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Configurations of social media-enabled strategies for open innovation, firm performance, and their barriers to adoption

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Abstract

The use of social media offers tremendous innovation potential. Yet, while current research emphasizes success stories, little is known about how firms can leverage the full potential of their social media use for open innovation. In this paper, the authors address this gap by conducting a configurational analysis to develop an integrative taxonomy of social media-enabled strategies for open innovation. This analysis stems from the integration of internal and external variables such as social media communication activities, organizational innovation seekers, potential innovation providers, the stages of the open innovation process, and their relationship with different performance outcomes and barriers to social media adoption for open innovation. Through an empirical study of 337 firms based in eight countries, four clusters have been identified that are characterized as distinct strategies: "marketing semi-open innovators," "cross-department semi-open innovators," "cross-department full process semi-open innovators" and "broad adopters open innovators." The findings reveal the trade-offs associated with different strategies for implementing social media for open innovation and provide insights of the use of these strategies. By doing so, they suggest a more nuanced approach that contrasts with the traditionally positive (or even rosy) depiction of the effects of social media on open innovation. Accordingly, managers are encouraged to contemplate their organizational competencies, capabilities, and their strategic intent when drafting social media strategies for open innovation. Selective approaches, along with greater adoption leading to greater benefits, are shown to be more rewarding than a middle way that spreads things too thin. Avenues for further research include qualitative explorations of the trajectories unfolding through implementing social media strategies for innovation activities and the use of objective performance measures rather than subjective perceptions from

informants to understand the complex relationships between social media adoption and performance.

KEYWORDS
configuration, innovation barriers, innovation performance, open innovation, social media

1 | INTRODUCTION

The contemporary business landscape is marked by digitalization, globalization, and rapidly evolving technologies, resulting in short product life cycles and pressure for fast innovation (Martin-Rojas et al., 2020). To compete in such environments, firms need to combine internal and external sources of innovation by "opening up" their innovation processes and ecosystems to external actors (Chesbrough, 2006; Martin-Rojas et al., 2020; Radziwon & Bogers, 2019; Randhawa et al., 2016; West & Bogers, 2014). This paper advances knowledge about how companies can do so by leveraging social media. It shows how combinations of social media and open innovation activities are configured and how these configurations are associated with barriers to social media adoption and different performance outcomes. Gaining such a holistic understanding about the use of social media for open innovation is an important endeavor for both research and practice.

Social media are defined as highly interactive web platforms through which individuals and communities share, co-create, discuss, and modify user-generated content (Arora et al., 2021; Carlson et al., 2018; Kaplan & Haenlein, 2010). Thus, social media is an umbrella term that encompasses diverse platforms (Ghezzi et al., 2016), such as social networking sites (e.g., Facebook), blogs (e.g., Blogger) and microblogs (e.g., Twitter), forums (e.g., Amex Open Forum), professional networking sites (e.g., LinkedIn), collaborative sites (e.g., Wikipedia), and sharing sites (e.g., YouTube or Instagram).

Recent studies show that some companies have successfully used social media to obtain knowledge from external stakeholders (He & Wang, 2016; Mount & Martinez, 2014; Roberts et al., 2016) at a low cost (Barlatier & Josserand, 2018; Haefliger et al., 2011; Hitchen et al., 2017). Social media allows firms not only to mine information and ideas from consumers (Ozcan et al., 2021) but also to involve customers in the innovation process (de Oliviera et al. 2020; Muninger et al., 2022). Thanks to social media, firms can leverage external knowledge for internal innovation and product development (Ogink & Dong, 2019) by creating complex patterns of communication between innovation seekers and innovation providers across the different stages of the innovation process (Muninger et al., 2019; Testa et al., 2020). Hence, social media use by firms has grown radically (Arora et al., 2021), to become one of the most prominent tools in knowledge development (Soto-Acosta et al., 2017; Zhang et al., 2017).

Practitioner points

- Firms use four resource and strategy configurations of social media-based open innovation strategies.
- These configurations request considering trade-offs regarding investment requirements, adoption barriers, and performance outcomes.
- Configurations focused on marketing activities are easier to adopt, but have limited performance effects.
- Configuration on broad open innovation activities has higher and wider performance implication, but also need significant resource investment to overcome adoption barriers.

However, leveraging social media for open innovation in practice is difficult (Jussila et al., 2011; Roberts & Piller, 2016). Most firms face barriers to using these technologies (Dekker et al., 2020; He & Wang, 2016; Nijssen & Ordanini, 2020; Roberts & Candi, 2014). Although firms recognize the need to be active on social media, they struggle to do so effectively (Jussila et al., 2011) in a way that contributes to business performance (Bashir et al., 2017; Roberts & Candi, 2014; Roberts & Piller, 2016; Wang et al., 2016).

Moreover, empirical research on the contribution of social media to open innovation remains sparse (Corral de Zubielqui et al., 2019; Ghanadpour & Shokouhyar, 2021). Existing knowledge is fragmented, and a comprehensive picture is still lacking (Testa et al., 2020; Zhang & Zhu, 2021). A plausible reason for this stems from the fact that evidence to date relies mainly on anecdotal case studies, depicting success stories in initiatives using social media for product innovation by specific companies (Bayus, 2013; Gallaugher & Ransbotham, 2010; Huston & Sakkab, 2006; Nambisan & Nambisan, 2008) and focusing on specific actors or stages of the innovation process

(Mount & Martinez, 2014; Muninger et al., 2019; Muninger et al., 2022).

This means that the extant literature still fails to fully capture the complexities which come from the knowledge that numerous factors must be combined to generate the performance benefits of social media–enabled innovation (Barlatier & Josserand, 2018; Benitez et al., 2018; Mount & Martinez, 2014; Patroni et al., 2020; Roberts & Piller, 2016).

Accordingly, this study aims to advance the current understanding of which social media strategies for open innovation are used by organizations and how these strategies are associated with firm performance. To do so, the literature on social media is connected to research on open innovation to identify four core elements of social media strategies for open innovation: the communication activities intended through social media (Testa et al., 2020), the innovation seekers involved (Barlatier & Josserand, 2018; Mount & Martinez, 2014), the innovation providers involved (Testa et al., 2020), and the stages of the open innovation process for which social media are used (Barlatier & Mention, 2019; Bashir et al., 2017; Mount & Martinez, 2014).

Then, an exploratory configuration methodology is used to identify the patterns of social media strategies for open innovation used by firms based on characteristics identified in the literature. The configurational approach allows to study the complex and multifaceted phenomenon of social media use for open innovation by identifying configurations across multiple constructs, rather than only the bivariate relationships between these variables (Gruber et al., 2010; Homburg et al., 2008). Classic linear regression analysis is limited to the significance and effect size of individual variables (or the interactions between only two and three variables), while the other variables are held constant (Fiss, 2007). In contrast, the configurational approach allows to examine multidimensional combinations or bundles of conceptually distinct characteristics that might occur together (Fiss, 2007; Meyer et al., 1993). Thus, this approach aids theoretical parsimony while offering realistic descriptions of complex and diverse phenomena (Dess et al., 1993). Finally, an analysis of covariance (ANCOVA) is used to examine how these configurations relate to firm performance and barriers to social media adoption.

This research contributes in several ways to the current debate regarding social media and open innovation. It shows how strategies for social media and open innovation activities are configured and used by firms. In particular, four distinct strategies are revealed: marketing semi-open innovation cross-department semi-open innovation, cross-department full process semi-open innovation, and broad adopter open innovation. This research also shows how these social media strategies for open innovation activities are associated with different performance outcomes and different barriers to adoption, which implies strategic trade-offs for firms.

The resulting organizational taxonomy of social media strategies for open innovation paves the way for future theory development and empirical research in this area. Moreover, this study has practical relevance, as it provides insights for firms to improve their social media–enabled open innovation strategies, challenging the perspective of "one-size-fits-all" recommendations in accounting for the variability between firms' behaviors.

This paper starts with a review of the literature on social media strategies for open innovation and then introduces the configurational analysis approach, data collection method, constructs and measures, clustering variables, and procedures. The results section presents the configurational analysis and their links to firm performance indicators and implementation barriers. The paper concludes with implications for academic research and practice and offers limitations and future research perspectives.

2 | LITERATURE REVIEW

Social media is now integrated in our lives (Khan & Khan, 2019). It also has dramatically changed the way individuals and firms conduct knowledge search activities, especially when seeking external ideas (Han & Xu, 2021). Through interactive and dynamic exchanges between communities and stakeholders, social media allows knowledge exchanges between individuals and between organizations (Corral de Zubielqui et al., 2019; Mangold & Faulds, 2009).

The new methods of communication offered by social media facilitate the connection of heterogeneous actors to create boundless opportunities for developing firms' creative and innovative capabilities (Mention et al., 2019; Palacios-Marqués et al., 2015), regardless of their location, domain specificities, or size (Mount & Martinez, 2014; Ooms et al., 2015; Soto-Acosta et al., 2017). The use of social media technologies for acquiring outside knowledge from customers may ensure better engagement between a firm and its customers (Tortora et al., 2021) and an understanding of customers' needs and preferences (Kim & Chae, 2018), reinforcing their ability to adapt to changing markets (Pérez-González et al., 2017). For example, social media can facilitate collaboration and the creation of valuable user-generated content (Soto-Acosta et al., 2017). Simultaneously, firms can also acquire valuable information from suppliers, which enhances innovation and new product development (Cheng & Shiu, 2020).

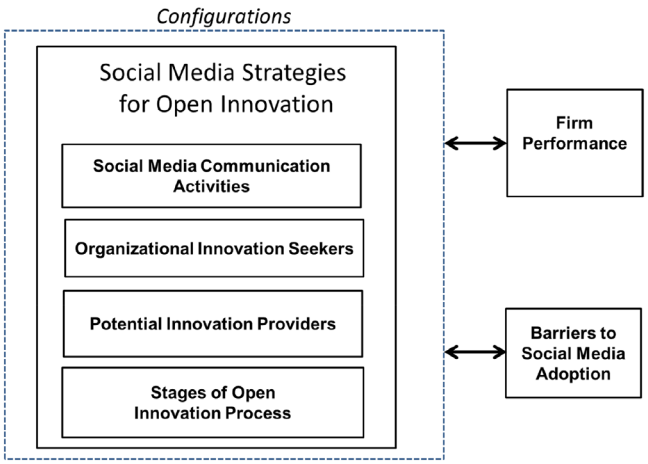

FIGURE 1 Theoretical framework.

2.1 | Social media strategies for open innovation

Building on existing literature on social media for innovation and open innovation, four core theoretical elements of such a strategy are identified (see Figure 1): first, social media–based communication activities, for which different social media tools are used (Muninger et al., 2019; Turban et al., 2011); second, the actors actively engaged in the pursuit of information and knowledge via social media tools, which are called organizational innovation seekers (Barlatier & Josserand, 2018; Mount & Martinez, 2014; Testa et al., 2020); third, the different sources of information and knowledge brought by the innovation providers (Bhimani et al., 2019; Testa et al., 2020); and fourth, the different stages of the open innovation process in which these inputs are used (Barlatier & Mention, 2019; Bashir et al., 2017; Mount & Martinez, 2014; Muninger et al., 2019).

First, social media can contribute to information and knowledge in- and out-flows through the development of new forms of communications that leverage engagement with stakeholders (Testa et al., 2020). Managing knowledge inputs from internal and external sources is central to innovation in general, and to open innovation in particular (Brunswicker & Chesbrough, 2018; Randhawa et al., 2016). For managers and employees alike, social media provides a fast, efficient mechanism for communicating, learning, and sharing knowledge (Corral de Zubielqui et al., 2019; de Oliveira et al., 2020). However, knowledge flows are inherently related to the functions and features of social media (Nisar et al., 2019). Depending on the platforms adopted and how they are used, social media can enable a broad spectrum of communication activities to stimulate participation, share information or views, leverage connectivity, and collaborate to co-create value for open innovation (Bhimani et al., 2019; Halale et al., 2015; Turban et al., 2011). This means that fostering the right type of social media–based communication activity is key to obtaining a specific and valuable outcome (Muninger et al., 2022).

The introduction of social media has marked a shift in the spectrum of available communication activities. This can be captured by the distinction between social publishing and social community communication activities (Tuten & Solomon, 2017). Social publishing focuses on the exchange of information (Turban et al., 2011) and covers classic one-to-many communication as well as new possibilities to communicate one-to-one with personalized content that is delivered when the receiver chooses (Kim & Chandler, 2018). In social communities, social media supports knowledge exchanges and co-production (Kim & Chandler, 2018; Turban et al., 2011), where knowledge is information that has been processed to be more meaningful and create value (Kim & Chandler, 2018). This happens because, in social communities, participants become active contributors (O'Hern & Rindfleisch, 2009) who develop a shared language (Kim & Chandler, 2018) and are able to engage in multiway communication and joint activities with like-minded participants (Tuten & Mintu-Wimsatt, 2018).

To foster such knowledge production, companies undertake communication activities aimed at creating engagement opportunities that lead to further participation, collaboration, and co-production (Carvalho & Fernandes, 2018), with such collaboration potentially contributing directly to innovation (Turban et al., 2011). Focal organizations engage in discovering knowledge by analyzing social media content produced by social communities (Turban et al., 2011).

Second, there is a need to consider the use of social media practices by the various organizational units mobilizing it (Barlatier & Josserand, 2018; Mount & Martinez, 2014), as innovation spans different organizational units (Chesbrough & Brunswicker, 2013; Mount & Martinez, 2014). In the context of open innovation, organizational units operate as innovation seekers (Testa et al., 2020) that design, organize, and manage social media–based contributions to firms' open innovation processes. In the case of a single firm, innovation seekers can have different organizational units or functions, such as R&D (Marion et al., 2014) or marketing (Bashir et al., 2017). To date, however, researchers have focused on specific, isolated social media–enabled innovation seekers' activities—that is, R&D and marketing. Thus, further research is needed to provide evidence regarding the performance effects associated with the use of social media for innovation across different departments (Barlatier & Josserand, 2018).

Third, the assumption that a firm can neither possess nor generate all required new knowledge internally and

thus is dependent on external knowledge, is central to open innovation (Chesbrough, 2006; Dahlander & Gann, 2010). Consequently, open innovation research has a long tradition in demonstrating the positive effect on innovation of gaining access to new knowledge through external stakeholders (Laursen & Salter, 2006; Randhawa et al., 2016). In the same vein, research on social media-based open innovation also explores knowledge inputs from individual stakeholder groups, external to the focal firm. For example, several studies highlight that firms cannot create new knowledge about the perceptions and utility of their new products and services without input from customers (Nambisan & Nambisan, 2008; Han & Xu 2021). Bashir et al. (2017) show that social media–enabled interactions enabling customer co-creation activities are key to performance effects.

Similarly, firms also need to include the voices of suppliers in new product development (Cheng & Krumwiede, 2018; Cooper, 2019). The types and diversity of stakeholders associated through social media with the innovation process as innovation providers (Testa et al., 2020) are crucial for open innovation outcomes (Corral de Zubielqui et al., 2019). While prior research provides strong support for the impact of knowledge exchanges with innovation providers on product innovation success, notably through collaborative activities such as co-design with customers and suppliers, it fails to integrate the full spectrum of social media-based communications possible with a broader ensemble of stakeholders along the innovation cycle.

Fourth, innovation research distinguishes between different stages and activities, which are frequently grouped into different innovation stages, from idea generation to product launch (Chesbrough, 2006; Cooper, 2008). The potential of social media to facilitate external knowledge search and exchange (Candi et al., 2018) spans all stages of the innovation process (Du et al., 2016; Mount & Martinez, 2014; Muninger et al., 2022). It covers idea and design – essentially through crowdsourcing activities (Huston & Sakkab, 2006; Ozcan et al., 2021), new product development – mainly by fostering communication and interactions across innovation teams (Marion et al., 2014), and product commercialization—by motivating social media users to engage in behaviors that are beneficial to new product launch activities, such as paying attention to advertisements or providing recommendations.

Thereby, social media are efficient vehicles for gathering market insights and customer needs (Rakshit et al., 2021), generating new product ideas and identifying market trends (Mount & Martinez, 2014), and gathering solution-oriented knowledge from internal stakeholders (Bayus, 2013). This means that leveraging social media at different stages of the innovation process can yield specific innovation performance benefits (Mount & Martinez, 2014). However, we know very little on whether firms should leverage such possibilities selectively – that is, by selecting isolated selective stages of the innovation process, or, are better off adopting social media more broadly across the innovation cycle.

2.2 | Firm performance and barriers to social media adoption

Scholars argue that social media can enhance firm competences, increase technological knowledge, improve standards of practice, and subsequently, impact innovation capability and performance (Garrido-Moreno et al., 2014; Nisar et al., 2019). Many studies assume a relationship between the use of social media for open innovation and innovation or economic performance, but only a few contributions have investigated the outcomes of social media–enabled innovations, whether regarding the efficiency of the R&D and innovation process in itself or assessing its impact on the performance of innovation seekers (Testa et al., 2020). The few studies that have investigated such impacts show that using social media does not necessarily increase innovation performance and that performance effects should not be taken for granted (Du et al., 2016).

Thus, it is crucial to consider the barriers that could limit the performance effects of social media use for open innovation. Nonprepared firms are usually overwhelmed by data or information or distracted by the diversity of inputs from social media (Marion et al., 2014) and may therefore be at risk of listening to the wrong audience (Roberts & Candi, 2014) or failing to engage with external stakeholders (Qin et al., 2016), which can lead to innovation underperformance (Roberts & Piller, 2016). Firms often lack internal processes that allow them to meaningfully process large pools of unstructured data emanating from diverse communities (Hoornaert et al., 2017; Roberts et al., 2016).

The prior review has shown the importance of four core theoretical elements of open innovation strategies (social media communication activities, innovation seekers, innovation providers, and innovation stages, cf. Figure 1). However, our understanding of the connection between these four theoretical elements of social strategies for open innovation is still limited, as existing research does not provide a comprehensive analysis of the interdependencies between them (Muninger et al., 2022; Testa et al., 2020). Research focused mainly on combinations addressing the value of specific social-media based communication activities—for instance, collaborative knowledge production—by a specific group of innovation seekers—mainly R&D (Marion et al., 2014; Mount & Martinez, 2014) or marketing (Bashir

et al., 2017), in relation to a specific group of innovation providers – mainly users and user communities (Testa et al., 2020) during a specific stage of the innovation process – mainly ideation and/or commercialization stages (Muninger et al., 2019). In addition, research to date also neglects the significant impact of barriers on firm performance. Considering the critical importance of the use of social media for open innovation, firms need to manipulate and combine these key elements into viable strategies. To account for these interdependencies and uncover these strategic configurations, an exploration of this phenomenon in its entirety is needed (Muninger et al., 2022; Testa et al., 2020).

3 | METHODOLOGY

3.1 | Configurational analysis

To examine the complex and multifaceted phenomenon of social media use for open innovation, this study relies on an exploratory configurational analysis (Gruber et al., 2010; Homburg et al., 2008). Configurational analysis is the process of identifying the multidimensional combinations or bundles of conceptually distinct characteristics (or elements and activities) that commonly occur together (Fiss, 2007; Meyer et al., 1993). Configurational analysis is strongly established in organizational research and has been successfully applied in business areas such as marketing, strategy, and innovation (Barbosa et al., 2021; Bissola et al., 2014; De Jong & Marsili, 2006; Gruber et al., 2010; Homburg et al., 2008).

Classic linear regression analysis largely focuses on the significance and effect of individual variables while holding the other variables constant. Interaction analysis can account specifically for the joint impact of variables, but it normally does not go beyond two- and three-way interaction, as higher levels of interaction, are difficult to interpret and justify theoretically (Fiss, 2007). In contrast, the configurational approach underlying the premise is that it is difficult to isolate organizational factors and mechanisms as they can interact with each other. Additionally, the presence or absence of particular factors might provide value to other factors. Thus, it relies more on techniques that allow classifications into groups and analysis of differences between groups, such as cluster analysis, Q-sorting, and the repertory grid technique (Short et al., 2008). Therefore, it reduces the often-unrealistic oversimplification engrained in the focus on bivariate relationships in regression models, making it a methodological tool that aids theoretical parsimony while offering realistic descriptions of complex and diverse phenomena (Dess et al., 1993).

Thereby, the configurational approach allows to examine of the multidimensional combinations or bundles of conceptually distinct characteristics that might occur together (Fiss, 2007; Meyer et al., 1993). A key underlying assumption of the configurational approach is that the combined potential of organizational characteristics and activities can be limited because they may not completely, independently, and continuously vary. Therefore, organizations may tend to align their activities and characteristics in coherent patterns (Meyer et al., 1993). Configurational analysis allows researchers to describe the resulting complicated relationships among many organizational characteristics that are bundled into coherent strategies (Gruber et al., 2010; Homburg et al., 2008).

Homburg et al. (2008) distinguish two configurational analysis approaches. The first approach is the "fit or confirmative approach," which analyzes organizational performance as a function of organizational fit with a contingency and requires extensive prior theory about the subject matter. The second approach, which is adopted for this research, is the exploratory approach. When conducting an exploratory approach, configurations are not pre-empted by the research team, and instead of being deductively derived from the literature, the patterns identified, if any, emerge from the data (Randhawa et al., 2016). Thus, explorative configurational analysis is particularly suitable for a study of questions which little previous knowledge is available or theoretical prediction.

Given the diversity of affordances offered by the use of social media for open innovation (from crowdsourcing new product ideas to facilitating communication across seekers and solvers to accelerating product development and launch, etc.), and that this diversity intrinsically entails different forms of interaction, communication, and implementation, the exploratory approach is particularly suitable for this study. It allows the exploration of the phenomena without preconceived assumptions regarding potential configurations, thus avoiding force-fitting configurations onto empirical reality. This is important because social media for open innovation remains a relatively recent phenomenon, with few theoretical or empirical investigations (Randhawa et al., 2016), which still requires the development of research encompassing the social media uses of companies for open innovation, the types of actors involved, and the effects of these uses (Muninger et al., 2022; Testa et al., 2020).

3.2 | Data collection

Detailed data on social media practices and open innovation activities are generally not available in public data sets; thus, a survey was designed and conducted with the support of Qualtrics Online Research Panels. Previous

studies used survey panels as a reliable and valid means of collecting data (Bennett & Chatterji, 2019; Courtright et al., 2016), and researchers have recently shown the suitability of online panel data by highlighting the convergence of panel and conventional data (Walter et al. 2018).

Furthermore, survey results depend heavily on the quality of the respondents. Accordingly, the following job titles were selectively targeted to source respondents: social media manager, innovation manager, R&D manager, product manager, marketing manager, digital strategy manager, chief innovation officer, chief digital officer, chief technology officer, and chief executive officer. In addition, a selection question probed whether these respondents were directly involved in their firm's innovation activities. This was important to increase the reliability of the responses. Additionally, although the sample was not limited to specific industries, government and nonprofit organizations were excluded as these firms might operate with different institutional logics, and comparison becomes difficult.

Geographically, the survey was built on a stratified sample across eight countries (Australia, Denmark, Finland, Germany, the Netherlands, Sweden, Switzerland, and the United Kingdom [UK]) was used. These countries were selected based on their high placement in comparative innovation rankings (Innovation Union Scoreboard; World Economic Forum Global Competitiveness Report and IMD World Competitiveness Ranking). For each country, the authors requested a minimum number of responses ($n = 35$) from existing Qualtrics panels.

To achieve a minimum number of stratified responses, 3232 prospective respondents were contacted, of whom 3081 initially agreed to take part in the survey. However, only 1703 started the survey. At the beginning of the survey, individuals were asked if they were involved in innovation activities and if their location was among the target regions. If this was not the case, the survey was terminated. This led to an additional 1078 surveys being dropped with 625 remaining. Although the number of discarded responses was very large, it ensured the consistency and reliability of the responses. After incomplete and nonsensical responses were eliminated ($n = 288$), 337 usable responses were available for analysis. This final decrease in the number of respondents is substantial but is most likely due to the considerable length of the survey.

The response rate depends on the base of its calculation; that is, in the case of the overall number of initial contacts, it is 10.4% (337/3.232) and in the case of the number of eligible responses of the observed target population, it is 53.9% (337/625). Although the lower response rate is likely an underestimation, the higher response rate is likely an overestimation, as the response rate does not account for potential eligible respondents who did not respond to the survey at all. Furthermore, the response rate is comparable to related studies with micro-level surveys on open innovation (Bengtsson et al., 2015; Bogers et al., 2018; Mina et al., 2014; Parida et al., 2012).

To explore potential biases due to the lower response rate, several comparisons between the set of initial responses and the final sample, using chi-square tests, were conducted. First, potential selection bias based on social media use was explored by comparing respondents based on their extent of social media use. This was possible as the survey incorporated a question on social media use at the beginning before respondents dropped out or were excluded based on the selection criteria (Question: "My organization uses social media to implement a new or significantly improved service, product, process, or organizational method"; the response options were "Not at all", "Sometimes," "Often,", and "Almost always"). The analysis showed that for most degrees of social media use, the samples are not statistically different; however, the "Not at all" category is over proportionally represented in the final sample (19.5%) in comparison to the initial sample (10.6%). This is somewhat surprising, as one could expect that nonsocial media users are less likely to respond to a social media questionnaire. Importantly, all levels of social media users are represented in the sample.

Second, differences in firm and respondent characteristics between initial responses and the final sample were examined. None of the characteristics (location, client type, firm age, industry, and respondent type) showed significant differences between the samples.

Third, a detailed review of the response pattern showed that the number of responses decreased after the initial set of open innovation questions. Thus, the response patterns of the respondents who completed the survey and those who did not were examined. The initial block of nine questions, largely completed by both groups, was checked for the existence of different response patterns. The analysis using the chi-square tests showed no significant different response patterns between these groups.

Table 1 presents the sample firms' characteristics: major industries, including retail, financial, and professional services, and different sizes and ages. Although a concentration in the descriptive variables was identified (e.g., firms in the business-to-business context and firms in the information and communication sector), the diversity of the sample should provide substantial confidence in the sample. Additionally, although the selection question focused on individuals directly involved in innovation activities, the respondents came from different areas and levels of their organizations.

TABLE 1 Sample composition

Majority of clients		Company age		Company size	
Other enterprises	29.4%	<5 years	9.2%	Unspecified	5.9%
Private consumers	70.6%	5–9 years	19.3%	0–19 employees	22.8%
		10–14 years	18.4%	20–99 employees	11.6%
		15–24 years	22.3%	100–399 employees	17.5%
		25+ years	30.9%	400–999 employees	18.1%
				1000–4999 employees	11.3%
				5000+ employees	12.8%

Respondent type		Location of headquarters	
CEO	7.1%	Australia	11.9%
Innovation	17.8%	Denmark	11.0%
Marketing	4.7%	Finland	10.7%
Other	9.4%	Germany	11.6%
Owner	15.8%	Netherlands	11.0%
Product management	14.5%	Sweden	10.7%
Social media manager	10.4%	Switzerland	17.8%
Technology and R&D	20.2%	United Kingdom	15.4%

Industry	
Accommodation and food service	2.7%
Construction	8.3%
Electricity, gas, steam, and air conditioning supply	1.2%
Financial and insurance	8.9%
Information and communication	24.9%
Luxury goods (manufacturing and/or sale)	2.4%
Manufacturing	13.9%
Professional, scientific, and technical	11.0%
Real estate	0.9%
Retail and distribution	10.7%
Transportation and storage	7.7%
Water supply: sewage, waste management, and remediation	0.6%
Wholesale and retail trade; motor vehicle and motorcycles repair	1.5%
Other	5.3%

3.3 | Constructs and measures

The selection of constructs is an important aspect of classification and configurational analysis, with the aim of providing a parsimonious description of the phenomenon under study (Dess et al., 1993; Homburg et al., 2008; Rich, 1992). Ketchen and Shook (1996) argue that, particularly for an unexplored phenomenon, it is important to allow for rich and realistic description. However, incorporating too many variables and variables that are central to the question of interest can negatively affect the detection of clusters in the subsequent analysis (Punj & Stewart, 1983). Thus, to achieve a parsimonious list of variables, a two-step selection procedure common to configuration research was applied (Homburg et al., 2008).

Initially, a specific set of open innovation and social media theoretical core constructs was identified (see Figure 1: Social Media Communication Activities, Organizational Innovation Seekers, Potential Innovation Providers, Stages of the Open Innovation Process). The focus was not only on the relevant construct in its respective literature stream but also in relation to the others (i.e., social media constructs affecting open innovation and vice versa). For each construct, sub-constructs were identified based on their relevance and use in previous literature. These constructs build the base for the

clustering algorithm (clustering variables). In addition to the cluster variables, outcome variables, which are grouped into firm performance and barriers to social media adoption, were explored. Finally, and aligned with previous configuration research, control variables are used in the supporting analysis, but do not enter the cluster procedures (Homburg et al., 2008).

3.4 | Clustering variables

The clustering procedure is based on four open innovation and social media theoretical core constructs derived from the literature review: (1) social media–based communication activities, (2) the organizational innovation seekers involved, (3) the relevant innovation providers, and (4) the different stages of the innovation process. Each construct is comprised of a set of core sub-constructs identified in previous literature, for a total of 32 sub-constructs.

3.4.1 | Social media–based communication activities

This construct includes the type of social media communication(s) (Turban et al., 2011; Tuten & Solomon, 2017). Three sub-constructs address the traditional "one-to-one" and "push" communications that correspond to the social publishing of information (Tuten & Solomon, 2017): direct one-to-one exchanges with existing and potential clients, communication (e.g., blogging, microblogging, and forums); and information broadcasting (e.g., news broadcasting, online newspapers, photo and video sharing, and livecasting). The remaining three sub-constructs relate to more sophisticated methods of communication that lead to the exchange and production of knowledge (Kim & Chandler, 2018): trendspotting (forecasting and analyzing trends, such as Google trends); collaboration (e.g., wikis, social bookmarking, and opinion sites); and stimulating participation (e.g., online contests and crowdsourcing).

3.4.2 | Organizational innovation seekers

To capture the internal use of social media activities (the use of social media for fostering innovation across different organizational departments), eight categories aligned with Marketing, Research & Development, Sales, Communication, Production, Human Resources, Procurement, and Finance were used (Chesbrough & Brunswicker, 2013; Mount & Martinez, 2014).

3.4.3 | Innovation providers involved

Open innovation researchers have frequently distinguished between different actors in the innovation process (Laursen & Salter, 2006; Muninger et al., 2019). In line with this research, nine types of innovation providers are described by the Oslo *Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data* (2005) and the Community Innovation Survey (CIS) were distinguished: (1) my organization or group, (2) suppliers, (3) private-sector clients or customers; (4) public-sector clients or customers, (5) opinion leaders and lead users, (6) competitors, (7) partners or other enterprises in my industry, (8) consultants and commercial labs, and (9) academics or scientists.

3.4.4 | Innovation stages

Aligned with previous research on innovation stages by Muninger et al. (2022), Muninger et al. (2019), and Mount and Martinez (2014), three main stages are distinguished, which were captured with the following items: (1) the idea and design phase, comprising fundamental R&D, idea generation or ideation, idea screening, concept development, and design of products or services; (2) the development phase, comprising technical implementation, and beta and market testing; and (3) the commercialization phase, comprising market and business analysis, commercialization and improvement. To test robustness, cluster analysis was performed with all items separately and with the items grouped into the three phases, with the results being comparable. To be aligned with the other constructs and to show the richness of the data, we present the findings for the model based on individual items.

To provide an exhaustive account of social media use, these 32 sub-constructs were mapped against four types of social media tools identified by Bhimani et al. (2019). These social media tools are public social media (e.g., Facebook, Twitter, and LinkedIn); company-built social media (e.g., IBM Beehive, My Starbucks Idea, and Amex Open Forum); company-licensed social media (e.g., IBM Connections, Microsoft Yammer/Sharepoint, and Jive); and innovation intermediary social media (e.g., Innocentive, NineSigma, and OneBillionMinds). This mapping implies that respondents had to answer 128 questions.

To account for the scope and number of questions and ease the process for the respondents, the relevant constructs were based on a matrix of sub-constructs and the four social media tools. For example, in the case of organizational innovation seekers, respondents were

asked, "Which departments in your organization use social media to foster innovation? Tick all that apply - multiple ticks possible". The "tick" options were based on the eight departments (Marketing, Research & Development, Sales, Communication, Production, Human Resources, Procurement, and Finance) across the four social media tools (public, company-built, company-licensed, and innovation intermediary; see example Figure 1).

To analyze the 128 responses in the cluster analysis, the social media tools were aggregated for each of the 32 sub-constructs. Thus, each of the 32 sub-constructs could have values between 0 and 4, representing the extent of social media use in each sub-construct. To examine this issue of potentially skipped question matrices, respondents who did not answer any question for a specific construct were examined. The analysis of the 337 final responses shows that only a very limited number of respondents did not answer a question matrix, that is, one for the department, one for purpose, and three for phase; all other matrices were zero. Additionally, these cases do not overlap or are linked to the same respondent. Thus, although it is not possible to assess whether these cases are based on a deliberate response choice or "skipping," the very low number of cases increases the confidence in the results.

3.5 | Firm performance

To explore the performance outcomes of social media configurations, respondents were asked whether their organizations obtained benefits in three distinct areas of firm performance: innovation outcomes, economic benefits, and communications benefits. Each performance area was measured with multiple items on a 5-point Likert scale.

Innovation outcomes were measured by asking, "What innovation outcomes does your organization obtain or has obtained from using social media for innovation?" Respondents were presented with seven items from the Oslo *Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data* (2005): increase in the number of new ideas; increase in idea flows, increase in the number of projects in the innovation pipeline, increase in the product or service range, faster advancement in ongoing innovation projects (i.e., projects moving from one stage to the next), switch from a product-oriented to a service-oriented business model, and discovery of new technologies. Respondents answered via a 5-point Likert scale: "Never," "Rarely," "Sometimes," "Very often," and "Always."

Economic benefits were measured with the following question: "What economic benefits does your organization obtain or has obtained from using social media for innovation?" Respondents were presented with seven items from the Oslo *Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data* (2005), accounting for different economic benefits: entry into a new market(s), increased market share, cost reduction, increased profit margins, higher revenues from new services or products, increased efficiency or productivity, and higher profits. Again, respondents answered via a 5-point Likert scale: "Never," "Rarely," "Sometimes," "Very often," and "Always.".

Communications benefits were assessed with the following statement: "My organization obtains or has obtained the following communication benefits from using social media for innovation." Five response items were provided (Dreher, 2014): improved internal communications, improved external communications, improved human relationships within the organization, improved human relationships with other actors, and improved diffusion of information and knowledge. In this case, the 5-point Likert scale included ("Strongly disagree," "Disagree," "Neither agree nor disagree", "Agree," and "Strongly agree.")

3.6 | Barriers to social media adoption

The barriers to the successful adoption of social media activities were determined across five dimensions (Linke & Zerfass, 2013; Qin et al., 2016; Turban et al., 2011) with multiple items and a 5-point Likert scale ("Strongly disagree," "Disagree," "Neither agree nor disagree", "Agree," and "Strongly agree").

Respondents were asked to assess the importance of *information technology* issues in the use of social media in their organization (Linke & Zerfass, 2013; Qin et al., 2016). Three items were presented: the possible introduction of viruses and malware, exposure to a fraudulent or hijacked corporate presence, and fear of information leaks.

Next, *organizational barriers* (Dreher, 2014; Turban et al., 2011) were determined through questions regarding reputation concerns, misalignment of internal policies, a lack of recognition concerning inputs provided by social media, and a lack of perceived added value from social media use.

Behavioral barriers (Dreher, 2014; Qin et al., 2016) were measured with the following statements: "managers do not actively promote the use of social media", "lack of training for the use of social media", "social media is perceived as time-consuming", "social media does not fit with our company culture", "social media does not fit with the generational profile of our management", and "social media is feared to be out of control in a crisis situation".

Technological barriers (Qin et al., 2016) were assessed via three statements probing the difficulties in identifying the correct social media tools, the difficulties in identifying and extracting relevant information, and whether no added value was expected from adding software or tools.

Finally, *intellectual property rights and privacy concerns* (Dreher, 2014; Qin et al., 2016) were assessed via questions regarding the respondents' agreement and disagreement with confidentiality and privacy concerns, information about R&D, innovation being too sensitive to be shared, and the possible fear of imitation.

3.7 | Measuring procedure

The main variables of this study are based on two different perceptual measures. First, the three performance outcomes and five adoption barriers are based on reflective multi-item scales, and the underlying items represent interchangeable manifestations of underlying constructs (Bagozzi & Baumgartner, 1994). Thus, the reliability and validity of these measures were assessed using a variety of indicators, including results from a confirmative factor analysis (CFA). The individual factor loadings on the item level and Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) on the construct level (see Table A1 in the appendix) were examined. Most indicators are higher than the conventional thresholds (e.g., Cronbach alpha >0.7, factor loadings >0.6; CR >0.8); however, in three cases, the factor loadings were lower for individual items, which also impacted the AVE levels. As an additional step, the analysis was repeated without the items with low factor loadings, which improved the overall reliability and validity indicators. The impact of the exclusion of these items was then tested, but the results remained stable.

Second, the clustering variables are formative multi-item indexes. The aggregation of the different social media tools for each of the 32 clustering sub-constructs led to a summary index (i.e., use of social media). This index defines and determines the sub-construct, but the underlying items (use of social media in certain areas) are not necessarily correlated (Jarvis et al., 2003). For example, different social media tools can be used by different departments to different extents, and it is not necessarily expected that a department uses all social media tools consistently. Distinct from the reflective measure, for a formative measure, it would not lead to a measurement problem if the Sales (or any other) department uses only a limited set of social media tools. On the contrary, this might even be expected for some departments or organizations.

3.8 | Clustering procedure

Following previous studies that used configurational analysis logic (Gruber et al., 2010; Homburg et al., 2008), a three-stage procedure was applied. First, to determine the appropriate number of clusters, a focus on Ward's D as the clustering method in combination with the cubic clustering criterion (Sarle, 1983), and the pseudot2 index (Duda & Hart, 1973) was created, which suggested a four-cluster solution. Next, observations were assigned to the clusters through two-stage hybrid clustering using Ward's method, followed by k-means (Arabie & Hubert, 1994; Punj & Stewart, 1983). Ward's method was used to calculate the starting solution, which was then input in the k-means procedure.

Finally, the stability of the clustering solution was assessed using Rand's (1971) index after a similar approach to the cross-validation methodology proposed by McIntyre and Blashfield (1980) was applied. Therefore, 60% of the full sample was randomly selected, and hybrid clustering was applied. Rand's index was calculated for the original allocation and the second clustering to measure the similarity between the two clustering allocations. Rand's index counts the number of positive and negative coincidences and is scaled between 0 and 1, with 1 indicating perfect stability. Owing to the size of the sample, bootstrapping was used, and the process was repeated 20 times to yield an average Rand index of 0.867 and an adjusted Rand index of 0.681, thus confirming the stability of this cluster solution. The overall procedure suggested a four-cluster solution for a better fit and reliability of statistics as well as interpretative richness.

4 | RESULTS

Table 2 shows the percentage of use of any of the four distinct social media activities for each of the 32 cluster variables within the four main cluster dimensions (social media communications activities, open innovation seekers, open innovation providers, and open innovation process stages). Similar to previous research (Gruber et al., 2010), the clusters were compared using the Waller–Duncan k-ratio t-test (Waller & Duncan, 1969) for multiple comparisons ($p < 0.05$). Based on the results, significant differences, as indicated by the cluster number in the subscript, are emphasized. The results show that across the different dimensions, Cluster 1 is the most different from the other clusters, followed by Cluster 4. Meanwhile, clusters 3 and 4 are the most similar, with the only main difference pertaining to the partners involved in the innovation process. The results are more mixed with respect to the cluster differences for the

TABLE 2 Statistical cluster comparison

Variables	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
Organizational innovation seekers								
Marketing	84.6%	(2,3,4)	100.0%	(1)	99.1%	(1)	100%	(1)
R&D	13.8%	(2,3,4)	90.6%	(1,4)	97.4%	(1)	100%	(1,2)
Sales	49.2%	(2,3,4)	96.9%	(1)	97.4%	(1)	100%	(1)
Communication	69.2%	(2,3,4)	100.0%	(1)	99.1%	(1)	100%	(1)
Production	1.5%	(2,3,4)	93.8%	(1)	93.1%	(1)	100%	(1)
Human resources	27.7%	(2,3,4)	93.8%	(1)	93.1%	(1)	100%	(1)
Procurement	6.2%	(2,3,4)	90.6%	(1,3,4)	98.3%	(1,2)	100%	(1,2)
Finance	4.6%	(2,3,4)	84.4%	(1,3,4)	97.4%	(1,2)	100%	(1,2)
Social media communication activities								
Direct one-to-one exchanges with existing and potential clients	73.8%	(3,4)	75.0%	(3,4)	100%	(1,2)	100%	(1,2)
Communication (e.g., blogging)	66.2%	(2,3,4)	78.1%	(1,3,4)	100%	(1,2)	100%	(1,2)
Information broadcasting	67.7%	(3,4)	62.5%	(3,4)	100%	(1,2)	100%	(1,2)
Trendspotting	21.5%	(2,3,4)	53.1%	(1,3,4)	99.1%	(1,2)	100%	(1,2)
Collaboration	23.1%	(2,3,4)	62.5%	(1,3,4)	98.3%	(1,2)	100%	(1,2)
Stimulating participation	26.2%	(2,3,4)	62.5%	(1,3,4)	99.1%	(1,2)	100%	(1,2)
Innovation process stage								
Fundamental R&D	29.2%	(3,4)	37.5%	(3,4)	98.3%	(1,2)	100%	(1,2)
Idea generation	40.0%	(2,3,4)	65.5%	(1,3,4)	100%	(1,2)	100%	(1,2)
Idea screening	30.8%	(2,3,4)	56.3%	(1,3,4)	97.4%	(1,2)	100%	(1,2)
Concept development	38.5%	(2,3,4)	59.4%	(1,3,4)	100%	(1,2)	100%	(1,2)
Technical implementation	23.1%	(2,3,4)	59.4%	(1,3,4)	99.1%	(1,2)	100%	(1,2)
Beta and market testing	38.5%	(3,4)	28.1%	(3,4)	100%	(1,2)	99.2%	(1,2)
Market and business analytics	38.5%	(2,3,4)	56.3%	(1,3,4)	98.3%	(1,2)	99.2%	(1,2)
Design products and services	32.3%	(2,3,4)	50.0%	(1,3,4)	99.1%	(1,2)	100%	(1,2)
Commercialization and improvement	44.6%	(3,4)	46.9%	(3,4)	98.3%	(1,2)	100%	(1,2)
Potential innovation providers								
My organization or group	75.4%	(4)	78.1%	(4)	71.6%	(4)	86.8%	(1,2,3)
Suppliers	54.2%	(2,4)	65.5%	(1,3,4)	53.9%	(2,4)	81.0%	(1,2,3)
Private-sector clients or customers	72.7%		71.9%		67.5%	(4)	79.0%	(3)
Public-sector clients or customers	65.8%	(4)	71.1%	(4)	66.4%	(4)	83.9%	(1,2,3)
Opinion leaders, lead users	60.4%	(2,4)	71.1%	(1,3,4)	56.7%	(2,4)	83.9%	(1,2,3)
Competitors	59.4%	(2,4)	68.1%	(1,4)	64.0%	(4)	84.2%	(1,2,3)
Partners or other enterprises in my industry	67.1%	(4)	66.3%	(4)	69.3%	(4)	83.7%	(1,2,3)
Consultants and commercial labs	59.1%	(4)	66.9%	(4)	65.3%	(4)	84.5%	(1,2,3)
Academics or scientists	48.1%	(4)	49.2%	(4)	53.2%	(4)	78.6%	(1,2,3)

Note: The superscripts in parentheses refer to which other cluster(s) are significantly different from the focal cluster at $p < 0.05$.

performance outcomes and barriers (Table 3). In the context of benefits, all clusters are different, with clusters 1 and 4 presenting extreme patterns. Regarding the barriers to the use of social media, a continuum was observed, with clusters 1 and 4 being the extremes.

Table 4 shows the differences between the clusters for the control variables (the industry, company size category, and firm age controls). Most of the control groupings are insignificant, with the exception of firm age (less than 5 years) and company size. When interpreting the

TABLE 3 Cluster solution on performance and barriers

Variables	Cluster 1		Cluster 2		Cluster 3		Cluster 4	
Performance								
Innovation outcomes	21.9	(2,3,4)	26.4	(1,4)	25.7	(1,4)	30.2	(1,2,3)
Economic benefits	18.8	(2,3,4)	22.0	(1,4)	22.6	(1,4)	26.7	(1,2,3)
Communication benefits	16.7	(2,4)	18.1	(1,4)	17.7	(4)	20.6	(1,2,3)
Barriers								
Information technology barriers	10.2	(4)	10.0	(4)	10.8		11.8	(1,2)
Organizational barriers	12.4	(3,4)	13.7	(4)	13.9	(1,4)	15.5	(1,2,3)
Behavioral barriers	17.4	(4)	17.5	(4)	19.3		21.5	(1,2)
Technical barriers	8.8	(3,4)	8.8	(3,4)	10.2	(1,2)	11.2	(1,2)
Intellectual property and privacy barriers	9.6	(4)	9.9	(4)	10.6		11.5	(1,2)

Note: The superscripts in parentheses refer to which other cluster(s) are significantly different from the focal cluster at $p < 0.05$.

results for the performance outcomes, barriers, and control variables, it is important to note that these variables were not used to create the clusters. Thus, results of the exploration are shown in Tables 3 and 4 whether the clusters differ regarding outcomes and context. A later analysis examines the extent to which these variables relate to firm performance outcomes and barriers.

4.1 | Interpretation of clusters

For ease of comparison and interpretation of the clusters, the common practice in configurational analysis was followed (Gruber et al., 2010; Homburg et al., 2008), and the statistical results were translated into direct comparable signs. The difference between the highest and lowest scores was subdivided into the five categories presented in Table 5 using "—" for the bottom 20%, "-"for the next highest, "o" for the middle, "+" for the second highest. and "++" for the highest 20% of the range. Furthermore, labels were assigned to each configuration. Although these labels may oversimplify the actual solutions, they highlight the empirically distinct characteristics of each configuration and facilitate the discussion of the findings.

Cluster 1 ("Marketing semi-open innovators") represents 19.3% of the sample firms. This 65-firm cluster is characterized by a very strong focus on social media only by the Marketing and, to a lesser extent, Sales and Communications departments. Any other innovation seekers at the firms in this cluster rarely engage in social media activities. Thus, it is not surprising that the communication strategy is mainly focused on direct one-to-one exchanges with existing and potential clients, communication activities, and information broadcasting.

With regard to the innovation stages, the firms in Cluster 1 generally rely less on social media. The most noticeable use of social media in the context of innovation stages is focused on idea generation and commercialization, but even in these cases, usage is lower than in the other clusters (particularly clusters 3 and 4). The focus on the commercialization stage accords with the fact that Marketing departments are the main users. Similarly, idea generation is commonly associated with this department. However, all other cluster configurations show more use of social media during the idea and design phases. Finally, despite the specific role of social media activities, firms in this cluster engage with a relatively wide set of innovation providers; thus, they were categorized as semi-open innovators, while noting that they focus mainly downstream (clients and lead users) and within their own industry. These firms differ from the firms in Cluster 4 in the sense that they tend to have lower scores in relation to each type of partner; in that aspect, they are comparable to clusters 2 and 3.

Cluster 2 ("Cross-department semi-open innovators") comprises 32 firms, representing 9.5% of the sample firms. Firms in this cluster use social media across all internal departments and are comparable to firms in clusters 3 and 4 in that aspect; Cluster 2 firms contrast with Cluster 1 firms, which focus solely on marketing. However, the communication strategy of Cluster 2 firms, even if slightly broader than that adopted by Cluster 1 firms, is still narrow when compared to that of cluster 3 and 4 firms. Cluster 2 firms focus on using social media in the idea generation phase and with more intensity across all innovation cycle phases when compared to Cluster 1 firms. However, according to their communication strategy, their use of social media across the innovation stages is much less intensive when compared to clusters

TABLE 4 Cluster solution on control variables

Cluster	1		2		3		4	
Respondents (*n*)	65		32		116		124	
In %	19.3%		9.5%		34.4%		36.8%	
Number of employees								
0–19 employees	47.7%	(3,4)	37.5%	(4)	21.6%	(1)	7.3%	(1,2)
20–99 employees	15.4%		15.6%		11.2%		8.9%	
100–399 employees	6.2%	(4)	12.5%		12.9%		29.0%	(1)
400–999 employees	12.3%		3.1%	(4)	19.0%		24.2%	(2)
1000–4999 employees	9.2%		15.6%		12.9%		9.7%	
5000+ employees	3.1%		12.5%		14.7%		16.1%	
Company age								
Less than 5 years	23.1%	(3,4)	15.6%	(4)	8.6%	(1)	0.8%	(1,2)
5–9 years	16.9%		15.6%		19.0%		21.8%	
10–14 years	12.3%		21.9%		18.1%		21.0%	
15–24 years	15.4%		15.6%		23.3%		26.6%	
25+ years	32.3%		31.3%		31.0%		29.8%	
Industry								
Retail, accommodation, and food services	15.4%		18.8%		13.8%		24.2%	
Construction, manufacturing, and transportation	23.1%		25.0%		36.2%		30.6%	
Utilities	1.5%		0.0%		2.6%		1.6%	
Financial, insurance, and real estate	7.7%		6.3%		8.6%		12.9%	
Professional, scientific and technical services, information and communication	44.6%		43.8%		36.2%		29.0%	
Respondent category								
CEO	10.8%		0.0%		6.0%		5.6%	
Innovation	9.2%		15.6%		15.5%		19.4%	
Marketing	4.6%		6.3%		5.2%		2.4%	
Other	23.1%		18.8%		19.0%		19.4%	
Owner	12.3%		6.3%		12.9%		14.5%	
Product management	26.2%	(3,4)	25.0%	(4)	12.1%	(1)	6.5%	(1,2)
Social media manager	6.2%		6.3%		10.3%		11.3%	
Technology and R&D	7.7%		21.9%		19.0%		21.0%	
Majority of clients								
Private consumers	66.2%		71.9%		63.8%		79.0%	

Note: The superscripts in brackets refer to which other cluster(s) are significantly different from the focal cluster at $p < 0.05$.

3 and 4. Interestingly, social media is used to engage with a wider set of partners than not only Cluster 1 but also Cluster 3; however, the use of social media by the firms in Cluster 2 to engage with partners is still significantly less than that of the firms in Cluster 4. Therefore, the firms in Cluster 2 can be regarded as semi-open innovators.

Cluster 3 ("Cross-department full process semi-open innovators") comprises 116 firms, representing 34.4% of the sample. Firms in Cluster 3 use social media across all departments for all purposes and in every phase of the innovation process but do not engage with the broadest range of innovation providers. Compared with Cluster 2, firms in Cluster 3 have a much broader use of social media across departments, purposes, and phases; however, they conduct fewer innovation activities with suppliers, opinion leaders, and lead users. Similar to clusters 1 and 2, the scores for the innovation providers the firms in Cluster 3 engage with are much lower than those measured for Cluster 4.

TABLE 5 Cluster interpretation

Cluster/ label	1. Marketing semi-open innovators	2. Cross-dep. Semi-open innovators	3. Cross-dep. Full-process semi-open innovators	4. Broad adopters open innovators
Clustering variables				
Organizational innovation seekers				
Marketing	++	++	++	++
R&D	--	++	++	++
Sales	o	++	++	++
Communication	+	++	++	++
Production	--	++	++	++
Human resources	-	++	++	++
Procurement	--	++	++	++
Finance	--	++	++	++
Social media communication activities				
Direct exchanges with clients	+	+	++	++
Communication (e.g., blogging)	+	+	++	++
Information broadcasting	+	+	++	++
Trendspotting	-	o	++	++
Collaboration	-	+	++	++
Stimulating participation	-	+	++	++
Innovation process stage				
Fundamental R&D	-	-	++	++
Idea generation	o	+	++	++
Idea screening	-	o	++	++
Concept development	-	o	++	++
Technical implementation	-	o	++	++
Beta and marketing testing	-	-	++	++
Market and business analytics	-	o	++	++
Design of products and services	-	o	++	++
Commercialization and improvement	o	o	++	++
Potential innovation providers				
My organization or group	+	+	+	++
Suppliers	o	+	o	++
Private-sector clients or customers	+	+	+	+
Public-sector clients or customers	+	+	+	++
Option leaders, lead users	+	+	o	++
Competitors	o	+	+	++
Partners or other enterprises in industry	+	+	+	++
Consultants and commercial labs	o	+	+	++
Academics or scientists	o	o	o	+
Performance and barriers				
Benefits				
Innovation outcomes	--	o	-	+

TABLE 5 (Continued)

Cluster/ label	1. Marketing semi-open innovators	2. Cross-dep. Semi-open innovators	3. Cross-dep. Full-process semi-open innovators	4. Broad adopters open innovators
Economic benefits	--	-	-	+
Communication benefits	o	+	+	++
Barriers				
Information technology barriers	o	o	+	++
Organizational barriers	-	o	o	++
Behavioral barriers	--	--	-	+
Technical barriers	--	--	o	+
Intellectual property and privacy barriers	-	o	o	++

Note: The difference between the highest and lowest scores was subdivided into five categories. These five categories are indicated in the table with "--" for the bottom 20%, "-" for the next highest, "o" for the mid-range, "+" for the second highest, and "++" for the highest 20% of the range.

Cluster 4 ("Broad adopter open innovators") represents 36.8% of the sample and comprises 124 firms. Firms in Cluster 4 use social media with all innovation seekers for all purposes and innovation phases. In this sense, they are similar to the firms in Cluster 3. However, the firms in Cluster 4 contrast with that group because they engage more substantially and have the highest score with a wider range of innovation providers. In this sense, they are the strongest embodiment of the idea of open innovation.

4.2 | Exploration of performance and barriers

The results for the performance outcomes and barriers linked to the four clusters are shown in the bottom of Table 5. Positive outcomes across all three performance dimensions are found only in Cluster 4: innovation, economic, and communication. On the other end of the spectrum, in Cluster 1, only relatively weak effects on communication and no impact on innovation outcomes or economic benefits are found. The firms in Cluster 2 perform significantly better in all dimensions than those in Cluster 1. In contrast, Cluster 3 firms, despite intensively using social media for innovation across departments, purposes, and phases, score significantly higher than Cluster 1 firms only in innovation and economic benefits and not in communication benefits. The main difference between clusters 2 and 3 is the breadth with which innovation providers use social media. The main difference between clusters 3 and 4 is the level of engagement of the firms in Cluster 4 with a broad spectrum of external partners. Thus, it becomes apparent that the breadth of openness of the innovation process (i.e., the level of engagement with and the diversity of innovation providers associated with social media for innovation strategy) is critical for firm outcomes. The distinctive outcome results for the firms in Cluster 4 (particularly in comparison with those in Cluster 3) also emphasize the importance of a configurational effect, where all dimensions of social media for innovation need to be integrated with the breadth of openness to yield higher benefits.

However, the benefits of the adopted solutions come at a cost. A higher degree of adoption and diversity of social media activities is associated with all five dimensions of barrier measures (information technology barriers, organizational barriers, behavioral barriers, technical barriers, and intellectual property and privacy barriers). In contrast, the least used approach (Cluster 1) seems to marginally struggle solely with information technology barriers. Interestingly, the comparison of clusters 3 and 4, which show similar patterns of social media use except in relation to external partners, reveals a significant difference across all barriers. This indicates increased difficulties when implementing a broad open innovation strategy; however, as previously indicated, such a strategy was perceived as yielding strong benefits, suggesting that these barriers were overcome to some extent.

4.3 | Industry and size contingencies

It is important to explore whether the between-cluster differences in benefits and barriers remain significant when control variables are accounted for. Thus, eight analysis of covariance (ANCOVA) models were computed to test the three performance outcomes (innovation outcomes, economic benefits, and communication benefits) and five barriers (organizational, behavioral,

technical, information technology, and intellectual property and privacy barriers). To integrate these sub-constructs in the ANOVA, individual items were weighted with their factor loadings of the CFA before the average for each sub-construct was built. To assess robustness, an analysis with summed and averaged scores without incorporating CFA weighting was run, and the results are similar. Each of the eight ANCOVA models used four class predictor variables: cluster membership, industry, and company size, and private versus public consumer. As Table 6 shows, the cluster variable describing the four cluster solutions remains highly significant for all firm outcomes and barriers after firm industry and size are included.

5 | DISCUSSION

The aim of this study was to advance the current understanding of which social media strategies for open innovation are used by organizations and how they are associated with firm performance. This aim was motivated by the need for an integrated perspective that would provide a sense of how organizations approach the complexity of social media for open innovation (Testa et al., 2020). Accordingly, we conducted an exploratory configurational analysis (Homburg et al., 2008; Liu et al., 2017) to develop a taxonomy of social media strategies for innovation adopted by a global sample of 337 companies, linking these strategies to performance outcomes and the social media adoption barriers encountered.

To our knowledge, this is the first study to provide a quantitative analysis of social media strategies for open innovation while accounting for the complex configurational effects between the broad set of variables associated with the delivery of outcomes (Chesbrough & Brunswicker, 2013). Thereby, it contributes to taxonomies focused on social media or open innovation separately, for example, only social media marketing strategies (Li et al., 2021), social media-enabled interactions in specific sectors (Smailhodzic et al., 2021), or open innovation (Bacon et al., 2019; Carmona-Lavado et al., 2021). Researchers to date have provided some anecdotal evidence of the potential impact of social media on organizational outcomes (Bayus, 2013; Carlson et al., 2018; Dahlander & Wallin, 2006; Huston & Sakkab, 2006; Mount & Martinez, 2014; Muninger et al., 2019; Roberts et al., 2016). Researchers have also shown that the benefits and performance effects of social media should not be taken for granted (He & Wang, 2016; Jussila et al., 2011; Roberts & Candi, 2014; Roberts & Piller, 2016; Testa et al., 2020). Although alignment between the various constructs of a social media for open innovation strategy might be essential in generating the expected outcomes (Barlatier & Josserand, 2018; Mention et al., 2019; Mount & Martinez, 2014; Roberts & Piller, 2016), this research is a unique attempt to advance knowledge on the matter and distinguish which strategies are applied and the type of performance effects they can enable.

The four identified clusters capture a contrasting picture of how firms use social media for innovation: marketing semi-open innovators, cross-department semi-open innovators, cross-department full process semi-open innovators, and broad adopter open innovators. Each cluster has a distinctive use of social media and approach to open innovation. This is the first exhaustive and holistic description of the contrasting use of social media within a significant and diverse sample of companies. Importantly, the four strategies yield notably different benefits, which are related to the firm's level of resource and capability investment. In this sense, it supports the fundamental configurational analysis, which are that firms combine activities, resources, and process into separate configurations (Fiss, 2007; Meyer et al., 1993).

The described configurations also inform prior research, which focuses on specific relationships between the core theoretical elements we identified in Figure 1. For example, it shows that social media-based open innovation is not only a matter for R&D (Marion et al., 2014; Mount & Martinez, 2014) or marketing functions (Bashir et al., 2017) but also for human resources, production, or finance. The results challenge the current focus of the literature on social media and open innovation on the importance of users, communities of users, and lead users (Testa et al., 2020), in showing that also knowledge inputs from other types of potential innovation providers are valuable for firms such as suppliers, consultants or competitors. They somewhat confirm the importance of external search breadth for open innovation (Laursen & Salter, 2006) but using social media solutions may help firms to push away the over-search frontier, and thereby improving innovation performance. Furthermore, the findings point out that advanced users of social media for open innovation (clusters 3 and 4) use them not only for ideation and/or commercialization stages (Muninger et al., 2019), but intensively in all the different stages of the innovation process. Finally, they also bring a more nuanced perspective about the negative relationship identified by Roberts and Candi (2014) regarding the use of social media for innovation and market growth.

5.1 | Understanding the strategic trade-offs of social media for open innovation

An important contribution of this research concerns the strategic trade-offs associated with the adoption of

TABLE 6 ANCOVA of cluster performance.

Dependent variable		Sum of squares	d.f.	Mean square	F		R2	Dependent variable		Sum of squares	d.f.	Mean square	F		R2
Innovation outcomes[a]	Corrected model	39.44	22	1.79	11.33	***	0.443	Organizational barriers	Corrected model	27.91	22	1.27	4.71	***	0.248
	Error	49.68	314	0.16					Error	84.52	314	0.27			
	Size of organization	7.83	6	1.30	8.25	***			Size of organization	5.97	6	1.00	3.70	***	
	Industry grouping	1.66	5	0.33	2.09	*			Industry grouping	3.09	5	0.62	2.30	*	
	Private consumers	0.91	1	0.91	5.78	**			Private consumers	0.02	1	0.02	0.09		
	Respondent type	2.85	7	0.41	2.58	**			Respondent type	1.25	7	0.18	0.67		
	Clusters	11.82	3	3.94	24.91	***			Clusters	5.85	3	1.95	7.24	***	
Economic benefits	Corrected model	46.26	22	2.10	11.61	***	0.449	Behavioral barriers	Corrected model	68.44	22	3.11	6.38	***	0.309
	Error	56.86	314	0.18					Error	153.09	314	0.49			
	Size of organization	9.13	6	1.52	8.41	***			Size of organization	23.08	6	3.85	7.89	***	
	Industry grouping	1.15	5	0.23	1.28				Industry grouping	10.46	5	2.09	4.29	***	
	Private consumers	0.42	1	0.42	2.32				Private consumers	1.11	1	1.11	2.28		
	Respondent type	4.39	7	0.63	3.46	***			Respondent type	1.91	7	0.27	0.56		
	Clusters	16.54	3	5.51	30.44	***			Clusters	4.35	3	1.45	2.97	**	
Communication benefits[a]	Corrected model	30.10	22	1.37	7.56	***	0.346	Technical Barriers	Corrected model	39.54	22	1.80	5.33	***	0.272
	Error	56.81	314	0.18					Error	105.92	314	0.34			
	Size of organization	4.13	6	0.69	3.81	***			Size of organization	7.47	6	1.24	3.69	***	
	Industry grouping	1.54	5	0.31	1.70				Industry grouping	5.66	5	1.13	3.36	**	
	Private consumers	0.04	1	0.04	0.22				Private consumers	0.06	1	0.06	0.18		
	Respondent type	1.09	7	0.16	0.86				Respondent type	2.85	7	0.41	1.21		
	Clusters	14.87	3	4.96	27.40	***			Clusters	8.03	3	2.68	7.94	***	
IT barriers	Corrected model	20.10	22	0.91	2.45	***	0.146	IP and privacy barriers	Corrected model	29.74	22	1.35	3.63	***	0.203
	Error	117.30	314	0.37					Error	117.02	314	0.37			
	Size of organization	3.32	6	0.55	1.48				Size of organization	10.09	6	1.68	4.51	***	
	Industry grouping	4.04	5	0.81	2.16	*			Industry grouping	1.91	5	0.38	1.03		
	Private consumers	0.28	1	0.28	0.76				Private consumers	1.03	1	1.03	2.76		
	Respondent type	1.94	7	0.28	0.74				Respondent type	1.04	7	0.15	0.40		
	Clusters	6.70	3	2.23	5.98	***			Clusters	4.27	3	1.42	3.82	**	

Note: Significance levels: *$p < 0.10$. **$p < 0.05$. ***$p < 0.01$.

[a]Construct based on corrected reduced items.

different configurations. This leads to insights into how the different elements of the strategies implemented interact and which strategic options are used when aiming for a specific outcome (see Table 7).

Differences between the four strategies can be theoretically explained by different trade-offs in terms of resource and capability commitment and the associated results. This conclusion is the outcome of the analysis of the trade-offs and alignment issues that are likely to take place across the four strategies. One of the key rationales for the use of social media for open innovation is the trade-off between value creation and cost. The latter is an important consideration: One of the key advantages of social media is that it allows firms to engage and collaborate more easily and at low cost with external stakeholders (Barlatier & Josserand, 2018; Haefliger et al., 2011; Hitchen et al., 2017).

However, this does not mean that social media for open innovation comes without an investment and the need to commit resources and develop new capabilities. This is important because technological-organizational alignment is a key concern for technology adoption, and misalignment can result from a lack of focus on organizational capabilities (Leonard-Barton, 1988; Mention et al., 2019; Witschel et al., 2019). Previous studies have highlighted the role of specific capabilities in effectively mediating the relationship between social media for open innovation and performance (Garcia-Moreno et al., 2020), where organizational capabilities allow for the integration of information into value-adding knowledge (Peteraf, 1993). Such capabilities include the ability to sense threats and overcome barriers to digitization, integrating customers in the ideation phase, modeling value proposition and value-capturing mechanisms, and integrating external partners into the ideation process (Garcia-Moreno et al., 2020).

Although social media presents opportunities, its implementation is a significant challenge that manifests in specific barriers to adoption. To overcome these barriers, organizations need to invest resources to develop new capabilities (Witschel et al., 2019). Companies implementing social media more extensively must be well prepared if they want to avoid data overload and a lack of focus (Marion et al., 2014; Roberts & Candi, 2014), which can be detrimental to performance (Roberts & Piller, 2016). There is strong evidence that implementing social media comes with a trade-off between performance benefits and the costs associated with the development of new capabilities, notably when addressing the barriers to adoption. Below, this theoretical insight is leveraged to offer insight into the cost–benefit trade-off of the four strategies that emerged from the analysis. It is hypothesized that the costs associated with the adoption of the technology will be higher to a degree when the technology is deployed broadly (in terms of social media communication activities, innovation seekers, innovation providers, and innovation stages), but more importantly if the perceived barriers are higher, leading to the need to dedicate resources to the development of specific organizational capabilities.

The broad adoption open innovation strategy utilized by organizations in Cluster 4 is associated with

TABLE 7 A strategic taxonomy of social media use for open innovation.

Strategy	Marketing semi-open innovator	Cross-department semi-open innovators	Cross-department full process semi-open innovators	Broad adopter open innovators
Social media communication activities	Focused on customers	Moderate communicators	Large communicators	Large communicators
Innovation seekers	Focused on marketing	Very strong across all functions	Very strong across all functions	Strong across all functions
Innovation providers	Selective use	Use of most providers	Selective use	Very strong across all providers
Innovation stages	Moderate use in idea generation, commercialization and improvement	Moderate use in most stages	Wide use in all stages	Wide use in all stages
Barriers	Largely low or very low	Low to intermediate	Intermediate	Largely very high
Benefits	Very limited	Largely focused on communication	Largely focused on communication	Strong across different areas
Trade-off	Low resource investment/ minimum outcome	Moderate resource investment/moderate outcome	Significant resource investment/ moderate outcome	High capability investment/ high outcome

strong benefits and thus, is presented as the first viable option. However, the analysis of social media for open innovation strategy and barriers suggests a strong investment in capabilities. This strategy is the most extensive in terms of deployment across all categories, including all innovation providers; it is also the strategy that comes with more strongly experienced barriers. This suggests that these companies were well prepared and avoided the pitfalls of misalignment and lack of focus by investing in appropriate resources and capabilities. In contrast to the other firms in the other clusters, Cluster 4 firms were confronted with significant barriers, but the benefits that social media for open innovation brought suggest that the firms overcame the barriers by dedicating adequate resourcing and developing organizational capabilities.

In contrast, the cross-department full process semi-open innovators strategy (Cluster 3) seems to correspond to firms that fell into a poor trade-off between investment and outcome. These companies deployed the technology broadly in the organization, with all departments using social media for innovation across all communication capabilities. This would come with a significant investment in IT and associated resources. However, for this group, the barriers did not manifest, suggesting that the corresponding investment in capabilities was not present. These companies appear to be "stuck in the middle," where they invested significant resources but did not develop the capabilities that would support corresponding benefits. Although the companies experience some benefits from their superficial adoption of the strategy, these benefits are lower compared to those enjoyed by the companies in Cluster 2.

Although the strategies used by cluster 1 and 2 differ in terms of the innovation seekers' involvement in the use of social media for open innovation, they appear to constitute two valid trade-offs in which limited investment in resources and capabilities—notably captured by less breadth in terms of the communication approach—naturally leads to fewer benefits. The results do not suggest that one strategy is better than the other. The marketing semi-open innovation strategy (Cluster 1) is likely to require fewer resources and yield fewer benefits. In this strategy, fewer innovation seekers use social media, and they do so with a selective subset of innovation providers. This is a well-articulated strategy that would demand low investment (i.e., only a few people use social media for only a few activities; thus, limited capabilities need to be developed and nurtured), which is evidenced by low barriers. This strategy pays off with some benefits where they are to be expected: communication.

Cross-department semi open-innovation (Cluster 2) require more investment and reap somewhat greater benefits. A higher level of investment is inferred because of the high scores for innovation seekers; however, this is tempered by scores similar to those for Cluster 1 across communication phases and innovation providers. More significantly, the barriers remain at a comparable level (when put into perspective with those encountered by Cluster 4 firms) with those experienced by Cluster 1 firms, which are associated with a decreased need for specific organizational capability development. This strategy is in line with a balanced trade-off in which the costs are slightly higher than those found for Cluster 1 firms but yield slightly higher returns for the organization. In addition, the marketing semi-open innovator strategy suggests a baseline focus on marketing, which includes some emphasis on idea generation.

Thus, the findings provide a certain amount of clarity regarding which strategies can be used in relation to social media for open innovation. Social media use provides its full performance outcome—in terms of innovation, economic benefits, and communication benefits—only if the approach is within a fully holistic open innovation strategy. Previous claims that social media can dramatically change the way companies conduct external knowledge management (Soto-Acosta et al., 2017; Zhang et al., 2017) appear to be corroborated only for firms that fully embrace the open innovation strategy.

However, this "all-in" strategy is not the only strategy that makes sense. Other, more superficial approaches can also be justified when fewer resources are invested, leading to commensurately lower benefits for the organization. In cases where resources are scarce, or the capability gap is large, these strategies could be a way to generate some benefits from the use of social media, while possibly preparing for a more ambitious strategy. But there is a risk of over-investing in the technology but not developing adequate capabilities, as illustrated by the broad adopter semi-open innovators.

In this context, it is also interesting to note that most of the control variables did not significantly impact social media use or its benefits. That is, the clusters that are presented are not systematically connected to size, company age, industry, or client portfolio. This result is important because it shows that the social media usage decisions that were observed depended mainly on the strategic and operational decisions and capabilities of each company rather than on contingent external factors.

5.2 | Understanding the configurational effects of social media for open innovation

Results also show what type of configurational effects are at play when implementing an open innovation strategy.

The sharp contrast between clusters suggests strong configurational effects that are associated with investing in capabilities that will generate high benefits while allowing companies to overcome the barriers to using social media for open innovation. For example, in the case of Cluster 4, the open innovation choices are typical of a "full" open innovation strategy where performance is derived from adopting the specific model of the broad adopter open innovators. However, this cluster configuration is also associated with substantial barriers to adoption, which hints at capability needs for this type of social media strategy.

The strategies associated with clusters 1 and 2 and part of Cluster 3 suggest an effect that was not directly depicted by previous studies. The results for clusters 1 and 2 suggest a configuration in which the different factors co-evolve: higher resource investment is associated with higher outcomes and stronger barriers. However, Cluster 3 shows that increased investment does not directly result in increased performance. This can be explained by the fact that, above a certain threshold in terms of social media investment, the organization must develop specific capabilities to reap the benefits of that strategy. From a configuration perspective, there is a limit: beyond a certain level of investment in technology, the semi-open innovator model does not provide performance benefits that correspond to the resources invested.

5.3 | Managerial implications

This study demonstrates that the configurational effects observed are an essential consideration if companies want to achieve the outcomes they desire from their social media use. These findings demonstrate that social media use for open innovation is not the panacea that is sometimes described in the extant literature. Although the study findings show the potential of social media for open innovation, it introduces some important nuances regarding adoption strategies. The findings send a strong signal to managers and executives that social media should be approached in a serious manner and is not in itself a quick or cheap fix for communication issues or a lack of innovativeness.

First, a clear delineation between the two major options is provided. The first option corresponds to the strategies adopted by clusters 1 and 2; social media is adopted selectively, cautiously considering the communication purpose, innovation seekers, innovation providers, and innovation stages concerned. Adoption in this case implies the allocation of resources, but not the development of new organizational competencies. The combination of selective adoption and limited resource investment can be commensurate with lower performance effects. The second option implies embracing the open innovation paradigm. This corresponds to the strategy adopted by the firms in Cluster 4. This approach comes with a significant commitment to developing new organizational capabilities that address the barriers that come with an extensive adoption of social media for open innovation.

Second, the strategy associated with Cluster 3 reveals possible risks where companies could be "stuck in the middle." Because they try to cover all innovation seekers, all communication purposes, and all phases of the innovation process extensively, they are likely to expend significant resources. However, the findings show that this might not result in commensurate performance outcomes unless there is an open innovation strategy.

The findings also extend beyond the claim that social media is a noncostly fix. Although social media can be adopted without significant expenditures, which may reduce the risk of its use (Ahmad et al., 2019), the findings also demonstrate that such an approach will result in limited performance effects. Beyond the quick fix, a more ambitious strategy associated with the development of new organizational capabilities and a full open innovation strategy require significant investment in capability development.

5.4 | Limitations and future research

This research marks a significant progression in existing knowledge of the association between social media use for open innovation and performance outcome. Although considerable effort has been made to ensure the quality of the data and analysis, certain limitations should be kept in mind when interpreting the results, limitations that pave the way for important future research avenues.

The online panel survey approach allowed us to target respondents very accurately and obtain rich and diverse information. However, some inherent limitations of the survey data in this study remain. For example, the data are self-reported, and based on the respondents' perceptions, the sample is also not random, which limits the generalizability beyond the sample. Moreover, the sequenced sampling procedure did not allow testing for standard early- and late-response bias statistics. Additionally, the strength of the underlying methodological approach is to examine configurations and interdependencies of conceptually distinct characteristics (or resources, processes, actors, etc.) that commonly occur together and to examine the equifinality of the resulting configurations (Fiss, 2007). However, this comes at the expense of identifying causal relationships between constructs (Short et al., 2008). Thus, the depicted relationships should not be interpreted as causal.

Future research might build on these findings and test specific performance effects with objective firm performance measures. Conceptually, there is a limitation in terms of the number of variables that could be included in the configurations and the depth of each set of variables. This means that the exploration of other factors that might drive performance is also limited, including mediating or moderating variables. Although a strong configurational effect with an association with performance was demonstrated, the explanation for this effect still requires validation.

In particular, a theoretical argument to explain the findings was used in the discussion of the results. Key to this line of argument is the notion of organizational capabilities that are needed to shift from a superficial use of social media for open innovation toward a more ambitious use that is associated with a full open innovation approach. Although this theoretical argument is coherent with the findings, future research should test this explanation by introducing variables that can measure the level of resources committed and the organizational competencies that were needed to shift toward the broad adopter open innovators strategy. This will allow for a finer understanding of the cost–benefit trade-offs that underlie the configurational effects observed.

Qualitative studies could also be conducted to better understand the processes associated with the successful adoption of social media for open innovation. Specifically, the threshold effect was emphasized, as well as a risk of being "stuck in the middle" with significant investment in social media that would yield only limited benefits. This raises the question about the transition between the initial superficial adoption of the technology and a more committed open innovation strategy. Comparative multiple case study research into the process of transitioning from the open innovator strategy to the broad adopter open innovator strategy could offer a strong theoretical understanding of the barriers at play, the corresponding competencies that need to be developed, and the challenges of developing such strategies.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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APPENDIX A

TABLE A1 Measurement statistics.

Constructs	Items	Factor loadings
Performance		
Innovation outcomes	*AVE: 0.876/0.868; CR: 0.480/0.495; α: 0.876*	
	Increase in the number of new ideas	0.693/0.663
	Increase of idea flows	0.609/ -
	Introduction of new business lines	0.640/0.640
	Increase in the number of projects in the innovation pipeline	0.743/0.758
	Increase the product or service range	0.648/0.651
	Faster advancement in on-going innovation projects	0.762/0.756
	Switch from product-oriented business model to service-oriented business model	0.734/0.747
	Discovery of new technologies	0.662/0.662
Economic benefits	*AVE: 0.881; CR: 0.519; α: 0.881*	
	Entry to new markets(s)	0.706
	Increased market share	0.649
	Cost reduction	0.673
	Increased profit margins	0.790
	Higher revenues from new services/products	0.694
	Increased efficiency/productivity	0.727
	Higher profits	0.785
Communication benefits	*AVE: 0.723/0.729; CR: 0.361/0.482; α: 0.723*	
	Improved internal communications	0.678/0.656
	Improved external communications	0.459/ -
	Improved human relationships inside the organization	0.687/0.768
	Improved human relationships with other actors	0.689/0.642
	Improved diffusion of information and knowledge	0.425/ -
Barriers		
IT barriers	*AVE: 0.786; CR 0.569; α: 0.786*	
	Possible introduction of viruses and malware to the corporate IT system	0.667
	Possible exposure to a fraudulent or hijacked corporate presence	0.884
	Fear for information leaks	0.684
Organizational barriers	*AVE: 0.829; CR: 0.549; α: 0.829*	
	Reputation concerns	0.730
	Misalignment of internal policies	0.742
	Lack of recognition concerning inputs provided by social media	0.722
	Lack of perceived added value from use of social media	0.767
Behavioral barriers	*AVE: 0.882; CR: 0.571; α: 0.882*	
	Managers do not actively promote use of social media	0.752
	Lack of training for the use of social media	0.662
	Social media is perceived as time consuming	0.593
	Social media does not fit with our company culture	0.826
	Social media does not fit with the generational profile of our management	0.829
	Social media feared to be out of control in crisis situation	0.785

TABLE A1 (Continued)

Constructs	Items	Factor loadings
Technical barriers	*AVE: 0.802; CR: 0.577; α: 0.802*	
	Difficulties in identifying the right social media tools	0.807
	Difficult to identify and extract relevant information	0.773
	No value added expected from adding one extra software/tool	0.699
IP and privacy barriers	*AVE: 0.756; CR: 0.517; α: 0.756*	
	Confidentiality and privacy concerns	0.696
	Information on R&D and innovation too sensitive to be shared	0.809
	Fear of imitation	0.640

Note: Second factor loadings are based on reduced number of items; AVE, average variance extracted; CR, composite reliability; α, Cronbach Alpha