

Karachiwalla, Rea; Pinkow, Felix

Article — Published Version

Understanding crowdsourcing projects: A review on the key design elements of a crowdsourcing initiative

Creativity and Innovation Management

Provided in Cooperation with:

John Wiley & Sons

Suggested Citation: Karachiwalla, Rea; Pinkow, Felix (2021) : Understanding crowdsourcing projects: A review on the key design elements of a crowdsourcing initiative, Creativity and Innovation Management, ISSN 1467-8691, Wiley, Hoboken, NJ, Vol. 30, Iss. 3, pp. 563-584, <https://doi.org/10.1111/caim.12454>

This Version is available at:

<https://hdl.handle.net/10419/240941>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<http://creativecommons.org/licenses/by/4.0/>

REGULAR ARTICLE

Understanding crowdsourcing projects: A review on the key design elements of a crowdsourcing initiative

Rea Karachiwalla  | Felix Pinkow Institute of Technology and Management,
Technische Universität Berlin, Berlin, Germany**Correspondence**Rea Karachiwalla, Institute of Technology and
Management, Technische Universität Berlin,
Straße des 17. Juni 135, 10623 Berlin,
Germany.
Email: rhea.k.10@gmail.com

Crowdsourcing has gained considerable traction over the past decade and has emerged as a powerful tool in the innovation process of organizations. Given its growing significance in practice, a profound understanding of the concept is crucial. The goal of this study is to develop a comprehensive understanding of designing crowdsourcing projects for innovation by identifying and analyzing critical design elements of crowdsourcing contests. Through synthesizing the principles of the social exchange theory and absorptive capacity, this study provides a novel conceptual configuration that accounts for both the attraction of solvers and the ability of the crowdsourcer to capture value from crowdsourcing contests. Therefore, this paper adopts a morphological approach to structure the four dimensions, namely, (i) task, (ii) crowd, (iii) platform and (iv) crowdsourcer, into a conceptual framework to present an integrated overview of the various crowdsourcing design options. The morphological analysis allows the possibility of identifying relevant interdependencies between design elements, based on the goals of the problem to be crowdsourced. In doing so, the paper aims to enrich the extant literature by providing a comprehensive overview of crowdsourcing and to serve as a blueprint for practitioners to make more informed decisions when designing and executing crowdsourcing projects.

KEYWORDS

absorptive capacity, crowdsourcing contest, crowdsourcing design, morphological framework, open innovation, social exchange theory, systematic literature review

1 | INTRODUCTION

Innovations are considered a cornerstone of achieving and maintaining competitive advantage (Salomo et al., 2008). However, the ways how organizations innovate experienced fundamental changes in the last two decades. Enkel et al. (2009) highlight that many organizations are compelled to shift their focus from exclusive internal research and development (R&D) to cooperation with external partners. This understanding is rooted in the open innovation paradigm coined by Chesbrough (2003). The concept of open innovation assumes that knowledge is widely distributed, and organizations

seeking external knowledge for their own innovation purposes engage in open innovation practices (Bogers & West, 2012; Chesbrough & Bogers, 2014). Chesbrough and Bogers (2014) thereby explicitly highlight that the rise of the Internet contributes to an ongoing paradigm shift in innovation.

The emergence of Web 2.0 has enabled enterprises, people and societies across the globe to connect and collaborate easily (Vukovic, 2009; Zhao & Zhu, 2014b). In this context, crowdsourcing has emerged as an effective problem-solving approach, attracting firms to tap into a global pool of expertise, knowledge and creativity at substantially lower costs (Afuah & Tucci, 2012; Boudreau & Lakhani, 2013;

This is an open access article under the terms of the Creative Commons Attribution License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2021 The Authors. *Creativity and Innovation Management* published by John Wiley & Sons Ltd.

Brabham, 2008; Jeppesen & Lakhani, 2010; Vukovic, 2009). Over the past decade, many organizations have benefited from crowdsourcing-based business models to solve internal problems, adapt to rapidly evolving customer needs, shorten product lifecycles and increase overall innovation efficiency (Brabham, 2008; Kohler, 2015).

Since the term was first coined by Howe (2006), crowdsourcing has emerged as a complex, multidisciplinary concept with applications in a wide variety of domains, including computer science, public health, disaster and crisis management, information technology, engineering, business and management (Afuah & Tucci, 2012; Brabham, 2008, 2009; Gao et al., 2011; Hossain, 2015). Crowdsourcing for innovation primarily refers to innovation contests, also called tournament-based crowdsourcing or broadcast search (Afuah & Tucci, 2012; Boudreau & Lakhani, 2013; Terwiesch & Xu, 2008). Innovation contests are typically used to solve innovative, challenging or creative problems in the form of an open call to large network of potential contributors (Afuah & Tucci, 2012; Blohm et al., 2018; Boudreau & Lakhani, 2013; Jeppesen & Lakhani, 2010). In such contests, contributors self-select into participating and compete with each other to generate the best solution(s). Consequently, the best solution(s) is awarded by the seeking firm, typically in the form of monetary awards (Afuah & Tucci, 2012; Blohm et al., 2018). The primary essence of such contests lies in mobilizing knowledge and expertise that is otherwise distributed among the crowd to obtain novel solutions beyond the traditional boundaries of an organization (Blohm et al., 2013).

Despite the widespread adoption of crowdsourcing and the many advantages it offers, there are many managerial challenges in running crowdsourcing contests, and consequently, many companies do not use the crowd effectively (Boudreau & Lakhani, 2013). In particular, managers are concerned about executing crowdsourcing challenges at reasonable costs that deliver appropriate solutions, which are ultimately implementable in their organizations (Acar, 2019; Afuah & Tucci, 2012; Boudreau & Lakhani, 2013). Addressing these managerial challenges, the plethora of literature on crowdsourcing concerns two central aspects. On the one hand, a crowdsourcer must motivate the crowd to develop solutions (Acar, 2019; Zhao & Zhu, 2014a; Zheng et al., 2011), and on the other hand, the crowdsourcing firm must ensure that it can implement and capture value from the crowdsourced solutions (Blohm et al., 2013; Ghezzi et al., 2018).

Therefore, when setting up and planning a crowdsourcing initiative, crowdsourcing firms must consider these two central aspects, which requires crowdsourcing managers to make informed decisions that account for both aspects. In the course of this study, we define decisions that relate to both crowd motivation or engagement and capturing value as design-related decisions. The scope of the design of a crowdsourcing challenge thus refers to the complete set of decisions managers must address when designing a crowdsourcing contest. In this context, crowdsourcing research often focuses on individual crowdsourcing design elements, such as the motivation of crowd members (Leimeister et al., 2009; Zhao & Zhu, 2014a), task design (Nakatsu et al., 2014; Zheng et al., 2011) and communication

and feedback mechanisms (Camacho et al., 2019; Piezunka & Dahlander, 2019; Schäfer et al., 2017). However, these studies have primarily focused on addressing single or specific design elements, without developing an integrated picture of the overall crowdsourcing system. As a result, there is still a lack of standardization for designing crowdsourcing projects, and a conceptual framework representing the important elements has yet to be established (Neto & Santos, 2018; Zheng et al., 2011). Amrollahi (2015, p. 2) also points out that the 'crowdsourcing literature lacks a comprehensive guideline through which practitioners can initiate and manage their crowdsourcing projects'. As emphasized in the context of innovation contests by Adamczyk et al. (2012), the design of a contest must be tailored for its individual purpose. As such, from a practical standpoint, it is crucial to have a comprehensive and standardized blueprint, which allows to efficiently address the elaborated managerial challenges when setting up crowdsourcing contests.

The central research question derived from this gap in crowdsourcing literature therefore is: Which decisions must crowdsourcing managers take during the design process of a crowdsourcing initiative in order to both motivate the crowd to develop solutions and ensure that the solutions can be implemented and provide value to the crowdsourcing firm? In particular, what are the attributes that managers can choose from within these design-related decisions? In consideration of the two central managerial challenges, attracting the crowd and capturing value from crowdsourced solutions, we seek to answer this call for research through synthesizing existing research on crowdsourcing design. This paper is organized as follows. First, we elaborate on two major theoretical considerations that conceptually relate to the derived managerial challenges and that outline the central dimensions along which design-related decisions must be taken. To identify the concrete design-related decisions, we conducted a systematic literature review in order to capture a comprehensive overview of the current state of research in the field of crowdsourcing. As a result, a decision-centric overview of design elements for crowdsourcing contests for innovation is developed and discussed, and promising avenues for future research based on the findings are presented.

2 | CONCEPTUAL BACKGROUND

2.1 | Defining crowdsourcing contests for innovations

As proposed originally by Howe (2006), the underlying premise of crowdsourcing is that an organization outsources a task to a large, undefined external group of individuals in the form of an open call. In the context of crowdsourcing for innovation, the crowd typically solves problems through creating prototypes, contributing ideas in ideation contests or developing intellectual property for crowdsourcing firms. Therefore, the individual solvers who decide to develop a solution compete with each other. Since its emergence, research on crowdsourcing has identified a range of elements defining

the process of crowdsourcing for innovations. A common denominator in the vast majority of crowdsourcing literature is that the crowdsourcing environment encompasses four distinct dimensions that Hosseini et al. (2014) classify as the four fundamental pillars of crowdsourcing: the crowdsourcing firm, the crowdsourced task, the crowd and the system or platform used to connect the crowd and the crowdsourcing firm (e.g. Afuah & Tucci, 2012; Brabham, 2008, 2009; Estellés-Arolas & González-Ladrón-de-Guevara, 2012; Kazman & Chen, 2009; Pedersen et al., 2013; Vukovic, 2009).

Assuming this classification of the crowdsourcing environment, many of the characteristics of crowdsourcing challenges that have already been identified in extant crowdsourcing literature can be subsumed under these four pillars, or dimensions, of crowdsourcing. For instance, the task dimension includes certain characteristics such as the task specificity and the degree of idea elaboration (Leimeister et al., 2009) or the task definition (Blohm et al., 2018). The crowdsourcing firm is characterized, for instance, by factors contributing to the quality assurance concerning the received solutions (Blohm et al., 2018) or how firms evaluate the submitted ideas from the crowd (Muhdi et al., 2011). The crowd, in turn, can be characterized by the type of target group the crowdsourcer seeks to address (Leimeister et al., 2009), which determines the specific skills and knowledge the crowd requires to develop solutions (Blohm et al., 2018). Against this backdrop, the four fundamental pillars of crowdsourcing are considered a robust classification of the crowdsourcing environment, encompassing four distinct dimensions that allow to clearly distinguish and categorize a vast majority of more specific characteristics of crowdsourcing. In the following, we will use these four dimensions to derive their linkage to the stated two central managerial challenges for conducting crowdsourcing challenges.

2.2 | Motivating and encouraging the crowd

The fundamental mechanism that enables successful crowdsourcing initiatives is the participation of individual crowd members. Therefore, crowdsourcing firms must convince the crowd to develop solutions by conveying the task to be solved through a suitable platform. Thus, the crowdsourcing firm and the solvers engage in an exchange process—the solvers put effort into developing solutions and expect to receive rewards for their efforts. This exchange process reflects the basic notion of the social exchange theory introduced by Blau (1964). The exchange process hereby ‘refers to voluntary actions of individuals that are motivated by the returns they are expected to bring and typically do in fact bring from others’ (Blau, 1964, p. 91). In a crowdsourcing context, potential solvers screen the task provided by the crowdsourcing firm and evaluate both the expected benefits and the related costs.

In fact, previous research on crowdsourcing participation primarily focuses on factors motivating the crowd to participate. Individuals may be motivated to develop solutions based on intrinsic motives such as altruism, working on an interesting project, being creative or demonstrating their skills (Afuah & Tucci, 2012;

Garcia Martinez, 2017; Schäper et al., 2021). These intrinsic motivators illustrate that crowdsourcing is not exclusively an economic relationship and exchange process (Allon & Babich, 2020). Solvers may enjoy the very process of developing solutions merely based on the required creativity and the individual autonomy to solve the given problems (Garcia Martinez, 2017). Although intrinsic motivation plays a central role for crowdsourcing participation, crowdsourcing firms also offer extrinsic motivation by providing monetary rewards for the best solution(s) (Afuah & Tucci, 2012). Solvers who provide solutions hence provide knowledge and ideas in return for an expected outcome, which can be either monetary or non-monetary (Afuah & Tucci, 2012). Ye and Kankanhalli (2017) acknowledge the central role of motivators for the crowd to engage in this exchange process but highlight the lack of research on possible deterrents of participation and thus introduce the social exchange perspective to the context of crowdsourcing. More specifically, individuals who develop solutions also face costs in terms of required time and effort. Ultimately, individuals only engage in developing solutions when they expect a positive net reward from a cost-benefit analysis (Ye & Kankanhalli, 2017), which is reflecting the central notion of the social exchange theory (Blau, 1964).

Therefore, the description of the task to be crowdsourced provides the relevant information for solvers to create solutions and conveys potential motivators and costs. This constitutes the central interdependence required for a social exchange process—the outcome (the solutions developed by the crowd) depends on both (i) the crowdsourcing firm through providing a sufficiently detailed task description and defining solution requirements and (ii) the knowledge and skills of the crowd to interpret the task and to develop solutions. This interdependence is a fundamental requirement of social exchange (Cropanzano & Mitchell, 2005). We build on the argumentation provided by Ye and Kankanhalli (2017) and seek to identify the factors in a crowdsourcing contest that determine the benefits and costs of the participating solvers that must be considered during the design phase of a crowdsourcing campaign. In particular, this highlights that the crowdsourced task must be sufficiently delineated in order to provide adequate information to potential solvers. Applying the social exchange perspective further emphasizes that managers must not only take extrinsic motivators, in terms of monetary awards, into consideration but must also deliberately determine which potential intrinsic motivation, and which costs, the task description conveys to the crowd. This theoretical perspective thereby captures and motivates three of the fundamental pillars of crowdsourcing that are the communication of the crowdsourced task, which provides the required information for the cost-benefit analysis, and thus conveys motivational and cost factors to the crowd through a chosen crowdsourcing platform.

2.3 | Capturing value from crowdsourced ideas and solutions

Besides the elements that support attracting potential solvers to develop solutions, firms must also take into account that the

crowdsourced solutions ultimately should provide value to the firm (Cappa et al., 2019). Malone et al. (2010) raise the central question of why crowdsourcers engage in crowdsourcing projects in the first place, emphasizing the need to define how solutions can eventually be utilized to provide value. Recent crowdsourcing research therefore increasingly focuses on the absorptive capacity of organizations in the context of crowdsourcing (e.g. Afuah & Tucci, 2012; Boons & Stam, 2019; Gassenheimer et al., 2013; Ruiz et al., 2020).

In its core, absorptive capacity relates to an organization's ability to recognize the value of external information, the assimilation of said value and the implementation and application to commercial ends (Cohen & Levinthal, 1990). In the context of crowdsourcing, absorptive capacities can include the platform that is used to connect the crowdsourcer and the crowd, filtering processes that enable the crowdsourcer to exclude weak solutions quickly, establishing information exchange processes between the crowd and the crowdsourcer and attracting a critical mass of contributors (Blohm et al., 2013). Furthermore, gaining crowdsourcing experience and thereby creating knowledge on how to conduct crowdsourcing projects ultimately can positively affect the absorptive capability for future crowdsourcing projects and knowledge exchange processes (Pollok et al., 2019b).

These approaches to build absorptive capacities to capture value from crowdsourcing demonstrate that this is primarily the task of the crowdsourcing firm. Given the solutions provided by the crowd are contingent on the description of the crowdsourcing task, the crowdsourcer can already account for creating absorptive capacities during the design phase of a crowdsourcing contest. As such, defining certain success metrics to evaluate solutions (Ford et al., 2015), estimating the costs of required resources such as personnel (Muhdi et al., 2011) and deliberate risk management (Liu, Xia, Zhang, & Wang, 2016) can positively contribute to crowdsourcing success. These exemplary issues facilitate to receive solutions that ultimately can provide value to the crowdsourcing firm. We hereby emphasize the importance of the early design phase of a crowdsourcing contest to determine whether a firm can benefit from the received solutions. Moreover, this consideration goes beyond the scope of the introduced exchange process between the crowd and the crowdsourcer. Crowdsourcing firms have to determine internal organizational factors that are not directly linked or perceived by the crowd, but that contribute to the ability to capture value. For instance, firms must determine the internal costs of executing a crowdsourcing campaign and subsequently determine whether the expected benefits of the solutions exceed the internal costs. This cost-benefit analysis is a prerequisite for firms to ultimately capture value from crowdsourcing. This second theoretical perspective relates to two of the mentioned pillars of crowdsourcing, which are the crowd, in terms of decisions related to which type of crowd to attract, and the crowdsourcing firm, in terms of internal organizational capacities that enable the firm to capture value.

2.4 | Theoretical framework and contributions

Although these distinct theoretical perspectives, the social exchange theory and absorptive capacity, have been investigated separately in the context of crowdsourcing, we aim to integrate these perspectives from both a theoretical and practical point of view. On the one hand, this integration allows to provide design-related implications for crowdsourcing managers to make more informed decisions when designing and executing crowdsourcing projects for innovation by offering a decision-centric blueprint for crowdsourcing challenge design. On the other hand, the synthesis of the different theoretical perspectives—social exchange theory and absorptive capacity—constitutes a novel conceptual approach in crowdsourcing literature. As indicated above, only this integrative perspective allows to address all four fundamental dimensions of crowdsourcing and thereby captures the two main challenges for crowdsourcing managers to attract and motivate the crowd and capture value from crowdsourcing.

Amidst the plethora of literature on crowdsourcing, this conceptual paper is positioned in the context of crowdsourcing contests for innovation. As Hosseini et al. (2014) elaborate on a general perspective on the four dimensions of crowdsourcing, their categorization seeks to maintain a rather multidisciplinary perspective. With this paper, we refine and enhance the conceptual understanding of crowdsourcing contests, adopting the perspective of the crowdsourcing firm. The central contribution of this perspective to the extant literature is twofold. First, the elaboration of design-related decisions along the four crowdsourcing dimensions contributes to a unitary understanding of the process of designing a crowdsourcing contest. Future research can thus benefit from this refined understanding as further insights on crowdsourcing can be clearly positioned within this framework, resulting in more coherent research designs. Second, the novel conceptual approach emphasizes that in order to advance our understanding of crowdsourcing for innovation, research results must be discussed in the context of all four dimensions. As Ghezzi et al. (2018) outline, there is still need for further research on both the mechanisms that allow firms to effectively integrate solvers ideas and practices that enable firms to increase solver participation through intrinsic and extrinsic motivational factors. While investigating factors that impact the extrinsic or intrinsic motivation of the crowd, not relating these factors to the ability of firms to effectively utilize the crowd to create value, or vice versa, fails to address fundamental managerial concerns. This paper therefore provides a groundwork for discussing specific findings in the broader context of the crowdsourcing environment. Furthermore, by adopting a decision-centric approach to conceptualize crowdsourcing project design, this paper highlights the overall design space opportunities available to firms engaging in crowdsourcing for innovation. Because planning and framing a crowdsourcing contest is rather cost intensive, it is of particular importance to cautiously define all fundamental aspects and decision to be taken (Paik et al., 2020).

This study, therefore, contributes to this central managerial challenge by providing an integrative overview on the different possible campaign configurations for a crowdsourcing initiative.

3 | RESEARCH METHODOLOGY

Building on the four pillars of crowdsourcing proposed by Hosseini et al. (2014), we review existing literature and broadly classify previous research into the following four dimensions: (i) the task to be crowdsourced, (ii) the crowd, (iii) the platform and (iv) the crowdsourcer. Next, individual design elements corresponding to each of the four dimensions are extracted and analysed. The introduced theoretical background provides further guidance to structure the reviewed literature. Against this backdrop, for example, the motivation of the crowd to participate in a crowdsourcing initiative could be intrinsic, extrinsic or both. In order to consolidate the findings from the literature, a morphological framework considering the different design elements is proposed. The morphological approach accommodates multiple alternative configurations because it allows the possibility of choosing different combinations of attributes for each design element.

This paper uses a systematic literature review as the research method to identify and analyse the different design elements of a crowdsourcing project. A systematic literature review is a structured analysis of previous work done in a field by evaluating and assimilating extant research using a concept-centric approach (Webster & Watson, 2002). Because prior research has explored individual, specific elements of a crowdsourcing project, a systematic literature review is an appropriate research method for extracting and synthesizing the literature to develop a comprehensive overview of a given field of research. We followed the four essential stages of a systematic literature review, namely, (i) plan the review, (ii) conduct search, (iii) extract data and (iv) report results, as proposed by Okoli and Schabram (2010).

3.1 | Systematic review

The first stage of a systematic literature review is to meticulously plan the research strategy. This comprises defining the research questions to be addressed and outlining the search strategy, including identifying appropriate databases, defining search terms and setting selection criteria for the search. As discussed in the previous section, the goal of this paper is to develop a profound conceptual understanding of crowdsourcing projects by answering the central research question which key elements of a crowdsourcing project can be identified in consideration of a holistic perspective on crowdsourcing contests for innovations. In particular, this study aims to develop a comprehensive overview of all aspects that need to be considered when designing a crowdsourcing contest.

3.1.1 | Databases

As a preliminary step, suitable databases for the search process were selected. EBSCO Business Source Complete is a leading scholarly business database, with content from over 10,000 well-established academic journals. Because the focal point of this paper is to better understand crowdsourcing projects in the business context, this database seemed appropriate. As a second source, the Web of Science database was selected because of its breadth of interdisciplinary research literature from over 30,000 peer-reviewed scientific journals. As a third source, the ABI/Inform was used, because it offers a plethora of research literature on business trends, corporate strategy and management theory, which are relevant for this paper.

3.1.2 | Search terms

In order to get a complete overview of prior work done in the field, we intentionally chose broad keywords. Because this study focuses on exploring crowdsourcing in the context of sourcing innovations, the search terms included *crowdsourc** or *crowd sourc** restricted to business and management literature. This restriction was made in order to exclude other forms of crowdsourcing, such as crowdsourcing for software engineering, and to account for the scope of this study considering the focus on crowdsourcing contests for innovation. In line with Snyder (2019), we developed predefined criteria to determine which articles to include in the final analysis from the initial pool of articles that have been identified through searching for the keywords. These criteria include (i) articles that focus on crowdsourcing in the business or management context (not NGOs, social context or non-business organizations), (ii) articles that focus on crowdsourcing innovation contests, (iii) articles that must include design elements of the crowdsourcing concept, (iv) primary focus on articles from high-quality academic journals (peer-reviewed), (v) articles within the time frame 2006 (when the term was first coined) until 2019 and (vi) articles written in English.

3.1.3 | Conduct search

As a preliminary step, the keywords *crowdsourc** and *crowd sourc** were used in all three selected databases, applying the following first-level criteria: articles published in the time frame January 2006 and April 2021 and articles published in English. This resulted in a total population of 22,178 results. A broad search was intentionally conducted at first in order to generate a wide range of results and to get an overview of prior work done in the field. Because this study focuses on understanding crowdsourcing projects in the business and management context specifically, the search was narrowed down by applying the following second-level criteria: articles focused on crowdsourcing in the business or management fields and articles published in academic or scholarly journals. In doing so, the population of

articles was reduced to 1,859 articles. The significant reduction in articles shows that there has been comparatively little crowdsourcing research in the business and management context. As a final step, the following third-level criteria were applied: articles that focus particularly on innovation contests or tournament-based crowdsourcing and articles that include at least one dimension or design element. During this step, the relevance of the articles was determined by reading the abstract, introduction and conclusion and in some cases by examining the paper. Our search resulted in a total of 94 articles that we identified as eligible for further review, which is accordingly illustrated in Table 1.

After removing duplicates, a total of 55 articles were left. In order to identify additional relevant articles, a backward and forward search was conducted (Webster & Watson, 2002). In this step, relevant conference papers were additionally included. This yielded another 11 journal and conference articles, resulting in a final pool of 66 articles.

3.2 | Data extraction

In this stage, data were extracted from the final pool of articles to identify the different elements of a crowdsourcing initiative. Building on the ‘four pillars of crowdsourcing’ proposed by Hosseini et al. (2014), the existing literature was first classified and coded into the following four fundamental dimensions of crowdsourcing: (i) the task to be crowdsourced, (ii) the crowd, (iii) the crowdsourcer and (iv) the platform. For each of the articles, the main findings and corresponding design elements were recorded.

Because the four selected dimensions are relatively broad and contain multiple elements within them (for instance, the task

dimension includes different elements such task delineation, task modularity and task granularity), many articles address more than one dimension. It is worth pointing out that a relatively permissive approach was adopted when classifying the literature, meaning that even articles that vaguely related to any crowdsourcing design elements were initially considered. The purpose in doing so was to ensure that the review took into account different findings previously suggested in the literature in order to develop a comprehensive and cohesive picture of the key design elements of crowdsourcing.

3.3 | Descriptive results

Including the final pool of 66 articles, Figure 1 illustrates the number of publications per year as a result of the systematic literature search. The distribution shows that the number of studies related specifically to crowdsourcing contests for innovation is relatively low, in contrast to the literature in the crowdsourcing field in general. In the first years since the coined was termed, most studies focused on exploring the general crowdsourcing concept and its potential applications in other fields. However, in the past few years, there have been an increasing number of publications per year with regard to crowdsourcing contests, which indicates the growing relevance of crowdsourcing for innovation in the business and management context.

As previously mentioned, the articles in the final pool were coded based on the four fundamental dimensions of crowdsourcing. Papers that dwelled upon any of the design elements corresponding to the four dimensions were included. For each of the selected articles, the main findings and corresponding design elements were recorded.

Database	First-level criteria	Second-level criteria	Third-level criteria
Business Source Complete	3,811	802	38
Web of Science	10,813	477	32
ABI/Inform	7,554	580	24
Total	22,178	1,859	94

TABLE 1 Database search results

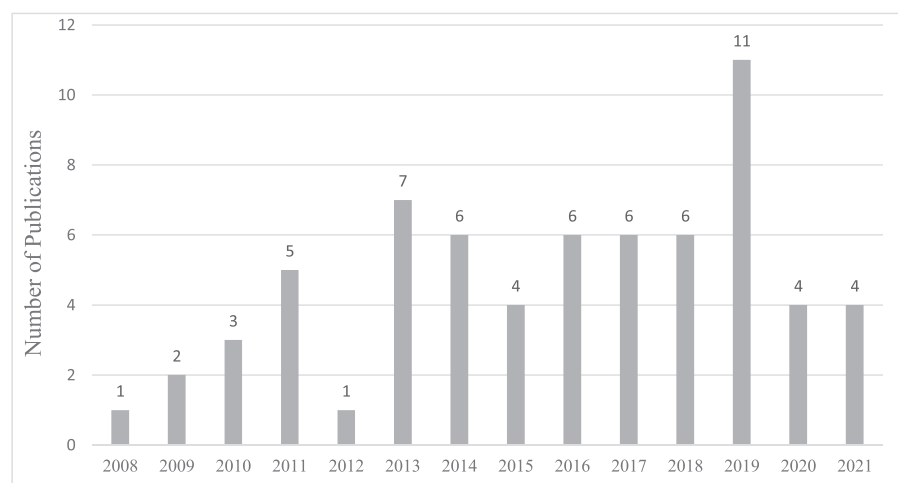


FIGURE 1 Publications per year (journal and conference articles)

Consistent with prior research, the results show that the task to be crowdsourced is one of the most critical factors influencing the overall success of crowdsourcing projects (Afuah & Tucci, 2012; Blohm et al., 2018; Ghezzi et al., 2018; Gillier et al., 2018; Nakatsu et al., 2014; Zheng et al., 2011). As the nature and complexity of the task has a significant impact on elements in the other dimensions such as crowd participation, incentive design and intellectual property mechanisms, effective task design is crucial for crowdsourcing projects. The results of the literature review also demonstrate that the crowdsourcer dimension is highly important for the success of crowdsourcing contests. Because the crowdsourcer is responsible for initiating and operating the project, several key decisions need to be made, for instance, how to manage risk, allocate resources and evaluate and implement crowdsourced ideas. From the crowd perspective, the success of any crowdsourcing project largely depends on the knowledge and diversity, motivation and size of the crowd. Therefore, crowdsourcing firms must consider the characteristics of the crowd when designing a crowdsourcing project. The platform dimension seems to have received relatively less attention. However some prior studies point out that the decision to set up an own platform versus contract an intermediary is an important decision for crowdsourcing firms (Ford et al., 2015; Thuan et al., 2016).

4 | LITERATURE SYNTHESIS AND ANALYSIS

In this section, the results of the literature review are presented and discussed. The first subsection essentially summarizes prior work related to design elements for innovation contests. Subsequently, the individual design elements are analysed and discussed in more detail.

4.1 | Literature synthesis

A concept-centric approach is used to present a summary of the relevant findings (Webster & Watson, 2002). More specifically, Table 2 maps the various design elements identified in the literature to the four fundamental dimensions as guided by the introduced theoretical background. As previously mentioned, articles that explicitly dwelled upon any of the design elements corresponding to the four dimensions were coded and included in the context of this study. In the concept matrix below, studies corresponding to each of the design elements are also highlighted. In total, 20 design elements were extracted.

4.2 | Literature analysis

4.2.1 | Task

The task or problem to be crowdsourced is one of the most important aspects of a crowdsourcing initiative. The task is usually the first point

of contact between the crowdsourcer and the crowd, based on which solvers decide to self-select into participating or not (Afuah & Tucci, 2012; Steils & Hanine, 2016). Based on an analysis of prior literature, seven essential design elements related to the task dimension are identified, and their relevance for the design phase is illustrated in Table 3.

Task delineation

The delineation of a task refers to how well the crowdsourced problem is described and formulated (Afuah & Tucci, 2012). A well-articulated problem statement is one of the most fundamental steps in the crowdsourcing process. Prior research suggests that the formulation of the problem statement has a direct impact on the quality of the solutions received (Allahbakhsh et al., 2013; Gillier et al., 2018; Hetmank, 2013; Jespersen, 2018; Lee et al., 2015; Thuan et al., 2016). Well-delineated problems are easier to understand and interpret, but on the other hand, problems that are not clearly described can increase the chances of being misinterpreted (Afuah & Tucci, 2012; Muhdi et al., 2011; Natalicchio et al., 2017; Schenk & Guittard, 2011). In order to formulate a well-delineated problem statement, the following characteristics should be considered in more detail.

Task specificity

Task specificity refers to the scope of the problem to be solved. It could range from highly specific tasks to open-ended tasks for which no particular problem solving approach or solution is known (Jespersen, 2018; Leimeister et al., 2009; Nakatsu et al., 2014; Ren et al., 2021). Jespersen (2018) argues that highly specific tasks reduce the solution space and often lead to an incremental nature of solutions submitted. On the other hand, unstructured, open-ended tasks foster creativity and could lead to the discovery of new knowledge. In particular, tasks with a rather broad scope may attract more solvers but in turn lead to higher firm efforts considering the evaluation of a more heterogeneous pool of solutions (Christensen & Karlsson, 2019).

The specificity of the task reflects whether the company searches for solutions that are 'local' or 'distant' from its existing knowledge base (Afuah & Tucci, 2012; Jespersen, 2018). For instance, if a company searches for improvements to an existing technology, it is conducting a local search, but on the other hand, if a company is searching for new technologies that it is unfamiliar with, it is conducting a distant search (Afuah & Tucci, 2012). Pollok et al. (2019a) suggest that in order to attract an optimal number of solutions, the seeker should have sufficient domain knowledge to formulate a comprehensive problem statement, but at the same time not be too specific such that the problem-solving space is overly constrained. Given that the task briefing should contain all the necessary information needed by the solvers to develop a solution (Colombo et al., 2013; Schenk & Guittard, 2011; Zheng et al., 2011), tasks with highly confidential information are not ideal for crowdsourcing because sensitive components are made unavailable to the solvers, which in turn may affect the quality of the solutions (Afuah & Tucci, 2012; Ghezzi et al., 2018; Hetmank, 2013; Nakatsu et al., 2014; Natalicchio et al., 2017).

TABLE 2 Crowdsourcing design elements

Dimension	Design element	Sources
Task	Task delineation (10)	Afuah & Tucci, 2012; Allahbakhsh et al., 2013; Gillier et al., 2018; Hetmank, 2013; Jespersen, 2018; Lee et al., 2015; Muhdi et al., 2011; Natalicchio et al., 2017; Schenk & Guittard, 2011; Thuan et al., 2016
	Task specificity (13)	Afuah & Tucci, 2012; Christensen & Karlsson, 2019; Colombo et al., 2013; Ghezzi et al., 2018; Hetmank, 2013; Jespersen, 2018; Leimeister et al., 2009; Nakatsu et al., 2014; Natalicchio et al., 2017; Pollok et al., 2019a; Ren et al., 2021; Schenk & Guittard, 2011; Zheng et al., 2011
	Task granularity (10)	Afuah & Tucci, 2012; Garcia Martinez, 2017; Ghezzi et al., 2018; Lee et al., 2015; Liu, Xia, Zhang, Pan, & Zhang, 2016; Muhdi et al., 2011; Natalicchio et al., 2017; Rouse, 2010; Zhao & Zhu, 2014a; Zheng et al., 2011
	Task modularity (6)	Afuah & Tucci, 2012; Blohm et al., 2018; Liu, Xia, Zhang, Pan, & Zhang, 2016; Nakatsu et al., 2014; Natalicchio et al., 2017; Pee et al., 2018
	Solution requirements (8)	Afuah & Tucci, 2012; Blohm et al., 2018; Ford et al., 2015; Ghezzi et al., 2018; Koh, 2019; Mazzola et al., 2018; Steils & Hanine, 2016; Zheng et al., 2011
	Task allocation (10)	Afuah & Tucci, 2012; Blohm et al., 2018; Boudreau & Lakhani, 2013; Brabham, 2008; Christensen & Karlsson, 2019; Geiger & Schader, 2014; Hetmank, 2013; Jeppesen & Lakhani, 2010; Leimeister et al., 2009; Piezunka & Dahlander, 2015
	Contest duration (4)	Ayaburi et al., 2020; Chen et al., 2021; Leimeister et al., 2009; Muhdi et al., 2011
Crowd	Motivation and incentives (21)	Acar, 2019; Afuah & Tucci, 2012; Blohm et al., 2018; Brabham, 2010; Chen et al., 2021; de Beer et al., 2017; Frey et al., 2011; Garcia Martinez, 2017; Ghezzi et al., 2018; Görzen, 2021; Hanine & Steils, 2019; Jeppesen & Lakhani, 2010; Lee et al., 2015; Leimeister et al., 2009; Li & Hu, 2017; Mazzola et al., 2018; Mazzola et al., 2020; Pee et al., 2018; Schenk & Guittard, 2011; Zhao & Zhu, 2014a; Zheng et al., 2011
	Knowledge diversity (8)	Afuah & Tucci, 2012; Blohm et al., 2018; Boons & Stam, 2019; Ford et al., 2015; Frey et al., 2011; Natalicchio et al., 2017; Steils & Hanine, 2016; Thuan et al., 2016
	Size (2)	Afuah & Tucci, 2012; Boudreau et al., 2011
Platform	Ownership (9)	Blohm et al., 2018; Colombo et al., 2013; Diener & Piller, 2013; Ford et al., 2015; Leicht et al., 2016; Schenk et al., 2019; Thuan et al., 2016; Zhao & Zhu, 2014a; Zogaj et al., 2014

TABLE 2 (Continued)

Dimension	Design element	Sources
Crowdsourcer	Solution evaluation (10)	Afuah & Tucci, 2012; Blohm et al., 2013; Blohm et al., 2018; Chen et al., 2020; Geiger & Schader, 2014; Ghezzi et al., 2018; Mack & Landau, 2020; Muhdi et al., 2011; Piezunka & Dahlander, 2015; Ye & Kankanhalli, 2015
	Implementation potential (5)	Afuah & Tucci, 2012; Blohm et al., 2013; Ford et al., 2015; Lüttgens et al., 2014; Muhdi et al., 2011
	Feedback and communication (11)	Blohm et al., 2013; Blohm et al., 2018; Camacho et al., 2019; Chan et al., 2021; Jian et al., 2019; Leimeister et al., 2009; Muhdi et al., 2011; Piezunka & Dahlander, 2019; Schäfer et al., 2017; Wooten & Ulrich, 2017; Zheng et al., 2014
	Incentives and awards (11)	Afuah & Tucci, 2012; Blohm et al., 2018; Boudreau et al., 2011; Geiger & Schader, 2014; Lee et al., 2015; Leimeister et al., 2009; Mazzola et al., 2018; Muhdi et al., 2011; Schenk & Guittard, 2011; Zhao & Zhu, 2014a; Zheng et al., 2011
	Resource planning (10)	Afuah & Tucci, 2012; Boudreau & Lakhani, 2013; Brabham, 2008; Ford et al., 2015; Jeppesen & Lakhani, 2010; Lüttgens et al., 2014; Muhdi et al., 2011; Thuan et al., 2016; Vukovic, 2009; Ye & Kankanhalli, 2015
	Risk management (10)	Afuah & Tucci, 2012; de Beer et al., 2017; Ford et al., 2015; Ghezzi et al., 2018; Liu, Xia, Zhang, Pan, & Zhang, 2016; Liu, Xia, Zhang, & Wang, 2016; Nakatsu et al., 2014; Natalicchio et al., 2017; Nirosh Kannangara & Uguccioni, 2013; Sauerwein et al., 2016
	Legal and intellectual property management (4)	Blohm et al., 2018; de Beer et al., 2017; Foege et al., 2019; Mazzola et al., 2018
	Brand image and trust (4)	Blohm et al., 2013; Garcia Martinez, 2017; Liu, Xia, Zhang, Pan, & Zhang, 2016; Ye & Kankanhalli, 2015
	Success metrics (2)	Blohm et al., 2013; Ford et al., 2015

Therefore, it is highly important to distinguish between crowdsourcing specific problems for which a predefined solution or approach exists and open-ended problems for which creative, innovative solutions are needed.

Task granularity

Task granularity refers to the degree of complexity of the problem to be solved. Rouse (2010) distinguishes three classifications of tasks to be crowdsourced: *simple tasks*, *moderate tasks* and *sophisticated tasks*. Simple tasks refer to those of low complexity that do not require specific skills or expertise, whereas sophisticated tasks,

on the other hand, are more complex in nature and demand certain competencies and substantial domain knowledge. Moderate tasks refer to tasks that involve a moderate level of skill and knowledge.

Zheng et al. (2011) further define two components of task complexity: *analysability* and *variability*. Analysability refers to the difficulty of the knowledge search process in developing the solution. Variability refers to the amount of new knowledge required to solve a problem. Similarly, Natalicchio et al. (2017) highlight that task complexity is represented by the number of knowledge components involved in the problem.

TABLE 3 Design-related elements in the task dimension

Task dimension	Design-related relevance
Task delineation	Problem and task articulation
	Facilitate interpretation of crowdsourced task
Task specificity	Defines the scope and solution space of the task
	Determines whether the task requires local or distant knowledge
Task granularity	Defines the complexity of the task
	Conveys the required skills to solve the task and thereby impacts crowd motivation to engage in solving the task
Task modularity	Decomposition of tasks into sub-tasks (if applicable)
	Illustrate interdependence of sub-tasks, which can increase the task complexity
Solution requirements	Criteria that a solution must fulfil
	Guide solvers during solution development
	Indicate the evaluation procedure by the crowdsourcer
Task allocation	Indicate expectations on intellectual property rights
	Specifies the target group contingent on required expertise and skills
Contest duration	Time frame defining the deadline to submit solutions
	Depends on the defined complexity of the task

Prior studies suggest that the complexity of the task strongly influences the motivation of the crowd to participate in crowdsourcing contests (Ghezzi et al., 2018; Lee et al., 2015; Zhao & Zhu, 2014a; Zheng et al., 2011). For instance, a complex task often requires a higher level of specific knowledge and skill and is more likely to satisfy an intrinsic need to further develop one's competences (Garcia Martinez, 2017). However, as the task complexity increases, the level of involvement, effort and cognitive skills needed to solve the problem also increase, and therefore, solvers need to be incentivized appropriately. During the task design phase, it is crucial to assess the level of complexity of the task and the effort required to solve it (Lee et al., 2015; Liu, Xia, Zhang, Pan, & Zhang, 2016). Afuah and Tucci (2012) highlight that because highly complex problems can often be difficult to delineate, they increase the chances of being misinterpreted (Lee et al., 2015; Muhdi et al., 2011). Therefore, crowdsourcing companies should take into account the level of complexity and ease of delineation when deciding to crowdsource a problem.

Task modularity

Task modularity refers to the decomposition of the task into smaller sub-tasks. Though not all tasks can be decomposed, it is important to point out that modularity is effective only when there is a low degree of interdependence among the task components (Afuah & Tucci, 2012;

Natalicchio et al., 2017). Modular tasks with a low level of interdependence can be easier to delineate and hence easier for the solvers to interpret. It also provides the opportunity for individuals to work on sub-tasks for which they have high levels of expertise and skills (Afuah & Tucci, 2012). However, for problems that require a high level of interaction among the task components, decomposing the problem can increase the overall complexity, because different knowledge components need to be combined to develop the solution. Furthermore, such tasks require individuals to collaborate and share knowledge (Pee et al., 2018). As a result, any missing information or lack of knowledge for any of the sub-tasks can negatively influence the quality of the solution. Some prior studies suggest that task decomposition is more appropriate for collaborative crowdsourcing that leverages collective intelligence (Afuah & Tucci, 2012; Blohm et al., 2018; Nakatsu et al., 2014) than tournament-based crowdsourcing for which individuals compete individually to develop the best solutions (Liu, Xia, Zhang, Pan, & Zhang, 2016). Therefore, when delineating the problem, crowdsourcing firms should take into consideration the degree of interactions between the sub-tasks when deciding whether to decompose it or not.

Solution requirements

Solution requirements refer to the criteria that must be fulfilled in developing a solution. Defining the contribution requirements is considered to be one of the most crucial steps because it influences the solvers' decision to participate (Afuah & Tucci, 2012; Blohm et al., 2018; Zheng et al., 2011). Seekers should ensure that contribution requirements are explicitly defined because they serve as a guide for solvers to develop solutions (Steils & Hanine, 2016). Furthermore, the contribution requirements stated in the project briefing serve as an indicator for how the solutions will be evaluated and assessed by the seeker. Some studies suggest providing examples to improve the quality and effectiveness of solutions (Ghezzi et al., 2018; Koh, 2019).

Afuah and Tucci (2012) further highlight that firms must take into account the potential for integrating solutions into the company's existing value chain. This becomes especially relevant for organizations that search for 'distant' solutions beyond their current trajectories. On the other hand, integrating 'local' alternative solutions that are incremental in nature is relatively less complicated. Therefore, to benefit from crowdsourcing initiatives, it is important to consider the implementation potential when delineating the problem and defining requirements (Ford et al., 2015).

Prior research also indicates that firms must clearly indicate the expectations regarding intellectual property rights (IPR) in the problem statement, because this has a significant impact on participation in crowdsourcing contests (Mazzola et al., 2018; Steils & Hanine, 2016). Intellectual property arrangements should be defined based on the level of complexity of the problem and expected solution requirements (Mazzola et al., 2018).

Task allocation

Task allocation refers to allocation of the task to a specific group of individuals in the crowd, depending on the expertise required to solve

the problem. For instance, crowdsourcing companies can target contributors with specific knowledge that may be better suited to develop a solution (Blohm et al., 2018; Leimeister et al., 2009). Blohm et al. (2018) highlight that crowdsourcing firms can target crowd contributors based on specific skills, demography and performance in prior contests.

Although tournament-based crowdsourcing leverages the diversity of the crowd to solve problems (Afuah & Tucci, 2012; Boudreau & Lakhani, 2013; Brabham, 2008; Jeppesen & Lakhani, 2010), it can also result in a lot of ‘crowding’ from low-quality and irrelevant solutions (Piezunka & Dahlander, 2015). Therefore, targeting crowd contributors with the appropriate knowledge and expertise could be an effective approach to reduce the ‘noise’ and generate higher quality solutions (Blohm et al., 2018; Christensen & Karlsson, 2019; Geiger & Schader, 2014; Hetmank, 2013).

Contest duration

Contest duration refers to the time frame during which solvers can actively submit solutions. When designing a crowdsourcing project, it is important to consider the contest duration, because this could affect the overall quality of solutions (Ayaburi et al., 2020; Leimeister et al., 2009). In a study of 12 crowdsourcing projects for idea generation, Muhdi et al. (2011) find that most of the ideas were submitted within the first 4 weeks of the contest being online. However, it is important to point out that these findings could differ with the nature of the problem. For instance, for problems with a higher level of complexity and specific solution requirements, solvers may need more time and effort to develop high-quality solutions (Ayaburi et al., 2020). Chen et al. (2021) find that although a higher contest duration increases the amount of solvers and thus the likelihood of receiving high-quality solutions, they also report a decrease in the attraction of high-quality contestants. Ultimately, it is crucial for managers to take into account the difficulty of the problem, the specificity of the solution requirements and the level of skill and expertise required when defining the duration of the contest.

4.2.2 | Crowd

The crowd refers to the people that participate in a crowdsourcing activity. The crowd is one of the most important actors in the crowdsourcing system (Zhao & Zhu, 2014a). The success of any crowdsourcing initiative largely depends on the ability to attract and motivate a crowd to develop solutions (Ford et al., 2015). Based on a literature analysis, three crucial characteristics of the crowd are identified, and the central points are summarized in Table 4.

Crowd motivation and incentives

Crowd motivation refers to the motivation of the crowd to participate in innovation contests. Many previous studies have investigated the motivation aspect of crowdsourcing (Acar, 2019; Brabham, 2010; Frey et al., 2011; Garcia Martinez, 2017; Leimeister et al., 2009;

TABLE 4 Design-related elements in the crowd dimension

Crowd dimension	Design-related relevance
Crowd motivation and incentives	Indication of incentives for the crowd to participate in the contest
	Conveys monetary and/or non-monetary incentives
	Incentives should consider emerging costs (time and effort) for the crowd to develop solutions
Knowledge diversity	Crowdsourcer needs to specify the required knowledge diversity
	Determines the crowd to be targeted
Crowd size	Crowdsourcer needs to determine the amount of required solvers
	Address an open crowd or selected participants (experts) contingent on required knowledge diversity

Pee et al., 2018; Zhao & Zhu, 2014a; Zheng et al., 2011). Because incentives are an inherent component of tournament-based crowdsourcing (Blohm et al., 2018; Leimeister et al., 2009), a thorough understanding of what motivates the crowd is important for crowdsourcing firms when designing incentive mechanisms. The award money, as a central extrinsic motivator, increases both the number of solutions and the solution quality (Chen et al., 2021). However, as Leimeister et al. (2009) explore different incentives that motivate individuals to participate in ideas competitions, they find that incentives providing direct compensation (extrinsic) are not the only motivating factor. Other forms of motivation such as appreciation and learning through interaction with knowledge experts and mentors (intrinsic) are also important. Similarly, Brabham (2010) identifies four primary motivators for participation in crowdsourcing initiatives: the opportunity to make money, the opportunity to develop one's skills, the opportunity to take up full-time work and the love of community. Hanine and Steils (2019) state that negative feelings must be avoided, for instance, through transparency and encouraging a positive and respectful climate. In particular, perceived fairness of a crowdsourcing contest increases the likelihood of crowd participation (Mazzola et al., 2020). Görzen (2021) complements these findings on perceived feelings and reports that a meaningful task can stimulate positive mood among solvers, which positively impacts the creativity of solutions, and as such, task meaningfulness is considered an indirect motivator (Görzen, 2021).

Prior research has further linked the nature and complexity of the crowdsourced problem with the motivation of solvers to participate (Afuah & Tucci, 2012; Garcia Martinez, 2017; Ghezzi et al., 2018; Li & Hu, 2017; Pee et al., 2018; Zheng et al., 2011). For instance, Pee et al. (2018) demonstrate that participants that are motivated to develop competence focus on high-commitment tasks, whereas those motivated by the ‘love of community’ focus on tasks that require interaction between solvers. Zheng et al. (2011) state that tasks that are ill-structured and poorly delineated may have a negative influence

the motivation to participate. On the other hand, well-structured tasks with high level of autonomy have a positive influence on participation in crowdsourcing contests (Garcia Martinez, 2017; Lee et al., 2015).

Another crucial aspect that plays a significant role in participant motivation is the treatment of intellectual property. Stringent intellectual property arrangements could significantly discourage participation in crowdsourcing contests (Mazzola et al., 2018). Prior studies indicate that intellectual property decisions are typically dependent on the complexity and stage of development of the problems (de Beer et al., 2017; Mazzola et al., 2018). Crowdsourcing firms should consider the negative influence on participation when designing intellectual property arrangements. For instance, one possible way to motivate solvers that have to fully transfer rights is to offer significantly higher monetary rewards (Mazzola et al., 2018).

Although prior research suggests that both intrinsic and extrinsic motivation is important in crowdsourcing contests (Zhao & Zhu, 2014a), crowdsourcing firms must take into account the nature and complexity of the problem when designing incentives. For problems with a higher complexity that require more time and effort, financial incentives are particularly important (Afuah & Tucci, 2012; Blohm et al., 2018; Jeppesen & Lakhani, 2010; Schenk & Guittard, 2011; Zhao & Zhu, 2014a). Managers should also find ways to incentivize solvers that are intrinsically motivated to develop competencies and learn from experience. For instance, Leimeister et al. (2009) show that solvers that are motivated to develop their skills appreciate feedback from experts. Therefore, incorporating feedback mechanisms can be very helpful to foster learning and competence development.

Knowledge diversity

Knowledge diversity refers to the range of knowledge, skills and expertise of the crowd members. The required knowledge to solve a problem is closely related to the complexity of the task, which is represented by the number of knowledge components involved in the problem (Ford et al., 2015; Natalicchio et al., 2017; Thuan et al., 2016). Some tasks such as software testing require highly specialized knowledge (Afuah & Tucci, 2012; Blohm et al., 2018), whereas other generic problems rely on the heterogeneity of the crowd (Steils & Hanine, 2016). Boons and Stam (2019) argue that the ability to combine and integrate 'related' (specific domain knowledge) and 'unrelated' (other domain knowledge) perspectives are key in generating high-quality, novel solutions. Similarly, Frey et al. (2011) highlight that individuals with knowledge in diverse areas are better able to combine knowledge and make connections. Though knowledge diversity plays an important role in crowdsourcing contests, making the distinction between problems that require specific knowledge versus generic problems is essential for crowdsourcing companies to benefit from crowdsourcing initiatives.

Crowd size

Crowd size refers to the number of solvers participating in a crowdsourcing contest. Crowd size is an important element of a crowdsourcing initiative, as it has a direct impact on the quantity

and quality of solutions received. Afuah and Tucci (2012) highlight that because knowledge and expertise are widely dispersed among the crowd, a larger solver base increases the possibility of receiving higher quality solutions. Boudreau et al. (2011) point out that in tournament-based crowdsourcing contests in which few winning solutions are selected, the larger the number of participants, the less likely it is for individual contestants to win, which in turn reduces the effort exerted by individuals in developing solutions. However, for problems that draw on multiple knowledge domains and that do not have a specific problem-solving approach, this effect is reversed. In other words, a large (diverse) crowd could lead to better performance for problems with greater knowledge uncertainty. On the other hand, for problems in which a specific knowledge domain is required and predefined solutions exist, targeting professionals with the appropriate skills and expertise could be a more effective approach. Therefore, managers should take into account the nature of the problem when deciding whether to address an open crowd (unlimited contestants) or to target individuals with specific expertise to develop solutions.

4.2.3 | Platform

The platform refers to the interface through which a firm broadcasts the problem to be solved, and the design-related considerations are indicated in Table 5.

Organizations can either develop their own crowdsourcing platform or use third-party (intermediary-based crowdsourcing) platforms. Although many renowned enterprises (including Dell, SAP, Google, LEGO and Procter & Gamble) have successfully developed their own crowdsourcing platforms (eYeka, 2015), it is important to take into account the costs of setting up, operating and managing such platforms (Ford et al., 2015; Schenk et al., 2019). Blohm et al. (2018) further highlight that developing scalable platforms with appropriate governance mechanisms can be very challenging for firms with no prior experience in crowdsourcing. Another crucial aspect is the access to a large crowd with diverse skills and expertise. The success of any crowdsourcing initiative largely depends on the ability to attract and motivate a crowd to develop solutions (Ford et al., 2015). This is especially relevant for tournament-based crowdsourcing for challenging, innovative problems.

TABLE 5 Design-related elements in the platform dimension

Platform dimension	Design-related relevance
Platform	Connects crowdsourcer and crowd
	Considers the costs associated with developing an own platform or using existing (external) crowdsourcing platforms as intermediary
	Depends on existing crowdsourcing experience
	Platform specifies the size of the network of potential solvers

Over the past decade, the market for crowdsourcing intermediaries has grown significantly (Diener & Piller, 2013). Some well-known examples include InnoCentive, NineSigma, IdeaConnection and Yet2. These intermediaries have a large global network of experts and professionals in diverse fields and play a mediating role by connecting the seeker firm with external solvers via their own web-based platform (Diener & Piller, 2013; Leicht et al., 2016). Because crowdsourcing intermediaries differ in expertise (Colombo et al., 2013; Diener & Piller, 2013), firms must select the right one, based on the nature and complexity of problem to be solved.

Recent developments indicate that many organizations have turned to intermediary-based crowdsourcing to broadcast innovation problems. Intermediaries play a key role in managing the crowdsourcing process (Zogaj et al., 2014), including formulating the problem statement, broadcasting the task to their solver community, preselecting appropriate solutions and providing feedback to solvers. Furthermore, intermediaries support seeker firms by providing advice, managing intellectual property and associated risks and tracking overall crowdsourcing performance (Colombo et al., 2013; Diener & Piller, 2013; Leicht et al., 2016). Prior research suggests that using intermediaries can significantly decrease development costs and other risks associated with crowdsourcing, therefore making it an attractive problem-solving approach for firms (Ford et al., 2015; Zhao & Zhu, 2014a). Therefore, the choice between establishing an internal platform and using an external intermediary is a crucial decision in the crowdsourcing process (Ford et al., 2015; Schenk et al., 2019; Thuan et al., 2016; Zhao & Zhu, 2014a).

4.2.4 | Crowdsourcer

The crowdsourcer refers to the organization seeking to solve a task through crowdsourcing. The crowdsourcing firm is responsible for designing the overall contest starting from formulating the problem statement to attracting solvers and finally evaluation and implementation of crowdsourced ideas. Based on a review of prior literature, nine design elements corresponding to the crowdsourcing firm are extracted and illustrated in Table 6.

Solution evaluation

Solution evaluation refers to how firms assess the solutions developed by the crowd. In tournament-based crowdsourcing, participants typically compete with each other to generate solutions to a defined problem. Crowdsourcing firms then screen and evaluate the set of solutions received to select the best one(s), which are ultimately rewarded (Geiger & Schader, 2014).

Although crowdsourcing provides the opportunity to tap into diverse knowledge that is distributed among the crowd, it can also lead to a state of 'crowding', in which organizations received a large number of solutions (Mack & Landau, 2020; Piezunka & Dahlander, 2015). Because organizations have limited resources, evaluating large sets of solutions can be tedious and increase the overall transaction cost of crowdsourcing (Afuah & Tucci, 2012;

TABLE 6 Design-related elements in the crowdsourcer dimension

Crowdsourcer dimension	Design-related relevance
Solution evaluation	Internal evaluation process of received solutions Determine how to deal with a large number of solutions
Implementation potential	Determine how to transform solutions into valuable information Establish criteria to determine the technical and economic feasibility of solutions Top management commitment
Communication and feedback	Create communication channels to communicate with the crowd Determine adequate communication forms and flows Create feedback structures and channels
Incentives and rewards	Define potential intrinsic motivators that are conveyed through the nature of the task Provide external motivators (e.g. monetary rewards) Align rewards with required effort and time the crowd needs to develop solutions Consider amount of potentially winning solution(s)
Resource planning	Assess internal expertise and experience on crowdsourcing Determine all associated costs (financial, time, personnel) Allocate sufficient resources in advance Create informal organizational roles (gatekeepers, champions)
Risk management	Identify potential uncertainties (e.g. receiving only inferior solutions) Identify sources of potential threats to intellectual property (IP) that may be exposed through the crowdsourcing contest Consider data protection/data privacy
Legal and IP management	Determine the legal terms and conditions, and IP rights arrangements Determine the ownership of the IP created through the crowdsourced solutions
Brand image and trust	Consider marketing-related aspects of crowdsourcing Determine the influence crowdsourcing firm's brand on the perception of the crowd with regards to the task
Success metrics	Assess the overall success of a crowdsourcing contest Recognize failures and encourage learning

Blohm et al., 2013; Ye & Kankanhalli, 2015). Piezunka and Dahlander (2015) further highlight that as crowding increases, firms tend to limit their attention to solutions that are familiar and within

the local knowledge domain. Consequently, when crowding occurs, organizations tend to filter out solutions that include distant knowledge that could be potentially relevant. Therefore, in order to benefit from the diversity (local and distant solutions), firms should establish clear evaluation criteria through which relevant solutions are selected. Defining clear guidelines for solution requirements in the problem statement can be helpful for solvers to develop solutions that better meet the expectations of seeking firms (Afuah & Tucci, 2012; Blohm et al., 2018). Previous studies also indicate that different evaluation tools and methods can be used when assessing crowdsourced ideas (Blohm et al., 2018; Geiger & Schader, 2014; Ghezzi et al., 2018; Muhdi et al., 2011). Blohm et al. (2018) point out that in tournament-based crowdsourcing, manual assessment is crucial because automated tools could potential overlook relevant contributions. To reduce the transaction costs from crowding, firms can integrate peer assessment techniques in the contest design, in which other crowd contributors can also rate the quality of contributions. As such, the jury evaluating solution may be composed of the end users of the solution, who can judge the value of solutions based on their own needs and requirements (Afuah & Tucci, 2012). In this context, Chen et al. (2020) find the benefit that when the crowd itself can vote for the winning solutions, the overall motivation to participate in a contest can be increased. For solutions that primarily will be used by the crowdsourcing firm, and not by other end users, the firm must employ internal evaluators with sufficient knowledge (Afuah & Tucci, 2012). As such, internal experts that have sufficient domain knowledge should be involved in evaluating ideas received from crowdsourcing contests, if the firm evaluates the received solutions internally.

Implementation potential

Implementation potential refers to the ability to utilize the solutions received by the crowd. Crowdsourcing contests often generate an overwhelming number of solutions, and therefore, organizations must be prepared to effectively transform relevant solutions into valuable information for the company (Afuah & Tucci, 2012; Blohm et al., 2013). Prior studies suggest that in order to benefit from crowdsourcing initiatives, firms must develop distinct capabilities to integrate and transfer externally developed solutions (Afuah & Tucci, 2012; Ford et al., 2015). Firms need to carefully assess the technical and economic feasibility of crowdsourced solutions. Blohm et al. (2013) further highlight that solutions received by the crowd may need to be modified and tailored to fit the exact internal needs of the company.

Muhdi et al. (2011) stress the importance of a concrete implementation plan to better manage and transfer crowdsourced ideas either into existing projects or to initiate new projects. Communication of crowdsourcing project results to other business units within the organization can also increase the potential for implementation (Blohm et al., 2013). Finally, the support and commitment from the top management is instrumental for overcoming internal resistance towards externally developed solutions, making the transformation of crowdsourced ideas faster and easier (Ford et al., 2015; Lüttgens et al., 2014).

Communication and feedback

Communication and feedback refer to how crowdsourcing firms communicate with the crowd at different stages of the contest. Many studies affirm that communication and feedback to solvers is a critical component, which can significantly influence the quality of solutions received (Blohm et al., 2013; Camacho et al., 2019; Chan et al., 2021; Jian et al., 2019; Leimeister et al., 2009; Piezunka & Dahlander, 2019; Schäfer et al., 2017; Wooten & Ulrich, 2017).

Schäfer et al. (2017) distinguish three types of communication flows in crowdsourcing contests: unidirectional (suggestion boxes), bidirectional (e-mail) and multidirectional (forums, wikis). The authors further outline which communication flow is best suited for different stages of the contest. The study revealed that unidirectional and multidirectional communication are most valuable before the contest and bidirectional communication during and after the contest (Schäfer et al., 2017). Communicating with crowd members during the runtime of the contest increases the chances of high-quality submissions (Blohm et al., 2018; Zheng et al., 2014) because, in some cases, solvers may require additional information about the problem to develop appropriate solutions (Jian et al., 2019; Schäfer et al., 2017). A further feedback mechanism that firms can employ is creating peer-feedback structures, such that members of the crowd can provide feedback to other members (Chan et al., 2021). In fact, both peer- and firm-feedback impact solvers' motivation to improve solutions and lead to high-quality ideas (Chan et al., 2021). Though in-process communication is important, feedback after the contest, especially when solutions are rejected, are particularly important (Piezunka & Dahlander, 2019; Schäfer et al., 2017). For solvers that are intrinsically motivated to learn and develop competencies (Leimeister et al., 2009), providing constructive feedback can play a critical role in participation in future contests (Piezunka & Dahlander, 2019).

In order to benefit from crowdsourcing initiatives, crowdsourcing firms should establish appropriate communication tools for different stages of the crowdsourcing process. Additionally, firms should allocate time to communicate and answer questions from solvers (Muhdi et al., 2011). Trained moderators to provide constructive feedback at appropriate phases of the contest can highly influence the participation and success rates of crowdsourcing projects (Camacho et al., 2019).

Incentives and rewards

Incentives and rewards refer to the remuneration that solvers receive in exchange for winning solutions. As previously discussed, incentives are one of the most critical components in tournament-based crowdsourcing (Blohm et al., 2018; Leimeister et al., 2009). Although prior research indicates that both intrinsic and extrinsic motivation influence participation in crowdsourcing contests (Lee et al., 2015; Zhao & Zhu, 2014a; Zheng et al., 2011), the nature and complexity of the problem plays a critical role when designing effective incentive structures. For problems with a higher complexity that require participants to invest substantial time and effort, financial incentives are particularly important (Afuah & Tucci, 2012; Blohm et al., 2018; Schenk & Guittard, 2011; Zhao & Zhu, 2014a). Furthermore, for

problems that require solvers to transfer IPR, firms must ensure that the rewards are sufficiently high (Mazzola et al., 2018).

Though intrinsic motivators such as passion or personal achievement cannot be directly controlled (Geiger & Schader, 2014; Leimeister et al., 2009), crowdsourcing firms should try to incorporate elements that promote learning and competence development in incentive mechanisms, for instance, the possibility to communicate and receive feedback from experts or potential collaboration opportunities to further develop promising solutions (Leimeister et al., 2009).

Tournament-based crowdsourcing is typically associated with success-based remuneration, which means that only successful contributions are rewarded (Geiger & Schader, 2014). As a result, the higher the number of potential contributors, the smaller the chance of winning for individual contributors. This could potentially discourage solvers from investing time and effort into developing solutions, which in turn could negatively influence the performance of the contest (Boudreau et al., 2011). Therefore, instead of following the 'winner takes it all' approach, crowdsourcing firms should consider distributing awards among the top contributors (Blohm et al., 2018; Muhdi et al., 2011).

From a managerial perspective, designing appropriate incentive structures are very important for the success of crowdsourcing projects. Crowdsourcing firms must take into account the nature and complexity of the problem crowdsourced, the type of intellectual property arrangement and the different intrinsic and extrinsic motivators when defining awards and incentives.

Resource planning

Resource planning refers to management of resources (time, human capital and financial capital) in a crowdsourcing project. Prior crowdsourcing literature suggests that when making the decision to crowdsource, one of the most important factors that must be considered is whether an organization has sufficient internal expertise to solve the problem (Thuan et al., 2016; Ye & Kankanhalli, 2015). Organizations typically engage in crowdsourcing initiatives when they do not possess the required expertise or knowledge (Afuah & Tucci, 2012). Another critical factor that influences the decision to crowdsource is the cost of running crowdsourcing projects. Whereas many studies argue that crowdsourcing can significantly reduce development costs (Afuah & Tucci, 2012; Boudreau & Lakhani, 2013; Brabham, 2008; Jeppesen & Lakhani, 2010; Vukovic, 2009), some studies suggest that dedicated budgets are required to effectively carry out crowdsourcing projects (Ford et al., 2015; Thuan et al., 2016). Therefore, crowdsourcing firms must consider the different transaction costs involved, for instance, the cost to develop a platform (or hire an intermediary), the cost of internal human resources and the cost of incentivizing the crowd (Ford et al., 2015; Ye & Kankanhalli, 2015).

Managing crowdsourcing initiatives is similar to managing projects. Allocating sufficient resources and defining a concrete project plan with clear milestones are important (Ford et al., 2015; Muhdi et al., 2011). Furthermore, competent managers with crowdsourcing experience are critical for the success of crowdsourcing projects

(Ford et al., 2015). Lüttgens et al. (2014) recommend that in addition to getting the strong commitment from the top management, creating informal organizational roles such as gatekeepers and champions can be particularly beneficial in overcoming organizational resistance and barriers in crowdsourcing projects. Therefore, from a resource perspective, it is crucial for firms to weigh the costs and benefits when deciding whether to crowdsource or not and to ensure the commitment of employees to effectively support and manage crowdsourcing initiatives.

Risk management

Risk management refers to the management of uncertainties in the context of crowdsourcing projects. Although most previous research has focused on the different benefits of crowdsourcing, it is equally important for firms to consider the potential risks involved in crowdsourcing projects. One of the most prominent risks in crowdsourcing projects is the possibility of receiving inferior solutions of low quality (Liu, Xia, Zhang, Pan, & Zhang, 2016; Liu, Xia, Zhang, & Wang, 2016; Nirosh Kannangara & Ugucconi, 2013). Because crowd members are not confined to employment contracts, firms may not have effective control over the quality of the output (Nirosh Kannangara & Ugucconi, 2013). However, by defining the problem explicitly, providing clear solution requirements and addressing an appropriate crowd, organizations can reduce the risk of receiving poor quality solutions.

Another critical risk in crowdsourcing initiatives is the loss of intellectual property and knowhow. Crowdsourcing projects run the risk of revealing too much information when delineating a problem, which could negatively impact competitive advantage (Ford et al., 2015; Nirosh Kannangara & Ugucconi, 2013). Prior studies suggest that tasks with highly confidential information are not ideal for crowdsourcing (Afuah & Tucci, 2012; Ghezzi et al., 2018; Nakatsu et al., 2014; Natalicchio et al., 2017). Therefore, crowdsourcing firms should be cautious when defining problem statements and ensure that no sensitive information is revealed. Including non-disclosure agreements could also be effective when working with external crowds (de Beer et al., 2017).

Other risks related to information and data security include violation of personal data and malicious activity on crowdsourcing platforms (Sauerwein et al., 2016). To ensure platform security, performing penetration tests to evaluate the vulnerability of the system can be an effective measure.

Similar to any other projects, crowdsourcing projects also involve risks. Therefore, organizations must carefully assess potential risks, and define measures to mitigate them, before embarking on crowdsourcing initiatives.

Legal and IPR management

Legal and IPR management refer to the legal terms and conditions and intellectual property mechanisms in crowdsourcing projects. IPR arrangements can significantly impact the participation and performance in crowdsourcing contests (de Beer et al., 2017;

Foege et al., 2019; Mazzola et al., 2018); therefore, firms need to carefully decide which intellectual property treatment to use when designing crowdsourcing projects.

de Beer et al. (2017) distinguish four different approaches to manage intellectual property in crowdsourcing projects based on the degree of ownership and the potential to reduce liabilities associated with crowdsourced solutions. The degree of ownership refers to the degree to which organizations acquire IPR of crowdsourced solutions. In the case of high degree of ownership, seekers have exclusive control over the intellectual property, but in the case of low degree of ownership, the solvers retain exclusive rights, which means that the IPR can be licensed out to other parties. Reducing liabilities refers to the degree to which organizations protect themselves from liabilities associated with crowdsource solutions, for instance, third-party intellectual property that may possibly be embedded in the solutions.

Mazzola et al. (2018) highlight that firms should also consider the complexity and the stage of development of the crowdsourced problem when deciding the degree of ownership. For problems with higher complexity or those related to the later stages of development, seeking firms generally prefer to have a high degree of ownership because the potential value generated is larger. In such situations, crowdsourcing firms should ensure that contributors are adequately compensated (Blohm et al., 2018; Foege et al., 2019). From a solver perspective, when IPR arrangements are too stringent, individuals are less motivated to participate in crowdsourcing contests because they are not always willing to give up ownership (de Beer et al., 2017; Mazzola et al., 2018). Because crowds are not protected by employment regulations, a fair and balanced approach to manage intellectual property is important (de Beer et al., 2017). Therefore, firms should prioritize in which circumstances retaining exclusive control can be beneficial and define appropriate remuneration (Foege et al., 2019).

By defining explicit terms and conditions, including non-disclosure agreements and outlining appropriate intellectual property arrangement in the problem statement, firms can ensure widespread participation as well as protect themselves from legal contamination (de Beer et al., 2017).

Brand image and trust

Crowdsourcing provides the opportunity for firms to gain visibility and advertise their brand (Ye & Kankanhalli, 2015). The *Lego Ideas* platform is an excellent example of creating a strong brand image and enhancing customer loyalty through crowdsourcing. With an established online community of almost one million members, Lego actively works together with the crowd to convert promising ideas into tangible products. Through its crowdsourcing platform, Lego has attracted an increasing number of loyal customers and fans, who are enthusiastic about developing new Lego products (PD., 2018).

Another related aspect is developing a sense of trust among solvers (Blohm et al., 2013; Garcia Martinez, 2017; Liu, Xia, Zhang, Pan, & Zhang, 2016). When solvers associate with the brand, they may be more motivated to develop solutions. Therefore, when designing crowdsourcing projects, firms should ensure a sense of trust and

perceived fairness. Not only does this encourage participation but also provides the opportunity to create a strong brand image.

Success metrics

Success metrics are important to evaluate the overall performance and effectiveness of crowdsourcing initiatives. Crowdsourcing firms should develop specific metrics to track the success of crowdsourcing outcomes (Blohm et al., 2013; Ford et al., 2015). Although it is clear that not every crowdsourcing project may result in high-quality solutions, establishing success criteria can be helpful for organizations to recognize failures and foster learning (Ford et al., 2015).

5 | A MORPHOLOGICAL FRAMEWORK ON CROWDSOURCING CONTEST DESIGN

In this section, the results of the literature analysis are consolidated to present a concrete, holistic overview. In particular, a morphological framework is developed to better structure and investigate the different design elements in a crowdsourcing project. The morphological approach was first popularized by Zwicky (1969) to 'study the more abstract structural interrelations among phenomena, concepts, and ideas' (Ritchey, 2013, p. 3). A morphological analysis is essentially a systematic approach to structure and analyse multidimensional problems by identifying and investigating possible relationships or configurations in the system (Ritchey, 2013). This approach is an alternative to other quantitative modeling methods and is particularly useful when organizing and synthesizing qualitative aspects to determine different possible outcomes.

The development of a morphological framework typically begins by identifying important 'dimensions' of the overall system. Consequently, the dimensions can be further broken down into sub-dimensions (in this case elements and sub-elements). For each dimension (and sub-dimension), possible 'values' or attributes are identified and structured into a matrix, known as a morphological box (Ritchey, 2013). By organizing the different design parameters and possible options in a morphological box, it presents an integrative, visual representation of the overall solution space (Ritchey, 2006). In other words, the box seeks to uncover different possible solutions to a problem by accommodating multiple alternative perspectives rather than prescribing a single solution (Ritchey, 2006). This allows the possibility of choosing different combinations of options for each design parameter, best suited to the goals of the problem.

A morphological framework is specifically chosen for this study because it provides a cohesive, integrative picture of the findings in the literature. Table 7 presents the morphological framework developed in the context of crowdsourcing contest design. The matrix comprises the four fundamental pillars of crowdsourcing: the task, the crowd, the platform and the crowdsourcer (Hosseini et al., 2014). For each dimension, corresponding design parameters (16 elements and 12 sub-elements) are identified through a rigorous systematic literature review. Consequently, for each parameter, possible 'values' or attributes are outlined. By assigning options to each parameter, the

TABLE 7 A morphological framework of crowdsourcing design elements

Dimensions	Elements	Sub-elements (if applicable)	Attributes				
Task	Task delineation	Task specificity	Low	Moderate	High		
		Task granularity	Simple	Moderate	Complex		
		Task modularity	Decomposed	Undecomposed			
		Solution requirements	Bounded	Unbounded			
	Task allocation		Performance based	Demographic based	Skill based	Open	
	Contest duration		Short	Medium	Long		
Crowd	Motivation		Intrinsic	Extrinsic	Both		
	Knowledge diversity		Related	Unrelated	Both		
	Size		Small	Medium	Large		
Platform	Ownership		Own platform	Intermediary platform			
Crowdsourcer	Solution evaluation		Expert evaluation	Peer evaluation	Both		
	Implementation potential	Technical feasibility	Low	Moderate	High		
		Economic feasibility	Low	Moderate	High		
	Feedback and communication		Uni-directional	Bi-directional	Multi-directional	All	
	Incentives and awards		Financial	Non-financial	Both		
	Resource planning	Financial resources	Low	Moderate	High		
		Time resources	Low	Moderate	High		
		Personnel resources	Low	Moderate	High		
	Risk management	Solution quality risk	Low	Moderate	High		
		Loss of IP risk	Low	Moderate	High		
		Platform & Security Risk	Low	Moderate	High		
	Legal and IP management		Passive	Prudent	Persuasive	Possessive	
	Brand image impact		Low	Medium	High		
Success metrics		Quantitative	Qualitative	Both			

morphological box serves as a well-structured framework with different potential configurations, allowing managers to make well-informed decisions when designing crowdsourcing contests.

6 | DISCUSSION

Crowdsourcing contests are a promising and innovative approach in the field of open innovation to tap into a global pool of widely distributed external knowledge. In consideration of the fundamental phase of designing a crowdsourcing contest, this paper sought to answer the question that design-related factors organizations must consider. Existing literature informs practitioners about specific factors that help to succeed with crowdsourcing a task to an external crowd. However, the lack of a theory-based yet practicably applicable framework on crowdsourcing renders efficient crowdsourcing contest design a time-consuming effort. Therefore, by applying a decision-centric view, we provide a systematic review on design-related elements that help in guiding practitioners and future research.

6.1 | Theoretical implications

From a theoretical perspective, this study responds to the calls for further research regarding the 'lack of standardization' and the need for a 'comprehensive guideline' to better understand and manage crowdsourcing projects (Amrollahi, 2015; Neto & Santos, 2018). By synthesizing two distinct theoretical perspectives on crowdsourcing, social exchange theory and absorptive capacity, we provide an integrative conceptual approach that pursues the goal to determine which factors contribute to executing successful crowdsourcing contests.

Though many studies focus on the crowd participation motivation, and as such on the expected benefits (e.g. Acar, 2019; Zhao & Zhu, 2014a; Zheng et al., 2011), the crowdsourcing firm must also consider which costs it signals to the crowd by delineating the task (Ye & Kankanhalli, 2015). We draw on the principles of the social exchange theory to elaborate which potential costs the crowd perceives and argue that only when individual crowd members perceive a positive expected net gain from a cost-benefit analysis based on the information conveyed through the task description, they engage in

developing solutions. Thereby, we add to extant literature that the identified design elements cannot be considered sequentially, but our results indicate that they are closely related. Although a crowdsourcer must determine internal factors such as deciding on the evaluation process or a deliberate risk management, these factors impact the way how the crowdsourcer can describe the task and thereby convey the costs and benefits to the crowd in terms of time and effort versus intrinsic and extrinsic motivation.

Bayus (2013) shows that some firms are able to establish own crowdsourcing platforms and communities over time and thus establish long-term relationships with potential solvers who provide solutions to several crowdsourced tasks over time. This consideration adds to the idea of social exchange to develop a lasting relationship between two parties (Blau, 1964), and our results indicate that crowdsourcing is a learning experience for firms as well. Although crowdsourcers may initially utilize intermediary platforms to connect to the crowd, they gain experience in executing crowdsourcing contests and may establish their own platform over time. However, this implies that the crowdsourcer can benefit, or capture value, from the received solutions.

Thus, we add an absorptive capacity perspective in order to account for the value that organizations aim to create through crowdsourcing contests. Bloodgood (2013) emphasizes that capturing value is a fundamental issue that impacts the decision how to solve problems, with crowdsourcing being one approach. Thus, effective crowdsourcing requires certain organizational capabilities to capture value. We accounted for this consideration by integrating an absorptive capacity perspective to our research design. First, absorptive capacity is built through deliberate internal planning, referring to the crowdsourcer dimension in our morphological approach. Second, though the absorptive capacity primarily emerges from internal processes of the crowdsourcer, it impacts the way how the task can be communicated to the crowd. As such, crowdsourcers must be aware that building absorptive capacity should be part of the design process of a crowdsourcing contest, as it impacts the crowdsourced task and contributes to defining the solution space for the task. Thus, the concept of absorptive capacity is implicitly included in the task dimension, because task-related design decision may emerge or be based on internal decisions that aim to create the ability to capture value from the submitted solutions. This finding extends previous research that investigated the task-related elements by the perspective that the task description and delineation not only conveys the motivation to engage in crowdsourcing and provide high-quality solutions but also determines whether crowdsourcers can ultimately benefit from these solutions.

6.2 | Managerial implications

From a practical perspective, this paper provides several valuable insights for practitioners and managers undertaking crowdsourcing projects. In recent years, crowdsourcing contests have become an increasingly popular innovation management practice to leverage the knowledge and wisdom of external crowds. In spite of its widespread

adoption in practice, it is important to point out that not all crowdsourcing initiatives are an immediate success, and therefore, a thorough understanding of the underlying dynamics is crucial. This study specifically aims to bridge this gap by presenting an integrative account of the key design elements of a crowdsourcing contest. By adopting a morphological approach, this paper provides different configurations of crowdsourcing projects, allowing managers to choose alternative solutions for each design parameter. The findings of this study aim to serve a comprehensive guideline and blueprint through which managers can effectively carry out crowdsourcing contests and use this guideline as a checklist. Using the morphological approach presented in this study allows practitioners to consider elements that relate to both the crowd's motivation to engage in the crowdsourcing contest and the internal management of crowdsourcing. There are two central managerial implications that we derive from this study.

First, attracting the crowd requires a comprehensive perspective on the crowd's perception on associated costs and benefits for solving a task. Although the crowdsourcing firm can explicitly determine the extrinsic motivation in form of monetary rewards, the intrinsic motivation is more difficult to assess. However, intrinsic motivation plays a fundamental role, and the crowdsourcer can emphasize certain issues in the task description that relate to intrinsic motivation, such as promising feedback to submitted solutions (Hanine & Steils, 2019). Whereas motivation is one aspect that the crowd considers for participation in crowdsourcing, another aspect is the related costs in terms of time and effort that occur in the solution development. The crowdsourcer must make sure to provide adequate benefits, such that contingent on the task complexity, the rewards and incentives must be adapted accordingly. This requires that the crowdsourcing firm is aware of the complexity of the task and the potential expectations of the crowd. Sourcing specific knowledge to a complex problem might be more costly than sourcing diverse knowledge to a rather simple problem. This consideration must be addressed during the early design phase of a crowdsourcing contest in order to attract the right crowd members to develop high-quality solutions.

Second, crowdsourcing firms must define the factors that determine whether crowdsourcing a specific task ultimately can provide value to the firm. It may be particularly difficult for the crowdsourcer to determine the internal workload associated with conducting a crowdsourcing campaign (Hanine & Steils, 2019). Thus, a first step is to explicitly consider the related internal costs of resources, such as personnel. Moreover, the crowdsourcer must be aware whether the required knowledge sourced from the crowd should be local or distant to the firm, because the resulting crowdsourcing design is contingent on this requirement (Jespersen, 2018). When crowdsourcing a task is evaluated as promising based on an internal evaluation, the second requirement to capture value from crowdsourcing is to make sure to receive high-quality solutions. Thus, from a general perspective, capturing value comprises both the decision taken internally related to the organizational processes associated with crowdsourcing and the decisions taken related to the way how the task is communicated to the crowd.

6.3 | Limitations and future research

As with any systematic literature review, this paper is not without limitations. Although the morphological approach presents a structured overview of the potential design configurations, we acknowledge that it does not capture potential relationships or interdependencies between individual design options. Although this is a relevant aspect, we perceive these interdependencies to be beyond the scope of the current study due to the chosen morphological approach. Because designing a crowdsourcing campaign entails multifold interrelated decisions, future research is encouraged to explore the interrelationships among the various design elements, as certain decision taken might confine the decision opportunities for other elements. In particular, further research should investigate whether there is a certain hierarchy between design choices such that certain decisions taken early on consequently influence other decisions and thereby limit the decision space of other design elements.

A further limitation is related to crowd motivation. Though crowd motivation as a central factor for crowdsourcing is accounted for in this study, there are more potential advancements that can be made to the suggested morphology. We suggest that it could be interesting to investigate how the crowdsourcer can foster rewards that correspond to the intrinsic motivation of individuals to participate in crowdsourcing, for instance, how crowdsourcers can implement rewards in the design phase of a crowdsourcing contest that relate to the motivation of social recognition as a central intrinsic motivator (Hanine & Steils, 2019). This requires the crowdsourcer to understand the crowd composition and what determines prestige within the crowd communities. These rather subjective factors perceived by the crowd, for example, prestige within communities, cannot be directly designed by the crowdsourcer and thus are not included in the morphology. Although we are well aware that such scoping decisions also go along with excluding potentially relevant but more indirect effects of crowdsourcing design approaches, we perceive this to be beyond the scope of this study. We acknowledge that collaborative crowdsourcing models, which enable active discussions of participants and sharing of solutions and encourage community building, may increase community belonging and promote higher levels of solver activity and better solutions (Bayus, 2013; Boudreau & Lakhani, 2013; Hutter et al., 2011; Vuculescu & Bergenholtz, 2014). Though these aspects of design effects are certainly relevant, in the context of this paper, we primarily focus on innovation contests, wherein individuals compete with one another to develop the best solutions. Therefore, we chose to focus on central design aspects and their systematic development rather than aiming at the discussion of all potentially indirect effects of campaigns. The latter certainly deserves attention from further research. Our study thus provides an avenue for exploring relevant but more indirect effects of design decisions.

Moreover, because the primary focus of this study is on crowdsourcing contests for innovation, the results may be different in other crowdsourcing settings, such as open collaboration, micro-tasking or information pooling. Though we provide an initial starting

point, we encourage future research to investigate other types of crowdsourcing using the morphological box and adapt the box accordingly, if required.

Lastly, the morphological framework needs to be validated in a practical setting. Although the morphological approach is theory-based and derived from extant research, we see great potential in applying this approach to practice. Future research could test the framework on crowdsourcing contests to fill any gaps and strengthen the validity of the framework. Moreover, the morphological approach could serve to identify archetypes of crowdsourcing contests, which potentially demonstrate certain patterns across the morphological box presented in this study. This could serve to facilitate future crowdsourcing contests by defining the nature of the task, determining the crowdsourcing archetype and following the corresponding suggestions of the morphological framework.

DATA AVAILABILITY STATEMENT

Data sharing not applicable - no new data generated

ORCID

Rea Karachiwalla  <https://orcid.org/0000-0002-1852-8888>

Felix Pinkow  <https://orcid.org/0000-0002-3680-5682>

REFERENCES

- Acar, O. A. (2019). Motivations and solution appropriateness in crowdsourcing challenges for innovation. *Research Policy*, 48(8), 103716. <https://doi.org/10.1016/j.respol.2018.11.010>
- Adamczyk, S., Bullinger, A. C., & Möslein, K. M. (2012). Innovation contests: A review, classification and outlook. *Creativity and Innovation Management*, 21(4), 335–360. <https://doi.org/10.1111/caim.12003>
- Afuah, A., & Tucci, C. L. (2012). Crowdsourcing as a solution to distant search. *Academy of Management Review*, 37(3), 355–375. <https://doi.org/10.5465/amr.2010.0146>
- Allahbakhsh, M., Benatallah, B., Ignjatovic, A., Motahari-Nezhad, H. R., Bertino, E., & Dustdar, S. (2013). Quality control in crowdsourcing systems: Issues and directions. *IEEE Internet Computing*, 17(2), 76–81. <https://doi.org/10.1109/MIC.2013.20>
- Allon, G., & Babich, V. (2020). Crowdsourcing and crowdfunding in the manufacturing and services sectors. *Manufacturing & Service Operations Management*, 22(1), 102–112. <https://doi.org/10.1287/msom.2019.0825>
- Amrollahi, A. (2015). A process model for crowdsourcing: Insights from the literature on implementation. In: Australasian Conference on Information Systems, Adelaide. <https://arxiv.org/pdf/1605.04695>
- Ayaburi, E. W., Lee, J., & Maasberg, M. (2020). Understanding crowdsourcing contest fitness strategic decision factors and performance: An expectation-confirmation theory perspective. *Information Systems Frontiers*, 22(5), 1227–1240. <https://doi.org/10.1007/s10796-019-09926-w>
- Bayus, B. L. (2013). Crowdsourcing new product ideas over time: An analysis of the Dell IdeaStorm community. *Management Science*, 59(1), 226–244. <https://doi.org/10.1287/mnsc.1120.1599>
- Blau, P. M. (1964). *Exchange and power in social life*. John Wiley & Sons, Inc.
- Blohm, I., Leimeister, J. M., & Krcmar, H. (2013). Crowdsourcing: How to benefit from (too) many great ideas. *MIS Quarterly Executive*, 12(4), 199–211.
- Blohm, I., Zogaj, S., Bretschneider, U., & Leimeister, J. M. (2018). How to manage crowdsourcing platforms effectively? *California*

- Management Review*, 60(2), 122–149. <https://doi.org/10.1177/0008125617738255>
- Bloodgood, J. (2013). Crowdsourcing: Useful for problem solving, but what about value capture? *Academy of Management Review*, 38(3), 455–457. <https://doi.org/10.5465/amr.2012.0318>
- Bogers, M., & West, J. (2012). Managing distributed innovation: Strategic utilization of open and user innovation. *Creativity and Innovation Management*, 21(1), 61–75. <https://doi.org/10.1111/j.1467-8691.2011.00622.x>
- Boons, M., & Stam, D. (2019). Crowdsourcing for innovation: How related and unrelated perspectives interact to increase creative performance. *Research Policy*, 48(7), 1758–1770. <https://doi.org/10.1016/j.respol.2019.04.005>
- Boudreau, K. J., Lacetera, N., & Lakhani, K. R. (2011). Incentives and problem uncertainty in innovation contests: An empirical analysis. *Management Science*, 57(5), 843–863. <https://doi.org/10.1287/mnsc.1110.1322>
- Boudreau, K. J., & Lakhani, K. R. (2013). Using the crowd as an innovation partner. *Harvard Business Review*, 91(4), 60–69, 140.
- Brabham, D. C. (2008). Crowdsourcing as a model for problem solving. *Convergence: The International Journal of Research into New Media Technologies*, 14(1), 75–90. <https://doi.org/10.1177/1354856507084420>
- Brabham, D. C. (2009). Crowdsourcing the public participation process for planning projects. *Planning Theory*, 8(3), 242–262. <https://doi.org/10.1177/1473095209104824>
- Brabham, D. C. (2010). Moving the crowd at Threadless. *Information, Communication & Society*, 13(8), 1122–1145. <https://doi.org/10.1080/13691181003624090>
- Camacho, N., Nam, H., Kannan, P. K., & Stremersch, S. (2019). Tournaments to crowdsource innovation: The role of moderator feedback and participation intensity. *Journal of Marketing*, 83(2), 138–157. <https://doi.org/10.1177/0022242918809673>
- Cappa, F., Oriani, R., Pinelli, M., & de Massis, A. (2019). When does crowdsourcing benefit firm stock market performance? *Research Policy*, 48(9), 103825. <https://doi.org/10.1016/j.respol.2019.103825>
- Chan, K. W., Li, S. Y., Ni, J., & Zhu, J. J. (2021). What feedback matters? The role of experience in motivating crowdsourcing innovation. *Production and Operations Management*, 30(1), 103–126. <https://doi.org/10.1111/poms.13259>
- Chen, L., Xu, P., & Liu, D. (2020). Effect of crowd voting on participation in crowdsourcing contests. *Journal of Management Information Systems*, 37(2), 510–535. <https://doi.org/10.1080/07421222.2020.1759342>
- Chen, P.-Y., Pavlou, P., Wu, S., & Yang, Y. (2021). Attracting high-quality contestants to contest in the context of crowdsourcing contest platform. *Production and Operations Management. Advance Online Publication*. <https://doi.org/10.1111/poms.13340>
- Chesbrough, H. W. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business School Press.
- Chesbrough, H. W., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In H. W. Chesbrough, W. Vanhaverbeke, & J. West (Eds.), *New frontiers in open innovation* (pp. 3–28). Oxford University Press.
- Christensen, I., & Karlsson, C. (2019). Open innovation and the effects of crowdsourcing in a pharma ecosystem. *Journal of Innovation & Knowledge*, 4(4), 240–247. <https://doi.org/10.1016/j.jik.2018.03.008>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 35(1), 128. <https://doi.org/10.2307/2393553>
- Colombo, G., Buganza, T., Klanner, I.-M., & Roiser, S. (2013). Crowdsourcing intermediaries and problem typologies: An explorative study. *International Journal of Innovation Management*, 17(02), 1350005. <https://doi.org/10.1142/S1363919613500059>
- Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An interdisciplinary review. *Journal of Management*, 31(6), 874–900. <https://doi.org/10.1177/0149206305279602>
- de Beer, J., McCarthy, I. P., Soliman, A., & Treen, E. (2017). Click here to agree: Managing intellectual property when crowdsourcing solutions. *Business Horizons*, 60(2), 207–217. <https://doi.org/10.1016/j.bushor.2016.11.002>
- Diener, K., & Piller, F. (2013). The market for open innovation. Raleigh, NC, USA: Lulu. <https://doi.org/10.13140/RG.2.2.24961.35682>
- Enkel, E., Gassmann, O., & Chesbrough, H. W. (2009). Open R&D and open innovation: Exploring the phenomenon. *R&D Management*, 39(4), 311–316. <https://doi.org/10.1111/j.1467-9310.2009.00570.x>
- Estellés-Arolas, E., & González-Ladrón-de-Guevara, F. (2012). Towards an integrated crowdsourcing definition. *Journal of Information Science*, 38(2), 189–200. <https://doi.org/10.1177/0165551512437638>
- eYeka. (2015). The state of crowdsourcing in 2015. <https://eyeka.pr.co/99215-eyeka-releases-the-state-of-crowdsourcing-in-2015-trend-report>
- Foege, J. N., Lauritzen, G. D., Tietze, F., & Salge, T. O. (2019). Reconceptualizing the paradox of openness: How solvers navigate sharing-protecting tensions in crowdsourcing. *Research Policy*, 48(6), 1323–1339. <https://doi.org/10.1016/j.respol.2019.01.013>
- Ford, R. C., Richard, B., & Ciuchta, M. P. (2015). Crowdsourcing: A new way of employing non-employees? *Business Horizons*, 58(4), 377–388. <https://doi.org/10.1016/j.bushor.2015.03.003>
- Frey, K., Lüthje, C., & Haag, S. (2011). Whom should firms attract to open innovation platforms? The role of knowledge diversity and motivation. *Long Range Planning*, 44(5–6), 397–420. <https://doi.org/10.1016/j.lrp.2011.09.006>
- Gao, H., Wang, X., Barbier, G., & Liu, H. (2011). Promoting coordination for disaster relief – From crowdsourcing to coordination. In J. Salerno, S. J. Yang, D. Nau, & S.-K. Chai (Eds.), *Social computing, behavioral-cultural modeling and prediction: 4th international conference, SBP 2011, College Park, MD, USA, March 29-31, 2011; proceedings* (Vol. 6589). Lecture Notes in Computer Science. (pp. 197–204). Springer.
- García Martínez, M. (2017). Inspiring crowdsourcing communities to create novel solutions: Competition design and the mediating role of trust. *Technological Forecasting and Social Change*, 117, 296–304. <https://doi.org/10.1016/j.techfore.2016.11.015>
- Gassenheimer, J. B., Siguaw, J. A., & Hunter, G. L. (2013). Exploring motivations and the capacity for business crowdsourcing. *AMS Review*, 3(4), 205–216. <https://doi.org/10.1007/s13162-013-0055-8>
- Geiger, D., & Schader, M. (2014). Personalized task recommendation in crowdsourcing information systems—Current state of the art. *Decision Support Systems*, 65, 3–16. <https://doi.org/10.1016/j.dss.2014.05.007>
- Ghezzi, A., Gabbelloni, D., Martini, A., & Natalicchio, A. (2018). Crowdsourcing: A review and suggestions for future research. *International Journal of Management Reviews*, 20(2), 343–363. <https://doi.org/10.1111/ijmr.12135>
- Gillier, T., Chaffois, C., Belkhouja, M., Roth, Y., & Bayus, B. L. (2018). The effects of task instructions in crowdsourcing innovative ideas. *Technological Forecasting and Social Change*, 134, 35–44. <https://doi.org/10.1016/j.techfore.2018.05.005>
- Görzen, T. (2021). “What’s the point of the task?” exploring the influence of task meaning on creativity in crowdsourcing. *International Journal of Innovation Management*, 25(01), 2150007. <https://doi.org/10.1142/S1363919621500079>
- Hanine, S., & Steils, N. (2019). Ideation contests: Crowd management and valorization to avoid negative feelings of participants. *Creativity and Innovation Management*, 28(4), 425–435. <https://doi.org/10.1111/caim.12325>
- Hetmank, L. (2013). Components and functions of crowdsourcing systems – A systematic literature review. In: *Wirtschaftsinformatik Proceedings 2013*.
- Hossain, M. (2015). Crowdsourcing in business and management disciplines: An integrative literature review. *Journal of Global Entrepreneurship Research*, 5(1). <https://doi.org/10.1186/s40497-015-0039-2>

- Hosseini, M., Phalp, K., Taylor, J., & Ali, R. (2014). The four pillars of crowdsourcing: A reference model. In M. Bajec (Ed.), *2014 IEEE eighth international conference on research challenges in information science (RCIS): Marrakech, Morocco, 28-30 May 2014* (pp. 1–12). IEEE.
- Howe, J. (2006). The rise of crowdsourcing. *Wired Magazine*, 14(6), 1–4.
- Hutter, K., Hautz, J., Füller, J., Mueller, J., & Matzler, K. (2011). Communitition: The tension between competition and collaboration in community-based design contests. *Creativity and Innovation Management*, 20(1), 3–21. <https://doi.org/10.1111/j.1467-8691.2011.00589.x>
- Jeppesen, L. B., & Lakhani, K. R. (2010). Marginality and problem-solving effectiveness in broadcast search. *Organization Science*, 21(5), 1016–1033. <https://doi.org/10.1287/orsc.1090.0491>
- Jespersen, K. R. (2018). Crowdsourcing design decisions for optimal integration into the company innovation system. *Decision Support Systems*, 115, 52–63. <https://doi.org/10.1016/j.dss.2018.09.005>
- Jian, L., Yang, S., Ba, S., Lu, L., & Jiang, L. C. (2019). Managing the crowds: The effect of prize guarantees and in-process feedback on participation in crowdsourcing contests. *MIS Quarterly*, 43(1), 97–112. <https://doi.org/10.25300/MISQ/2019/13649>
- Kazman, R., & Chen, H.-M. (2009). The metropolis model a new logic for development of crowdsourced systems. *Communications of the ACM*, 52(7), 76–84. <https://doi.org/10.1145/1538788.1538808>
- Koh, T. K. (2019). Adopting seekers' solution exemplars in crowdsourcing ideation contests: Antecedents and consequences. *Information Systems Research*, 30(2), 486–506. <https://doi.org/10.1287/isre.2018.0810>
- Kohler, T. (2015). Crowdsourcing-based business models: How to create and capture value. *California Management Review*, 57(4), 63–84. <https://doi.org/10.1525/cmr.2015.57.4.63>
- Lee, C., Chan, C. Y., Ho, S., Choy, K. L., & Ip, W. H. (2015). Explore the feasibility of adopting crowdsourcing for innovative problem solving. *Industrial Management & Data Systems*, 115(5), 803–832. <https://doi.org/10.1108/IMDS-09-2014-0249>
- Leicht, N., Durward, D., Haas, P., Zogaj, S., Blohm, I., & Leimeister, J. M. (2016). An empirical taxonomy of crowdsourcing intermediaries. *Academy of Management Proceedings*, 2016(1), 17518. <https://doi.org/10.5465/ambpp.2016.17518abstract>
- Leimeister, J. M., Huber, M., Bretschneider, U., & Krcmar, H. (2009). Leveraging crowdsourcing: Activation-supporting components for IT-based ideas competition. *Journal of Management Information Systems*, 26(1), 197–224. <https://doi.org/10.2753/mis0742-1222260108>
- Li, D., & Hu, L. (2017). Exploring the effects of reward and competition intensity on participation in crowdsourcing contests. *Electronic Markets*, 27(3), 199–210. <https://doi.org/10.1007/s12525-017-0252-7>
- Liu, S., Xia, F., Zhang, J., Pan, W., & Zhang, Y. (2016). Exploring the trends, characteristic antecedents, and performance consequences of crowdsourcing project risks. *International Journal of Project Management*, 34(8), 1625–1637. <https://doi.org/10.1016/j.ijproman.2016.09.002>
- Liu, S., Xia, F., Zhang, J., & Wang, L. (2016). How crowdsourcing risks affect performance: An exploratory model. *Management Decision*, 54(9), 2235–2255. <https://doi.org/10.1108/MD-12-2015-0604>
- Lüttgens, D., Pollok, P., Antons, D., & Piller, F. (2014). Wisdom of the crowd and capabilities of a few: Internal success factors of crowdsourcing for innovation. *Journal of Business Economics*, 84(3), 339–374. <https://doi.org/10.1007/s11573-014-0723-7>
- Mack, T., & Landau, C. (2020). Submission quality in open innovation contests - An analysis of individual-level determinants of idea innovativeness. *R&D Management*, 50(1), 47–62. <https://doi.org/10.1111/radm.12345>
- Malone, T., Laubacher, R., & Dellarocas, C. (2010). The collective intelligence genome. *IEEE Engineering Management Review*, 38(3), 38–52. <https://doi.org/10.1109/EMR.2010.5559142>
- Mazzola, E., Acur, N., Piazza, M., & Perrone, G. (2018). “To own or not to own?” A study on the determinants and consequences of alternative intellectual property rights arrangements in crowdsourcing for innovation contests. *Journal of Product Innovation Management*, 35(6), 908–929. <https://doi.org/10.1111/jpim.12467>
- Mazzola, E., Piazza, M., Acur, N., & Perrone, G. (2020). Treating the crowd fairly: Increasing the solvers' self-selection in idea innovation contests. *Industrial Marketing Management*, 91, 16–29. <https://doi.org/10.1016/j.indmarman.2020.07.019>
- Muhdi, L., Daiber, M., Friesike, S., & Boutellier, R. (2011). The crowdsourcing process: An intermediary mediated idea generation approach in the early phase of innovation. *International Journal of Entrepreneurship and Innovation Management*, 14(4), 43052. <https://doi.org/10.1504/ijeim.2011.043052>
- Nakatsu, R. T., Grossman, E. B., & Iacovou, C. L. (2014). A taxonomy of crowdsourcing based on task complexity. *Journal of Information Science*, 40(6), 823–834. <https://doi.org/10.1177/0165551514550140>
- Natalicchio, A., Messeni Petruzzelli, A., & Garavelli, A. C. (2017). Innovation problems and search for solutions in crowdsourcing platforms – A simulation approach. *Technovation*, 64–65, 28–42. <https://doi.org/10.1016/j.technovation.2017.05.002>
- Neto, F. R. A., & Santos, C. A. (2018). Understanding crowdsourcing projects: A systematic review of tendencies, workflow, and quality management. *Information Processing & Management*, 54(4), 490–506. <https://doi.org/10.1016/j.ipm.2018.03.006>
- Nirosh Kannangara, S., & Uguccioni, P. (2013). Risk management in crowdsourcing-based business ecosystems. *Technology Innovation Management Review*, 3(12), 32–38. <https://doi.org/10.22215/timreview/751>
- Okoli, C., & Schabram, K. (2010). A guide to conducting a systematic literature review of information systems research. *SSRN Electronic Journal. Advance Online Publication*. <https://doi.org/10.2139/ssrn.1954824>
- Paik, J. H., Scholl, M., Sergeev, R., Randazzo, S., & Lakhani, K. R. (2020). Innovation contests for high-tech procurement. *Research-Technology Management*, 63(2), 36–45. <https://doi.org/10.1080/08956308.2020.1707007>
- PD. (2018). Building together: How LEGO leverages crowdsourcing to sustain both innovation and brand love. HBS Digital Innovation and Transformation. <https://digital.hbs.edu/platform-digit/submission/building-together-how-lego-leverages-crowdsourcing-to-sustain-both-innovation-and-brand-love/>
- Pedersen, J., Kocsis, D., Tripathi, A., Tarrell, A., Weerakoon, A., Tahmasbi, N., Xiong, J., Deng, W., Oh, O., & de Vreede, G.-J. (2013). Conceptual foundations of crowdsourcing: A review of IS research. In: 2013 46th Hawaii International Conference on System Sciences (pp. 579–588). IEEE. <https://doi.org/10.1109/HICSS.2013.143>
- Pee, L. G., Koh, E., & Goh, M. (2018). Trait motivations of crowdsourcing and task choice: A distal-proximal perspective. *International Journal of Information Management*, 40, 28–41. <https://doi.org/10.1016/j.ijinfomgt.2018.01.008>
- Piezunka, H., & Dahlander, L. (2015). Distant search, narrow attention: How crowding alters organizations' filtering of suggestions in crowdsourcing. *Academy of Management Journal*, 58(3), 856–880. <https://doi.org/10.5465/amj.2012.0458>
- Piezunka, H., & Dahlander, L. (2019). Idea rejected, tie formed: Organizations' feedback on crowdsourced ideas. *Academy of Management Journal*, 62(2), 503–530. <https://doi.org/10.5465/amj.2016.0703>
- Pollok, P., Lüttgens, D., & Piller, F. T. (2019a). Attracting solutions in crowdsourcing contests: The role of knowledge distance, identity disclosure, and seeker status. *Research Policy*, 48(1), 98–114. <https://doi.org/10.1016/j.respol.2018.07.022>
- Pollok, P., Lüttgens, D., & Piller, F. T. (2019b). How firms develop capabilities for crowdsourcing to increase open innovation performance: The interplay between organizational roles and knowledge processes. *Journal of Product Innovation Management*, 36(4), 412–441. <https://doi.org/10.1111/jpim.12485>

- Ren, J., Han, Y., Genc, Y., Yeoh, W., & Popović, A. (2021). The boundary of crowdsourcing in the domain of creativity. *Technological Forecasting and Social Change*, 165, 120530. <https://doi.org/10.1016/j.techfore.2020.120530>
- Ritchey, T. (2006). Problem structuring using computer-aided morphological analysis. *The Journal of the Operational Research Society*, 57(7), 792–801. <https://doi.org/10.1057/palgrave.jors.2602177>
- Ritchey, T. (2013). *General morphological analysis: A general method for non-quantified modelling*. Swedish Morphological Society.
- Rouse, A. C. (2010). A preliminary taxonomy of crowdsourcing. In: ACIS 2010 Proceedings. <http://aisel.aisnet.org/acis2010/76>
- Ruiz, É., Brion, S., & Parmentier, G. (2020). Absorbing knowledge in the digital age: The key role of integration mechanisms in the context of crowdsourcing for innovation. *R&D Management*, 50(1), 63–74. <https://doi.org/10.1111/radm.12349>
- Salomo, S., Talke, K., & Strecker, N. (2008). Innovation field orientation and its effect on innovativeness and firm performance. *Journal of Product Innovation Management*, 25(6), 560–576. <https://doi.org/10.1111/j.1540-5885.2008.00322.x>
- Sauerwein, C., Gander, M., Felderer, M., & Breu, R. (2016). A systematic literature review of crowdsourcing-based research in information security. In 2016 IEEE Symposium on Service-Oriented System Engineering (SOSE) (pp. 364–371). IEEE. <https://doi.org/10.1109/SOSE.2016.67>
- Schäfer, S., Antons, D., Lüttgens, D., Piller, F., & Salge, T. O. (2017). Talk to your crowd. *Research-Technology Management*, 60(4), 33–42. <https://doi.org/10.1080/08956308.2017.1325689>
- Schäper, T., Foege, J. N., Nüesch, S., & Schäfer, S. (2021). Determinants of idea sharing in crowdsourcing: Evidence from the automotive industry. *R&D Management*, 51(1), 101–113. <https://doi.org/10.1111/radm.12429>
- Schenk, E., & Guittard, C. (2011). Towards a characterization of crowdsourcing practices. *Journal of Innovation Economics*, 7(1), 93. <https://doi.org/10.3917/jie.007.0093>
- Schenk, E., Guittard, C., & Pénin, J. (2019). Open or proprietary? Choosing the right crowdsourcing platform for innovation. *Technological Forecasting and Social Change*, 144, 303–310. <https://doi.org/10.1016/j.techfore.2017.11.021>
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104, 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- Steils, N., & Hanine, S. (2016). Creative contests: Knowledge generation and underlying learning dynamics for idea generation. *Journal of Marketing Management*, 32(17–18), 1647–1669. <https://doi.org/10.1080/0267257X.2016.1251956>
- Terwiesch, C., & Xu, Y. (2008). Innovation contests, open innovation, and multiagent problem solving. *Management Science*, 54(9), 1529–1543. <https://doi.org/10.1287/mnsc.1080.0884>
- Thuan, N. H., Antunes, P., & Johnstone, D. (2016). Factors influencing the decision to crowdsource: A systematic literature review. *Information Systems Frontiers*, 18(1), 47–68. <https://doi.org/10.1007/s10796-015-9578-x>
- Vuculescu, O., & Bergenholtz, C. (2014). How to solve problems with crowds: A computer-based simulation model. *Creativity and Innovation Management*, 23(2), 121–136. <https://doi.org/10.1111/caim.12059>
- Vukovic, M. (2009). Crowdsourcing for enterprises. In: 2009 Congress on Services - I (pp. 686–692). IEEE. <https://doi.org/10.1109/SERVICES-I.2009.56>
- Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), xiii–xxiii.
- Wooten, J. O., & Ulrich, K. T. (2017). Idea generation and the role of feedback: Evidence from field experiments with innovation tournaments. *Production and Operations Management*, 26(1), 80–99. <https://doi.org/10.1111/poms.12613>
- Ye, H., & Kankanhalli, A. (2015). Investigating the antecedents of organizational task crowdsourcing. *Information & Management*, 52(1), 98–110. <https://doi.org/10.1016/j.im.2014.10.007>
- Ye, H., & Kankanhalli, A. (2017). Solvers' participation in crowdsourcing platforms: Examining the impacts of trust, and benefit and cost factors. *The Journal of Strategic Information Systems*, 26(2), 101–117. <https://doi.org/10.1016/j.jsis.2017.02.001>
- Zhao, Y. C., & Zhu, Q. (2014a). Effects of extrinsic and intrinsic motivation on participation in crowdsourcing contest. *Online Information Review*, 38(7), 896–917. <https://doi.org/10.1108/OIR-08-2014-0188>
- Zhao, Y. C., & Zhu, Q. (2014b). Evaluation on crowdsourcing research: Current status and future direction. *Information Systems Frontiers*, 16(3), 417–434. <https://doi.org/10.1007/s10796-012-9350-4>
- Zheng, H., Li, D., & Hou, W. (2011). Task design, motivation, and participation in crowdsourcing contests. *International Journal of Electronic Commerce*, 15(4), 57–88. <https://doi.org/10.2753/jec1086-4415150402>
- Zheng, H., Xie, Z., Hou, W., & Li, D. (2014). Antecedents of solution quality in crowdsourcing: The sponsor's perspective. *Journal of Electronic Commerce Research*, 15(3), 212–224.
- Zogaj, S., Bretschneider, U., & Leimeister, J. M. (2014). Managing crowdsourced software testing: A case study based insight on the challenges of a crowdsourcing intermediary. *Journal of Business Economics*, 84(3), 375–405. <https://doi.org/10.1007/s11573-014-0721-9>
- Zwicky, F. (1969). *Discovery, invention, research through the morphological approach*. Macmillan.

AUTHOR BIOGRAPHIES

Rea Karachiwalla holds a Master of Science from the European School of Management and Technology in Berlin. Since 2018, she is an industrial PhD candidate at the Chair of Technology and Innovation Management at Technische Universität Berlin. Working alongside in a large automotive company, her primary interests are the operationalization of new innovation methods and tools. Her main research focus is open innovation and crowdsourcing, in particular exploring the design of crowdsourcing projects for innovation. Her work was presented at international conferences, such as the Innovation and Product Development Management Conference and the Open and User Innovation Conference.

Felix Pinkow holds a Master of Science in Management from University of Mannheim. Since 2018, he works as a Research Fellow and PhD candidate at the Chair of Technology and Innovation Management at Technische Universität Berlin. His primary research interests concern creativity and creative thinking processes, in particular the relationship between affect and creativity. Further research topics include open innovation, crowdsourcing, and crowdfunding. His work was presented at international conferences, such as the Innovation and Product Development Management Conference, the JPIM Research Forum, and the Open and User Innovation Conference.

How to cite this article: Karachiwalla R, Pinkow F.

Understanding crowdsourcing projects: A review on the key design elements of a crowdsourcing initiative. *Creat Innov Manag.* 2021;30:563–584. <https://doi.org/10.1111/caim.12454>