2020). Social media agility involves active research activities designed to grasp current and future customer needs using social media. Social media agility requires short and iterative process cycles inside firms and a flexible scope of work (Muninger et al., 2019). Furthermore, the term agility refers to a firm's ability to rapidly sense and seize market opportunities and threats (Chen & Siau, 2012;

Chuang, 2020; Sambamurthy, Bharadwaj, & Grover, 2003). Sensing is about probing and understanding customer needs and competitive moves on social media. Sensing occurs mainly through social listening (Muninger et al., 2019; Roberts & Grover, 2012). Responding consists of seizing competitive opportunities on social media with speed and surprise to respond efficiently and effectively through the assembling of knowledge, requisite assets, and relationships (Overby, Bharadwaj, & Sambamurthy, 2006; Sambamurthy et al., 2003). It necessitates quick and cost-effective responses with appropriate content (Chuang, 2020). Following the above definitions in the literature, we conceptualize social media agility as a two-dimensional construct that entails sensing and responding capabilities.

Social media analytical capability entails the development and evaluation of IT tools and frameworks to collect, monitor, analyze, summarize, and visualize social media data (Zeng, Chen, Lusch, & Li, 2010). This process enables firms to quickly leverage both unstructured and structured data by turning them into knowledge that will support the improvement of business operations. A good illustration of big data exploitation is Amazon.com, which leveraged huge amounts of customer data to develop and launch its AWS cloud platform (Van Rijmenam, 2013). Social media data management involves sophisticated infrastructures and the creation of novel technologies to handle the large amount of unstructured data (Mikalef, Pappas, Krogstie, & Giannakos, 2018).

Scholars have conceptualized social media analytical capability as the combination of tangible (e.g., data and technology), intangible (e.g., data-driven culture and intensity of organizational learning), and human (e.g., managerial and technical skills) resources (Gupta & George, 2016). In line with Janssen, van der Voort, & Wahyudi (2017), we conceptualize social media analytical capability as the ability to deliver big-data-generated insights for decision making. This means that big data should be transformed into outputs of high quality.

Hypotheses development

Figure 4.1 presents the conceptual model. Social media use in the three stages of the NPD process are considered to be the antecedents of the two mediators: social media agility and social media analytical capabilities. NPD market and financial performance and NPD future business potential are the two distinct variables representing the NPD outcomes. Next, the rationale supporting social media agility and analytical capabilities as mediators of social media use in NPD and NPD performance is explained.
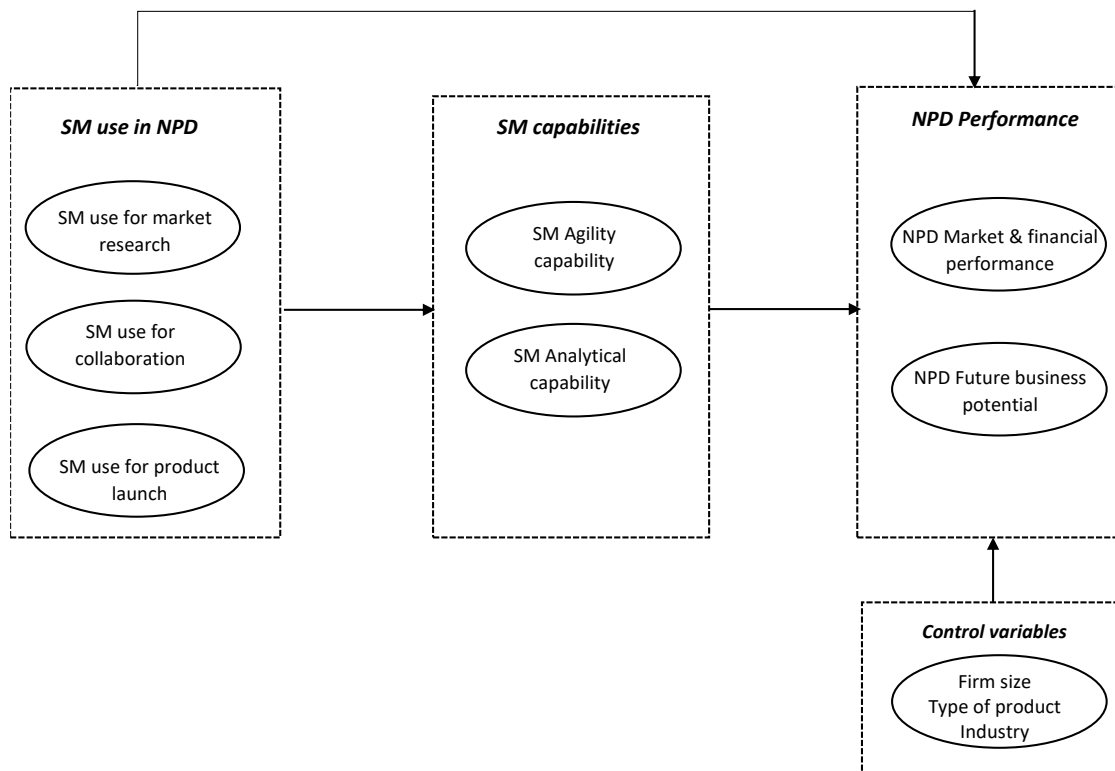
Figure 4.1: The conceptual mediation model

The mediating role of social media agility capability

The increasing use of social media to interact with and strengthen relationships with customers is regarded as an important element of the digital revolution. This exchange between firm and customer acts as a great source of information and insights for innovation throughout the various stages of the NPD process (Roberts & Candi, 2014). However, to deal with social media's multiplicity, ubiquity, and speed of information transfer, firms need to build capabilities that address this uncertain and rapidly changing environment. Uncertainty is defined as the inability to predict future results accurately due to little information and conflicting signals (Nemkova, 2017). In such a challenging context, new capabilities should be enriched through iterations of doing and learning, with each iteration adding to the capability (Marsh & Stock, 2003). Hence, firms that use social media are expected to build unique

capabilities through a path-dependent process of learning from experimentation (McEvily & Marcus, 2005) across all the NPD stages.

In the front end of the NPD process, *market research* encompasses all activities that allow firms to capture customer insights and market opportunities for future product development. Social media have strongly impacted this first stage of the NPD process by transforming the nature of firm-customer interactions through increasing real-time interaction opportunities with a large customer base (Jang & Chung, 2015). Exposure to information related to user needs on social media is a way to reduce uncertainty (Autio, Esmt, & Frederiksen, 2013). The continuous exposure and interactions between firms and users on social media will also increase a firm's learning process. Prior literature suggests that social media data is likely to be leveraged in firms that are oriented towards exploration activities. The sheer volume of social media data requires experimentation and exploration to sense market trends (Johnson et al., 2017). In turn, these firms will respond quickly and flexibly to take advantage of various opportunities (Day, 2000; Roberts & Grover, 2012). In doing so, they will increase their social media agility capability by learning how to better sense customer needs and respond with appropriate content on social media. The constant changes in terms of economy, consumer trends, technological evolutions, and competitive moves requires a strong ability to sense these environmental shifts (Overby et al., 2006).

The development stage involves *collaboration* activities with various stakeholders for designing and prototyping the new product (Marion et al., 2014). The increase of exchanges between different counterparts is a way to improve the development of new products, because the firm gets equipped with the necessary information to make adaptations and deliver these products in a timely manner (Chuang, 2020). At this stage, social media use should be associated with learning and a willingness to work together in order make rapid adaptations, thereby growing the firm's flexibility and social media agility (Reid et al., 2018). In the *launch* stage, firms often rely on social media to gather feedback and communicate about the new product. Both feedback and communication force firms to improve their flexibility in processing the resulting information from social media (Chuang, 2020). Conversely, firms need methods to identify and work further on customer feedback within short time periods (Cooper, 2016).

In the uncertain context of social media, firms that sense and seize market opportunities by responding to expected and unexpected events with the efficient use of their resources and with

speed and surprise are more likely to succeed (Mathiassen & Pries-Heje, 2006; Sambamurthy et al., 2003). This goal can be achieved through the fast delivery of appropriate content, aligned with internal objectives that addresses social media users' needs (Roberts & Grover, 2012). Firms able to show such flexibility and adaptation— for example, by accelerating the delivery of product and service offerings and by better answering customer demands (Chuang, 2020)— tend to show better NPD performance (Ledwith & O'Dwyer, 2009). The mediation role of agility on firm performance has been verified in prior contexts with positive effects (Jacobs, Droge, Vickery, & Calantone, 2011; Roberts & Grover, 2012). Thus, we hypothesize the following:

H1: Social media agility mediates the relationship between social media use for market research and (a) NPD market and financial performance; (b) NPD future business potential.

H2: Social media agility mediates the relationship between social media use for collaboration and (a) NPD market and financial performance; (b) NPD future business potential.

H3: Social media agility mediates the relationship between social media use for product launch and (a) NPD market and financial performance; (b) NPD future business potential.

The mediating role of social media analytical capability

Social media allow firms to work with data-rich environments in various stages of the NPD. These data sources enable managers to advance their consumer knowledge to inform NPD decisions only if analytical challenges are addressed. Accordingly, firms need employees with knowledge and analytical skills, together with systems that are flexible, reliable, readily accessible, and effective (Erevelles et al., 2016). Specifically, data quality, reflected by factors including completeness and accuracy, needs to be secured to reach successful business outcomes (Surbakti et al., 2020).

Market research activities in the front end of the NPD process encompass access to the huge amounts of diverse, structured, and unstructured social media data that firms need to process (Moe & Schweidel, 2017). These data are presented in the form of text, images, videos, and audio on multiple platforms. They include a vast majority of unstructured data (Sivarajah, Kamal, Irani, & Weerakkody, 2017). This overwhelming amount of heterogenous data first needs to be filtered by firms to provide new and actionable knowledge for NPD development. Elements such as IT infrastructure, analytical skills, and powerful algorithms contribute to the

identification of hidden insights (Erevelles et al., 2016). In this stage, data veracity needs to be secured with the use of tools and analytics developed to manage uncertain data (Gandomi & Haider, 2015).

In the development stage, firms need to process big data for exploitation. As this stage involves a high level of *collaboration* between team members and top management, methods that facilitate evidence-based decision-making by turning big data into meaningful knowledge are warranted (Sivarajah et al., 2017). Exploitation requires a thorough use of knowledge and compels firms to concentrate their efforts on the refinement of routines to develop new products (Johnson et al., 2017). Moreover, product codevelopment on social media, for example via product configuration, also requires capabilities to identify relevant user profile and process information (Saldanha et al., 2017). The launch stage includes a higher level of interactions on social media with the support of social sharing platforms and an active presence in online communities, social networking sites like Facebook, and blogs (Gruner et al., 2019). In this last stage, firms need to monitor and analyze content shared on social media because it offers valuable feedback that firms can leverage for future improvements (Roberts et al., 2016).

A growing body of research has started examining the links between social media use, analytical capability, and business performance (Gupta & George, 2016; Wamba et al., 2017). Akhtar, Frynas, Mellahi, & Ullah (2019) have investigated the relation between big data savvy teams, big data actions, and business performance and found a positive relation driven by teams' valuable insights. Similarly, big data's analytics capability was found to have a positive effect on sales growth, market share growth, profitability, and return on investment (Akter, Wamba, Gunasekaran, Dubey, & Childe, 2016). Big data capability has also been associated with greater market performance, operational performance (Gupta & George, 2016), and firm performance (Ren, Fosso Wamba, Akter, Dubey, & Childe, 2017; Wamba et al., 2017). Based on these findings, we build the following hypotheses:

H4: Social media analytical capability mediates the relationship between social media use for market research and (a) NPD market and financial performance;(b) NPD future business potential.

H5: Social media analytical capability mediates the relationship between social media use for collaboration and NPD market and financial performance;(b) NPD future business potential.

H6: Social media analytical capability mediates the relationship between social media use for product launch and (a) NPD market and financial performance;(b) NPD future business potential.

Method

Sample and data collection

The study was conducted in the United States over a period of 10 days in January 2020 before the pandemic crisis of COVID 19. A questionnaire was sent to 650 managers that were expected to be engaged in social media and/or innovation management activities. To be eligible, managers had to meet the following criteria. First, the firm had to be engaged in product or service innovation activities. Second, the respondents needed to have a very good overview of the firm's latest NPD project to ensure enough knowledge on the researched topic. Lastly, the respondents had to work for a firm that employs more than 25 employees to secure a sufficient level of structure and processes inside the firm. Altogether 340 usable responses (response rate 52.3%) were received. The sample consisted of 73% multinational companies (>250 employees). 69% of respondents are men, 43% are between 31 and 40 years old, and 30% are between 41 and 50 years old. 68% of respondents are the heads of their division or department, and 28% are team managers. Table 4.1 presents a sample summary.

To assess potential nonresponse bias, we compared early and late respondents (first quartile and last quartile) through a time trend extrapolation procedure, as recommended by Armstrong and Overton (1977). No significant differences emerged in the mean responses on any constructs. Similarly, a routine check for respondent and industry biases was conducted across respondents with various functional backgrounds and indicated no significant differences in the mean responses on any construct. Given that this study relied on a single source of data, common method bias could be a potential issue. Common method bias was assessed through a series of a priori and post hoc techniques. This research sought to reduce single source bias by using different techniques (MacKenzie & Podsakoff, 2012; Podsakoff & MacKenzie, 2003): (1) assuring the anonymity and clearly explaining the academic purpose; (2) avoiding the use of complex, abstract, and vague concepts in our questions; and (3) targeting experienced managers that would be acquainted with the topic. Post-hoc analyses were conducted as well via exploratory and confirmatory factor analyses, as described in the next section. No evidence of common method bias was found.

Table 4.1: Composition of the sample for hypothesis testing

Number of respondents	340
Average firm size (number of employees):	
Small (25–50)	5
Medium (51–250)	86
Large (>251)	249
Management Level:	
Head of division	122
Head of department	107
Team manager	95
Team member	8
Other	9
Business sector	
Consumer packaged goods	23
Healthcare	42
Transportation	8
Finance and accounting services	42
Consulting services	23
Media and communication	30
Manufacturing	47
Personal services	14
Retail	21
Sports and leisure	2
Education	17
Other	71
Age	
<30	11
31–40	146
41–50	101
51–60	50
>60	32
Gender	
Male	236
Female	104

Measurement properties and descriptive statistics

The reflective measurement scales used for this study are based on earlier literature and adapted to the study's context. The exact measurement items are presented in the appendix. The study's unit of analysis is the innovation project.

NPD performance is assessed through two different variables. The scale of the first variable measures the NPD *market and financial performance (Cronbach's alpha 0.79;* Mahr, Lievens, & Blazevic, 2014; Moorman, 1995) and the second variable relies on managers' estimates of performance relating to NPD *future business potential (Cronbach's alpha 0.83)* in the project. The first scale includes three items which measure profitability, market share, and sales (Narver & Slater, 1990). The second scale consists of four items measuring the extent to which the new

product or service opens up new opportunities in terms of NPD and market technology know-how (Martinsuo & Poskela, 2011).

Social media use in the different steps of the NPD process. To assess the use of social media in the different stages of the NPD process, we used the scale developed by Roberts and Candi (2014) in their seminal paper discussing the use of social media in the innovation process. The scale includes eleven items that we split into three for the different stages: three items cover the use of social media for *market research (Cronbach's alpha 0.84)* in the front end of the NPD process, three items focus on *collaboration (Cronbach's alpha 0.87)* through social media in the development stage of the NPD, and the five remaining items measure the use of social media for *product launch (Cronbach's alpha 0.87)* in the back end of the NPD process.

Social media agility (Cronbach's alpha 0.93). Following Roberts and Grover (2012)'s conceptualization of agility and Teece (2007)'s examination of the nature of dynamic capabilities, we posit that social media agility capability occurs when a firm's sensing and responding capabilities are aligned and consistent with social media users' objectives and structure (Teece, 2007). Thus, the scale from Roberts and Grover (2012), which includes both social media sensing and responding capabilities, was adapted. It is measured by six items capturing relevant aspects of social media and NPD.

Social media analytical capability (Cronbach's alpha 0.93). Social media analytical capability includes different steps because social media data must be filtered and prepared to be complete. This data then needs to be visualized in a meaningful way (Stieglitz et al., 2018). Hence, social media analytical capability is measured by five items that reflect a firm's ability to analyze social media data in order to deliver complete and accurate information in a clear format (Wixom & Todd, 2005).

To control for other potential extraneous effects (Bernerth & Aguinis, 2016), dummy control variables were included: (1) company sizes: large size enterprises (coded 1) and small and medium size enterprises (coded 2); (2) types of products: B2C (coded 1) or B2B (coded 0); and (3) industry: products (coded 1) or services (coded 0).

Firm size. Numerous empirical studies have reported a positive relation between size and innovation, as large firms tend to have better support systems and management tools (Nijssen, Hillebrand, De Jong, & Kemp, 2012; Stephan et al., 2019). The number of employees serves as a control for firm size.

Type of product. The type of product (B2C vs. B2B) is also expected to lead to different NPD outcomes. The previous literature reports that social media use is more intensive for B2B markets than for B2C markets (Roberts et al., 2016).

Industry. Manufacturing and service industries tend to show different results in terms of innovation and innovation success (Stephan et al., 2019). Similarly to other studies with small industry subsamples (e.g., Candi et al., 2018), a third control variable based on industry (product vs. service) was included.

Our pool of items was pretested in two phases: (1) interviews with two academics and (2) interviews with ten managers. At each stage, participants were invited to provide feedback on items that were not clear or confusing and on any potential hurdles identified. Problematic items were replaced or removed. By the end of the second phase, managers had no concerns to report, and the survey was ready for the pilot study. Next, we sent the questionnaire to a small sample of respondents (N=35) to flag any potential issues left before administrating the large-scale survey.

Multi-item Likert type scales were used for the dependent, independent, and mediating variables. Component factor analyses were performed using IBM SPSS 26 (IBM Corp., Armonk, NY, USA). In this first purifying step, we started by running exploratory factor analyses (principal components analysis with varimax rotation) to test the variable structures separately for the dependent, independent, and mediating variables. The factor models showed good results for all variables: dependent variables (MSA 0.90 with 58% of variance explained); independent variables (MSA 0.94 with 60% of variance explained); and mediators (MSA 0.95 with 69% of variance explained). Though some overlap exists between the independent variables, we decided to include the items that loaded the highest on the principal component.

We used IBM SPSS 26 and SMART PLS 3.0 to investigate the conceptual model. The internal consistency of each measure was assessed by calculating Cronbach alpha's coefficients. In this step, item-to-total correlations were checked, and items with low correlations were removed if doing so didn't impact the measure's coverage of the construct domain. Following this step, five items were removed. Final Cronbach's alphas were calculated, and these were all above the .70 threshold (Nunnally, 1978). Next, a set of analyses was conducted to assess the discriminant validity of the final scales (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). These

analyses did not show significant cross-loading of the items, with acceptable measures ranging from .79 to .93 for all loadings (significant at the <.05 level).

Table 4.2 presents the means, standard deviations, composite reliabilities (CR), average variances extracted (AVE), pairwise correlation coefficients, and their associated *p*-values for all the constructs included in the study. All AVE's are equal or above 0.55, showing convergent validity, and all composite reliabilities are above the threshold of 0.7 (Hair, Sarstedt, Hopkins, & Kuppelwieser, 2014). The comparison of the square roots of the AVE values of each construct with the Pearson correlations between the constructs of latent variables respected Fornell and Larcker (1981)'s criteria of greater square roots of the AVE values compared to correlations of the constructs.

Table 4.2: Correlations and psychometric properties of variables

	Measures	1	2	3	4	5	6	7	8	9	10
1	NPD market and financial performance										
2	NPD future business potential	.751**									
3	SM use for market research	.681**	.687**								
4	SM use for collaboration	.721**	.689**	.704**							
5	SM use for market launch	.669**	.696**	.796**	.772**						
6	SM agility capability	.660**	.717**	.736**	.689**	.718**					
7	SM analytical capability	.713**	.696**	.747**	.715**	.704**	.821**				
8	Company size – dummy coded	.179**	.234**	.236**	.131*	.165**	.192**	.176**			
9	Industry (product vs. service) – dummy coded	.166**	.085	.089	.106	.078	.104	.087	.122*		
10	Type of product (B2C vs. B2B) – dummy coded	-.006	.011	.081	.072	.051	.067	.058	1.36**	.077	1
	M	3.98	4.00	4.01	3.93	4.02	3.91	3.88	.68	.52	.63
	SD	.72	.73	.88	.91	.79	.92	.99	.47	.50	.48
	Composite reliability	.79	.83	.84	.87	.87	.93	.93			
	AVE	.55	.55	.63	.64	.58	.69	.73			

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Grewal, Cote, & Baumgartner (2004) make a recommendation for detecting multicollinearity for correlations between independent variables. For ranges above 0.8, of which there is one instance in table 4.2, the authors suggest that with a reliability (>0.7), an acceptable R^2 (all R^2>50%) and a large sample size (N=340), multicollinearity should not be an issue. Further checks were conducted for each regression analysis through the calculation of variance inflation

factors (VIF). All VIFs were far below 5.0, showing the absence of multicollinearity (Hair, Sarstedt, Pieper, & Ringle, 2012).

Finally, a confirmatory factor analysis (CFA) model was run with AMOS 24 software on the items of the independent and dependent variables. All the items were modeled as indicators for a single factor. The overall model fit was good, and all items loaded significantly and substantially on their expected factor: (χ^2 = 766,911, p<.000, df=356, χ^2/df=2.154, goodness-of-fit index (GFI)= .87, comparative fit index (CFI)=.95 and the root mean squared error of approximation (RMSEA)= .058.

Results

Hypothesis testing

Hypothesized model relationships were examined by conducting a series of Partial Least Squares Structural Equation Modeling (PLS-SEM) in SMART PLS 3 software to test the direct and indirect effects between the independent and dependent variables. This approach is superior to regression analysis when assessing mediation and presents the advantage of removing measurement error and reducing bias (Hair, Sarstedt, & Ringle, 2019). Furthermore, PLS-SEM provides robust model estimations for data that have normal and non-normal distributions (Ringle, Sarstedt, & Straub, 2012). The variables of the model were mean centered for a better interpretation of the estimates (Little, Card, Bovaird, Preacher, & Crandall, 2007). To increase the robustness of our analyses, the following calculations were conducted with PLS consistent (PLSc;Cheah, Memon, Chuah, Ting, & Ramayah, 2018): (1) PLSc algorithm set at 1,000 iterations with stop criterion at 7; (2) PLSc bootstrapping for significance testing included 1,000 subsamples for complete bootstrapping and 95% bias-corrected percentile-based confidence intervals to generate standard error and *t*-values.

We followed Hayes' (2018, p. 143) recommendation to run separate models (models 1, 2, and 3), for the independent variables because the correlations between the independent variables are high. High correlations could result in canceling the effects of the model. We also included direct effects between social media use in NPD and NPD performance for a better assessment of the indirect effects. Control variables were included in each model. The PLS path diagrams, which show path coefficients and significance levels, are in the appendix. An inspection of Table 4.3 shows significance for many relationships.

Table 4.3: PLS path analysis: Standardized estimates

	Model 1 – Market research	Model 2 – Collaboration	Model 3 – Product launch
Hypothesized relationships			
SM use for MR -> MFP**	.351*		
SM use for MR -> FBP***	.416**		
SM use for MR-> SM agility capability	.833***		
SM agility capability->MFP	-.048		
SM agility capability->FBP	.360*		
SM use for MR -> SM agility capability -> MFP	-.040 H1a		
SM use for MR -> SM agility capability -> FBP	**.300* H1b**		
SM use for MR -> SM analytical capability	.846***		
SM analytical capability -> MFP	.572***		
SM analytical capability -> FBP	.116		
SM use for MR->SM analytical capability -> MFP	**.484*** H4a**		
SM use for MR-> SM analytical capability -> FBP	.098 H4b		
R² of MFP	.73		
R² of FBP	.74		
SM use for collaboration -> MFP		.520***	
SM use for collaboration -> FBP		.468***	
SM use for collaboration -> SM agility capability		.779*	
SM agility capability ->MFP		-.063	
SM agility capability ->FBP		.377**	
SM use for collaboration- > SM agility capability -> MFP		-.049 H2a	
SM use for collaboration -> SM agility capability -> FBP		**.294*** H2b**	
SM use for collaboration -> SM analytical capability		.809***	
SM analytical capability -> MFP		.455***	
SM analytical capability -> FBP		.067	
SM use for collaboration -> SM analytical capability -> MFP		**.368*** H5a**	
SM use for collaboration -> SM analytical capability -> FBP		.054 H5b	
R² of MFP		.79	
R² of FBP		.77	
SM use for launch -> MFP			.319***
SM use for launch -> FBP			.423***
SM use for launch -> SM agility capability			.796***
SM agility capability ->MFP			-.067
SM agility capability ->FBP			.308*
SM use for launch -> SM agility capability -> MFP			-.054 H3a
SM use for launch -> SM agility capability -> FBP			**.246* H3b**
SM use for launch -> SM analytical capability			.781***
SM analytical capability -> MFP			.630***
SM analytical capability -> FBP			.176
SM use for launch -> SM analytical capability -> MFP			**.492*** H6a**
SM use for launch -> SM analytical capability -> FBP			.137 H6b
R² of MFP			.73
R² of FBP			.76

Control relationships			
Firm size -> MFP	-.005	.035	.022
Firm size -> FBP	.056	.102**	.087*
Product type -> MFP	-.074*	-.075*	-.062
Product type -> FBP	-055	-.053	-.041
Industry -> MFP	.092**	.077**	.097**
Industry -> FBP	.001	-.010	.008

* p < .05; **p<.01; ***<.001 (one-tailed test). Significance levels were estimated using bias-corrected bootstrap confidence intervals.

** MFP represents NPD Market and Financial Performance

***FBP represents NPD Future Business Potential

Model 1: This first structural model focusing on social media use for market research explains 69.4%, 71.5%, 73.3%, and 74.2% of the variance (R^2) in social media agility capability, social media analytical capability, NPD market and financial performance, and NPD future business potential, respectively. Social media agility is significantly associated with NPD future business potential (β=.360), whereas it has no significant impact on NPD market and financial performance. In contrast, social media analytical capability exhibits a strong impact on NPD market and financial performance (β=.572) but has no significant impact on NPD future business potential. In addition, social media agility and analytical capabilities exhibit mediation relationships between social media use for market research and the two dependent variables but in different ways. Social media agility capability mediates the relationship between market research and NPD future business potential (β=.300) but does not significantly mediate the path to NPD market and financial performance. On the contrary, social media analytical capability significantly mediates the relationship between market research and NPD market and financial performance (β=.484) with no significant effect on NPD future business potential. Regarding the independent variable of market research, it displays a small but significant effect on both NPD market and financial performance (β=.351) and NPD future business potential (β=.416). It also exhibits a strong and significant relationship with social media agility capability (β=.833) and social media analytical capability (β=.846). Thus, social media agility mediates the relationship between social media use for market research and NPD future business potential (supporting hypothesis 1b) and social media analytical capability mediates the relationship between social media use for market research and NPD market and financial performance (supporting hypothesis 4a). However, H1a and H4b are not supported, as social media agility capability does not mediate the relationship between the use of social media for market research and NPD market and financial performance, and social media analytical capability does not

mediate the relationship between the use of social media for market research and NPD future business potential.

Model 2: The second structural model focusing on social media use for collaboration reveals that the variance (R²) is explained at 60.7% in social media agility capability, 65.4% in social media analytical capability, 79.1% in NPD market and financial performance, and 77.1% in NPD future business potential. Social media agility is significantly associated with NPD future business potential (β=.377), while it shows no significant impact on NPD market and financial performance. Conversely, social media analytical capability strongly impacts NPD market and financial performance (β=.455) but has no significant impact on NPD future business potential. Yet social media agility and analytical capabilities expose mediation relationships between collaboration and the two dependent variables. Social media agility capability shows a significant mediation effect between collaboration and NPD future business potential (β=.294), while it does not significantly mediate the path to NPD market and financial performance. In contrast, social media analytical capability significantly mediates the relationship between collaboration and NPD market and financial performance (β=.368), with no significant effect on NPD future business potential. The independent variable of collaboration exhibits a strong and significant effect on NPD market and financial performance (β=.520), NPD future business potential (β=.468), and social media analytical capability (β=.809). It also presents a less significant relationship with social media agility capability (β=.779). Consequently, hypotheses 2b and 5a are supported, in that social media agility mediates the relationship between collaboration and NPD future business potential, and social media analytical capability mediates the relationship between collaboration and NPD market and financial performance. H2a and H5b are not supported because social media agility capability has no mediation effect on the relationship between the use of social media for collaboration and NPD market and financial performance. Similarly, social media analytical capability has no mediation effect on the relationship between the use of social media for collaboration and NPD future business potential.

Model 3, the last structural model focusing on social media use for product launch, explains 63.4%, 60.9%, 73.7%, and 76.0% of the variance in social media agility capability, social media analytical capability, NPD market and financial performance, and NPD future business potential, respectively. Social media agility is significantly associated with NPD future business potential (β=.308), while it shows no significant impact on NPD market and financial

performance. Social media analytical capability strongly impacts NPD market and financial performance (β=.630) but has no significant impact on NPD future business potential. Social media agility and analytical capabilities expose mediation relationships between product launch and the two dependent variables. A significant mediation effect of social media agility capability exists between product launch and NPD future business potential (β=.246), while no significant mediation effect is found with NPD market and financial performance. By contrast, social media analytical capability significantly mediates the relationship between product launch and NPD market and financial performance (β=.492) without a significant effect on NPD future business potential. The independent variable of product launch significantly impacts NPD market and financial performance (β=.319), NPD future business potential (β=.423), social media agility capability (β=.796), and social media analytical capability (β=.781). This fully supports hypotheses 3b and 6a in that social media agility mediates the relationship between product launch and NPD future business potential, and social media analytical capability mediates the relationship between product launch and NPD market and financial performance. Following the first two models, H3a and H6b are not supported: social media agility capability has no mediation effect on the relationship between the use of social media for product launch and NPD market and financial performance, and social media analytical capability has no mediation effect on the relationship between the use of social media for product launch and NPD future business potential.

Discussion and implications

The purpose of this study is to examine how social media use in the different stages of the NPD process leads to NPD performance. Drawing on a sample of 340 firms, this research investigates the mediating effects of two organizational capabilities (social media agility and social media analytical capability) on NPD performance in the various stages of NPD. Thus, the study makes two contributions. First, despite their correlation, social media agility and social media analytical capabilities display different effects on the two outcome variables. Second, the results show that the use of social media through the various stages of NPD exhibit similar results. This suggests that it is not the stage itself that impacts NPD performance, but rather the way social media are leveraged during these various stages. So, when considering mediators jointly, key results from the analysis show: (1) social media agility capability impacts NPD future business potential throughout the NPD process, whereas it does not impact NPD market and financial performance, and social media analytical capability impacts NPD market and financial

performance across the three stages of NPD and has no influence on NPD future business potential; (2) though the different stages of NPD exhibit similar results, the effect of social media analytical capability on NPD market and financial performance is greater than the effect of social media agility capability on NPD future business potential, specifically in the launch stage of NPD.

This paper provides important theoretical and managerial implications. The first is an additional understanding of the role played by specific social media capabilities when using social media in NPD. This study also finds that these two specific social media capabilities (agility and analytical capabilities) mediate the relationship between social media use in NPD and NPD performance in different ways. Finally, in an attempt to reconcile fragmented and conflicting results about social media use across the NPD process, this research demonstrates that social media use in the different stages of NPD is a necessary but not sufficient condition for firms to reach NPD performance.

Theoretical implications

This study advances the knowledge of social media use for NPD and social media capabilities simultaneously. Despite its growing importance, the current understanding of how social media use contributes positively or negatively to NPD performance remains undertheorized in the current literature (Bstieler et al., 2018; Rindfleisch et al., 2020). While anecdotal evidence mainly points to positive effects of social media use on NPD performance, this research is among the first to identify and investigate the association between social media capabilities, the various stages of NPD, and two distinct NPD performance outcomes.

The use of social media for NPD involves a combination of external and internal knowledge processes that firms need to leverage. In this regard, social media agility and social media analytical capabilities complement prior findings that have focused on IT-based capabilities (Benitez et al., 2018; Dong & Wu, 2015; Rai et al., 2018) and knowledge-based capabilities (Cheng & Krumwiede, 2018; Ooms et al., 2015). The existing literature exhibits the critical role of IT capabilities, formed by technical and human resources skills, as enablers to acquire and leverage fine-grained information from social media (Braojos-Gomez, Benitez-Amado, & Llorens-Montes, 2015; Overby et al., 2006). These IT capabilities show positive impacts on NPD performance (Benitez et al., 2018).

An underlying rationale to work on NPD projects with social media is knowledge cocreation (Roberts & Candi, 2014). Specifically, an open search triggers the selection of appropriate channels, followed by a thorough exploration of the information gathered externally (Roberts et al., 2016). Therefore, knowledge-processing capabilities have been investigated and displayed a positive impact on innovativeness, market, and financial performance (Cheng & Krumwiede, 2018). This research has identified and examined two capabilities that extend IT and knowledge capabilities by addressing the complexity of social media in a more fine-grained way. Indeed, social media agility covers information acquisition from social media, communication flows, and responsiveness with appropriate content on social media (Chuang, 2020). Social media analytical capability is a multistep process that entails data discovery, collection, and preparation, along with data analysis and formatting (Stieglitz et al., 2018).

Another theoretical contribution concerns the mediation role of two social media capabilities on NPD performance. The indirect effect of social media use in NPD on NPD future business potential through social media agility capability is positive. The same indirect effect on NPD market and financial performance is null. Opposite results reflect the relationship between social media use in NPD on the two NPD performance outcomes through social media analytical capability. The findings suggest that both capabilities affect NPD performance positively in a similar way, regardless of what stage of NPD is occurring. To our knowledge, this is the first empirical study that demonstrates these relationships with the simultaneous use of two dynamic capabilities. This is a significant contribution because it validates past conjectures identified by scholars (Chuang, 2020; Jacobs et al., 2011; Roberts & Grover, 2012; Saldanha et al., 2017; Sivarajah et al., 2017).

These results emphasize the necessity of taking a more fine-grained approach when studying social media use across NPD. The increase of social media use implies a constant shift from internal to external inbound open innovation activities. Such a shift requires a good understanding of both the way external activities are conducted during the NPD process and their integration with internal activities throughout NPD (Barczak, 2012; Roberts et al., 2016).

Managerial Implications

Social media have received huge attention among small and large firms in the past years. Specifically, managers have been focusing on *when* and *how* to engage in social media activities for NPD. Concurrently, a growing number of firms have started experimenting with social

media use to gather insights, collaborate, and launch products, most often not knowing where this use would lead in terms of NPD performance and return on investment. These aspects remain part of the most important concerns for managers.

Although past research identifies capabilities to leverage NPD and social media, the current literature is fragmented and falls short of empirical evidence linking the use of social media in the various NPD stages with NPD performance (Mention et al., 2019; Rindfleisch et al., 2020). The similar results this study exhibits across the NPD process underpins the critical role played by capabilities to reach different types of NPD performance. While social media analytical capability has a greater influence on market growth and profitability, social media agility impacts NPD future business potential.

The ability to conduct sensing activities and to respond effectively on social media facilitates the gathering of rich insights and the creation of strong relationships with users (Chuang, 2020). Based on the results of the study, this is of high significance if the aim is to explore future opportunities. Conversely, a firm's capacity to derive actionable insights for innovation by mining, analyzing, and presenting clear and accurate information to managers is also important (Saldanha et al., 2017), particularly if the focus is financial performance, as demonstrated in this research. Another interesting finding relates to the stronger effect indirectly produced by social media use in the launch stage on NPD market and financial performance through social media analytical capability. These findings are particularly relevant to consider for managers because it suggests the existence of trade-offs that relate to firm objectives. Related to this, managers should evaluate their own organizational settings and capabilities to prioritize the resources and processes that need to be implemented based on their innovation objectives. As the increased use of social media for innovation can be expensive and time consuming, managers should keep in mind the aim that relates to the use of social media tools. as they might not always benefit NPD performance.

Limitations and future research

Although this study makes important contributions to the literature on innovation, capabilities, and social media, it has also some limitations.

More research is needed to dive into the underlying reasons explaining the relationships presented in the data more deeply. This study has focused on two capabilities that have been proven to make sense in this context. Yet they are not exhaustive and, as suggested by open

innovation and various streams of the literature, other elements of firms' strategies may account for the effects of social media use on NPD performance. Elements such as user profile (e.g., age and experience with social media) and usage (e.g., light vs. heavy use) deserve further exploration.

In addition, both small and large companies have adopted social media (Braojos-Gomez et al., 2015). However, the results of this study relate mainly to MNC's that typically invest more in human, technical, and financial resources to develop capabilities with a greater focus on new technologies. An interesting extension of this research would be to replicate the study on medium and small-sized firms.

This study focuses on external knowledge gathered from social media such as Facebook, LinkedIn, Twitter, etc. for internal exploitation, which is referred to as inbound open innovation. Yet social media are increasingly adopted by firms for internal use as well (Mention et al., 2019; Vuori, 2012). Future studies could provide more insights on the capabilities that firms need to develop for inside collaboration and knowledge sharing.

Furthermore, this study has employed a cross-sectional survey which relies on self-reported information. Though questions have been linked to concrete outcomes such as profit and new product opportunities, we are only analyzing a phenomenon at one point in time. A future inquiry could investigate the results at different points in time to take firms' learning curve into account, especially for longer-term outcomes.

Chapter 5

General conclusion

The significance of this dissertation resides in the nuanced, multidisciplinary approach it adopted to extend knowledge on social media use for innovation. In this work, important capabilities addressing the complex nature of social media were identified, and their impact was tested on NPD performance outcomes. The three studies of this dissertation employed mixed methodologies to tackle the subject from different and complementary angles. Dispersed results from various management disciplines were analyzed and consolidated. Accordingly, contributions were made to different streams of the literature. We start by summarizing the major findings of the dissertation through a transversal approach. Then we discuss research contributions and implications for practice before outlining the limitations and avenues for future research.

Synopsis of studies

Chapter 2 and 3 investigate the use of social media for innovation and the identification of resources, competences, and processes needed to leverage social media in this context. In chapter 2, the exploration is anchored in the literature of dynamic capabilities and provides a framework designed to support applications of social media for innovation. Specifically, this framework sheds light on three core capabilities and resources that emerged from the empirical study: (1) social media managers who orchestrate social media activities in the three stages of the innovation process, (2) top management support that drives team empowerment and an intrapreneurial culture across the organization, and (3) agile processes for a fast and efficient decision-making process.

Using multiple streams of the literature, chapter 3 contributes to work on open innovation and dynamic capabilities. This chapter provides an overview and summary of findings disseminated across various management disciplines (i.e., innovation, general management, marketing, and information systems). A rigorous and systematic approach shows that research on social media and innovation has been studied using three major perspectives. First, the resource-based view of the firm served as a basis for identifying essential capabilities to leverage social media tools for innovation. Specifically, IT and knowledge-related capabilities dominate this perspective. Second, the dynamics of network theory shed light on social behavior occurring in different network positions. Third, psychology provided insights on the role played by cognition and motivation in users and managers' willingness to adopt social media. Furthermore, a conceptual framework presented the firm's prominent external, internal, and contingency factors of social

media use for innovation. It also exhibited the contrasting results that have emerged from prior studies in terms of social media use and NPD performance and effectiveness. Finally, this chapter sets a path for future research by presenting new trends in the business and academic literature streams and by offering guidance to academic researchers and managers.

Insights from chapters 2 and 3 inform the theoretical section of chapter 4. Chapter 4 aims to reconcile conflicting findings from prior research. It identifies and tests empirically the mediating effects of two social media capabilities—namely social media agility and social media analytical capabilities—on the relationship between social media use for NPD and NPD performance. These two specific social media capabilities extend the literature pertaining to other capabilities linking social media use to NPD. They address various challenges posed by the complex nature of social media that were pointed out in previous chapters of this dissertation (e.g., big data volume, velocity, and variety). To our knowledge, this is the first study that analyzes the two capabilities in this context. Finally, chapter 4 zooms in on two distinct NPD performance outcomes. One relates to market and financial performance; the other to future business potential. Key results from this last study suggest that potential trade-offs relate to the capabilities that firms decide to leverage across NPD stages.

Research contributions

The three studies contribute substantially to the academic literature in various ways. This section presents the main theoretical and methodological contributions of this dissertation.

Theoretical contributions

Different theoretical angles were employed to explore the complex phenomenon of social media use for NPD. Accordingly, this doctoral project contributes to three streams of research.

First, the use of social media for innovation has become an important matter for both academics and managers. Yet it remains largely undertheorized in the current literature (Bhimani et al., 2019). An important contribution of this doctoral project is its focus on the firm perspective to investigate the topic, as few authors have adopted this view (e.g., Bashir et al., 2017; Nijssen & Ordanini, 2020). Study 1 provides clarity on the reasons *why* firms use social media throughout the various stages of NPD. It extends prior findings that have either focused on the general use of social media in NPD, or that have investigated one stage in isolation (Gruner et al., 2019; Marion et al., 2014; Riedl & Seidel, 2018). In this first study, a maturity model that

complements previous findings from Effing and Spil (2016) was introduced. This maturity model entails three stages that correspond to firms' proficiency with the use of social media. The highlighted processes, resources, and skills by maturity stage help firms in evaluating their own organizational capabilities.

Study 2 contributes to the literature by integrating theoretical perspectives from various management disciplines to forge conceptual bridges between the two domains of social media and innovation. It shows that together with capabilities (Nguyen et al., 2015; Roberts et al., 2016), scholars have examined user characteristics such as cognition, trust, motivation, and engagement (Bartl, Füller, Mühlbacher, & Ernst, 2012; Bayus, 2013; Camacho, Nam, Kannan, & Stremersch, 2019; Hautz et al., 2014). Scholars have also looked at network dynamics (Dahlander & Frederiksen, 2012) and stakeholder management (Du, Yalcinkaya, & Bstieler, 2016; Singaraju, Nguyen, Niininen, & Sullivan-Mort, 2016). The integrative framework that comes next is informed by the dispersed findings stemming from the four research areas that discuss innovation. In study 3, the specific social media activities undertaken in the three stages of the NPD process were identified and their effects were tested on two NPD performance outcomes. This third study contributed to the literature by showing that it is not the activities conducted in the different stages that affect NPD performance but the way they are leveraged in these distinct stages.

Second, this dissertation contributes to the open innovation literature in multiple ways. A significant conceptual underpinning of open innovation is the distinction between the inside-out and outside-in approach. To date, greater attention has been dedicated to the outside-in approach (Chesbrough, 2017). A first contribution of the dissertation is to the better understanding of external and internal input processing and reconciliation. Study 1 displays the drivers and barriers pertaining to these flows of information sharing by relating them to industry specificities. Study 2 unveils the importance of new business models that include governance structures to align information processing and objectives and support firms in their social media interactions more effectively. This is consistent with recent findings highlighting the benefits of involving multiple sources of information to reach better innovation performance (Chesbrough, 2017; Laursen & Salter, 2005).

This dissertation provides a nuanced picture of social media use on NPD outcomes. Indeed, study 2 and study 3 exhibit contrasting results on NPD outcomes. The existing literature has shown the positive effects of social media use on innovativeness, product design, and quality

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(Marion et al., 2014; Nursiam et al., 2016; Roberts et al., 2016). Conversely, it has been suggested that product development cycles could be shortened with the use of social media (Mallapragada et al., 2012). Yet the picture created of market and financial performance is conflicted in that it displays both positive and negative effects (Chang & Taylor, 2016; Roberts & Candi, 2014). Study 3 reveals a positive relationship between the use of social media in NPD and NPD market and financial performance. It also confirms the mediating role of social media analytical capability. Similar to this, a positive effect between social media use in NPD and NPD future business potential is displayed. In this context, social media agility capability mediates the relationship between both. As such, the study complements prior findings about external and internal knowledge processing, including the effects on NPD performance.

Third, dynamic capabilities are enriched by the three studies of the dissertation. Social media use for innovation produces unique challenges for firms. That is, the velocity, veracity, variety, volume, and value (the 5 Vs) of social media data (Bharadwaj & Noble, 2017) imply that innovation activities are conducted in complex, data-rich environments. Furthermore, the increasing power of social media users, which has shifted from demand-based power to crowd-based power (Labrecque et al., 2013), has totally changed the nature of interactions on social media. These contextual elements provided an impetus to delve into dynamic capabilities across the three studies.

In the view of dynamic capabilities, strategic and organizational processes are combined to create value in dynamic markets (Eisenhardt & Martin, 2000). A key contribution of the first study is the presentation of a framework that highlights the complementarity of both strategic and operational capabilities. Prior research has tended to link one or two capabilities to NPD outcomes (e.g., Roberts et al., 2016). However, this prior work typically did not take a more holistic approach to address the complexity posed by the context of social media (Felix et al., 2017). An integrated assessment was needed to address the nonlinear evolution of social media. Study 1 shows that strategic elements, such as social media managers and teams working on long-term initiatives, should be connected to agile processes to capture social media data and turn this information into actionable insights that will improve the firm's decision-making. Furthermore, embedded capabilities contribute to a sustainable competitive advantage (Grewal & Slotegraaf, 2007). Building on this premise, the first study shows how embedding social media management into NPD process could lead to better project implementation.

In sum, study 1 introduces important capabilities and stresses the need for an overall integration. Study 2 contributes to dynamic capabilities by offering in-depth insights on major capabilities examined in prior research. For example, scholars have argued that IT- and knowledge-based capabilities are key in exploring and exploiting social media data for NPD (Barczak et al., 2007; Candi et al., 2018; Sethi, Pant, & Sethi, 2003). However, the second study indicates a gap in research that relates to capabilities tackling the rapid evolution and dissemination of social media information. Accordingly, the third study identifies and examines specific social media capabilities that firms should leverage to face these challenges. Indirect effects of social media agility and social media analytical capabilities on NPD performance are tested. Both capabilities extend prior findings on capabilities and NPD outcomes by addressing the complexity of social media.

Methodological contributions

The three studies of this doctoral project complement each other by investigating the phenomenon of social media use for NPD from different viewpoints. A mixed method approach was employed to address research questions in a more fine-grained way. Accordingly, we provide several methodological contributions.

One of the big advantages of a mixed method approach is to combine qualitative and quantitative strategies to reach a balanced level of explanation and comprehension of a topic (Tillman et al., 2011). This pragmatic stance allowed us to adopt a complementary position to tackle this research topic. Moreover, credibility and reliability are also increased through the triangulation of the different results (Creswell, Klassen, Plano, & Smith, 2011). Triangulation, enabled by the use of multiple measures, helped us to overcome the weaknesses of a single method approach and contributed to a deeper understanding of the problem (Jick, 1979).

In the first study, our aim was to explore the recent phenomenon of social media use for innovation in large-sized companies. Considering this stream of research was still embryonic, case studies following a discovery-oriented research approach (Wells, 1993) were chosen to gather rich data from managers across 16 large firms. Multiple assessments exhibited the reliability and validity of the data. Importantly, these assessments allowed us to introduce a framework displaying relationships between different classes of capabilities. Study 2 consisted of a systematic literature review wherein we thoroughly reviewed 163 articles pertaining to different streams of the literature. A specific study protocol that addressed our highly targeted

questions was used, thereby offering full transparency and rigor in the process (Dixon-Woods, Agarwal, Jones, Young, & Sutton, 2006). In the last study, a cross-sectional survey design was employed to collect quantitative data from a large sample of 340 U.S. firms. This methodology was relevant because the aim was to test hypotheses. Reliable and valid measures were taken from the existing literature (Edmondson & McManus, 2007).

Conversely, we looked at different units of analysis to investigate our research questions. The first study focused on the firm level, because the objective was to get a good understanding of the use of social media across the NPD stages and to identify the organizational capabilities supporting such use. In the second study, the aim was to consolidate the state of the art of the literature and stimulate future research avenues. Thus, we integrated the individual, project, and firm levels in the scope of our systematic review. The third study combined project and firm levels. The project level provided a granular understanding of the relationship between social media use across NPD and NPD performance outcomes, whereas the firm level enabled us to dig more deeply into the understanding of dynamic capabilities. By this means, we complemented the findings from study 1 and study 2 in a coherent way.

Lastly, different analysis techniques supported the triangulation of our findings. In study 1, the simultaneous use of grounded theory (Strauss & Corbin, 1994) and systematic combining (Dubois & Gadde, 2002) facilitated the analysis and theorization of the data. A multistep process, including both intrarater and intercoder reliability, was followed to assure validity and reliability of the data. In study 2, a framework synthesis approach (Barnett-Page & Thomas, 2009) helped us in structurally organizing the data to bring conceptual clarity. In the last study, several analyses were conducted to interpret the findings of the research model. A set of analyses checked for the reliability and validity of the scale items. Following descriptive statistics, a factor analysis was run to assess model fit. Finally, structural equation modeling with consistent bootstrapping and algorithm (Cheah et al., 2018) contributed to the robustness of our paths' analyses.

Managerial implications

There is little doubt that social media can support innovation activities in different ways. But how should social media be leveraged throughout the NPD? And are they beneficial or harmful for NPD? These two frequently raised questions in business contexts have been the cornerstone of this dissertation. Though social media are on top of managers' agenda, relatively little is

known about the tools that should be selected, prioritized, and leveraged in the various stages of NPD (Bashir et al., 2017; Marion et al., 2014; Roberts & Candi, 2014). In addition, managers are still concerned about the business impact of social media use on NPD performance and their return on investment (ROI; Hoffman & Fodor, 2010; Scuotto, Del Giudice, Peruta, & Tarba, 2017).

With the increasing number of social media users and the social media landscape becoming ever more crowded, firms must step up their game. This must be realized through strategic choices aligned with firms' objectives. A key matter that has been discussed in this doctoral project is the necessity for managers to evaluate their own organizational settings before jumping on the social media bandwagon. Social media use for NPD can only be achieved with the support of a clear social media strategy that entails organizational capabilities (Candi et al., 2018). Therefore, social media related activities need to be deployed in a coherent way to source, integrate, and create knowledge from these social platforms (Mention et al., 2019).

The framework introduced in study 1 highlights the need to empower employees at all levels of the organization. This can be achieved by showing mutual trust and support from top management. As shown in the study, firms that reap benefits from social media use have reduced their hierarchical barriers to stimulate risk-taking behaviors inside their organizations. Another significant implication for managers is the constant need to adapt to changing environments. Social media are uncertain and evolve fast. Consequently, firms must exhibit a high level of agility and should implement iterative cycles of test-and-learn. However, managers need to consider the following factors. First, the necessity to constantly question and adapt resource allocation and capabilities. Challenging the status quo is a sobering reality for managers but is a reality nonetheless. As presented in the maturity model from study 1, different levels of social media use proficiency can be reached. The results that firms could achieve will depend on the set of capabilities they deploy.

A second consideration is the necessity to decentralize organizational structures in order to simplify social media-related business processes. One of the major benefits of such a transformation is faster decision-making in line with social media evolution. Connected to this, and as underlined in study 2, implementing social media governance structures enables firms to interact more effectively within and outside the firm. Governance is also useful to coordinate and share information between business units working on social media and other entities inside

the organization. It contributes to the alignment of needs and objectives (Westerman, Bonnet, & McAfee, 2014, pp.147–148).

The aforementioned managerial implication is related to organizational culture, a commonly ignored variable of agility (Felipe, Roldán, & Leal-Rodríguez, 2017). Yet when it comes to management change, many organizations fail because they are not able to operate the necessary cultural shifts in terms of resources, communication, and decision-making (Lokuge, Sedera, Grover, & Dongming, 2019). Social media has shown without a doubt that they have the potential to reshape multiple business areas, including collaboration and innovation. Managers are advised to stimulate the use of social media inside their organizations. In doing so, they will implicitly increase social media literacy among their employees. Managers should also encourage an intrapreneurial mindset, as suggested in study 1. A good way of establishing such behavior is by launching cross-functional projects across the company and by providing exposure to high-potential employees. This recommendation is supported by study 2, which uncovered the importance of involving diverse innovators' profiles. Firms should consider participants' background and experience with social media (e.g., usage frequency and number of interactions). As such, they should do a better job in their targeting efforts on social media. Involving specific profiles to reflect on ideas or to participate in other innovation activities might be more beneficial for them than including large user groups.

A last major managerial implication of this dissertation is the selection and buildup of the right set of capabilities according to firms' objectives. By shedding light on two important social media capabilities and their contrasting effects on two distinct NPD outcomes, study 3 uncovered the importance of aligning the capabilities with the purpose of NPD initiatives. Indeed, the results indicated that social media agility tends to impact outcomes that relate to exploration, whereas social media analytical capability positively influences outcomes connected to exploitation. Considering the time and resources involved in social media related activities, managers should be aware of the trade-offs between resource allocation and expected benefits. Therefore, they should start by explicitly stating their business objectives before mobilizing resources inside their organization.

Limitations and future research

Each chapter of the thesis presents limits and paths for further exploration. This final section takes a step back to synthesize what could not be investigated in this dissertation and what is left open for scholars to examine in future research.

The drawbacks of a pluralist epistemological approach can be overcome to a certain extent by effectively integrating several methodologies, but some limitations remain. The first limitation pertains to knowledge reconciliation. While the first study of this dissertation has used a constructivist approach to understand the complex nature of social media use in NPD, the last two studies have scrutinized the literature to examine research questions, taking a positivist stance. Owing to this realm of abstraction, each paradigm is perceived as a contributing knowledge layer (Lewis & Grimes, 1999). This knowledge heterogeneity informs different facets of organizational capabilities, social media, and NPD. Yet, knowledge stemming from each study is not equal due to this pluralist pragmatic view that entails different methods.

Our research revealed most studies mainly consider the positive aspects of social media use in NPD. Yet existing empirical results suggest that social media benefits are not always achieved and that the use of social media may affect innovation performance negatively (Nijssen & Ordanini, 2020). This observation leads to two important implications. One is the necessity to dig more deeply into these negative aspects. The other is the need to address such challenges. Some authors have started examining these risks. For example, Gatzweiler, Blazevic, & Piller (2017) warn about the devolution of a firm's control to online communities and recommend the integration of a community manager to monitor online activities. Another recent study pointed to firm hurdles, such as the required amount of time needed to manage social media, the potential negative effects caused by word-of-mouth, and privacy concerns (Adilova, 2017). Other aspects of social media use relate to the amount of fake news circulating across platforms, aggressive conversations, inappropriate content sharing, and cyberbullying (Baccarella et al., 2018). Considering these negative effects of social media use, future research could explore new methods and processes to manage interactions on social media for NPD projects. Institutional theory can provide ideas in the way firms should operate in the context of social media by encouraging or constraining behavioral patterns. Additional attention could also be dedicated to the roles and responsibilities of virtual stakeholders involved in the NPD process. In this regard, stakeholder theory can inform value creation mechanics to motivate all participants of an innovation project. Likewise, more studies comparing the use of social media

in the distinct stages of NPD and analyzing outcomes for different types of NPD (e.g., incremental vs. disruptive innovation) could help firms make wiser investment decisions.

Next, this dissertation mainly focused on capabilities at the firm level. But as highlighted in study 2, the current literature falls short of studies linking the use of social media for innovation to microfoundations (Foss & Pedersen, 2016). Microfoundations could unveil additional contingencies that firms should address to perform better with the use of social media. One example of this would be a closer inspection of specific organizational processes that support social media and innovation activities. Future research could focus on the role played by individuals at different levels of the organization. Related to this, the various chapters of this dissertation mentioned interactions between firm members and social media users. Yet, as tackled in studies 1 and 2, other stakeholders might be involved in NPD projects with social media. Hence, additional studies could consider participants' heterogeneity and ecosystems as venues for further investigation. Social capital could represent an interesting theoretical angle to tackle these venues; specifically to investigate the relational and cognitive characteristics that underpin the networks formed on social media (Gubbins & Dooley, 2014). More empirical multilevel analyses are also needed to capture deeper insights on interactions between individuals.

A last angle to be tackled in future research is the growing integration of new technological advancements in social media and in firms' know-how. The exponential growth of digitally-based innovation is constantly challenging firms with opportunities and threats (Westerman et al., 2014). Artificial intelligence (AI), including powerful algorithms and machine learning, are some of the possibilities firms can use to innovate. Consider the recent examples of well-known corporations such as Amazon, Netflix, and L'Oréal. All three companies are active in different sectors but have understood the importance of approaching new technologies and social media in a holistic way to innovate. Netflix, for example, has a fan base that exceeds 60 million followers on Facebook and is also very active in posting relevant content to engage users on well-known social networks. Together with this strong social relationship approach, the firm dedicates a considerable focus on big data supported by machine learning. This double approach allows for better inspiration and creativity to serve customers with innovative solutions (Pumchanut, 2018; Ramakrishnan, 2019). Hence, future research should look at ways to enhance the user experience with artificial intelligence across NPD. For instance, facial recognition, which occurs on social media when people get tagged in photos, offers great

opportunities to target users with new customized products and services. The same goes for Deep Text AI algorithms. Yet these new technologies blur the lines between data privacy and new service personalization. Artificial intelligence also helps firms identify novel patterns on social media by connecting content shared across different platforms (Davenport, Guha, Grewal, & Bressgott, 2020). Using such tools has two major implications: tapping into a huge amount of creative ideas and giving more time to teams for innovation activities. This triggers two types of research questions: what will this shift mean for innovation management practices? And what will be the managerial implications of automating the labor surrounding innovation? Connected to this, automated chatbots and voice recognition offer new ways to interact with online innovation communities. Further studies could investigate how users discern and react to technology and human interactions; how these different types of relationships affect innovation activities; and what types of capabilities should be deployed to manage such changes.

Social value networks created inside and outside organizational boundaries comprise the development of multidimensional business model frameworks (Ketonen-Oksi, Jussila, & Kärkkäinen, 2016). Yet an important shortcoming identified in our systematic review relates to new business models that address social media use for innovation. Business models designed to leverage external data by integrating and analyzing their volume and variety enable reactions to customer feedback in a timely manner (Sorescu, 2017). The fast evolution of social media platforms involves regular shifts in the way firms operate and deliver new offers to their customers. Building on this premise, additional studies that could provide more clarity on the way firms should manage real-time information are warranted. Further research could also examine how new business models help firms to create competitive advantage and value from social media. Specifically, what are the internal and external elements that need to be considered in these new business models?

Concluding words

It is recognized that social media represents both a promise and a great challenge for academics and managers. Whereas social media platforms keep bourgeoning across the globe, new technological advances multiply the number of opportunities to enhance innovation activities. AI and AR have the potential to disrupt social media use further. An increased understanding of user needs with the help of big data and machine learning, the customization of new offers,

and enhanced interactions to stimulate engagement are some of the promising paths that will trigger more attention in the upcoming years.

This dissertation has attempted to show that social media can no longer be considered as a "simple" communication tool but should be integrated into firms' strategies. This work has been dedicated to helping managers and academics face the challenges of these pervasive digital tools. Our belief is that what we have faced pales in comparison to the change that is coming. Firms need to get ready to meet this uncertain future by experimenting, analyzing, and learning from all social media activities they undertake. One of the core requirements to achieve such a goal is to stimulate a strong intrapreneurial culture inside organizations. Firms that will not integrate these new technologies and implement capabilities to address their complexity will be left behind.

Appendices

Appendix I

Semi-structured interview guide study 1

Entretien exploratoire sur l'utilisation des médias sociaux dans le process d'innovation au sein des entreprises

A. **Introduction**
Présentations Explication de l'objectif de l'entretien et du thème de recherche Mises au point pratiques : confidentialité, enregistrement,…
B. **Le processus d'innovation** :

1. Qu'est-ce que le mot « innovation » vous évoque ?
2. Parlez-moi de l'innovation dans votre entreprise ?
    i. Comment décririez-vous le climat général de l'entreprise par rapport à l'innovation ?
    ii. Comment se porte votre entreprise en termes d'innovation ?
3. Quelles sont les ressources mises à disposition pour innover (stimuler la créativité) ?
4. Pourriez-vous décrire votre <u>processus</u> d'innovation ?
5. Pourriez-vous me parler de ses forces… et faiblesses.
    i. En cas de faiblesses, quels sont les problèmes majeurs ? Pourriez-vous éventuellement les décrire par phase ?
    ii. Travaillez-vous déjà sur une solution pour les résoudre ?
6. Mesurez-vous la performance d'une innovation ? Si oui, sur base de quels critères ?

C. **Les réseaux sociaux dans le processus d'innovation**

1. Que pensez-vous des médias sociaux ? De leur utilité en général ?
 	
2. Pensez-vous que les médias sociaux soient utiles pour l'innovation ? Si oui comment ?
 	
3. Que pensez-vous des entreprises qui font appel aux médias sociaux ?
 	
4. Les utilisez-vous dans votre entreprise ?
➔ Si oui :
    a. Qu'est ce qui vous pousse à faire appel aux médias sociaux ?
    b. Comment les utilisez-vous ?

        i.   Pour obtenir des idées ?
       ii.   Pour dialoguer ?
     iii.   Pour créer un design ?
     iv.   Comme outil de communication ?
      v.   Pour recevoir du feedback ?

c. A quelle fréquence ?

d. A quel stade du processus d'innovation ?

e. Sous quelle forme (blogs, wikis, espaces de travail partagés, sites de médias sociaux …)?
        i.   Quelles plateformes exactement ?
       ii.   Comment? (Jeux concours, workshops, toolkits de co-design, plateformes d'opinion,….)
     iii.   Pourquoi ces plateformes?

f. Recherchez-vous un profil d'utilisateur en particulier ?
        i.   Comment les sélectionnez-vous ? Sur base de quels critères ?

g. Quelles sont les ressources mobilisées pour l'intégration des réseaux sociaux au processus d'innovation (en termes de personnel, de matériel IT, d'argent, d'agences spécialisées…) ?

h. Dans la gestion des réseaux sociaux, qui est en charge de quoi ?
    ➤ (Si cumulé à une fonction (par ex marketing)) :
       ■ Quelle est la part du temps de travail consacrée à la gestion des réseaux sociaux ?
        i.   Comment cette gestion s'opère t'elle concrètement ?

i. Pourriez-vous me parler de quelques exemples d'innovation pour lesquels l'entreprise a fait appel aux médias sociaux ? (Reposer certaines questions ci-dessus pour plus de précision par projet).
        i.   Pour ce projet, à quel(s) stade(s) du processus d'innovation avez-vous intégré les réseaux sociaux ?
       ii.   Dans quel objectif ?
     iii.   Quels types de réseaux sociaux ?
     iv.   Le projet dont il est question a-t-il abouti à un lancement ? Est-il en cours ?
      v.   Si lancement :
        1. Comment évaluez-vous sa performance en termes de :
          a. De degré d'innovation ?
          b. De performance sur le marché ? (PDM, croissance du marché,...)
          c. De rentabilité ? (profit, ROI,…)
        2. Avez-vous établi des KPI's reliant l'utilisation de médias sociaux dans le processus d'innovation à la performance du NPD ?

j. Y a-t-il certains types d'innovation pour lesquels vous faites plus appel aux réseaux sociaux ?

k. Selon vous, à quel stade du processus d'innovation l'utilisation de réseaux sociaux se justifie t'elle le mieux ?

l. Quels sont les grands challenges rencontrés avec la gestion des réseaux sociaux en innovation ?
       1. Quels sont les problèmes rencontrés ?
       2. Comment y faites-vous face ?

➔ Si non :
   a. Pourquoi ne les utilisez-vous pas ?
   b. Y avez-vous fait appel dans le passé ?
      ➢ Si oui :
         ▪ Parlez-moi de votre expérience avec ces derniers ?

      ➢ Si non :
         ▪ Projetez-vous d'y faire appel prochainement ?
         ▪ Pourquoi ? (motivations ou freins)
         ▪ Sous quelles conditions ? Sur base de quels critères ?

5. Quelles sont les plus grandes opportunités offertes par les réseaux sociaux dans le processus d'innovation ?

6. Quels sont les plus grands risques ?

7. Y a t'-il actuellement des questions que vous/l'entreprise se pose en relation avec les réseaux sociaux ? Parlez-moi-en

8. Dans votre portefeuille de clients, qu'observez-vous en termes de médias sociaux ?

9. Quel est leur plus grand besoin ?

10. A quel moment y font-ils le plus appel ?

11. As-tu quelques exemples d'utilisation ?

Appendix II

Survey study 2: How does your firm use social media?

Dear respondent,

Thank you for your cooperation.

In this questionnaire we would like to investigate how your firm uses social media for innovation. Filling out the questionnaire will take you about 10 minutes and does not require any research from you. We assure you the strictest anonymity and we will use the results only for scientific purpose. It's not about being right or wrong. For all following questions, please fill out the text fields or mark the scale value that best reflects your opinion.

Contact person:
Marie-Isabelle Muninger (PhD researcher)
E-mail: marieisabelle.muninger@ichec.be

FILTERING QUESTIONS

1. Number of employees within my company:
- ❏ <25
- ❏ 25-50
- ❏ 50-100
- ❏ 100-150

- ❏ 150-250
- ❏ 250-500
- ❏ 500-1000
- ❏ >1000

2. My firm is involved in product or service's innovation activities:
- ❏ Yes
- ❏ No

3. I have a very good overview of my firm's latest product or service's innovation projects:
- ❏ Yes
- ❏ No

MARKET ORIENTATION

Please indicate the extent to which you agree or disagree with each of the following statements about your firm context (1= Strongly disagree -> 5= Strongly agree)

	Strongly disagree				Strongly agree
	1	2	3	4	5
1) We help our customers anticipate developments in their markets.	❏	❏	❏	❏	❏
2) We continuously try to discover additional needs of our customers of which they are unaware.	❏	❏	❏	❏	❏
3) We incorporate solutions to unarticulated customer needs in our new products and services.	❏	❏	❏	❏	❏
4) We brainstorm on how customers use our products and services.	❏	❏	❏	❏	❏
5) We innovate even at the risk of making our own products obsolete.	❏	❏	❏	❏	❏
6) We search for opportunities in areas where customers have a difficult time expressing their needs.	❏	❏	❏	❏	❏
7) We work closely with lead users who try to recognize customer needs months or even years before the majority of the market may recognize them.	❏	❏	❏	❏	❏

8) We extrapolate key trends to gain insight into what users in a current market will need in the future. ❑ ❑ ❑ ❑ ❑

9) We constantly monitor our level of commitment and orientation to serving customer needs. ❑ ❑ ❑ ❑ ❑

10) We freely communicate information about our successful and unsuccessful customer experiences across all business functions. ❑ ❑ ❑ ❑ ❑

11) Our strategy for competitive advantage is based on our understanding of customers' needs. ❑ ❑ ❑ ❑ ❑

12) We measure customer satisfaction systematically and frequently. ❑ ❑ ❑ ❑ ❑

13) I believe this company exists primarily to serve customers. ❑ ❑ ❑ ❑ ❑

14) Data on customer satisfaction are disseminated at all levels in this company on a regular basis. ❑ ❑ ❑ ❑ ❑

15) We are more customer focused than our competitors. ❑ ❑ ❑ ❑ ❑

COMPETITIVE INTENSITY

Please indicate the extent to which you agree or disagree with each of the following statements about your firm context (1=Strongly disagree -> 5= Strongly agree)

Strongly disagree   Strongly agree

1 2 3 4 5

1) Our competitive pressures are extremely high ❑ ❑ ❑ ❑ ❑

2) We are in a highly competitive industry ❑ ❑ ❑ ❑ ❑

3) We do not pay much attention to our competitors (reverse) ❑ ❑ ❑ ❑ ❑

4) Competitive moves in our market are slow and deliberate, with long time gap between companies' reactions (reverse) ❑ ❑ ❑ ❑ ❑

GENERAL USE OF SOCIAL MEDIA WITHIN THE FIRM

Please indicate the extent to which you agree with the statements about your use of the social media tools listed below (1=Strongly disagree -> 5= Strongly agree)

Strongly disagree   Strongly agree

1   2   3   4   5

1) We use social networking sites such as Facebook, Instagram and LinkedIn a lot ❏ ❏ ❏ ❏ ❏

2) We use blogs, including Twitter, a lot ❏ ❏ ❏ ❏ ❏

3) We use content sites such as YouTube, Flickr, and Slideshare a lot ❏ ❏ ❏ ❏ ❏

4) We use virtual social worlds such as Second Life a lot ❏ ❏ ❏ ❏ ❏

FIRM SOCIAL MEDIA CAPAPBILITES

Please indicate the extent to which you agree with the following statements (1= Strongly disagree -> 5= Strongly agree):

Strongly disagree   Strongly agree

1   2   3   4   5

With the use of social media:

1) we continuously try to discover additional needs of our customers of which they are unaware. ❏ ❏ ❏ ❏ ❏

2) we extrapolate key trends discovered to gain insight into what users in a current market will need in the future. ❏ ❏ ❏ ❏ ❏

3) we continuously try to anticipate our customers' needs even before they are aware of them. ❏ ❏ ❏ ❏ ❏

4) we attempt to develop new ways of looking at customers and their needs. ❏ ❏ ❏ ❏ ❏

5) we sense our customers' needs even before they are aware of them. ❏ ❏ ❏ ❏ ❏

6) We respond rapidly if something important happens on social media ❏ ❏ ❏ ❏ ❏

7) We quickly react to fundamental changes we discover on social media. ❏ ❏ ❏ ❏ ❏

8) When we identify a new user need on social media, we are quick to respond to it. ❏ ❏ ❏ ❏ ❏

9) When we detect on social media that our customers' product or service needs change, we are fast to respond ❏ ❏ ❏ ❏ ❏

The social media data we analyze:

1) provide a complete set of information. ❏ ❏ ❏ ❏ ❏

2) produce comprehensive information ❏ ❏ ❏ ❏ ❏

3) provide all the information needed ❏ ❏ ❏ ❏ ❏

Analyses of our social media data results in information that:

1) is well formatted ❏ ❏ ❏ ❏ ❏

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2)   is well laid out   ❏ ❏ ❏ ❏ ❏

3)   is clearly presented   ❏ ❏ ❏ ❏ ❏

The social media data we analyze:

  1)   produces correct information   ❏ ❏ ❏ ❏ ❏

  2)   provides few errors in the information   ❏ ❏ ❏ ❏ ❏

  3)   provides accurate information   ❏ ❏ ❏ ❏ ❏

In our interaction with social media communities:

  1)   we are open in sharing information.   ❏ ❏ ❏ ❏ ❏

  2)   we keep social media communities well informed.   ❏ ❏ ❏ ❏ ❏

  3)   we don't hold back information.   ❏ ❏ ❏ ❏ ❏

  4)   we empower social media users by sharing and providing them with access to information   ❏ ❏ ❏ ❏ ❏

  5)   we integrate social media users' preferences in our decision making processes.   ❏ ❏ ❏ ❏ ❏

  6)   we consider the role of social media users to be as important as our own   ❏ ❏ ❏ ❏ ❏

  7)   we share an equal role with social media users   ❏ ❏ ❏ ❏ ❏

  8)   we facilitate social media users to fully enjoy the community   ❏ ❏ ❏ ❏ ❏

  9)   we stimulate social media users to attach to the community or create a relationship with other social media users   ❏ ❏ ❏ ❏ ❏

  10) we constantly aimed to build a group, a community, or a network of consumers who are a fan of us   ❏ ❏ ❏ ❏ ❏

  11) we stimulate social media users to spread positive word of mouth in the social media community.   ❏ ❏ ❏ ❏ ❏

INNOVATION PROJECT INFORMATION

Think about one of the latest product or service innovation project developed by your firm and answer the following questions that relate to this specific project:
Please briefly describe the project in the box below:

```
┌─────────────────────────────────────────────┐
│                                             │
│                                             │
│                                             │
│                                             │
│                                             │
│                                             │
└─────────────────────────────────────────────┘
```

1. **Please indicate the strategic importance of the project within your company:**
   ❑ low
   ❑ medium
   ❑ high

2. **Target market: The new product was aimed at**
   ❑ consumers (or business-to-consumer market)
   ❑ organizations (or business-to-business market)

3. **Were you involved in the project?**
   ❑ Yes
   ❑ No

4. **On average, how many hours a week did you spend on this specific project?**

   ❑ Less than one hour a week

   ❑ Between 1 and 5 hours a week

   ❑ Between 5 and 10 hours a week

   ❑ Between 10 and 20 hours a week

   ❑ Between 20 and 30 hours a week

   ❑ More than 30 hours a week

USE OF SOCIAL MEDIA FOR SPECIFIC PROJECT

For the project you selected above, please indicate the extent to which you used social media, for the following purposes:
In this innovation project, we used social media to…………

Strongly disagree   Strongly agree

     1   2   3   4   5

1) research market trends for our new product/service development   ❑ ❑ ❑ ❑ ❑

2) collect useful ideas for our new product/service development   ❑ ❑ ❑ ❑ ❑

3) collect novel ideas for our new product/service development   ❑ ❑ ❑ ❑ ❑

4) enable customers to contribute to our product/service development   ❑ ❑ ❑ ❑ ❑

5) cocreate ideas for our new product/service with customers   ❑ ❑ ❑ ❑ ❑

6) cocreate our new product/service with customers   ❑ ❑ ❑ ❑ ❑

7) collect feedback about our new product/service during launch   ❑ ❑ ❑ ❑ ❑

8) test market acceptance of our new product/service during launch   ❑ ❑ ❑ ❑ ❑

9) encourage customers to recommend our new product/service after launch   ❑ ❑ ❑ ❑ ❑

10) increase brand engagement for our product/service after launch   ❑ ❑ ❑ ❑ ❑

11) enable customers to communicate their opinions of our new product/service   ❑ ❑ ❑ ❑ ❑

12) speed up new product/service acceptance   ❑ ❑ ❑ ❑ ❑

13) create word of mouth advocacy for our new product/service   ❑ ❑ ❑ ❑ ❑

INNOVATION OUTCOMES FOR SPECIFIC PROJECT

Please indicate the extent to which you agree or disagree with each of the following statements (1= Strongly disagree -> 5= Strongly agree)

Strongly disagree   Strongly agree

1 2 3 4 5

1) This new product or service exceeded market share objectives. ❑ ❑ ❑ ❑ ❑

2) This new product or service exceeded sales growth objectives. ❑ ❑ ❑ ❑ ❑

3) This new product or service exceeded profitability objectives. ❑ ❑ ❑ ❑ ❑

4) Overall profitability of this new product or service was low. ❑ ❑ ❑ ❑ ❑

5) The return on investment of the new product or service was higher than expected. ❑ ❑ ❑ ❑ ❑

6) The new product or service matched exactly customer requirements. ❑ ❑ ❑ ❑ ❑

7) The new product or service provided us access to new markets ❑ ❑ ❑ ❑ ❑

8) The new product or service opened up new product development possibilities ❑ ❑ ❑ ❑ ❑

9) The new product or service created new market know-how that may be utilized in the future ❑ ❑ ❑ ❑ ❑

10) The new product or service created new technical know-how that may be utilized in the future ❑ ❑ ❑ ❑ ❑

Could you please fill in the following information?

Gender:
❑ Man
❑ Female

Your age:
❑ Less than 30 years-old   ❑ 50 to 60 years-old
❑ 30 to 40 years-old   ❑ Over 60 years-old
❑ 40 to 50 years-old

What is your job title?

❑ Product or brand Manager
❑ Marketing Manager
❑ Innovation Manager
❑ Digital or social media Manager
❑ Project Manager
❑ Other

In what category does your functional background fit best? (Please give one answer only)
❑ Marketing
❑ Innovation
❑ Finance
❑ R&D
❑ Sales

- ❑ Human resources
- ❑ Information & Communication Technology
- ❑ Engineering
- ❑ Other

Your management level inside the firm:

❑ Head of division	❑ Team manager	❑ Other
❑ Head of department	❑ Team member	

Type of business your company is active in:

- ❑ Products
- ❑ Services

Sector:

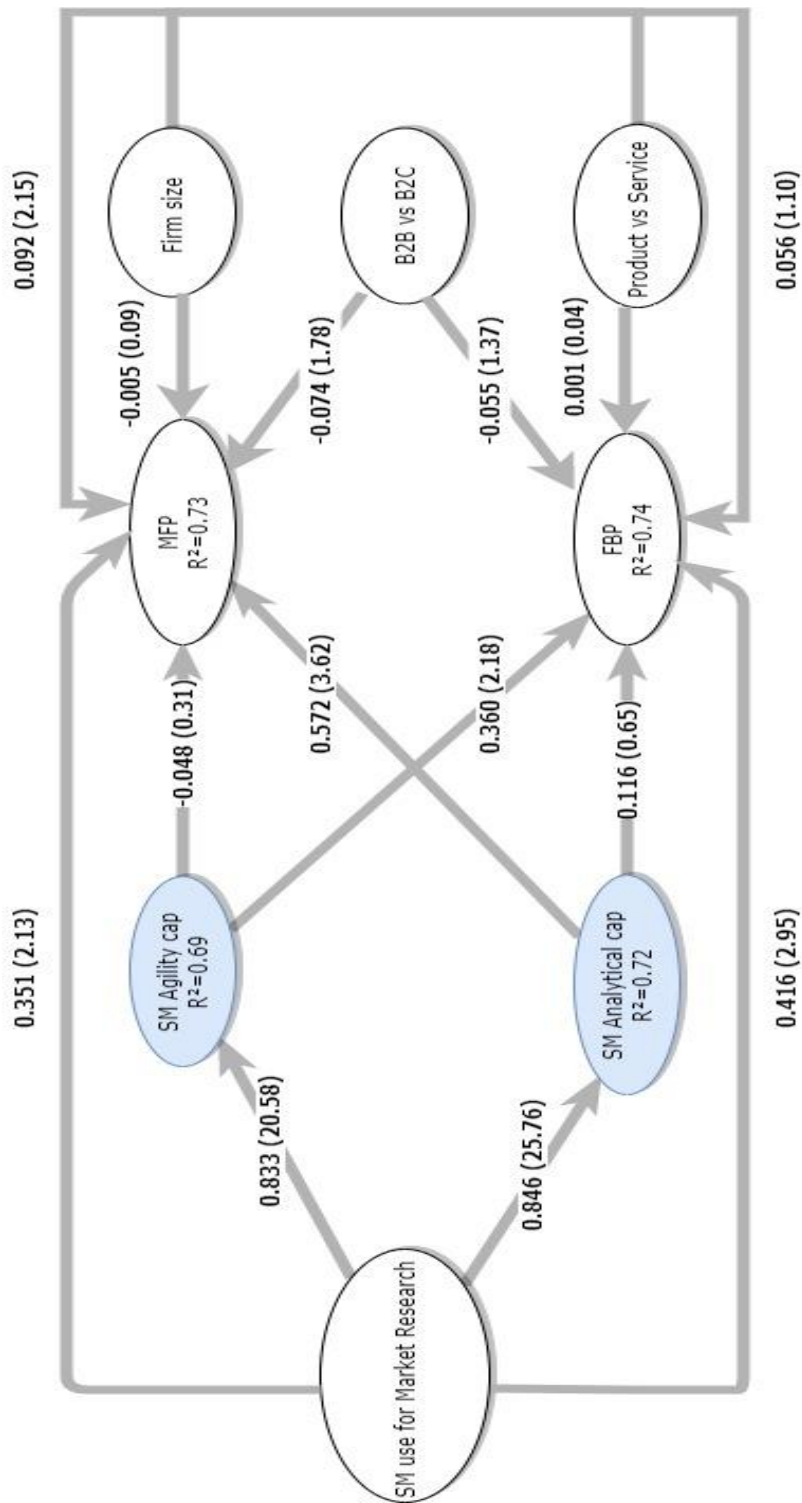|	
❑ FMCG	❑ Finance & accounting services
❑ Pharma	❑ Consulting services
❑ Transportation	❑ Media & communication
❑ Manufacturing	❑ Personal services
❑ Retail	❑ Sports & leisure
❑ Horeca	❑ Other
❑ Education	

MANY THANKS FOR YOUR PRECIOUS COLLABORATION

Fill in any additional remarks you may think of:

Appendix III

## Table 4.4: Variables, Cronbach's alphas, and survey items

All survey items had possible answers ranging from 1 to 5, where 1 indicated to strongly disagree and 5 to strongly agree

Variables of the models	Cronbach's alphas	Survey items
Market Financial performance (MFP)	.79	*Please indicate the extent to which you agree or disagree with each of the following statements (1= Strongly disagree -> 5= Strongly agree):* This new product or service exceeded market share objectives. This new product or service exceeded profitability objectives. The return on investment of the new product or service was higher than expected.
Future business potential (FBP)	.83	*Please indicate the extent to which you agree or disagree with each of the following statements (1= Strongly disagree -> 5= Strongly agree):* The new product or service provided us access to new markets The new product or service opened up new product development possibilities The new product or service created new market know-how that may be utilized in the future The new product or service created new technical know-how that may be utilized in the future
SM use for Market Research	.84	In this innovation project, we used social media to………… research market trends for our new product/service development collect useful ideas for our new product/service development collect novel ideas for our new product/service development
SM use for Collaboration	.87	In this innovation project, we used social media to………… enable customers to contribute to our product/service development cocreate ideas for our new product/service with customers cocreate our new product/service with customers
SM use for Market launch	.87	In this innovation project, we used social media to………… collect feedback about our new product/service during launch test market acceptance of our new product/service during launch enable customers to communicate their opinions of our new product/service speed up new product/service acceptance create word of mouth advocacy for our new product/service
SM Agility capability	.93	*Please indicate the extent to which you agree or disagree with each of the following statements (1= Strongly disagree -> 5= Strongly agree):* With the use of social media: we extrapolate key trends discovered to gain insight into what users in a current market will need in the future. we continuously try to anticipate our customers' needs even before they are aware of them. we attempt to develop new ways of looking at customers and their needs. we sense our customers' needs even before they are aware of them. we respond rapidly if something important happens on social media When we detect on social media that our customers' product or service needs change, we are fast to respond
SM Analytical capability	.93	*Please indicate the extent to which you agree or disagree with each of the following statements (1= Strongly disagree -> 5= Strongly agree):* The social media data we analyze provide a complete set of information. Analyses of our social media data results in information that is well formatted The social media data we analyze produces correct information The social media data we analyze provides few errors in the information The social media data we analyze provides accurate information

MFP: Market & Financial Performance – FBP: Future Business Potential

Figure 4.2: Social media use for Market Research: Structural Path Analysis – Beta values (T-values) and R squares
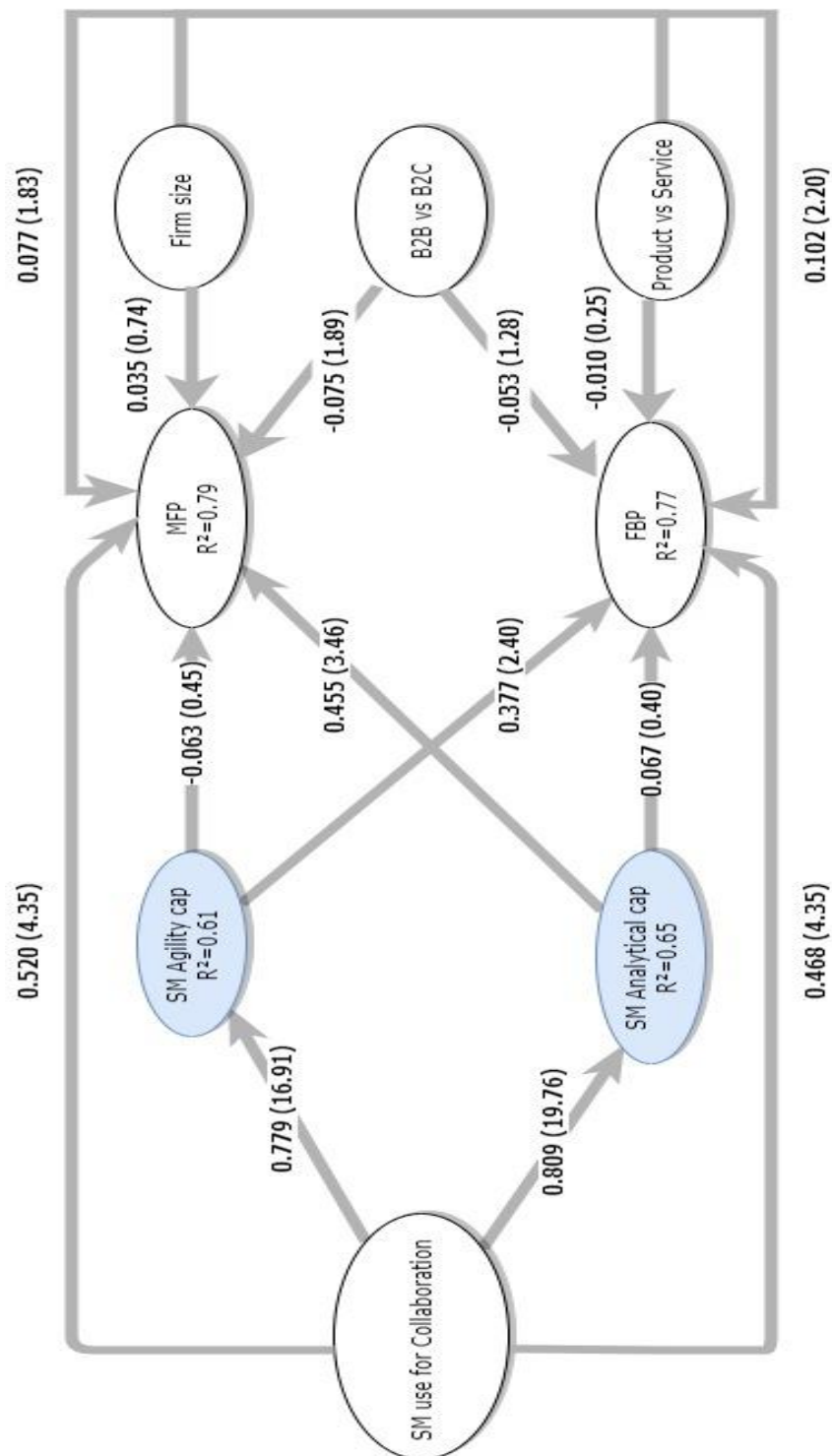
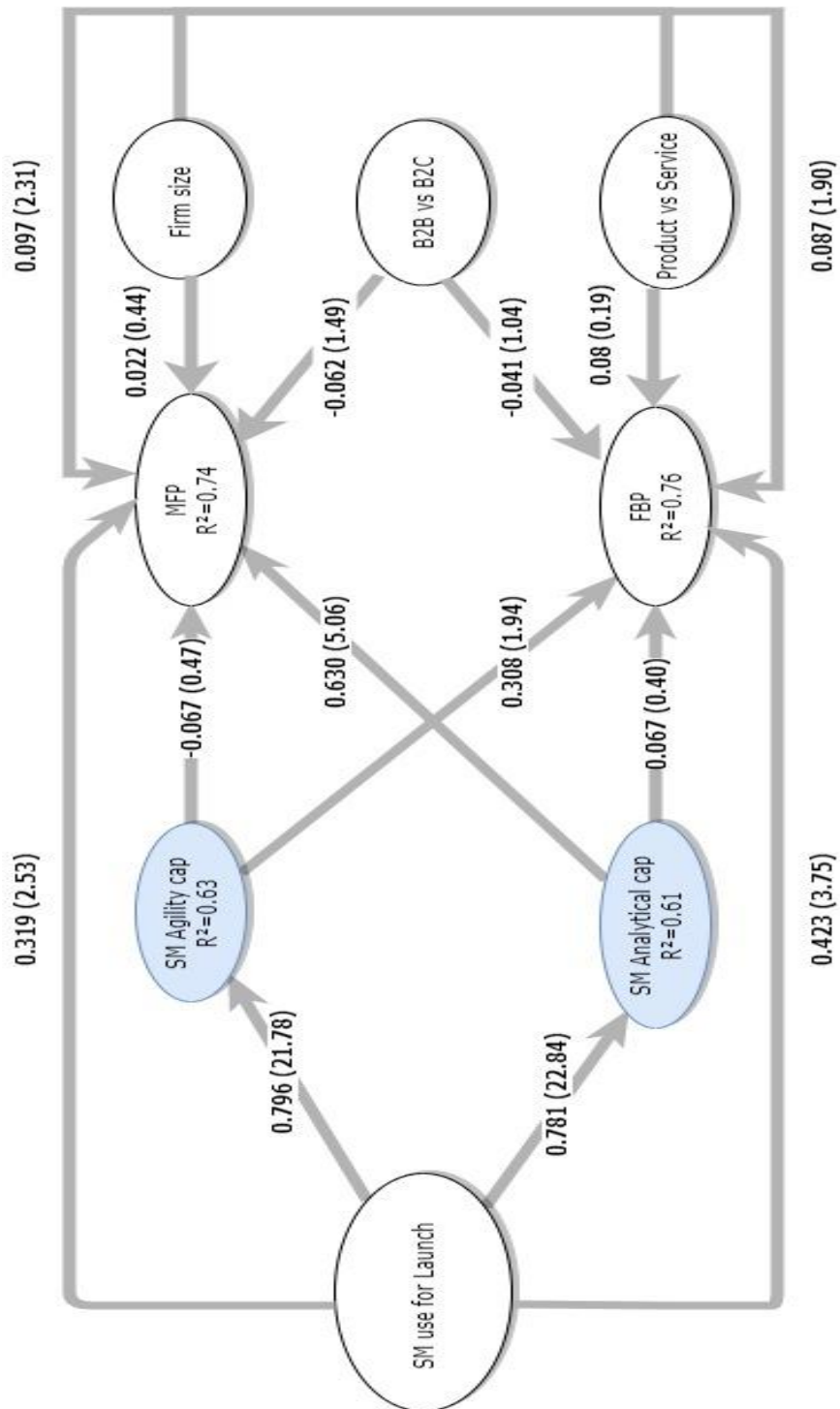**MFP: Market & Financial Performance – FBP: Future Business Potential**

Figure 4.3: Social media use for Collaboration: Structural Path Analysis – Beta values (T-values) and R squares

MFP: Market & Financial Performance – FBP: Future Business Potential

Figure 4.4: Social media use for Product Launch : Structural Path Analysis – Beta values (T-values) and R squares

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