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The effectiveness of crowdsourcing in knowledge-based industries: the moderating role of transformational leadership and organisational learning

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ABSTRACT

Crowdsourcing provides an opportunity for SMEs to exploit collective knowledge that is located outside the organisation. Crowdsourcing allows organisations to keep pace with a fast-changing environment by solving business problems, supporting R&D activities, and fostering innovation cheaply, flexibly, and dynamically. Nevertheless, managing crowdsourcing is difficult, and positive outcomes are not guaranteed. Drawing on the Resource-based View, we study transformational leadership and organisational learning capability as complementary assets to help SMEs deploy crowdsourcing. An empirical study of Spanish telecommunications and biotechnology companies confirmed the moderating effect of organisational learning on the relationship between crowdsourcing and organisational performance.

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KEYWORDS

Crowdsourcing; transformational leadership; organisational learning; organisational performance

1. Introduction

Using the power of IT-based tools, crowdsourcing allows companies to solve business problems and innovate faster and more cheaply than ever before. Crowdsourcing is defined as outsourcing a function or activity of an organisation to a network of people in the form of an open call (Estellés-Arolas & González-Ladrón-de-Guevara, 2012). For individuals, crowdsourcing is an opportunity to join a challenging and satisfying job market where they can apply their skills. Emerging crowdsourcing marketplaces such as TopCoder, CrowdSpring, InnoCentive and uTest let people collaborate across a network to complete a task (Vukovic, 2009).

This kind of knowledge and innovation creation is attractive for small and medium-sized enterprises (SMEs) and entrepreneurs because it provides access to pools of knowledge and skilled individuals that SMEs and start-ups are usually too small to afford. Crowdsourcing can be especially helpful for identifying market trends

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and product innovations, obtaining market feedback, collecting novel ideas and performing tedious tasks (Piezunka & Dahlander, 2015; Ye & Kankanhalli, 2017). Yet Qin, Van Der Velde, Chatzakis, McStea and Smith (2016) found that although small and large organisations are aware of crowdsourcing, only large organisations implement crowdsourcing using licensed or in-house platforms. In contrast, SMEs lack knowledge about available tools and the platforms that are suitable for their businesses and tasks. Qin et al. (2016) concluded that crowdsourcing by SMEs is an important yet underdeveloped research area.

By granting firms direct access to the market, crowdsourcing offers greater creativity at lower costs. However, crowdsourcing must be effectively managed to obtain good results. Crowdsourcing, without a general strategy and guidance, can suffer from poor deployment (Devece, Llopis-Albert, & Palacios, 2017). Effectively managing crowdsourcing has proven difficult for several reasons. First, a crowdsourcing project depends on several interrelated variables such as crowd composition, incentives, task performance and the product that is generated at the end of the project (Neto & Santos, 2018). Second, crowdsourcing needs a strong combination of technological, motivational and managerial capabilities. The most widely studied factors of crowdsourcing success relate to crowd participation (Lee & Seo, 2016; Ye & Kankanhalli, 2017), brand control (Bal, Weidner, Hanna, & Mills, 2017) and risk management (Liu, Xia, Zhang, & Wang, 2016).

Researchers have tended to focus on the motivations of crowdsourcing participants from incentive and activation perspectives (Leimeister, Huber, Bretschneider, & Krcmar, 2009). Too few studies have examined the organisational aspects that are central to crowd-level engagement (Palacios, Martinez-Corral, Nisar, & Grijalvo, 2016). This lack of studies contrasts with SMEs' interest in and desire to learn more about crowdsourcing (Qin et al., 2016).

Drawing on the resource-based view (RBV), this study examines the main organisational factors that complement crowdsourcing and improve organisational performance. The most widely cited resources and capabilities affecting innovation activities include organisational culture, absorptive capacity, human capital, leadership and organisational learning (Peris-Ortiz, Devece-Caranana, & Navarro-Garcia, 2018; Stock & Schnarr, 2016; Xie, Wang, & Zeng, 2018). Building on Naqshbandi and Tabche's (2018) findings on open innovation, we considered the effects of two factors on crowdsourcing activities that relate to product innovation and problem solving. These factors are transformational leadership and organisational learning.

This paper is divided into several sections. [Section 2](#) establishes the theoretical background for the study, defining crowdsourcing and analysing the complementary organisational capabilities and assets that enable its successful use. The hypotheses are also stated in [Section 2](#). [Section 3](#) introduces the research method. [Section 4](#) presents the validation of the measurement scales and empirical testing of the hypotheses using regression analysis of data from executives of 221 Spanish biotech and telecoms companies. Finally, [Section 5](#) discusses the results of the hypothesis testing and presents the conclusions, limitations and suggestions for future research.

2. Theoretical background

Crowdsourcing is a distributed problem-solving and production model (Bell, 2009; Estellés-Arolas & González-Ladrón-de-Guevara, 2012). Problems and tasks are posed to a virtual community of unknown people through technological platforms. Prpić, Shukla, Kietzmann and McCarthy (2015) identified four types of crowdsourcing: (1) crowd voting, whereby a crowd chooses from several alternatives; (2) idea crowdsourcing, where a question is put to the crowd and the best answers are selected; (3) microtasking, where the organisation divides a task into microtasks, each of which can easily be accomplished by individuals; and (4) solution crowdsourcing, where a problem is stated and the crowd proposes solutions. Although microtasking is an interesting subject, we focused on ideas and solutions generated through crowdsourcing.

Simply using a technological tool and posing a problem to the crowd does not guarantee a valid solution. Creative external input can be inspiring but may require revision and validation. Active knowledge management by the organisation is essential. The generation of ideas and solutions by the crowd has some inherent problems such as reliance on non-experts, highly variable data quality and the self-selection of participants (Flostrand, 2017). Moreover, the proposed solutions must be filtered, selected and implemented by the organisation. In terms of knowledge generation, there must be a mechanism to validate, share and absorb the new ideas and knowledge within the organisation. For Qin et al. (2016), the organisation must establish organisational patterns to mobilise the critical knowledge generated by crowdsourcing across boundaries. According to Qin et al. (2016), organisations must foster internal communication among functional departments and enable bottom-up innovation by in-house staff. This organisational perspective of crowdsourcing calls for complementary capabilities that help the selection, diffusion and absorption of new knowledge and the implementation and internalisation of innovations (Nonaka & Konno, 1998). The RBV offers a suitable framework to analyse these capabilities.

2.1. Crowdsourcing under the RBV

Crowdsourcing can lead to sustainable competitive advantage only when used to exploit differences in strategic resources. Yet the process whereby crowdsourcing is integrated in business activities is poorly understood and few empirical studies have addressed this issue. One of these rare studies (Xu, Ribeiro-Soriano, & Gonzalez-Garcia, 2015) showed that firms that use crowdsourcing to capture customer knowledge and transform this knowledge into innovation competencies can achieve better performance. The key organisational factors that help this knowledge transformation in crowdsourcing initiatives are the subject of this study. The RBV offers a solid conceptual framework to study the complementary assets that allow firms to exploit the potential benefits of crowdsourcing. The RBV has successfully been applied to study the complementary capabilities that facilitate the implementation of information systems and the use of information technologies (IT) in organisations (Devece, Palacios, & Martinez-Simarro, 2017; Wade & Hulland, 2004). The same approach can be used

to study crowdsourcing because crowdsourcing is based on Web 2.0, which helps collective knowledge sharing and innovation.

Focusing on the internal facet of organisations and their resources (Grant, 1991; Prahalad & Hamel, 1990), the RBV explains differences between organisations' performance in terms of varying strategic assets and capabilities. The RBV highlights the importance of distinctive capabilities, particularly those of an intangible nature. According to the RBV, a sustainable competitive advantage is based on unique resources and capabilities that are valuable, rare, inimitable and non-substitutable (Barney, 1991). Considering the RBV, its extension of the knowledge-based view (Guillen, 2000) and the fact that ideas generated by crowds are difficult to protect, the innovation and knowledge generated by accessing specialised skills through crowdsourcing cannot be a source of competitive advantage because competitors can easily replicate or access the same specialised skills. The same is true of the standardised IT tools used to implement crowdsourcing. Web 2.0 refers to standardised technology that is accessible to all firms, regardless of their size. Under the RBV, therefore, Web 2.0 per se cannot be a source of competitive advantage. Nevertheless, most RBV studies on IT repeatedly highlight the value of organisational complementary assets that contribute to integrating IT in business activities and making IT a source of competitive advantage (Bruque, Vargas, & Hernández, 2004; Ravichandran & Lertwongsatien, 2005; Wade & Hulland, 2004). Simply using technological platforms to interact with online social networks does not guarantee that the organisation can tap into collective intelligence and transform it into better products and services. However, when used for marketing purposes, crowdsourcing improves companies' understanding of the market and customer needs (Stanko, Molina-Castillo, & Harmancioglu, 2015), sensitising companies to market changes. The key element for crowdsourcing to become a source of competitive advantage is its integration with other business functions. According to Lang, Bharadwaj and Di Benedetto (2016), crowdsourcing applications can be used to process (acquire, distribute and interpret) market information in a unique way that can be applied directly to specific marketing questions and decisions, thereby improving market performance. This integration makes crowdsourcing difficult for competitors to copy, generating causal ambiguity and barriers to imitation. When integrated in business activities, crowdsourcing practices offer a powerful research tool (Devece, Llopis-Albert, & Palacios, 2017; Schmallegger & Carson, 2008) that improves market performance (Xu et al., 2015) and is difficult for competitors to replicate.

Adopting the RBV, Ye and Kankanhalli (2015) found that firms consider using crowdsourcing if it can fill the gap between the knowledge required for performing tasks and the knowledge available in the firm. Ye and Kankanhalli (2015) call this motive access to specialised skills. Other reasons for firms to use crowdsourcing are cost reduction and brand visibility (Ye & Kankanhalli, 2015). The first hypothesis reflects this idea.

Hypothesis 1 (H1): There is a positive relationship between crowdsourcing and organisational performance.

It is common to use organisational performance as a dependent variable in RBV studies. Nevertheless, overall performance indicators fail to reflect the advantages of specific business processes (Ray, Barney, & Muhanna, 2004). In our study,

organisational performance must be carefully operationalised to focus on the expected results of marketing and innovation activities fostered by crowdsourcing.

From an organisational perspective, the success of crowdsourcing depends on complementary assets that enable the integration of crowdsourcing practices in business processes. In the field of knowledge management, leadership is essential. Through transactional and transformational leadership, managers can foster collective knowledge management (Noruzy, Dalfard, Azhdari, Nazari-Shirkouhi, & Rezazadeh, 2013). Empirical research has identified a significant positive relationship between transformational leadership and knowledge management (Amitay, Popper, & Lipshitz, 2005). In this study, we therefore considered transformational leadership as a powerful moderator of the success of crowdsourcing initiatives.

In innovation and knowledge creation processes, organisational learning is a key organisational capability. According to the knowledge management literature, organisational learning is one of the primary ways in which the organisation can continuously improve the creation and use of knowledge (Chiva & Alegre, 2005; Wu & Chen, 2014). Thus, organisational learning capability must complement crowdsourcing as a source of innovation.

2.2. Transformational leadership and crowdsourcing

Transformational leadership occurs when leaders 'broaden and elevate the interests of their employees, when they generate awareness and acceptance of the purposes and mission of the group, and when they stir their employees to look beyond their own self-interest for the good of the group' (Bass 1985, p. 21). Bass (1985) identified four dimensions of transformational leadership: (1) idealised influence, (2) inspirational motivation, (3) individual consideration, and (4) intellectual stimulation. Idealised influence means that the leader serves as a model for employees. Inspirational motivation or charisma allows leaders to inspire and motivate employees. Individualised consideration entails genuine concern for the needs and feelings of employees. Finally, intellectual stimulation means that the leader challenges employees to innovate and create. In this study, inspirational motivation and intellectual stimulation dimensions were considered the most directly related to the generation and absorption of knowledge from crowdsourcing activities (Elkins & Keller, 2003).

The direct influence of leadership on crowdsourcing has not been studied, but numerous studies have examined the effects of leadership on organisational learning and knowledge management (Aragón-Correa, García-Morales, & Córdón-Pozo, 2007; Noruzy et al., 2013). Transformational leadership, particularly the intellectual stimulation dimension, helps employees think critically and re-examine old ways of doing things. According to Noruzy et al. (2013), transformational leadership positively and indirectly influences organisational innovation through organisational learning and knowledge management. The moderating effect of transformational leadership on performance has already been shown (Chi, Lan, & Dorjgotov, 2012). This moderation is especially pronounced in innovation processes. According to Elkins and Keller (2003), inspirational motivation and intellectual stimulation are important factors of organisational innovation. Thus, by nurturing the environment and decision-making,

transformational leadership plays the same role in filtering, absorbing and disseminating knowledge generated from crowdsourcing activities (Elkins & Keller, 2003; Gumusluoglu & Lisev, 2009).

The predictive accuracy of crowdsourcing depends on the organisational mechanisms that enhance information acquisition and interpretation (Lang et al., 2016). According to Atapattu and Ranawake (2017), internal leadership is the most critical antecedent that boosts workers' propensity to engage in knowledge management processes. Transformational leadership is the key predictor of knowledge management propensity and is a crucial factor of knowledge management success. Therefore, in relation to crowdsourcing activities related to tapping collective intelligence from customers, the following hypothesis can be stated:

Hypothesis 2 (H2): Transformational leadership moderates the relationship between crowdsourcing and organisational performance.

2.3. Organisational learning capability and crowdsourcing

Organisational learning is a complex construct with two principal perspectives: social and cognitive (Chiva & Alegre, 2005). According to Zollo and Winter (2002), organisational learning is a collective capability based on experiential and cognitive processes for acquiring, sharing and using knowledge. For Templeton, Lewis and Snyder (2002), organisational learning refers to the actions that relate to acquiring, interpreting and distributing knowledge within the organisation and that influence positive organisational change. Thus, organisational learning is a facilitator of knowledge initiatives within the organisation (King, 2009). According to Dimitrova and Scarso (2017), crowdsourcing means shifting the focus of knowledge management towards the organisation's external environment as a significant knowledge source. Under this approach, knowledge creation and acquisition activities prevail over knowledge transfer processes. Here, organisational learning plays an essential role.

Some scholars have shown the positive effect of organisational learning capability on performance (Aragón-Correa et al., 2007), whereas others have cited organisational learning capability as a mediator or moderator of business processes directly related to performance (Noruzy et al., 2013). Organisational learning is considered an important moderator of links between knowledge assets and business process capabilities (Wu & Chen, 2014), especially those related to knowledge management and innovation. Despite the link in the case of crowdsourcing activities for marketing and innovation, few studies have examined this relationship. One of the few empirical studies in this area (Schlagwein & Bjorn-Andersen, 2014) showed a positive relationship between IT-enabled organisational learning and crowdsourcing. Coelho, Nunes and Vieira (2018) found that, depending on the experts participating in crowdsourcing initiatives, learning is one of the most highly valued benefits of social product development and lies at the heart of crowdsourcing. We therefore tested the following hypothesis:

Hypothesis 3 (H3): Organisational learning capability moderates the relationship between crowdsourcing and organisational performance.

Organisational learning is a multidimensional construct, so its moderating effect on crowdsourcing can only truly be understood by examining each of its dimensions. Chiva, Alegre and Lapiedra (2007) identified five dimensions of organisational learning capability. Each dimension was analysed as an independent facilitator of crowdsourcing (see results).

3. Method

3.1. Sample

Data were collected from executives of Spanish telecommunications and biotechnology firms. Telecoms and biotech are suitable sectors to study crowdsourcing because they are complex and dynamic and because information is a principal factor of production (McEvily & Chakravarthy, 2002). Crowdsourcing may therefore be used for marketing and innovation activities (Cáceres, Guzmán, & Rekowski, 2011). This choice is reinforced by the technological nature of both industries. High-technology sectors are widely considered information- or knowledge-intensive sectors because technology is defined as applied knowledge. Based on technological intensity, the OECD (1999) defines four levels of sectors, with the biotechnology and telecommunications sectors ranking at the highest level. This type of sector analysis is common in empirical studies of organisational learning, generally in knowledge-intensive or high-tech industries where intangible assets are particularly important (Bhatti, Larimo, & Carrasco, 2016; Palacios-Marques, Peris-Ortiz, & Merigó, 2013). The information to prepare the database of surveyed companies was obtained from ASEBIO (Spanish Association of Biotech Firms) and SABI (Sistema de Análisis de Balances Ibéricos, a database of information on Spanish and Portuguese companies). The fieldwork took place between May 2015 and September 2015. The target respondents of our mail survey were general managers. Respondents completed a self-administered structured questionnaire designed and managed following Dillman's (2000) indications. The procedures for survey research proposed by Dillman (2000) and widely used by other authors (e.g., Conant, Mokwa, & Varadarajan, 1990) raise the response rate and quality of questionnaires. In this study, the questionnaire was administered to a simple random sample of 500 companies. The fieldwork yielded 221 valid questionnaires (102 telecoms and 119 biotech). Of these 221 firms, 10 were large (more than 500 employees). The average age of managers was 53 years, 45% had higher education and 86% were men.

The non-response bias was controlled using two variables: age and number of employees. The comparison revealed no significant differences. Therefore, the non-response bias was not relevant. The response rate, means and variances of the items for the telecoms and biotech industries were not significantly different for either SMEs or large companies. To estimate the extent of the common method variance, we conducted Harman's single factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Multiple factors with eigenvalues greater than 1.0 emerged from these analyses and no single factor accounted for a majority of the variance in the data. Thus, common method bias was not deemed a serious problem in the data set.

3.2. Variable measurement

The following scales were operationalised using a seven-point Likert scale (1 = strongly disagree and 7 = strongly agree).

3.2.1. Crowdsourcing

Xu et al.'s (2015) scale was used to measure crowdsourcing. This scale is based on a broad conceptualisation of crowdsourcing activities, including any IT initiative related to accessing collective knowledge in virtual networks. The basic premise for the selection of this scale is that firms are interested in crowdsourcing because customers are an essential source of knowledge and can be motivated to contribute freely with creative ideas (Marjanovic, Fry, & Chataway, 2012).

This property of the scale was especially important in this study because SMEs in Spain still make limited use of specialised crowdsourcing tools and markets. The scale had eight items: (1) the organisation has introduced platforms to develop ideas about new products or services; (2) users can freely express their ideas about the introduction of new innovations in the firm; (3) the firm considers that a group of users can develop new ideas about new products or services or improve existing ones; (4) there are financial and non-financial incentives to develop the best ideas; (5) the firm has evaluation systems to assess the effectiveness of ideas; (6) there are knowledge transfer systems to disseminate the best ideas; (7) the firm uses virtual communities to develop new products or services; and (8) new ideas take into account the stakeholders of the firm.

3.2.2. Transformational leadership

Transformational leadership (Bass & Avolio, 1994) was measured using a modified version of the multifactor leadership questionnaire scale developed by Bass (1999). The five items selected from the inspirational motivation and intellectual stimulation dimensions were as follows: the leader (1) encourages me to perform more than I am expected to; (2) increases my motivation to achieve individual and organisational goals; (3) encourages me to think more creatively and be more innovative; (4) sets challenging standards for all tasks given to me; and (5) gets me to rethink ideas that I had never questioned before.

3.2.3. Organisational learning capability

Several studies in the strategy literature have examined organisational learning (Tohidi & Jabbari, 2012). We employed the scale designed by Chiva et al. (2007), who operationalised organisational learning using a 14-item scale with five dimensions: (1) experimentation, (2) risk-taking, (3) interaction with the external environment, (4) dialogue and (5) participative decision-making.

3.2.4. Organisational performance

According to the RBV, achieving sustainable competitive advantages should result in better performance. Therefore, most RBV studies consider several financial indicators to assess performance (Melville, Kraemer, & Gurbaxani, 2004). Scholars have also considered the firm's relative position in the market (Bruque, Moyano, Vargas, & Hernández,

Table 1. Exploratory factor analysis of the organisational learning capability items.

Item/factor	Dialogue (D)	Experimentation and risk-taking (Ex & RT)	Participative decision-making (PDM)	Interaction with the environment (EI)
Ex1	.24	.76	-.00	-.01
Ex2	.24	.75	.14	.09
RT1	-.01	.77	.24	.15
RT2	-.10	.77	.35	.09
EI1	.15	.17	.15	.82
EI2	.03	.24	.15	.77
EI3	.34	-.18	-.17	.74
D1	.76	-.02	.14	.27
D2	.76	.09	.19	.08
D3	.76	.15	.03	-.03
D4	.79	.11	-.00	.18
PDM1	.13	.22	.81	.06
PDM2	.07	.13	.83	.03
PDM3	.11	.17	.78	.08

Note: EFA with Varimax rotation; bold numbers indicate the items for each factor.

2003), growth in sales (Tippins & Sohi, 2003) and revenue (Rai, Patnayakuni, & Seth, 2006). In this study, our focus was on the effect of crowdsourcing for marketing and innovation purposes. Therefore, the scale focused on market performance and consisted of four items: (1) customer retention rate, (2) success of new products or services, (3) product or service quality and (4) sales level (Nakata, Zhu, & Kraimer, 2008).

3.2.5. Control variables

To avoid endogeneity issues that might lead to misleading results, additional factors were considered. Following Ravichandran and Lertwongsatien (2005), we used organisation size and age as control variables. Size was measured by the number of employees and age was measured by the years since the date the firm was created. An industry (telecoms vs. biotech) control variable was also included in the models.

4. Results

The reliability of the measurement scales was examined before testing the hypotheses. Exploratory factor analysis with varimax rotation was carried out for the organisational learning capability items (Table 1). Four main factors were extracted. The experimentation and risk-taking dimensions were grouped into one factor. To avoid collinearity problems in the regression analyses, the experimentation and risk-taking dimensions were merged into one dimension for the rest of the study.

Figure 1 summarises the conceptual model based on the hypotheses and the distinction between the dimensions of organisational learning capability.

For each scale, Cronbach's alpha was calculated to test reliability. All values were higher than the threshold of 0.7. Values are shown in parentheses in Table 2. All variables were estimated by averaging the item score. For each variable, Table 2 shows the mean, standard deviation and correlations with other variables.

Hierarchical regressions using ordinary least squares were used to test the hypotheses. Organisational performance was the dependent variable (Table 3). Because some independent variables were highly correlated (see Table 1), we tested for multicollinearity using variance inflation factors. We considered a threshold value of 10 as an

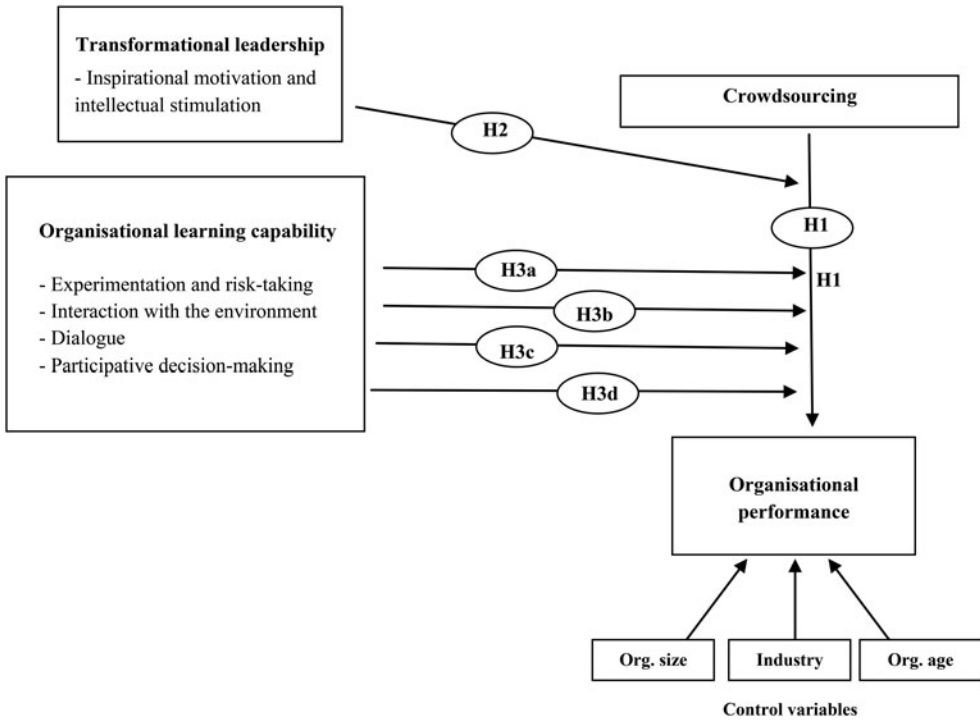


Figure 1. Conceptual model.

Table 2. Means, standard deviations and correlations.

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Experimentation and risk-taking	5.07	.72	(.81)								
2. Interaction with the environment	4.82	.79	.20**	(.71)							
3. Dialogue	4.88	.67	.24**	.38**	(.81)						
4. Participative decision-making	5.0	.65	.44**	.15*	.24**	(.79)					
5. Transformational leadership	5.06	.71	.14*	.03	.03	.19**	(.77)				
6. Crowdsourcing	4.92	.94	.00	-.05	.02	.04	.12	(.89)			
7. Organisational performance	4.56	1.50	-.05	-.10	.01	.067	.09	.33**	(.94)		
8. Age	25.7	24.0	-.01	-.14	.03	-.02	-.06	.05	-.03		
9. Size (no. employees)	132	458	.01	.00	-.04	-.08	.01	-.05	.02	.26**	
10. Industry	.55	.5	-.02	-.01	-.03	.02	-.01	.03	-.01	-.03	-.10

Notes: $n = 221$; * $p < .05$, ** $p < .01$; Cronbach's alpha in parentheses.

indicator of the presence of multicollinearity. Collinearity was low, even in Model 3 (max. VIF = 1.3; Table 3). The residuals for all models satisfied distributional assumptions.

Model 0 in Table 3 was the baseline model, which included only the control variables. Model 1 evaluated the direct effect of transformational leadership. There was no significant effect. Model 2 included the dimensions of organisational learning capability. There was no significant effect on performance. Model 3 was used to test hypothesis 1. In Model 3, including crowdsourcing as an independent variable yielded a significant improvement in R^2 ($p < .01$) with respect to Model 2. Crowdsourcing had a significant effect on performance (.32; $p < .01$), although explanatory power for performance was low ($R^2 = .13$), confirming hypothesis 1. The high correlation between crowdsourcing and performance that supports hypothesis 1 can be explained

Table 3. Hierarchical standardised regressions on organisational performance.

Model	0	1	2	3
Control variables				
Size	-.01	-.01	-.03	-.05
Age	.00	.00	.02	.03
Industry	-.02	-.02	-.02	-.02
Transformational leadership		.08	.06	.03
Organisational learning capability				
Experimentation and risk-taking			-.06	-.05
Interaction with the environment			-.15	-.12
Dialogue			-.00	-.01
Participative decision-making			.10	.06
Crowdsourcing				.32***
F-value	.02	.24	.72	2.50
R ²	.00	.01	.04	.13
^a Change in R ²		.01	.03	.10**
Max. VIF	1.02	1.02	1.29	1.3

Notes: $n = 221$; ^awith respect to model 0; * $p < .05$, ** $p < .01$, *** $p < .001$; organisational performance-dependent variable in all models.

Table 4. Moderation effects on relation between crowdsourcing and organisational performance.

Moderator variable	Correlation between crowdsourcing and organisational performance		Fisher Z	p^a
	Sample with low moderator (< 5)	Sample with high moderator (≥ 5)		
Transformational leadership	0.339** ($n = 123$)	0.339** ($n = 98$)	0	0.5
Organisational learning capability				
Experimentation and risk-taking	0.123 ($n = 77$)	0.428** ($n = 144$)	2.33	0.01
Interaction with the environment	0.297** ($n = 150$)	0.381** ($n = 71$)	0.65	0.26
Dialogue	0.288** ($n = 142$)	0.393** ($n = 117$)	0.94	0.17
Participative decision-making	0.209* ($n = 120$)	0.462** ($n = 101$)	2.10	0.02

Note: ^asignificance of difference between low and high sample; $n =$ sample size; * $p < .05$, ** $p < .01$.

by the choice of organisational performance measurement items, which related directly to the client's perceptions of products or services and the choice of the crowdsourcing measurement scale, which focused on product or service knowledge.

To analyse the moderating effect of transformational leadership (hypothesis 2) and organisational learning capability (hypothesis 3) on the relationship between crowdsourcing and organisational performance, we assessed two pairs of subsamples for each moderator variable. Table 4 shows the correlations between crowdsourcing and organisational performance for each pair of subsamples. Results are shown separately for each moderator variable (transformational leadership for H2; experimentation and risk-taking, interaction with the environment, dialogue and participative decision-making for H3). For each moderator variable, the sample was split into two (high and low samples). For the high sample, values for the moderator variables were greater than or equal to 5 (closest value to the mean for all the variables) in the Likert scale. For the low sample, values were less than 5. For each pair of samples, the Fisher Z test evaluated the significance of the difference between correlations.

As Table 4 indicates, the difference between subsamples was significant only for the experimental and risk-taking variable ($p = .01$) (H3a) and the participative decision-making variable ($p = .02$) (H3d). The significance of these two dimensions of organisational learning capability partially confirms hypothesis 3 because

organisational learning moderated the effect on performance. The results fail to confirm hypothesis 2. Transformational leadership did not moderate the relationship between crowdsourcing and organisational performance because of its low significance ($p = .5$) according to the Fisher Z test (Table 4). The inability to prove hypothesis 2 with the data set can be explained by the general measurement of transformational leadership in the firm. This measurement scale does not consider the specific support and involvement of managers in crowdsourcing activities.

5. Conclusions

This paper analyses the value of crowdsourcing for organisational performance, especially in SMEs. The empirical results support and add weight to the findings reported in the few studies that have employed a similar approach. More importantly, this study is one of the first to empirically test the organisational variables that moderate the effect of crowdsourcing on performance. A key conclusion of this study is that crowdsourcing, which was measured using Xu et al.'s (2015) scale, significantly influenced performance. However, only market performance was considered because of the close relationship between marketing intelligence and crowdsourcing. Despite the significant relationship between crowdsourcing and performance (see Model 3; Table 3), crowdsourcing explained a small amount of the variability in performance ($R^2 = .13$). This finding supports the RBV on crowdsourcing. Crowdsourcing alone does not guarantee improvements in firm performance despite offering a valuable source of knowledge. For organisations to fully exploit the potential of crowdsourcing, it must be complemented with other strategic assets and supported by managerial and organisational capabilities. Our findings support this statement. The variability in performance that can be explained by crowdsourcing increased considerably in the subsample with high experimentation and risk-taking ($R^2 = .18$; data not shown). Scholars have already shown that crowdsourcing and organisational learning are complementary (Schlagwein & Bjorn-Andersen, 2014). This study provides new evidence in support of this finding.

Another interesting finding relates to the behaviour of the dimensions of organisational learning capability with respect to the relationship between crowdsourcing and performance. Although hypothesis 3 refers to organisational learning capability as a single construct, its dimensions were analysed individually. The dimensions had different moderating effects on the relationship between crowdsourcing and performance. Although all organisational learning capability dimensions were highly correlated with one another (Table 2), the moderating effect on performance was only significant for the dimensions of experimentation and risk-taking and participative decision-making. These dimensions were the most strongly related to innovation. Scholars have already shown that organisational learning exerts an indirect positive influence on organisational performance through innovation (Noruzy et al., 2013).

Our results imply that transformational leadership does not directly affect the relationship between crowdsourcing and performance. However, our results are similar to those of Garcia-Morales Lloréns-Montes and Verdú-Jover (2008), who found that transformational leadership affects organisational performance through organisational

learning and innovation. We identified a close relationship between transformational leadership and organisational learning capability (Table 2). This relationship was especially strong for the dimensions of organisational learning that moderated crowdsourcing. Therefore, transformational leadership can be considered an antecedent of organisational learning. In this case, the effects of transformational leadership on crowdsourcing are indirect and fully mediated by organisational learning.

5.1. Managerial implications

Like Xu et al.'s (2015) study, this study showed that the use of crowdsourcing to capture collective knowledge from customers and social networks can improve market performance when combined with the right complementary assets and capabilities. This is true for both large companies and SMEs because no difference due to organisational size emerged during the analysis. This finding has important managerial implications. For example, SMEs can access specialised knowledge via crowdsourcing that they would otherwise find difficult to acquire because of their limited resources. SMEs' crowdsourcing can be strategically used to develop a deep understanding of customers' preferences and behaviours. This does not imply that crowdsourcing is a panacea for improving firm performance (Xu et al. 2015). Crowdsourcing must be nurtured with the support of organisational capabilities. This study highlights the importance of organisational learning.

In this study, we distinguished between different dimensions of organisational learning capability. We observed similarities in the way the dimensions of experimentation and risk-taking and participative decision-making behaved, although experimentation and risk-taking had a more significant effect on performance. According to these findings, crowdsourcing is a tool of knowledge creation and innovation and must be managed accordingly. If crowdsourcing is managed in this way, it has considerable potential to deliver market knowledge to support SMEs' innovation practices.

5.2. Limitations and future research

The first limitation of this study relates to the method. The self-administered questionnaires and the subjective measurement of the dependent variable (firm performance) were subject to bias (Podsakoff et al., 2003). In addition, the generalisability of the findings is limited because we included only two industries in the sample. Future research should verify the results of this study in different industries and investigate different levels of performance. The effect of crowdsourcing may be diluted or hidden by other general factors when only organisational performance is considered. Other important factors that complement crowdsourcing, such as organisational capabilities, should be studied and added to the model.

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