Social Media Technologies' use for the competitive information and knowledge sharing, and its effects on industrial SMEs' innovation

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Abstract: The effective use of technologies supporting the process of decision making became an essential capability for companies' survival. Only few and recent studies have analyzed Social Media Technologies (SMT) in the specific context of small and medium-sized enterprises (SMEs), with most of them contributing to the discussion on SMT benefits from the marketing perspective. This paper focuses on the effects of SMT use on innovation. Our findings provide empirical evidence on the positive effects of SMT use for acquiring external information and for sharing knowledge and innovation performance.

1. Introduction

Existing research offers extensive theoretical argumentation about the strategic potential of information technologies (IT) to drive competitiveness for companies that know how to take advantage of them. At the same time, most researchers agree that IT can represent a reason of failure for companies that do not adapt to new technological trends and fall behind in IT use (Porter, & Millar, 1985; Mata, Fuerst, & Barney, 1995; Melville, Kraemer, & Gurbaxani, 2004; Popa, Soto-Acosta, & Pérez-González, 2016).

In the actual context, a new collaborative paradigm draws its roots from the emergence of SMT. The web has become a channel of social and personal development for a growing number of people that are prone to exchange knowledge and experiences through the Internet. Technology usability, interoperability and collective intelligence, along with the growing integration of people into the Information Society, have given rise to what is known as the Web 2.0. (O'Reilly, 2005; Hwang, Altman, & Kim, 2009; Sigala, & Chalkiti, 2014).

Recently, the use of web 2.0 in companies has evolved. Initially, the web 2.0 was mainly used for advertising and marketing purposes. However, in the last decade web 2.0 technologies and, more specifically, SMT have become a popular business tool for monitoring, active listening and capturing trends in customers' needs and preferences (Chirumalla, 2013. He, Zha, & Li, 2013; Sigala, & Chalkiti, 2014). At the same time, the use of SMT has also evolved. More specifically, social media has become a place for public exhibition of people' and companies' achievements and knowledge. Thus, SMT have become an important tool for capturing external knowledge and competitive information (Bharati, Zhang, & Chaudhury, 2013; Díaz-Díaz, & Pérez-González, 2016; Scuotto, Del Giudice, & Carayannis, 2016).

These social and technological trends are changing the way in which organizations and users interact. In order to remain competitive, firms should respond and adapt to new product developments and new customers' needs and demands (Trusov, Bucklin, & Pauwels, 2009; Chuang, Morgan, & Robson, 2015). In this sense, numerous studies have analysed the use of Web 2.0 technologies in company-customer interactions (Cooke, & Buckley, 2008; Palmer, 2009; Cova, & White, 2010; Sashi, 2012), with only few and recent studies analysing SMT use for knowledge management within the company (Levy, 2009; Sultan, 2013; Soto-Acosta, & Cegarra-Navarro, 2016). At the same time, there is a growing interest on studying the influence of using Web 2.0 on business results. However, most of the research has been developed in the context of large companies from the service and tourism sectors (Yan Xin, Ramayah, Soto-Acosta, Popa, & Ai Ping, 2014; Soto-Acosta, Popa, & Palacios-Marqués, 2017).

In addition, there is a lack of research on the use of SMT as business intelligence tools for capturing external competitive information, not only from clients, but also of from competitors. In contrast, it is widely accepted in literature that purposive inflows

of knowledge from customers and competitors and capabilities to efficiently manage internal knowledge are even more relevant for sustainable competitiveness of SMEs because they face more severe resource constraints and higher competitive pressures (Chirumalla, 2013; Palacios-Marqués, Merigó, & Soto-Acosta, 2015b; Scuotto, et al., 2016). Therefore, there is a need for further studies on the use of web 2.0 technologies in processes of internal knowledge management and innovation, especially in the context of SMEs (Bharati, et al., 2013; Soto-Acosta, et al., 2017).

To address these issues, the aim of this paper is to analyse the use of SMT to acquire competitive external information and to share internal knowledge and its consequences on innovation performance in the specific context of industrial SMEs. The remainder of this paper is organized as follows. The next section presents the referential background and hypotheses. Following that, the research methods drawing from a large sample consisting of industrial SMEs are described. Then, data analysis and results are presented. Finally, the paper ends with a discussion on the research findings, concluding remarks, limitations and future research guidelines.

2. Theoretical background and hypotheses

The concept of Web 2.0. has received a growing attention in the last decade. The conceptual framework of Web 2.0. builds upon related concepts, such as: social software, social computing or participatory web (Berners-Lee, Hall, Hendler, & Weitzner, 2006). Although the conceptual framework of the concept is wide, there is no generally accepted definition in the previous literature. However, among those most accepted, there is the one carried out by O'Reilly (2005), who stated that Web 2.0 applications are those that make the most of the inherent advantages of the web,

offering a service that is continuously updated by acquiring and mixing information from multiple resources. The Web 2.0 builds on the inputs of individual users who offer their own information and services, so they can be reused by others, creating an architecture of network participation that goes beyond the characteristics of the web 1.0 traditional pages and offers increasingly richer user experiences. At the same time, there is a large consensus on that Web 2.0 is based on three interrelated dimensions: (1) technological, (2) social and (3) business, being these the pillars that support Web 2.0 (McAfee, 2006a; Murugesan, 2007; Hui, & Hayllar, 2010; Parveen, Jaafar, & Ainin, 2015).

Technological Perspective

From the technological point of view, Web 2.0 includes technological innovations introduced in recent years to increase usability. Usability refers to the integration of various sources of information and the interoperability of web applications (Berners-Lee, 2006; Murugesan, 2007). Consistent with the new characteristic of Web 2.0 applications, SMT have been developed in order to facilitate knowledge access, knowledge sharing and the collaboration among internal users (Hwang et al., 2009). Examples of these technologies are Blogs, Wikis, Podcasts, RSS feeds, social bookmarking, folksonomies and social networks. Therefore, the development of these applications is based on the principles of knowledge sharing, collective intelligence and the consideration of users as content producers (Díaz-Díaz, & Pérez-González, 2016).

Social Perspective

Web 2.0, rather than a technological revolution, has meant a revolution in the way in which people use the Web, including the expectations and use of technological innovations. From a social point of view, web 2.0 is based on collaboration and

participation, where the user is the protagonist, both in content creation and for content dissemination. Therefore, web 2.0 has changed the understanding of the "user" concept, moving from considering them merely as consumers of information, to treating them as active participants in the creation and management of content (McAfee, 2006b; Parveen et al., 2015).

The contribution of users is made more meaningful and rich through the collaboration and creation of user networks, for which the total is more than the sum of the individual contributions, emerging collective intelligence. With these premises, companies could take advantage of collective intelligence by means of using SMT. More specifically, firms could improve innovation by integrating the knowledge and experiences generated by users and competitors through Web 2.0 into their own knowledge bases and processes (Gronum, Verreynne, & Kastelle, 2012; Jones, Borgman, & Ulusoy, 2015).

Business Perspective

The interest on web 2.0 in academia and the business environment has grown during the last decade, from describing the concept and discussing the possible effects of its use in companies to its practical application. Initially, previous literature considered the web 2.0 as a marketing tool, first for advertising and later, as a tool for interaction and customer service (Palmer, 2009; Kotler, Kartajaya, & Setiawan, 2010). Previous studies on these topics are mainly focused on large companies, and more recently on services and tourism companies (He et al., 2013; Sigala, & Chalkiti, 2014; Yan Xin et al., 2014; Polat, & Akgün, 2015).

It is in recent years when the study and application of SMT in companies goes beyond the marketing perspective. In this sense, there is a growing interest in recent

research on analysing the factors that affect the adoption of web 2.0 in companies (Soto-Acosta, Pérez-González, & Popa, 2014b; Wang, Jung, Kang, & Chung, 2014; Palacios-Marqués, Soto-Acosta, & Merigó, 2015a), how the use of SMT affects knowledge management (Von Krogh, 2012; Sultan, 2013; Soto-Acosta, & Cegarra-Navarro, 2016) and SMT use consequences on business results (Andriole, 2010; Jones et al., 2015; Jia, Guo, & Barnes, 2017).

From this new approach, previous studies suggest that the widespread use of Web 2.0 for company-market interaction makes SMTs an important tool for acquiring knowledge from customers. Furthermore, previous literature suggests that SMEs have advantages over large firms in that they are more likely to benefit from outside knowledge. SMEs are comparatively less bureaucratic, more responsive to market needs and more flexible (Chang, Hughes, & Hotho, 2011; Moilanen, Østbye, & Woll, 2014). Drawing on these arguments, several studies suggest that firms could benefit from the SMT by using them for acquiring information from customers (Sashi, 2012; Palacios-Marques, Zegarra Saldaña, & Enrique Vila, 2013; Sultan, 2013; Trainor, Andzulis, Rapp & Agnihotri, 2014). Purposive inflows of knowledge enable a firm to look beyond its boundaries and enrich its own knowledge base. In this vein, the use of SMT for acquiring outside knowledge from customers may ensure a better understanding of customers' needs and preferences, reinforcing their ability to adapt to changing markets. Accordingly, this king of information may enable firms to adapt its products to changing market needs and, this way, improve products' success on market (Hung, & Chou, 2013; Zahra, Sapienza, & Davidsson, 2006). Therefore, this discussion leads to the following hypotheses:

Hypothesis 1: SMT use for the acquisition of customers' information is positively related to innovation performance.

Beyond customers and the use of web 2.0 for marketing purposes, SMT have become an effective tool for open innovation and innovation dissemination. Innovation forums, blogs and wikis of patents, professional social networks are becoming valuable tools for exploring and capturing new knowledge and technologies from competitors (Ying, 2012; Scuotto et al., 2016). Firms that use SMT for acquiring outside knowledge may benefit from new ideas and combinations of knowledge, new market opportunities and renewed problem-solving capabilities (Hung, & Chou, 2013; Zahra et al., 2006). In this sense, recent research links Web 2.0 with competitive intelligence. This is because SMT may allow firms to acquire external information from competitors through competitive monitoring. At the same time, competitive monitoring facilitates business innovation (Lau, Liao, Wong, & Chiu, 2012; Chuang et al., 2015; He, Shen, Tian, Li, Akula, Yan, & Tao, 2015). Based on this discussion, the following hypothesis is proposed:

Hypothesis 2: SMT use for the acquisition of competitors' information is positively related to innovation performance.

Along with the ability to absorb information from external sources, previous literature claims that innovation depends also on the ability to share knowledge among the members of the organization (Levy, 2009; Von Krogh, 2012; Sultan, 2013). There is a general consensus in previous literature on considering new knowledge as the main driver for innovation in products, services and processes. At the same time, there are plenty of research studies suggesting that new knowledge comes mostly from the collective ability of employees to share and combine knowledge (Del Giudice, Della Peruta, & Maggioni, 2013; Nahapiet, & Ghoshal, 1998; Soto-Acosta, Popa, & Palacios-Marqués, 2016). Thus, knowledge sharing has been widely recognized as a key driver of innovation. In this line, recent research analyses the use of Web 2.0 for sharing

internal knowledge and its effects on the capacity to innovate (Chirumalla, 2013; Zeng, Gonzalez, & Lobato, 2015; Soto-Acosta et al., 2017; Valaei, & Rezaei, 2016).

The social web constitutes an Internet-based digital platform that enables the creation of social networks, facilitating information dissemination and knowledge sharing (Joo, & Normatov 2013; Pan, 2012). The main difference between the social web and traditional static web sites is that the former is based on interactive web platforms where users share and reconfigure existing knowledge simultaneously (Palacios-Marqués et al., 2015a; Yan Xin et al., 2014). Consequently, firms are deploying SMT to improve collaboration and knowledge sharing within their boundaries (Lim, Trimi, & Lee, 2010; Soto-Acosta et al., 2014a). Thus, the following hypotheses are suggested:

Hypothesis 3: SMT use for knowledge sharing is positively related to the innovation performance.

3. Research methodology

3.1 Data and Sample

The organisations selected for this study are industrial SMEs from Cantabria in the north of Spain. These kind of firms have been selected due to the relevance they have in the economy, representing more than the 95% of companies of development economies (OECD 2016). In contrast, there are insufficient works that analyse the effects of SMT adoption in these organizations (OECD 2015; Baller, Dutta, & Lanvin, 2016). At the same time, international organizations' reports suggest that the industrial a sector is behind in the implementation of new IT development in its processes and therefore, there is some space for improvement (OECD, 2015). Besides, in developed countries

there is an urgent need for improving the competitiveness of this sector through innovation and high added value products, since they are threatened by emerging economies that compete through lower costs (Wymenga, Spanikova, Barker, Konings, & Canton. 2012; OECD, 2015).

Previous research in the Spanish context suggested that using IT is crucial for firms with at least 10 employees and over (Trigueros-Preciado, Pérez-González, & Solana-González, 2013; Soto-Acosta, Perez-Gonzalez, & Popa, 2014b; Palacios-Marqués et al., 2015b). To ensure a minimum firm complexity in which IT may be relevant, the population considered in this study was industrial SMEs, with 10 employees or more, located in the Region of Cantabria. A total of 478 were identified and contacted for participation. The sample characteristics are presented in table 1.

[Please insert Table 1 around here]

Data collection was conducted following two phases. First, a pilot study was performed, and, following that, a questionnaire was conducted. Five SMEs were randomly selected from a database to perform the pilot study. Based on these responses and subsequent interviews with participants in the pilot study, minor modifications were made to the questionnaire for the next phase of data collection. Responses from these five pilot-study firms were not included in the final sample. The survey was administered to the CEO of the companies via personal interview and the unit of analysis for this study was the company. In total, 111 valid questionnaires were obtained, yielding a response rate of 23.2 percent. The technical research summary is presented in table 2.

[Please insert Table 2 around here]

3.2 Measures

Measurement items were introduced on the basis of a careful literature review. Constructs and associated indicators in the measurement model are listed in the Appendix and discussed below. To facilitate future research, scales of measure tested by previous studies were used. Scales were measured on a 5-point Likert scale with anchors from strongly disagree (1) to strongly agree (5). All the variables were operationalized as multi-item constructs.

The SMT use to acquire customers' information measured the extent to which companies used SMT to acquire competitive information from customers. Items for this variable are based on Roberts and Grover (2012), Díaz (2014), Trainor et al., (2014), Parveen et al., (2015), and Bugshan (2015).

SMT use to acquire competitors' information assessed the extent to which companies used SMT to acquire competitive information from competitors, considering in this category not only other companies but also research centres and universities that can generate substitutive products and technologies (Porter, & Millar, 1985; Mata et al., 1995). This variable was operationalized based on Trainor et al. (2014) and Chuang et al. (2015).

SMT use for knowledge sharing measured the extent of use of SMT for sharing collective knowledge between employees. Social web knowledge sharing scale is based on Soto-Acosta et al. (2014b), Palacios-Marqués, Merigó and Soto-Acosta (2015b), Soto-Acosta et al., (2017).

The Innovation performance measured the implementation of a new or significantly improved product, good or service, or process, organizational practice, or

marketing method. The variable was operationalized following the definition of the overall innovation performance of the firm provided in the OSLO manual (OECD 2005) and drawing on items used in previous studies, such as: Tanev and Bailetti, (2008), Gronum et al., (2012), Soto-Acosta, et al. (2017) and represents

3.3 Instrument validation

The measures from the dataset were refined by assessing their unidimensionality and reliability. First, an initial testing of unidimensionality was made using principal component factor analyses. In each analysis, eigenvalues were greater than 1, lending preliminary support to a claim of unidimensionality in the constructs. Next, confirmatory factor analysis (CFA) was performed to assess the required convergent validity, discriminant validity, and reliability of the constructs. This study uses EQS 6.1 to estimate the measurement model. The measurement model presented a good fit to the data ($\chi2(21)$= 32.479, p=0.152; CFI = 0.96; IFI = 0.96; GFI = 0.95; RMSEA = 0.06). All traditionally reported fit indexes were within the acceptable range. This study calculated reliability of measures, using Bagozzi and Yi's (1998) composite reliability index, and Fornell and Larcker's (1981) average variance extracted index. Based on the CFA assessment, the measurement models were further refined and then fitted again.

For all the measures, both indixes were higher than the evaluation criteria, namely 0.7 for composite reliability and 0.5 for the average variance extracted. With regard to convergent all estimated standard loadings are significant (p<0.01) and of acceptable magnitude (see table 3), suggesting good convergent validity. Furthermore, the Cronbach´s Alpha values of all indicators exceed the recommended value of 0.6 (Hair, Anderson, Tatham, & Black, 1999).

[Please insert Table 3 around here]

To assess the discriminant validity, Fornell and Larcker's (1981) criterion, that the square root of average variance extracted for each construct (diagonal elements of the correlation matrix in table 4) should be greater than the absolute value of inter-construct correlations (off-diagonal elements), was used. All constructs met this criterion, suggesting that the items share more variance with their respective constructs than with other constructs. Table 4 also provides an overview of the average, standard deviations and correlations of the constructs.

[Please insert Table 4 around here]

4 Results

This paper estimated the structural model with the EQS 6.1 software package, using maximum likelihood estimation techniques to test the model. The fit of the model is satisfactory ($\chi2(17)$=29.982, p=0.183; RMSEA=0.053; CFI=0.99; IFI=0.99; GFI=0.98), suggesting that the nomological network of relations fits the data and the validity of the measurement scales.

Figure 2 shows the standardized path coefficients with their respective significant levels. Hypothesis 1 was supported (0.19, p<0.05), indicating that use SMT to acquire Customers information is related to the innovations results in SMEs, although it is the weakest relation of the model.

Hypothesis 2 was supported (0.33, p<0.01), being use SMT to acquire competitor's information the strongest factor in the proposed model. This indicates that

the use of SMT for acquisition Competitors information is a critical factor to innovation in industrial SMEs.

Hypothesis 3 was supported (0.29, p<0.01), this result shows that use of web 2.0 for shared internal Knowledge in the firm is an important factor for the innovations in SMEs. Implications of these results are discussed in the next section.

[Please insert Figure 1 around here]

5 Discussion

This paper investigates the effects of the use of SMT to acquire external information and knowledge from customers and competitors, and also the SMT use to share internal knowledge and the effects of these precise SMT uses in the results of SMEs innovation. The empirical results have revealed that factors have differential effects.

The first finding shows as the use of SMT for the customers' information acquisition is weakly related to the extent of innovations in the industrial SMEs. A possible explanation to this can be, due to the set of companies, SMEs, and the sector of the sample, industrial. Industrial and service SMEs differ in the type and role of agents, customers and competitors and the structure and dynamics of market (Laforet, 2013). Service SMEs are more market-oriented than industrial SMEs, and small service firms are more likely to engage in innovation than small manufacturing firms (Freel, & Robson, 2004; De Jong, & Vermeulen, 2006; Trigueros-Preciado et al., 2013). Other possible explanation to this can be, that previous studies have focused on aggregate measures of the external information, considering jointly information from customers and competitors and the use of only the most popular SMT tools, as Facebook and

twitter (He et al.,2013).

Regarding the use of SMT to acquire competitors' information, results suggested that it is positively associated with the innovation results of SMEs. This finding supports recent research (He et al., 2015; Scuotto et al., 2016), which found that SMT are adequate tools to acquire competitors' information, and the good information about competitors is one of the main factors that affect the extent of innovations in the SMEs (Chirumalla, 2013; Yin, 2015).

With Regard to the use of SMT to share internal information and knowledge, its effect on innovation results of SMEs is analyzed. The results show a positive relation between these two constructs. This finding confirms previous research (Soto-Acosta et al., 2017; Scuotto et al., 2016). Thus, innovation performance in industrial SMEs emerges from external information from competitors and internal knowledge, rather than from customers' information and knowledge.

6. Conclusions, limitations and future research

The competitiveness of companies depends on their ability to innovate and for this, they need to have information of what customers need, the advances of their competitors and to have adequate internal knowledge (Parveen et al., 2015; Prescott, & Miree, 2015).

It is in this context, that the development of information technologies can become an essential tool for those companies which know how to take advantage of them. In particular, the use of web 2.0 and Social Media Technologies in companies has focused mainly on the marketing area, but soon the progress made in recent years in their new uses have given rise to new forms of working, interacting, sharing knowledge (Soto-Acosta, & Cegarra-Navarro, 2016; Sigala, 2017). Therefore, it becomes essential

to analyse the use of SMT to support the external competitive information acquisition and knowledge sharing within firms (Scuotto et al., 2016).

Thus, this study extends the analysis of the SMT in companies beyond marketing and examines the use of SMT to acquire external competitive information, information from competitors and customers -separately- and the use of SMT to share internal information and knowledge, analysing the effects of this three uses on innovations results of industrial SMEs. This paper makes several contributions to the literature. First, it focuses on SMEs. Previous studies in the literature tend to focus in large businesses, with very few and recent studies analysing Web 2.0 use in SMEs (Soto-Acosta et al., 2017). Based on a large sample of SMEs, this paper fosters the generalizability of results to industrial SMEs.

Second, we extend previous works by analysing how the use of Web 2.0 affects innovation performance. Our results suggest that improved performance innovation in the industrial SMEs requires firm strategies focusing on SMT use, to absorb external information and knowledge, principally from competitors and less from customers. Besides, in line with previous works, it is showed the positive relation between the use of SMT to share internal knowledge and the innovation capacity. This finding contributes to the strategic IT management field by offering an explanation of the innovation performance within a particular sector. Moreover, the findings mark an important contribution to the literature, with the consideration of new variable, SMT use to absorb external knowledge, which has a positive effect in innovation performance.

In this line, results indicate that exploration (March, 1991) now increasingly resides outside the boundaries of the traditional firm. Today's models of organizations and innovation need to reflect this reality of innovation in a world that is ever more open and interconnected (Martinez-Conesa; Soto-Acosta, & Carayannis, 2017; Popa,

Soto-Acosta, & Martinez-Conesa, 2017). Our organizational and innovation literature need to reflect and reconcile the implications of traditional innovation with open innovation models through the use of IT. SMT is going to alter the way of companies interact both internally and externally, and that is going to evolve towards companies on the network, that integrate the competitors' and customers' flows of information with their internal knowledge, as source of innovation to achieve the competitive advantage.

To conclude, while the contributions of the present study are significant, we would acknowledge that this study has some limitations, which could be addressed in future research. First, the sample used was from Spain. It may make that the findings could be extrapolated to other countries, since economic and technological development in Spain is similar to other OECD Member countries. However, in future research, a sampling frame that combines firms from different countries could be used in order to provide a more international perspective on the subject. Second, the sample consisted of small and medium sized enterprises (SMEs). As SMEs are characterized by having less technological resources than their higher-level counterparts (large firms), this may influence the extent of sophistication in the SMT use. Therefore, in future works, the segment of large companies is worth special analysis. Third, the key informant method was used for data collection. This method, while having its advantages, also suffers from the limitation that the data reflects the opinions of one person. Future studies could consider research designs that allow data collection from multiple respondents within an organization. Fourth, it takes a static, cross-sectional picture of SMT use, which makes it difficult to address the issue of how SMT evolves over years. A longitudinal study could enrich the findings. Related to the foregoing, as future research lines, it would be interesting to replicate this work in other sectors, like service companies. These suggestions should be taken into account in future studies to increase the validity of our

findings.

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