# Crowdsourcing: a systematic review of the literature using text mining

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## Abstract

**Purpose** – This study is a systematic literature review of crowdsourcing that aims to present the research evidence so far regarding the extent to which it can contribute to organisational performance and produce innovations and provide insights on how organisations can operationalise it successfully.

**Design/methodology/approach** – The systematic literature review revolved around a text mining methodology analysing 106 papers.

**Findings** – The themes identified are performance, innovation, operational aspects and motivations. The review revealed a few potential directions for future research in each of the themes considered.

**Practical implications** – This study helps researchers to consider the recent themes on crowdsourcing and identify potential areas for research. At the same time, it provides practitioners with an understanding of the usefulness and process of crowdsourcing and insights on what the critical elements are in order to organise a successful crowdsourcing project.

**Originality/value** – This study employed quantitative content analysis in order to identify the main research themes with higher reliability and validity. It is also the first review on crowdsourcing that incorporates the relevant literature on crowdfunding as a value-creation tool.

**Keywords** Crowdsourcing, Crowdfunding, Crowd venturing, Systematic literature review, Innovation, New product development, Platforms, Projects, Collective intelligence, Wisdom of the crowd

**Paper type** Literature review

## 1. Introduction

Crowdsourcing has recently received increasing attention from organisations and academics due to the opportunities it offers to firms for development and growth. These opportunities lie in easy access to distant human, social and network capital that can lead to value creation and efficient solutions. In the current rapidly changing environment, characterised by short product life cycles and high competition, it is challenging for ventures to survive and sustain competitive advantage. Therefore, they try to find efficient ways for problem-solving and acquiring resources in order to produce innovations and economic value. Access to multiple resources is necessary for both nascent and mature firms. For young ventures, the time between their conception and the revenue creation is critical and building a resource network which can accelerate this process is essential (Stayton and Mangematin, 2019). However, such access can also be significant even for mature ventures, which need to sustain or expand their

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market share. In such a context, crowdsourcing is an attractive proposition as it can enhance resources by opening up organisational boundaries to external actors (Afuah and Tucci, 2012). (Howe, 2009) was one of the first to describe crowdsourcing as the act of assigning a task that would be traditionally fulfilled by employees of a company to individuals or teams outside of an organisation, that is, outsourcing, but through an open-call invitation directed to a heterogeneous, indistinct and vast pool of people.

The crowdsourcing literature has grown over the years, with a number of reviews aiming to systematically and critically analyse it from different vantage points. For example, the review by (Assis Neto and Santos, 2018) focussed on the quality and workflow control aspects, while the work by (Estellés-Arolas *et al.*, 2015) suggested a typology. The review by (Hossain and Kauranen, 2015) primarily focussed on the applications and the work by (Ghezzi *et al.*, 2018) approached crowdsourcing as a process. Despite reviews covering a range of topics in this area, their coverage of crowdsourcing skills has been relatively scarce. Crowdfunding in previous reviews of crowdsourcing has either been presented exclusively as a category of crowdsourcing that is used to crowdsource financial value (Assis Neto and Santos, 2018; Estellés-Arolas *et al.*, 2015) or it has been completely excluded, which is also self-declared as a limitation (Ghezzi *et al.*, 2018; Hossain and Kauranen, 2015). It is broadly agreed that crowdfunding is more than an alternative form of finance, as it offers additional value to the different stakeholders (Alfiero *et al.*, 2014; Gleasure and Feller, 2016; Mollick and Robb, 2016; Short *et al.*, 2017). There is also consensus that in the future it will be even more established as a space that bridges the organisation's funding gap, market and knowledge (Alfiero *et al.*, 2014; Gleasure and Feller, 2016; Julien, 2007; Nucciarelli *et al.*, 2017; Short *et al.*, 2017).

Given the aforementioned, there is a need to adopt a wider stance. The objective of this paper is to present a holistic overview of the literature on online crowdsourcing. This is achieved by first highlighting what the evidence is for the value of the crowd as a solution provider and how this value can bring innovation results and increase the performance of a firm. Later, insights are presented regarding operational aspects and the construction and mobilisation of the crowd itself. In addition, the paper aims to illustrate the aforementioned perspective in online crowdfunding as an extended value-creation ecosystem. Based on this literature review, firms can get a better understanding on how crowdsourcing can be leveraged for organisational purposes. Furthermore, researchers can consider the literature areas and identify potential topics for future research. Last, this paper adopts a systematic approach that is based on a quantitative content analysis, making it possible to shed light on emerging themes with higher reliability and validity (Riffe, 2005; Short *et al.*, 2010).

This study is structured as follows. The next section presents the methodology that was employed to conduct the systematic literature review. The two sections following present the emerging themes derived from quantitative content analysis and the analysis of the research through the main categories identified. The final section concludes with recommendations for future research.

## 2. Methodology

A research literature review should have four main attributes: being systematic in the way it develops the methodology; being explicit by providing the process in detail; being comprehensive by covering the spectrum of the relevant research; being reproducible by allowing other scholars to understand it and use the same approach (Fink, 2005; Okoli and Schabram, 2010).

This literature review follows the guidelines recommended by (Tranfield *et al.*, 2003) in the direction of identifying published research work in the areas of crowdfunding and crowdsourcing. It consists of three stages: (1) planning the review, (2) conducting the review and (3) reporting and dissemination, which are adopted in this study, as depicted in Figure 1, and these are discussed more thoroughly in the following part of this section.

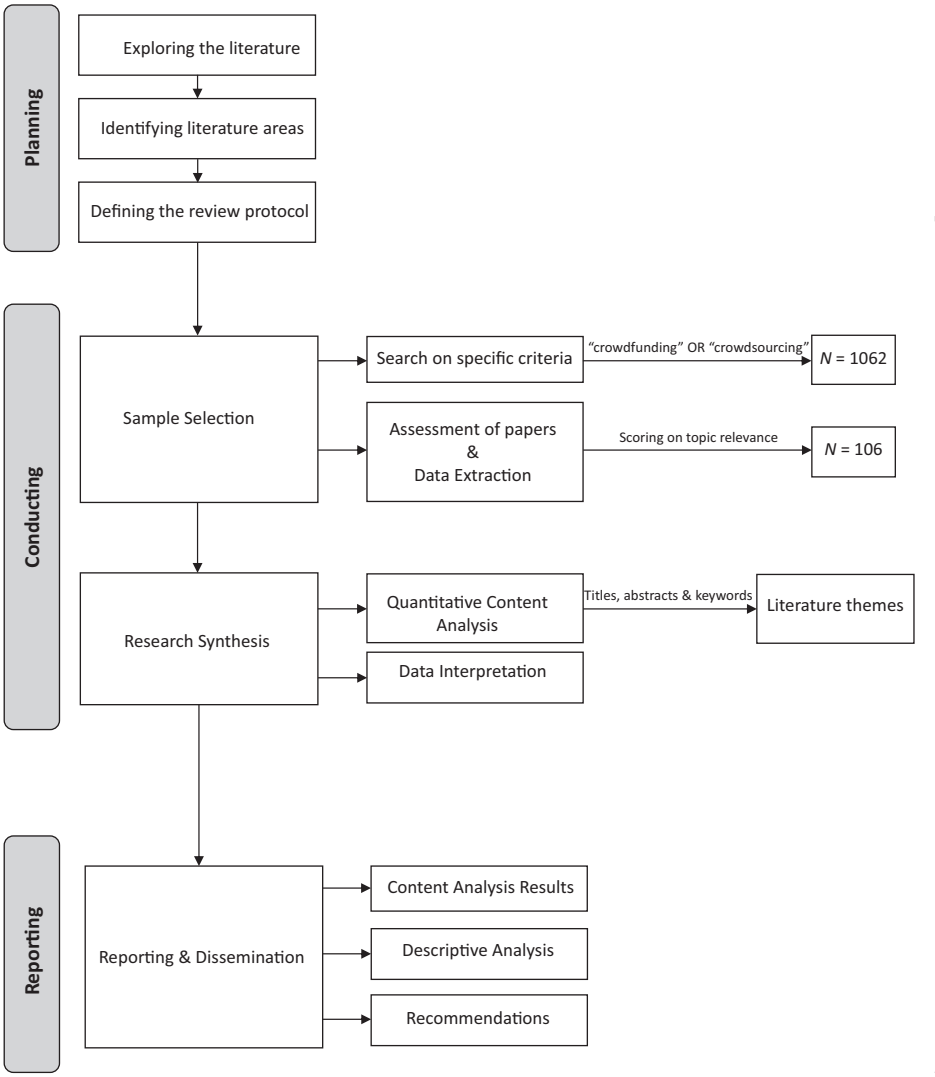


**Figure 1.**
Steps of the literature review process

*2.1 Planning the review*

During the planning step, an exploration of the subject was undertaken in order to gain a sense of the definitions, the main concepts and perspectives and to acquire a preliminary overview of the area. This was performed through an iterative process and concluded by implementing the subsequent review protocol based on the identified research gaps.

*2.2 Conducting the review*

In order to conduct the review, the tasks included searching the literature, assessing and extracting the most relevant papers and composing the research synthesis (Tranfield *et al.*, 2003). These are outlined further in turn.

Sample selection: The database search, conducted in August 2019, considered the title, abstract, keywords and context of the manuscripts using the terms "*crowdfunding*" or "*crowd funding*" or "*crowdsourcing*" or "*crowd sourcing*". The criteria of selection included that: (1) the language is English, (2) the papers are published in peer-reviewed journals and (3) the subject areas are limited to Business, Computer Science, Decision Sciences, Psychology and Economics and Social Sciences. The final number of the papers was 1062. The second step was conducted by two reviewers and included two rounds of assessment of papers through reviewing the titles, abstracts and keywords of the papers. This assessment was based on the relevance of the papers to the concept of crowdfunding or crowdsourcing and targeted studies that can make a theoretical contribution. Studies that were completely focussed on technical crowdsourcing applications were excluded. This process led to the final number of 106 papers.

Research synthesis: The synthesis stage is concerned with "*summarising, integrating, and, where possible, cumulating the findings of different studies on a topic*" (Tranfield *et al.*, 2003). This was performed through the method of quantitative content analysis (QCA), which employs systematic coding techniques in order to classify parts of text and draw inferences about the communication content (Krippendorff, 2004). QCA was utilised through QDA Miner software and its extension WordStat, which have been used successfully for text analysis across different domains of research (Al-Rawi, 2017; Davlembayeva *et al.*, 2019; Hartt, 2018). The main advantage of these tools lies in the fact that they combine a variety of well-established qualitative and quantitative measures, such as in Table 1, which allows for the verification and replicability of the process and results. They also accept and relate numerical to categorical data, allowing the creation and configuration of project-based dictionaries and integrating different types of text analysis visualisation that provide a comprehensive system for experimentation, development and finalisation of the analysis (Davlembayeva *et al.*, 2019). The source of this analysis included the titles, abstracts, keywords, author names and all the information about the paper's publication. The first step of QCA was content pre-processing and included removal of punctuation marks, symbols and common words, lemmatisation of the words, so as to count as a single word those that have common roots and high-frequency words that were not context related, such as "*journal*", "*paper*", "*article*", "*finding*", "*research*", "*study*", "*analysis*", "*reference*", "*gap*". This technique provided a fast, labour-efficient and accurate analysis of the major themes in the literature, but it does not offer an exhaustive representation of the secondary dimensions in each category. Thus further analysis is relied on combining the results with domain knowledge and the critical judgement of the researchers. The final analysis is presented in the Findings section below.

### *2.3 Reporting and dissemination*

The third stage of reporting and dissemination aims to present a summary of the results through descriptive statistics and offer insights into the different themes and perspectives covered in the literature. Figure 2 shows that the major stream of research on crowdsourcing starts in 2008 and demonstrates an extensive growth mainly after 2012. The topic has been approached from various methodological angles, as depicted in Figure 3.

## 3. Findings: themes on crowdsourcing

QCA was used to identify the most frequent terms that are encountered in the literature. Table 1 illustrates these terms along with the frequency with which they appear in the documents, the number and percentage of manuscripts in which they appear (No. Cases and % Cases respectively) and the Term Frequency–Inverse Document Frequency (TF IDF),

| | FREQUENCY | NO. CASES | % CASES | TF IDF |
|---|---|---|---|---|
| CROWDSOURCING | 489 | 97 | 86.61% | 30.5 |
| CROWD | 212 | 87 | 77.68% | 23.3 |
| CROWDFUNDING | 144 | 27 | 24.11% | 89 |
| INNOVATION | 109 | 36 | 32.14% | 53.7 |
| FIRMS | 99 | 39 | 34.82% | 45.4 |
| SOCIAL | 73 | 26 | 23.21% | 46.3 |
| ONLINE | 65 | 34 | 30.36% | 33.7 |
| IDEAS | 59 | 26 | 23.21% | 37.4 |
| DESIGN | 58 | 22 | 19.64% | 41 |
| KNOWLEDGE | 58 | 32 | 28.57% | 31.6 |
| FACTORS | 55 | 26 | 23.21% | 34.9 |
| PLATFORMS | 55 | 24 | 21.43% | 36.8 |
| PRODUCT | 54 | 17 | 15.18% | 44.2 |
| DEVELOPMENT | 52 | 26 | 23.21% | 33 |
| PROCESS | 52 | 34 | 30.36% | 26.9 |
| OPENINNOVATION | 51 | 29 | 25.89% | 29.9 |
| MOTIVATION | 50 | 17 | 15.18% | 40.9 |
| PARTICIPATION | 48 | 29 | 25.89% | 28.2 |
| CAPITAL | 46 | 14 | 12.50% | 41.5 |
| TASK | 43 | 17 | 15.18% | 35.2 |
| CROWDS | 42 | 27 | 24.11% | 25.9 |
| MODEL | 42 | 25 | 22.32% | 27.4 |
| PERFORMANCE | 42 | 19 | 16.96% | 32.4 |
| BUSINESS | 40 | 24 | 21.43% | 26.8 |
| PARTICIPANTS | 40 | 16 | 14.29% | 33.8 |
| QUALITY | 39 | 23 | 20.54% | 26.8 |
| IDEA | 36 | 21 | 18.75% | 26.2 |
| INFORMATION | 36 | 25 | 22.32% | 23.4 |
| OPEN | 36 | 20 | 17.86% | 26.9 |
| WORKERS | 36 | 13 | 11.61% | 33.7 |
| MARKET | 35 | 20 | 17.86% | 26.2 |
| TASKS | 35 | 19 | 16.96% | 27 |
| PROJECTS | 34 | 17 | 15.18% | 27.8 |
| WORK | 34 | 23 | 20.54% | 23.4 |
| INDIVIDUALS | 33 | 22 | 19.64% | 23.3 |
| ANALYSIS | 31 | 24 | 21.43% | 20.7 |
| CHALLENGES | 31 | 16 | 14.29% | 26.2 |
| UNDERSTANDING | 31 | 23 | 20.54% | 21.3 |
| COMMUNITY | 30 | 15 | 13.39% | 26.2 |
| CROWDSOURCED | 30 | 13 | 11.61% | 28.1 |
| MOTIVATIONS | 30 | 14 | 12.50% | 27.1 |
| RELATED | 30 | 18 | 16.07% | 23.8 |

**Table 1.** Literature's most frequent terms

which is a measure used to identify the words that are most frequent but relevant to the context (Aizawa, 2003). As expected, crowdsourcing and crowdfunding were among the most frequent terms. A surprising finding is that innovation is the first most frequent term after the topic terms, which reflects the high scholarly interest in using crowdsourcing, not as an instrument of execution of simple tasks, but for knowledge and value creation. The term frequency list also reveals the main stakeholders involved. Then, task, process, work, model, project refer to more operational aspects of the crowdsourcing activity, while innovation and product development refer to its objectives. Last, participation appears naturally to be of high frequency, as it is a prerequisite for crowdsourcing activity. Similarly, motivations appear frequently as they are the driving and engaging force to maintain participation.

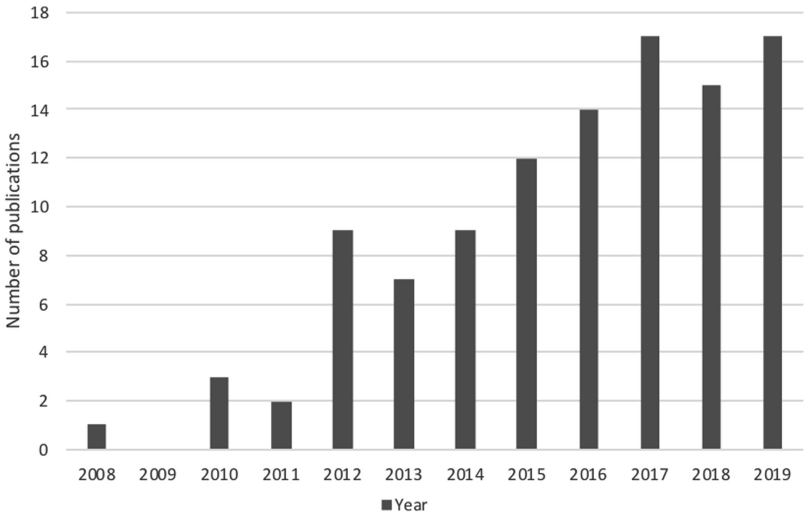


**Figure 2.**
Number of publications per year

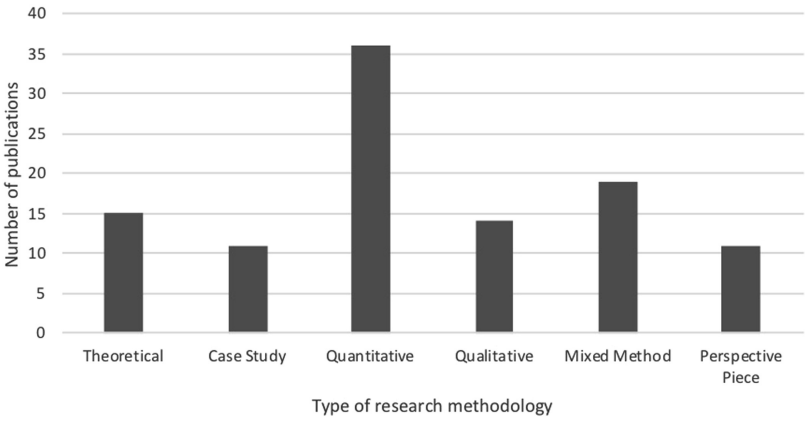


**Figure 3.**
Number of publications per research methodology

The dendrogram in Figure 4 shows in a hierarchical way which entities have high correlation between them based on their co-occurrence in research papers. The entities with the closer distance appear first in a cluster. For example, crowdsourcing and crowd are linked, and then this cluster is linked with a sprig with the next closest cluster and so on.

The last step of the content analysis was to perform a topic extraction (Table 2). Cluster analysis made it possible to organise the reporting of the literature into sections with higher validity and representativeness. These topics were thematically grouped further into larger categories, with each reviewed in the section following. For example, platforms, projects and crowd became sections of the category "operational", as all of those describe aspects related to the implementation of crowdsourcing activity. Open innovation and product development were placed under the category "innovation", as they consist of the two innovation applications of crowdsourcing. The cluster of social capital carries a semantic meaning that is cross-category; the social capital as a skill to attract, communicate and collaborate with

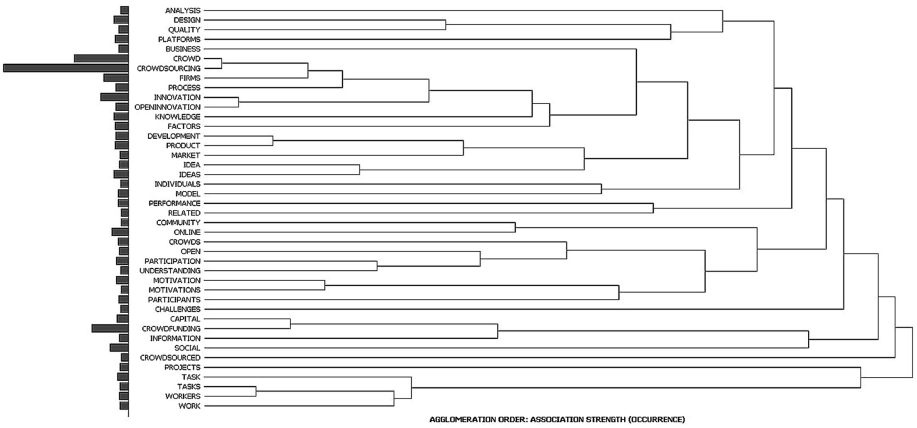


**Figure 4.**
Dendrogram

individuals is an ingredient of successful firms, projects, platforms and crowd participants, and thus it is discussed indirectly in all the sections.

## 4. Findings

### *4.1 Crowdsourcing performance*

The crowd as a solution provider and the role of the experts: Online crowdsourcing models became popular as the development of ICT empowered the swift communication and mobilisation of a high number of individuals across the globe, introducing higher efficiency in problem-solving. Such efficiency established the term "wisdom of the crowd", a reputation that comes from the performance of the crowd and the related benefits it provides to organisations. Crowds, being negatively characterised through history as non-thinking and easy-to-manipulate masses, started being seen as problem-solvers, innovators and conveyors of intelligence (Wexler, 2011). Performance benefits lie mainly in two dimensions: efficiency in processes and efficiency in quality. Efficiency in processes includes time and cost reduction. Time reductions are due to the fast aggregation of distributed value and the orchestration of simpler decomposed tasks or heterogeneous collaboration, in order to achieve more complex goals (Gruner and Power, 2017; Stol *et al.*, 2019). When it comes to quality efficiency, the wisdom of the crowd is a result of ideas aggregation. Such collective power has the ability to outshine the excellence of an individual performance (Brabham, 2010). The openness of participation and processes in crowdsourcing can result in knowledge-related benefits derived from a higher number of submissions, human intelligence and intuition, access to rare and specialised skills, knowledge diversity from high human diversity, knowledge sharing and verification (Franzoni and Sauermann, 2014). The wisdom of the crowd also lies in the ability to make successful judgements or evaluations with the crowd norm, counterbalancing outlying fallacies (Hervé and Schwienbacher, 2018). At the same time, the crowd can support the democratisation of access to services and capital. The contention is that the direct transactions between the two sides of a market help to supplant the traditional distribution channels and consequently lower the entry barriers for creators and organisations in the market of innovation, labour and investments. For instance, the crowd can provide opportunities in cases that experts would reject (Iyer *et al.*, 2015; Sørensen, 2012). Still, several scholars questioned whether the crowd can make valid contributions to innovation-driven and specialised projects, such as co-creating new products or making investment decisions, where traditionally the requirement for expert participation had been considered imperative (Ebel *et al.*, 2016; Hervé and Schwienbacher, 2018; Iyer *et al.*, 2015; Keongtae Kim and

**Table 2.**
Topic clusters

| THEME CLUSTER | | KEYWORDS | COHERENCE | FREQ | CASES | % CASES |
|---|---|---|---|---|---|---|
| CROWDSOURCING PERFORMANCE | CROWDSOURCING PERFORMANCE | QUALITY; PERFORMANCE; RELATED; MARKET; IDEA; IDEAS; MARKET PERFORMANCE | 0.347 | 72 | 32 | 28.57% |
| INNOVATION | CROWDSOURCING INNOVATION/ OPEN INNOVATION | INNOVATION; OPENINNOVATION; FIRMS; CROWDS; BUSINESS; CROWDSOURCING INNOVATION; INNOVATION PROCESS; FIRMS INNOVATION; BUSINESS MODEL; BUSINESS MODELS | 0.348 | 144 | 45 | 40.18% |
| | PRODUCT DEVELOPMENT | PRODUCT; DEVELOPMENT; IDEAS; DESIGN; PRODUCT DEVELOPMENT; PRODUCT DESIGN; PRODUCT IDEAS; DESIGN CROWDSOURCING | 0.297 | 97 | 26 | 23.21% |
| OPERATIONAL | CROWDSOURCING PLATFORMS | PLATFORMS; CROWDSOURCING; MODEL; ONLINE; DESIGN; CROWDSOURCING PLATFORMS; CROWDSOURCING CROWDSOURCING; ONLINE COMMUNITIES | 0.33 | 321 | 87 | 77.68% |
| | CROWD PROJECTS | OPEN; PROJECTS; CROWD; COMMUNITY; UNDERSTANDING; KNOWLEDGE; CROWD PROJECTS; OPEN SOURCE | 0.34 | 121 | 62 | 55.36% |
| | CROWD | WORKERS; TASK; TASKS; WORK; CROWD WORKERS | 0.274 | 65 | 21 | 18.75% |
| MOTIVATION FACTORS | MOTIVATION FACTORS | FACTORS; MOTIVATION; CROWDSOURCED; PARTICIPATION; MOTIVATION FACTORS; EXTRINSIC MOTIVATION | 0.297 | 81 | 28 | 25.00% |
| SOCIAL CAPITAL | SOCIAL CAPITAL | CAPITAL; SOCIAL; CROWDFUNDING; SOCIAL CAPITAL; INTELLECTUAL CAPITAL; TEAM PERFORMANCE | 0.238 | 119 | 33 | 29.46% |

Viswanathan, 2019; Poetz and Schreier, 2012; Walthoff-Borm *et al.*, 2018; Wang *et al.*, 2019; Zhu *et al.*, 2017). Other studies suggest that experts can play the role of "moderator" in order to bear the potential costs, such as task fulfilment uncertainty, lack of experienced perspective and ambiguous credibility (Lüttgens *et al.*, 2014; Muthukumaraswamy, 2010; O'Neil, 2010; Tran *et al.*, 2016; Walthoff-Borm *et al.*, 2018). Such a debate does not necessarily confute the crowd's reputation, because the crowd may also include experts (Brabham, 2012; Keongtae Kim and Viswanathan, 2019). Given the aforementioned, the literature supports the complementary nature of expert and crowd collaboration, in such a way that their collective inputs may lead to an extraordinary ferment.

Crowdsourcing skills to improve organisational and market performance: While one consideration is whether the crowd is able to provide substantial value to organisations, a transposed consideration is whether organisations can capitalise this value. By approaching crowdsourcing and crowdfunding as a value-creation tool, scholars have recently started exploring whether organisations can leverage on improving their organisational performance and ultimately their market performance. Concerning the first, there is evidence that companies which have high adaptive capacity are open to information signals from the crowd. As such, they can absorb external information in their knowledge and processes and manage to improve their innovation competences and organisational outputs (Gruner and Power, 2017; Stanko and Henard, 2017; Xu *et al.*, 2015). For example, the creation of a community around a product or service can lead to innovation-related benefits (Agrawal *et al.*, 2015; Lehner, 2013; Stanko and Henard, 2017). This is further reflected in the number of patent applications. Companies that fundraise through equity crowdfunding apply for a significantly higher number of patents compared to those that get funding from traditional institutions (Walthoff-Borm *et al.*, 2018).

Another recent area of research concerns the connection of crowdsourcing and crowdfunding with organisations' market performance, through either sales or capital investments. A crowdsourced product design improves usability and reliability and consequently increases sales (Allen *et al.*, 2018). In addition, products that are marketed as crowdsourced are found to sell more units because they are preferred for being co-created *by* consumers *for* the consumers (Nishikawa *et al.*, 2017). There is also evidence that under certain conditions firms that employ crowdsourcing can capture value further, as reflected in their fundraising, investments and future stock market performance (Cappa *et al.*, 2019a, b; Di Pietro *et al.*, 2018a; Hervé and Schwienbacher, 2018; Stanko and Henard, 2017; Xu *et al.*, 2015). For example, in the context of crowdfunding, when the crowd is involved in the campaign activities, this can help the company to bridge the funding gap and reach its funding goals (Agrawal *et al.*, 2015; Hong *et al.*, 2018; Mollick and Robb, 2016; Thürridl and Kamleitner, 2016; Vismara, 2016). Funders that believe in the success of a project or its social cause advocate for it on social media and help to attract more funds (Hong *et al.*, 2018; Kang *et al.*, 2017). In addition, the option of collaboration as a reward for a project's funders is linked with successful campaigns (Thürridl and Kamleitner, 2016). The effects of crowd involvement in the post-campaign outcome have also received attention recently with contradictory findings. Crowdfunding companies that leverage the crowd knowledge perform better when it comes to future rounds of fundraising. The knowledge acquisition, the trust of crowd investors in the potential of the company and the established demand from the early customers are perceived as innovation signals and act as "collateral" for future investors (Di Pietro *et al.*, 2018a; Hervé and Schwienbacher, 2018; Mollick, 2016; Roma *et al.*, 2017). Future stock market performance has also been found to be influenced by firms that engage in crowdsourcing as innovation-related activities are perceived as a promising signal by investors (Cappa *et al.*, 2019a, b). At the same time, though, crowdfunding companies that leverage on value creation are found to show higher post-campaign failure rates, a phenomenon worth studying further (Di Pietro *et al.*, 2018b; Walthoff-Borm *et al.*, 2018).

*4.2 Crowd innovation*

*4.2.1 Open innovation.* Maximising the knowledge search for increased innovation performance: Crowdsourcing is considered a major instrument for open innovation (Afuah and Tucci, 2012; Cappa *et al.*, 2019a, b; Lüttgens *et al.*, 2014). How open organisations are to successfully produce innovations is closely related to the degree to which they *search for knowledge, that is, open or knowledge search* and, more specifically, to the *breadth* and *depth* of knowledge search (Terjesen and Patel, 2017). Crowdsourcing can maximise the breadth and depth of knowledge search as it can extend searching to a theoretically "infinite" external space and resources (Afuah and Tucci, 2012). Depth of knowledge has been found to be linked to market performance and the breadth to radical innovation and product differentiation (Stanko and Henard, 2017). Crowdsourcing has also been approached as a form of innovation network that performs when three processes are enabled: knowledge mobility, which includes the facilitation of stimuli, information exchange and acquisition; secondly, innovation appropriability, as the ability to capture and distribute value in a fair way; and thirdly, dynamic stability of the innovation network, as an agile and sustainable engagement in innovation activities with strong adaptation to changes and entrance/exit of participants (Dhanaraj and Parkhe, 2006; Feller *et al.*, 2012).

Innovation enablers in crowdsourcing – crowd competences: A keystone for efficient innovation processes is to attract a big and diverse pool of contributors, as the more the sources, the more and better the concentrated knowledge (Afuah and Tucci, 2012; Allen *et al.*, 2018; Feller *et al.*, 2012; Hanine and Steils, 2019; Steils and Hanine, 2016). High participation can ensure sufficiency of submissions and bring a diversity of skills and backgrounds in order to promote thinking out of the box and the creation of new knowledge (Allen *et al.*, 2018; Feller *et al.*, 2012). In addition to creative thinking, diverse participants enable the efficient execution of tasks (Steils and Hanine, 2016). A number of studies have identified ways in which organisations can attract participants. An important example of such an approach is to activate the right motivations (Cappa *et al.*, 2019a, b; Ketonen-Oksi *et al.*, 2017; Lee *et al.*, 2015). Relevant participations have also been found to further enhance innovation processes and knowledge creation. For this reason firms with strong brands can be more successful in leveraging innovative outcomes, since they can attract relevant participants, already familiar with their activities (Cappa *et al.*, 2019a, b; Feller *et al.*, 2012; Steils and Hanine, 2016).

Depending on the crowdsourcing objective, the crowd may contribute to the three stages of innovation: idea generation, idea implementation and idea diffusion (Muller *et al.*, 2012; Scholz, 2015). Past research has identified what the required participants' characteristics are and how they are linked to better results in each of the aforementioned stages. The innovation processes and task execution require a great diversity of skills: technical, analytical, communicational and managerial (Steils and Hanine, 2016). Medium domain relevant skills (Mack and Landau, 2015) and an educational background that is at least partially related to the project were found in individuals who submit winning ideas, as background relevance helps individuals to have better understanding of the preferred outcome and thus provide more relevant ideas (Boons and Stam, 2019). Rewards are also linked with appropriateness of solutions and innovation performance (Acar, 2019; Mack and Landau, 2015). Surprisingly, although creativity is thought of as a seed of innovation, very creative individuals were not found to submit highly innovative ideas nor ideas that are selected by companies to get implemented (Mack and Landau, 2015; Zhu *et al.*, 2017). Creativity was only found to be related to a high degree of idea generation (Zhu *et al.*, 2014).

Innovation enablers in crowdsourcing – procedural aspects: Procedural aspects have been linked with the facilitation of innovation. An open call with diverse rewards can offer satisfaction to different types of individuals and attract diverse participants (Feller *et al.*, 2012; Saxton *et al.*, 2013). Moreover, the relationship of task description and participants' motivation has been explored. Lengthy descriptions that include more constraints are

perceived as a restriction on participation for reward-oriented individuals, but intrinsically motivated participants are not found to get influenced (Steils and Hanine, 2019).

After the open call, organisations need to facilitate innovation enablers throughout the crowdsourcing process. Sharing and highlighting information will allow participants to build on previously produced knowledge and perform knowledge combination and integration (Malhotra and Majchrzak, 2014). Additionally, community identification and social rapport, shared language and vision between the project team and the crowd empower the collaboration and are found to be important in producing product innovations (Eiteneyer *et al.*, 2019; Hanine and Steils, 2019). Facilitation of trust, justice and fairness in the crowdsourcing processes and fair distribution of ownership IP rights affect the willingness to participate and contribute towards the company's financial and reputational goals (Feller *et al.*, 2012; Franke *et al.*, 2013; Hanine and Steils, 2019; Ketonen-Oksi *et al.*, 2017).

*4.2.2 Product development.* Crowdsource for product development: Companies many times decide to crowdsource for new product development (NPD) (Allen *et al.*, 2018; Elia and Margherita, 2018; Zahay *et al.*, 2018; Zhu *et al.*, 2014). A number of academic papers have dealt with what drives managers to select crowdsourcing for NPD (Allen *et al.*, 2018; Gruner and Power, 2017; Ketonen-Oksi *et al.*, 2017; Zahay *et al.*, 2018). Innovation-related benefits connected with knowledge production are a core objective (Gruner and Power, 2017). Another reason is to refine a product in order to increase its perceived usability and meet consumer preferences (Allen *et al.*, 2018; Gruner and Power, 2017; Nishikawa *et al.*, 2017). Similarly, crowd funders may choose to run crowdfunding campaigns over traditional funding in order to elicit in parallel knowledge about consumer preferences (Nucciarelli *et al.*, 2017; Scholz, 2015). Managerial and organisational factors also affect whether to crowdsource for NPD. Corporate leadership might want to promote more informed decision-making (Zahay *et al.*, 2018). Moreover, the adaptive capability of the organisation influences how open a firm is to adopting new ways of creation and new processes for collaborations and the integration of new knowledge (Gruner and Power, 2017; Ketonen-Oksi *et al.*, 2017; Zahay *et al.*, 2018).

Different gain in different stages of product development: It is important to understand how beneficial and suitable crowdsourcing is for different stages of NPD. Findings have so far been ambiguous. On the one hand, there is evidence that companies many times crowdsource to find new product ideas (Bayus, 2012; Poetz and Schreier, 2012; Zhu *et al.*, 2017). Other studies conclude that companies might prefer first to sketch a prototype and then employ crowdsourcing to deal more efficiently with the increasing technical complexity or commercialisation (Allen *et al.*, 2018; Zahay *et al.*, 2018; Zhu *et al.*, 2014). One reason for this may be that crowdsourcing is relatively new for many organisations. In such cases organisations may want to create and test processes in an internal, safer environment and then use them to crowdsource externally (Zahay *et al.*, 2018). In general, a common practice among inexperienced firms is to perform pilot crowdsourcing projects first (Zahay *et al.*, 2018).

Another consideration is whether crowdsourcing is more suitable for front-end innovation or for product refinements at the later stages of testing and commercialisation. Evidence shows that companies that are in later stages of product development can still benefit from radical innovation (Stanko and Henard, 2017). The value that can be added in each stage of the product development depends on several factors. For example, for certain product features, crowdsourcing can contribute towards improving perceived usability and reliability throughout all the development stages (Allen *et al.*, 2018). Interestingly, perceived usability does increase not only because of actual feature refinements, but also as a result of consumers' assumptions on the value of products that are marketed as "crowdsourced" (Nishikawa *et al.*, 2017).

*4.3 Operational*

*4.3.1 Platforms.* Platforms facilitating value creation as solver brokerages: Online crowdsourcing is carried out by platforms which act as intermediaries between organisations and the crowd. Their characteristics can combine the characteristics of an online marketplace and an online community to varying extents (Marjanovic *et al.*, 2012; Zogaj *et al.*, 2014). They can accommodate the participants' listings, realise their agreements, enable incentives, participation and value creation while they obtain commission for their services (Ford *et al.*, 2015; Marjanovic *et al.*, 2012; Taylor and Joshi, 2019; Zogaj *et al.*, 2014). The extent to which the platforms provide a conducive space for communication within the value-creation process defines how much platforms shift towards the community side (à Campo *et al.*, 2019).

Based on the mediating role they take up in the value-creation process, there are three categories of crowdsourcing platforms (Kohler, 2015). First, platform integrators, which "buy" value from the crowd and "sell" it to companies, such as platforms that support crowdsourcing contests (Kohler, 2015). Then, product platforms, which resemble online collaborative communities, as open source communities, and aim to call the crowd to work on specific product refinements and then sell it to the market (Kohler, 2015). Last, multi-sided platforms with which the crowd and the crowdsourcers interact directly (Kohler, 2015). Crowdsourcing platforms have the mission to provide a solver brokerage system built on three pillars: a good network, appropriate knowledge facilitation and partnerships empowerment (Feller *et al.*, 2012; Yuan and Hsieh, 2018). A good network is necessary to provide organisations with a pool of a high number and high variety of individuals, skills and talents, which are requisites for co-creation (Schmidt and Jettinghoff, 2016; Yuan and Hsieh, 2018; Zogaj *et al.*, 2014). When the matching of appropriate actors is secured, knowledge facilitation mechanisms are necessary to ensure a productive crowdsourcing process. This includes all the digital affordances for knowledge management: sharing, organising, evaluating and storing (Yuan and Hsieh, 2018; Zogaj *et al.*, 2014). Partnership empowerment refers to maintaining participation and engagement to fulfil the process (Yuan and Hsieh, 2018). There are many factors that can help to build these three pillars. An accommodating platform design is the ground to build on and this translates into several elements. A digital brand name with a clear purpose and good reputation helps to attract relevant stakeholders (à Campo *et al.*, 2019). In addition, user-friendly website design helps to broaden participation by offering an inclusive environment for the less technology-skilled participants (Deng *et al.*, 2016; Niu *et al.*, 2019). A high variety of functions can also enhance the crowdsourcing activity (à Campo *et al.*, 2019; Deng *et al.*, 2016; Kohler, 2018; Niu *et al.*, 2019; Schmidt and Jettinghoff, 2016; Zogaj *et al.*, 2014).

In addition to efficient performance of the crowdsourcing platforms, these three pillars are also important for their expansion. Network effects bring more participants, contribute to knowledge facilitation and create resilience to deal with fluctuations in the activity of crowd members (Kohler, 2018). Network effects depend on the availability of relevant stakeholders, which determines not only the expansion of platforms, but also the platform creation itself (Dushnitsky *et al.*, 2016). For example, there is a higher probability for a crowdfunding platform to flourish in countries where the market is big and there is entrepreneurial orientation (Dushnitsky *et al.*, 2016).

*4.3.2 Projects.* The practical objectives of crowdsourcing can remain unfulfilled due to problems associated with project design and execution. Thus, attention is needed throughout all the stages of crowdsourcing to planning, open call, running the activity and evaluating the results (Chiu *et al.*, 2014).

Pre-activity decisions on how to crowdsource/on participation and task execution: The decision-making for designing a fruitful project is determined by four areas: user participation, the type of the task, process management and the expected outcome (Chiu *et al.*, 2014; Saxton

*et al.*, 2013; Ye and Kankanhalli, 2013). User participation can be in the form of open/closed collaboration or competing challenges (Chiu *et al.*, 2014; Ye and Kankanhalli, 2013). In open collaboration, the requirements are absent or loose (Chiu *et al.*, 2014; Ye and Kankanhalli, 2013). This type of participation is more suitable for tasks that are harder to decompose, have less defined goals and accumulation of knowledge through cooperation is an objective (Niu *et al.*, 2019; Ye and Kankanhalli, 2013). In the closed type of collaboration organisations apply strict criteria or pre-screening of candidates (Chiu *et al.*, 2014; Ye and Kankanhalli, 2013). Closed collaboration is preferable for problems that need longer time to get solved (Niu *et al.*, 2019; Ye and Kankanhalli, 2013). Competing challenges, on the other hand, do not promote collaboration and the task has clearly defined requirements and outcomes (Chiu *et al.*, 2014; Ye and Kankanhalli, 2013). They are most suitable for tasks where the evaluation of submissions is easier and the initiator expects high diversity of solutions (Chiu *et al.*, 2014; Niu *et al.*, 2019; Ye and Kankanhalli, 2013). After choosing the type of participation, organisations need to select the right model, by taking into account the nature of the expected outcome, whether it is objective (e.g. microtasking) or subjective (e.g. idea crowdsourcing), whether the submissions need to be aggregated (e.g. votes) or filtered (e.g. creative solutions), where the crowd will originate from, inside or outside the organisation, the form of co-creation, collaborative or independent, and the IT platform, inhouse or external (Ford *et al.*, 2015; Prpić *et al.*, 2015). Another consideration is whether to use paid or unpaid crowdsourcing. In unpaid crowdsourcing, recruiting participants can be more challenging and delivering the task more time demanding (Borromeo and Toyama, 2016). Special attention is required to choose a task that is realistic and solvable and can be defined and decomposed (Ford *et al.*, 2015; Lüttgens *et al.*, 2014). Last, focussing on one project at a time and creating a preliminary baseline for the crowd to work on have also been considered as success factors (Stol *et al.*, 2019; Tran *et al.*, 2016; Zahay *et al.*, 2018; Zhu *et al.*, 2014).

Designing the call for participation and orchestrating the activity: Following planning, a project announces an open call for participation. A precise description with timeline, requirements and expected goal makes it easy for an individual to assess whether they are interested and suitable for the project (Bush and Balven, 2018; Girdauskiene *et al.*, 2015; Niu *et al.*, 2019; Tokarchuk *et al.*, 2012). At the same time, incentives should be realistic and IP policy needs to be stated clearly to indicate that the participants' effort will be valued and not misused (Franke *et al.*, 2013; Hanine and Steils, 2019; Zogaj *et al.*, 2014). Last, task instructions need to reflect the nature of the expected solution and how it balances the specificity of the outcome, for example, feasibility over creativity (Steils and Hanine, 2016).

Running a crowdsourcing activity is a multidimensional mission. Selecting participants and assigning the tasks, if needed, can be either based on self-selection, on a qualification test or on experts' evaluation of the participants' personality, skills and experience (Dissanayake *et al.*, 2015; Niu *et al.*, 2019; Stol *et al.*, 2019; Tran *et al.*, 2016). In addition, recognition as an acknowledgement, reward or social approbation honours participants' effort and motivates them to do their best (Bush and Balven, 2018; Hanine and Steils, 2019; Schäfer *et al.*, 2017). Effective communication, combined with transparent regulations and procedures, promotes accountability and trust (Hanine and Steils, 2019). Building trust safeguards against knowledge spill overs (Zogaj *et al.*, 2014). Among the best practices are the ongoing monitoring of the process and allowing revisions (Ebel *et al.*, 2016; Zogaj *et al.*, 2014). Assigning employees of the organisation or crowd members as crowd leaders is also suggested (Ford *et al.*, 2015; Franzoni and Sauermann, 2014; Lüttgens *et al.*, 2014). Crowd leaders resemble project managers. They help to facilitate the process and motivate the participants. Social facilitation and interaction can be helpful, especially in tasks that have a higher degree of interdependencies and crowd members need to be aware of other people's progress (Feyisetan and Simperl, 2017; Ford *et al.*, 2015; Franzoni and Sauermann, 2014; Niu *et al.*, 2019; Tran *et al.*, 2016).

Validating and integrating new knowledge: Validating or evaluating the results can be either an internal corporate process or carried out by the crowd community (Niu *et al.*, 2019; Stol *et al.*, 2019). Companies may evaluate the results manually, by assigning the work to employees or experts, or perform it automatically by using quality assurance tools (Niu *et al.*, 2019; Stol *et al.*, 2019). Another way is community evaluation, where the crowd performs validation by rating, voting or testing as in a peer-reviewed process, sometimes followed by a secondary validation from experts (Niu *et al.*, 2019; Stol *et al.*, 2019). Data validation is quite important not only to ensure the correctness or appropriability of a solution, but also the originality (Stol *et al.*, 2019). Submitting "stolen" solutions can result in reputation-related consequences or IP rights disputes (Stol *et al.*, 2019).

Sometimes solution seekers, overwhelmed by fears and a lack of experience, approach crowdsourcing with reservation and do not invest efficiently in the activity. Concerns about revealing technological or managerial knowledge or not reaching the expected outcome drive them to provide limited effort and stagnated communication, which hinders the knowledge creation process (Gruner and Power, 2017; Hanine and Steils, 2019; Lüttgens *et al.*, 2014; Marjanovic *et al.*, 2012). At the same time, established corporate power dynamics might create obstacles for incoming knowledge (Ford *et al.*, 2015; Lüttgens *et al.*, 2014; Marjanovic *et al.*, 2012). In order to deal with the organisational inertia, managing the process and integrating the produced knowledge may require change management (Ford *et al.*, 2015; Lüttgens *et al.*, 2014; Marjanovic *et al.*, 2012).

*4.3.3 Crowd.* The impact of crowdsourcing on the crowd: An analysis of published media revealed that most of the public attention is drawn to the benefits and challenges organisations have in crowdsourcing, while the benefits and challenges from the crowd's perspective have been neglected (Sheehan and Pittman, 2019). There is indeed evidence that crowd participants are found to benefit for their personal development by engaging in the creation process through experiential and social learning (Steils and Hanine, 2016). But even in the case of paid microtasking of unskilled work where the crowd participants do not interact at all with each other, they are found to carry the feeling of professional solidarity and community (Almaatouq *et al.*, 2019; Schmidt and Jettinghoff, 2016).

At the same time, certain elements might provoke negative feelings that undermine these benefits. Crowd participants are concerned about the use of their contribution and intellectual property rights, especially when there is no procedural transparency (Deng *et al.*, 2016; Hanine and Steils, 2019). Consequently, this creates insecurity on whether their effort will be misused (Deng *et al.*, 2016; Hanine and Steils, 2019). Research shows that, among all participants, trust and commitment in the process affect the behaviour of participants that are more dependent on the work of others (Shen *et al.*, 2014). In general, there are four types of worker marginalisation: economic, where the participants feel that their effort is taken advantage of; policy, where they cannot make efficient use of the crowdsourcing opportunities; technology, where they cannot deal with the usability requirements; and competence marginalisation, in which their work does not contribute to their personal development and competitiveness (Deng *et al.*, 2016).

### *4.4 Motivation factors*

How different types of motivations influence participation: Enabling the right motivations can help to increase participation, attract the most suitable individuals and maintain engagement. Thus, an important part of the literature has made an effort to shed light on identifying the motivation mechanisms that can enhance the benefits of crowdsourcing activities.

One major form of motivation is financial compensation. The presence of a monetary reward is indeed considered important for drawing high participation (Brabham, 2008; Chit *et al.*, 2017; Deng *et al.*, 2016; Girdauskiene *et al.*, 2015; Lee *et al.*, 2015). This importance

appears especially compelling for the less motivated users (Liu *et al.*, 2012; Ren *et al.*, 2019). However, research shows that the increase of the reward amount does not increase the number of participations proportionally (Cappa *et al.*, 2019a, b; Stol *et al.*, 2019). Individuals might perceive higher monetary rewards as an indicator of a difficulty or as time demanding (Cappa *et al.*, 2019a, b; Tran and Park, 2015). Nevertheless, the presence of the monetary reward itself was not found to outweigh the significance of non-monetary motivations (Cappa *et al.*, 2019a, b; Stol *et al.*, 2019). Financial rewards have also been linked with the quality of contributions, for example, with more innovative and radical ideas (Lee *et al.*, 2015; Mack and Landau, 2015). On the other hand, in microtasking, the accuracy of unpaid work is found to be similar to or even better than paid work (Borromeo and Toyama, 2016).

Career-related motivations have been identified in the literature as factors that can attract more participants in the context of more skill-oriented crowdsourcing. Learning is valuable for professionals, investors or entrepreneurs, who want to become more experienced (Baumgardner *et al.*, 2017; Estrin *et al.*, 2018) Learning also motivates amateur participants who want to engage in a creative job and improve their technical, cognitive and business skills or prepare for a future career (Acar, 2019; Brabham, 2008, 2010; Budhathoki and Haythornthwaite, 2013; Taylor and Joshi, 2019). Nevertheless, participants motivated by learning were not found to submit more innovative solutions (Mack and Landau, 2015). Peer recognition has also been found to increase participation, as it offers individuals personal satisfaction and helps to find new professional opportunities (Brabham, 2008; Budhathoki and Haythornthwaite, 2013; Girdauskiene *et al.*, 2015; Lee *et al.*, 2015; Taylor and Joshi, 2019). The flexible working conditions were identified as important motivators as they provide greater working autonomy and independence (Acar, 2019; Deng *et al.*, 2016; Lee *et al.*, 2015; Taylor and Joshi, 2019). Learning, peer recognition and problem-solving motivations have been linked with appropriate submissions (Acar, 2019). In addition, motivation for autonomy is linked with innovativeness (Lee *et al.*, 2015).

Individual factors always create a thirst for action, for example, the need to satisfy a personal interest (Solemon and Bakar, 2018). The satisfaction of accepting a problem-solving challenge is also mentioned as mobilising participation (Aitamurto and Saldivar, 2017; Brabham, 2010; Lee *et al.*, 2015; Taylor and Joshi, 2019). Furthermore, participation itself can offer fulfilment or fun, even in cases where the individual believes that their contribution will not influence the result (Aitamurto and Saldivar, 2017; Brabham, 2008; Chit *et al.*, 2017; Tokarchuk *et al.*, 2012). For this reason, a gamified crowdsourcing activity can increase participation and engagement, especially for the less-motivated users, as it makes the experience more delightful and entertaining (Feyisetan and Simperl, 2017; Liu *et al.*, 2012).

Social interaction and community membership were found to increase participation (Brabham, 2008, 2010; Budhathoki and Haythornthwaite, 2013; Girdauskiene *et al.*, 2015; Hajiamiri and Korku, 2015). Moreover, in mobile crowdsourcing they are also connected with the most active participants (Budhathoki and Haythornthwaite, 2013; Liu *et al.*, 2012). Being a member of a community helps to understand it better, learn from others' perspectives and find support (Aitamurto, 2015; Aitamurto and Saldivar, 2017; Hajiamiri and Korku, 2015; Tokarchuk *et al.*, 2012). Interestingly, the social dimension of crowdsourcing was found to be important even in paid microtasking, which is individual and there is no social learning taking place at all. Working with the presence of others has been found to improve the accuracy and engagement of workers (Feyisetan and Simperl, 2017). On the other hand, in individual innovation-related activities there is the concern that social facilitation can reduce innovation outcomes by peer influence and the homogenisation of contributions (Felin *et al.*, 2017).

Altruism can also mobilise participation (Aitamurto, 2015; Cappa *et al.*, 2019a, b; Girdauskiene *et al.*, 2015; Solemon and Bakar, 2018; Tokarchuk *et al.*, 2012). The fulfilment of working for a higher purpose, the idea of improving the society or reducing a societal problem

motivates individuals to contribute (Aitamurto and Saldivar, 2017; Cappa *et al.*, 2019a, b; Girdauskiene *et al.*, 2015). On the other hand, though, supporting a crowdfunding campaign with a social orientation does not seem to influence the funders' decision (Motylska-Kuzma, 2018). Altruism in the sense of supporting democratic means and egalitarian ways of working has also been identified by a study as an important driver (Aitamurto, 2015). Although altruism increases participation, it does not necessarily mobilise the individuals to provide appropriate contributions (Acar, 2019). The participation of individuals itself might satisfy their feeling of duty and they consequently feel that they do not need to put in additional effort (Acar, 2019).

Another determining set of motivation factors illustrated in the literature is the category of task-related factors. A clear-cut, realistic description with specific requirements and timeline are important to attract a high number of participants (Girdauskiene *et al.*, 2015; Niu *et al.*, 2019; Tokarchuk *et al.*, 2012). In this way, individuals can better judge whether the task is suitable, feasible, interesting or enjoyable for them to participate in. Also, fair compensation, procedural transparency and sufficient communication make participants feel useful and valued and maintain their involvement throughout the activity (Deng *et al.*, 2016; Shen *et al.*, 2014). The feeling of being valued can be further enhanced by feedback, but in the case of paid microtasking, the evidence is ambiguous. Expressing gratitude appears to have a positive influence, but performance feedback before fulfilling the task seems to demotivate workers from completing it (Straub *et al.*, 2015).

Maintaining the equilibrium of engagement: Crowdsourcing is based on an open call, where the tasks are assigned based on crowd self-selection and motivation for the projects. However, it is essential to engage until the end and fulfil the task. Not all the motivations that mobilise the crowd to participate are strong factors for their long-term engagement and once the initial motivations are satisfied, the participants disengage (Acar, 2019; Aitamurto and Saldivar, 2017). An efficient approach is to target the most suitable participants carefully, identify what motivates them most and establish an ongoing motivation system from the open call to the end of the project (Ren *et al.*, 2019). This can help to maintain the high quality of contributions at each stage of crowdsourcing and also increase the participants by mobilising the less frequent contributors (Franzoni and Sauermann, 2014). A crowdsourcing activity is an ongoing battle of trying to keep the equilibrium of engagement by strengthening the factors that empower the crowd and minimising those that provoke resentment (Deng *et al.*, 2016).

## 5. Future research

In this last section we outline a few potential areas for research in each of the key themes identified in the literature.

Performance: There exists a strong connection in the literature between innovation activities, organisational learning and organisational performance (García-Morales *et al.*, 2012; Kuo, 2011; Migdadi, 2019). This might indicate that, apart from the completion of the project, firms might have gains that help them to perform better in the long run. Can companies that employ crowdsourcing improve their future organisational performance? Also crowdsourcing has been identified as an instrument for organisations to maximise knowledge search and increase their innovation performance (Afuah and Tucci, 2012). In order to achieve sustainability, prior literature suggests that organisations need to find a balance between explorative and exploitative innovation. As such, an important research question may be to examine whether crowdsourcing can be used to achieve the aims of an ambidextrous organisation. Furthermore, crowdfunding has been mostly studied as a means to increase investment performance. There is a need to study further the underlined interactions between the fundraisers and the crowd when it comes to innovation facilitation and organisational and market performance. Moreover, network effects are a critical factor

that helps to increase participation and to fulfil the goals of crowdsourcing for sales, investments and the strategic expansion of an organisation. Network effects may influence the process of attracting more funds, the marketing and strategic expansion of firms and the learning processes for the entrepreneurs and the investors. Network effects have not been systematically studied, though.

Innovation: Moving beyond individual characteristics and behaviours that affect idea generation for innovation and NPD, an understudied area is peer influence. High heterogeneity might create communication barriers and result in ineffective solutions; low heterogeneity might bring poor innovation results. How do the levels of peer heterogeneity in a team and in a crowdsourcing community influence the number of ideas and the innovation quality of ideas produced by teams and individuals? Peer interaction is a dimension of idea generation mainly in collaborative crowdsourcing, but it can also play a role in individual submissions through secondary community interaction. On the one hand, there is the concern about the homogenisation of ideas deriving from interaction (Felin *et al.*, 2017). On the other hand, there is an indication that certain levels of connectivity are helpful in producing innovations (Björk and Magnusson, 2009). What are the underlined network effects in the idea generation process and how do they influence the result? How do different degrees of connectivity in combination with actor characteristics contribute to knowledge construction and to producing innovations? Practising crowdsourcing for innovation can be different for different types of organisations (Desyllas *et al.*, 2018; Randhawa *et al.*, 2019). What are the constraints and benefits for different types of organisations that employ crowdsourcing for innovation? How do their characteristics affect their available choices and their innovation performance in the short and long run? Finally, the nature of the innovation can offer an interest research direction. For example, crowdsourcing can be studied in relation to the radical and incremental innovation, early versus mature innovations and so on.

Operations: Crowdsourcing is a digital model that can connect different stakeholders. While several scholars explored how to identify suitable participants for project crowdsourcing, the respective aspect of crowdfunding has been understudied (Baumgardner *et al.*, 2017). This can help platforms to perform efficient matchmaking between entrepreneurs and investors. In this direction, since stakeholders might come from different cultural backgrounds, research could also explore how the local intermediate environment influences the online behaviour in a crowdsourcing project. How do the local resources of the actors and their perceptions of social and professional relationships determine the operational decisions and project success? Also, despite research attempting to classify platforms regarding the main functions and processes, there has not been any attempt to explore the organisations' and individuals' perceptions on usability and satisfaction. In addition, while a large part of the media coverage and literature so far deals with how to leverage the crowd skills for the organisational needs, little research has been invested in examining the benefits for the crowd participants. For example, the effect of learning on the crowd's personal and professional development has not been explored (Sheehan and Pittman, 2019; Steils and Hanine, 2016). Similarly, crowd challenges, such as dissatisfaction due to unmet expectations and perceived exploitation, also constitute an understudied area that is important to highlight for productivity but also for ethical reasons (Sheehan and Pittman, 2019). Finally, what is the participants' perception on engaging during a crowdsourcing activity? What are the most common reasons they drop out?

Motivations: Current studies are aimed at identifying the motivations of individuals to participate in crowdsourcing, and some have attempted to link the motivations with the type of contributions. Research could also explore how to identify the individuals that repetitively provide inputs of high value and how to motivate them. In this way organisations and platforms could leverage their efficiency and potential in collaborating with them (Boons and Stam, 2019; Zahay *et al.*, 2018). Beyond attracting participants in the first place, ensuring

engagement is important for reducing drop-out rates and for enhancing the quality of contributions. Thus, there is a need to discover ways of creating an ongoing motivation system. In addition, despite research exploring the crowd motivations to participate, the opposite, that is, the organisations' motivations, has been understudied. Future research may study different types of companies to see how their drivers influence the crowdsourcing objectives and practices. Finally, research could examine why certain projects receive high attention while others do not manage to draw enough participants.

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