Interorganizational Information Acquisition in an Innovative SME Network: Innovation and Information Types

Abstract

Information and innovation have been increasingly recognized as sources for firms' competitive advantage. One of the ways firms have used to acquire these resources is through cooperative relationships, such as networks. This research proposes a conceptual model of antecedents and consequences of the volume of relevant information acquisition and innovation generation in the context of a Portuguese Innovative SME Network. This is an exploratory-descriptive study, conducted through a survey of 60 SMEs (34.9% of the population). The results showed that for most the firms, the participation on the network does not contribute to the acquisition of relevant information from other firms.

Keywords

Information acquisition; Interorganizational relationships; Innovative network; SME; innovation

1. Introduction

Due to the turbulent business environment, intangible assets, especially information and knowledge, have been recognized, more specifically from the 70s of the last century, as sources for the development of firms' competitive advantage. Because of this, firms are increasingly concerned about cultivating an internal base of information and knowledge, both through internal efforts and access to other's firms' resources. Because of the later, two phenomena have gained increasing attention in contemporary science: the organization of firms in cooperative relationships aiming, among other, learning gains and the sharing of interorganizational information as a means for the occurrence of the first.

The last phenomenon has been widely investigated in the last 20 years in different cooperative interorganizational contexts, such as large-scale distributed projects (Gal, et al., 2014), innovation networks (Fritsch & Kauffeld-Monz, 2008; Bond III, Houston, & Tang, 2008; Dolińska, 2015), supply-chains (Moberg, Cutler, Gross, & Speh, 2002; Carr & Kaynak, 2007; Madlberger, 2009), clusters (Dahl & Pedersen, 2004; Morrison & Rabellotti, 2009) and strategic alliances (Simonin, 2004; Hau & Evangelista, 2007; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008). Nevertheless, being a complex phenomenon with a multifaceted border, it still requires a better understanding, especially regarding four aspects: its process, its antecedents and consequences, the type of information acquired, and the dynamic of interactions between the firms (Simonin, 2004; Jack, 2005; Nieminen, 2007; Easterby-Smith, Lyles, & Tsang, 2008; Samarra & Biggiero, 2008; Wijk, Jansen, & Lyles, 2008; Martinkenaite, 2011). In this context, the general contribution of this research is to offer insights about the view on the various innovation or information types that firms can generate from innovative networks.

Regarding the process, this research aims to address the need for empirical research that instead taking for granted that information acquisition by itself generates organizational outcomes, assumes the mediating role of the information acquired. In this sense, this article presents a conceptual model based on the three dimensions of the process: antecedents (inputs), information acquisition (intermediate learning outputs) and organizational performance (Martinkenaite, 2011), namely in terms of innovation generated.

Regarding the second aspect – antecedents and consequences of information acquisition - the literature has already highlighted a range of them. However, "after two decades of research… a systematic overview of the underlying mechanisms and outcomes of knowledge transfer is still lacking" (Wijk, et al., 2008, p. 831). Due to this fact, this research aims to verify the influence of trust (regarding the social relation between firms), intention and ability to learn (regarding the receiving firm), source attractiveness and protectiveness (regarding the source of information) on the volume of relevant information acquisition among the firms belonging to a cooperative network. All these aspects are cited in the literature as drivers of information acquisition and some of them have been found as relevant drivers in earlier empirical studies focused on different contexts of interorganizational relationship (Simonin, 2004; Hau & Evangelista, 2007; Easterby-Smith, Lyles, & Tsang, 2008; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008; Wijk, Jansen, & Lyles, 2008; Martinkenaite, 2011). As consequences, this research aims to identify the creation of incremental and radical innovation related to management methods, organizational processes, markets, products and services. These antecedents and consequences dimensions were defined after an exploratory phase of interviews. The understanding of the antecedents and consequences of relevant information acquisition may favour the proposition of policies, incentives and

appropriate mechanisms improving the process of articulation and learning between the firms (Madlberger, 2009).

The third aspect - identification and measurement of the type of information acquired - is relevant, firstly due to the increasing importance of innovation among firms. As known, innovation generation requires the combination of different types of information from different organizational functions, indicating the need to broadening the focus of earlier researches previously centred only on technological knowledge (Hau & Evangelista, 2007; Samarra & Biggiero, 2008). Secondly, still little attention is being given to the identification and measurement of the content of information gained by the firms in cooperative relationships (Samarra & Biggiero, 2008; Martinkenaite, 2011).

Finally, regarding the dynamic of interactions between the firms a better understanding on the relationship between the source and the seeker of information is important since it is the relationship system among the members that ultimately define the network operation and the achievement of results (Moreira, 2007). Mapping the interactions that provide important information can help in the definition of policies and better ways of interaction (OECD, 2005).

In short, in the light of the above, this research aims to answer five research questions:

RQ1: The participation in an interorganizational innovative network contributes to firms to acquire relevant information from other firms?

If yes:

RQ2: Are trust; intention and ability to learn and source attractiveness and protectiveness antecedents of the volume of relevant information acquired?

RQ3: How much of the information acquired contributed to innovation and which kind of innovation is produced?

RQ4: What types of relevant information are acquired?

RQ5: What characterizes the source firm of the information and the relationship between it and the seeker firm?

This research was carried out in a Portuguese Innovative SME Network (called COTEC). The choice for this network took into consideration three reasons. Firstly, its focus on innovation, which makes information a more valued resource than in other types of interorganizational relationships (Corvelo, et al., 2001). Secondly, Portuguese researchers stress that "empirical study of interorganizational networks in Portugal is in an embryonic stage" (Moreira, 2007, p. 189). Finally, most of the previous research focus on Anglo-Saxon countries, revealing the importance of understand the phenomena in other countries before new theories are proposed (Bellou, 2010).

2. Literature Review

2.1. Information acquisition

Information acquisition is understood in this research as the increased volume of relevant information acquired by a firm from its relationships with other organizations (Birkinshaw, et al., 2010). Although most authors cited use the term knowledge, the term information was privileged in this research for conceptual reasons. It is believed that knowledge cannot be managed, once it constitutes what an individual knows, the mental process of apprehension and comprehension. The messages used to express this knowledge do not contain knowledge but are information, when

embedded in a relevant context for the receiver. Since, the mental structures of the source and receiver are different, the way information is assimilated by the knowledge of the receiver may be different from the way the source apprehended it (Wilson, 2002).

The use of the term acquisition relies on the focus of the study on the receiving firm. In a dyadic level analysis, the receiver "is the best judge of the value of knowledge received from a particular source" (Samarra & Biggiero, 2008, p. 811). It is important to highlight that alternative but related labels are also used in the literature (Wijk, et al., 2008), such as sharing (Carr & Kaynak, 2007; Mei & Nie, 2007; Cui, 2017; Olaisen & Revang, 2017), transfer (Tushman & Scanlan, 1981; Simonin, 2004; Barão, Vasconcelos, Rocha, & Pereira, 2017), exchange (Moberg, et al., 2002), flow (Dahl & Pedersen, 2004) and acquisition (Hau & Evangelista, 2007), most of them proceeded by the term knowledge. Information acquisition do not generate organizational outcomes by itself but is an intermediate step between antecedents' variables and organizational outcomes as showed on Figure 1 (Martinkenaite, 2011).

[Insert Figure 1]

Specifically apropos its antecedents, several variables are identified in the literature, such as aspects related to the firm's characteristics, both seeker and source (organization size, absorptive capacity, ability to transfer, motivation to teach and to learn, a centralized position in the network), to the nature of the knowledge (e.g., tacitness, complexity, specificity and ambiguity) and to the interorganizational dynamics (e.g., power, trust, social ties, the existence of vision and common

systems and exchange routines) (Easterby-Smith, Lyles, & Tsang, 2008; Wijk, Jansen, & Lyles, 2008; Madlberger, 2009; Martinkenaite, 2011; Majchrzak, Jarvenpaa, & Bagherzadeh, 2015).

The new information learned can be classified regarding its type, extent and nature. Type refers to the content of the information on focus, such as marketing, technology, technical management, manufacturing, production. This distinction is found in many researches (Simonin, 2004; Mei & Nie, 2007; Fritsch & Kauffeld-Monz, 2008; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008; Samarra & Biggiero, 2008) and is important due to two factors: firstly, the growth of international alliances, which increases the importance of information related to management; secondly, the importance of combining different types of information from different organizational functions for generating innovation. The extent refers to the volume of information acquired and the nature to the distinction between tacit and explicit knowledge.

Di Caprio (2014) states that the process of information transmission must be endowing with a topological structure that accounts for its dynamical properties. This formal abstraction leads to immediate behavioural implications regarding the way information should be acquired through time. the systemic interaction and knowledge exchange among innovating actors in a region constitute a key element for an innovation system

The consequences or outcomes of the process are understood as the results generated by the increased volume of relevant knowledge gained (Martinkenaite, 2011). The literature highlights outcomes such as product development improvement, innovation and performance capacity, new strategies development and customer satisfaction (Zhang, Vonderembse, & Lim, 2006; Mei & Nie, 2007; Wijk, Jansen, & Lyles, 2008; Lawson, Petersen, Cousins, & Handfield, 2009; Fang, Wang, & Chien, 2017). In the case of this research, the focus is on results relating to innovation, understood as the application of information to the creation of new knowledge, varying the degree

of novelty of knowledge created from incremental improvements to radical changes (Nieves & Osorio, 2012).

2.2. Antecedents and consequences of organizational information acquisition

2.2.1. Learning intention and capacity

To propose a conceptual model, exploratory interviews were carried out with five members of COTEC Innovative SME Network to identify possible antecedents and consequences of relevant information acquisition. As a result, it is expected that if firms show an innovative attitude and want to take part in a sectorial and geographically diversified network aimed, among others, at encouraging the maintenance and expansion of this posture toward innovation, they will acquire relevant information from other firms to the extent that: they show intention and capacity to learn with other firms; they perceive the information source as being attractive; and they consider to have a trustful and close relationship with the sources of the relevant information. In fact, the systemic interaction and knowledge exchange among innovating actors in a region constitutes a key element for an innovation system (Cantner, et al., 2010). On the other side, the volume of relevant information will be hindered if they perceive the source as having a protectiveness attitude towards its own information.

If a firm wants to obtain relevant information from another, it should present intention of learning, that is, the desire, motivation and willingness to do so (Simonin, 2004; Hau & Evangelista, 2007; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008). Although learning can happen randomly, the existence of learning intention is the first step toward effective learning, once it helps raise awareness on the necessity of learning and direct efforts and resources in this direction (Hau &

Evangelista, 2007). The motivation to learn also contributes to the receiver to be psychologically better prepared to understand the information and knowledge obtained (Pérez-Nordtvedt, et al., 2008).

Learning intention will be higher in two cases: when firms have a competitiveness, strategy focused on ability and not on products; and when firms are really interested in covering a knowledge gap rather than depend on the knowledge of others (Hau & Evangelista, 2007). Several authors emphasize the importance of learning intention in the process of information and knowledge acquisition (Simonin, 2004; Hau & Evangelista, 2007; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008; Martinkenaite, 2011; Barão, Vasconcelos, Rocha, & Pereira, 2017).

Learning capacity is identified as the capacity of the firm to internalize the information and knowledge offered. It was identified as the second most important antecedent for the acquisition of marketing knowledge in international joint ventures (Hau & Evangelista, 2007). Learning capacity is composed of three aspects: incentives (routines, rules and systems to develop guidance for learning), cognition (attitudes and beliefs that show openness to learning) and resources (commitment of human and physical resources) (Simonin, 2004). Regarding the last aspect, several authors highlight the importance of resources employment such as time, money, people commitment, including top managers, to influence the learning process and exchange of information and knowledge (Wagner & Bukó, 2005; Madlberger, 2009). Among the efforts that are made by a firm when there is intent to learn, it is possible to cite active participation in formal training, diligent study of manuals or documents, communication with other firms and observation of its behaviours (Hau & Evangelista, 2007). Therefore, the following hypotheses are proposed:

Hypothesis 1a: The greater the learning intent the greater the volume of relevant information acquired.

Hypothesis 1b: The greater the learning capacity the greater the volume of relevant information acquired.

2.2.2. Source's attractiveness and information protectiveness

Pérez-Nordtvedt, Kedia, Datta and Rasheed (2008) identified that a partner who is perceived as attractive is positively associated with the perception of usefulness of knowledge by the receiving company. The attractiveness is defined by the following characteristics: visible and stable results over time, the role of the firm in the development of its knowledge and the existence of cooperation projects with customers and suppliers. It could also be expected that if the source's attractiveness is positively associated with the perception of usefulness of knowledge, the more the firm is attractive, the more volume of information the receiver firm will acquire in a network arrangement.

The attitude of protecting information and knowledge is understood as the inability or unwillingness of the firm to share information and knowledge (Simonin, 2004). This attitude is related to the fear of the firm that possesses the information and knowledge of losing position, privilege or reward (Szulanski, 1996). Cooperative relations are still far from ubiquitous in the world of relationships among firms due to risks and costs of an incompetent partner and the possibility of an opportunistic behaviour by a competitor (Lütz, 1997). Therefore, the hypotheses 2a and 2b are proposed:

Hypothesis 2a: The greater the attractiveness of the supplier of information, the greater the volume of relevant information acquired.

Hypothesis 2b: The greater the information protectiveness by the supplier of the information, the smaller the volume of relevant information and knowledge obtained.

2.2.3. Trust

To facilitate the process of information and knowledge acquisition, trust should characterize the relationship between the firms. Trust increases the willingness of partners to help each other understand the new knowledge and favours the firms to obtain a common understanding between them (Wathne, Roos, & von Krogh, 1996; Pérez-Nordtvedt, Kedia, Datta, & Rasheed, 2008; Wijk, Jansen, & Lyles, 2008). Moreover, social proximity, which is based on trust, is also important, once frequent and intensive communication with the partners increases the satisfaction of managers with the results of sharing and trust between firms (Wagner & Bukó, 2005). Moreover, in 2012, Mattes (2012) emphasizes five types of proximity - cognitive, institutional, organizational, social or geographical, which contribute to the trust and interaction between firms. Thus, it follows hypothesis 3:

Hypothesis 3: The greater the trust between the firms, the greater the volume of relevant information acquired.

2.2.4. Innovation

Technology plays multiple roles in service innovation (Ryu & Lee, 2018), but in terms of consequences, the literature highlights the importance of external information and knowledge to generate innovation (Mei & Nie, 2007; Wijk, Jansen, & Lyles, 2008). Firms can accelerate their innovation process through information and knowledge sharing with other firms, rather than focusing only on their own resources and seek innovation only through the internal efforts of research and development (Chesbrough, 2003). Therefore, hypothesis 4 is proposed:

Hypothesis 4: The greater the volume of relevant information acquired, the greater the volume of innovation generated.

2.3. Proposed conceptual model

From the foregoing, the conceptual model of this study is composed of antecedents and consequences of volume of relevant information acquisition (Figure 2). Among the antecedents, characteristics of both information seeker and source and characteristics of the relationship between them are included. As consequences, the innovation is expected.

[Insert Figure 2]

3. Methodology

3.1. Network studied, sampling and data collection

This descriptive-exploratory research was carried out through four data collection stages. The first stage aimed at obtaining a general comprehension and description of the COTEC network. Through the second stage the variables of the conceptual model were identified. The third stage targeted at testing the conceptual model and meeting the researchers' questions. Finally, the fourth stage intended to discuss the results obtained in the previous stage.

3.1.1. First stage: interview with technical consultant of the network and secondary data

The first stage of the research was composed of an interview with a representative of the central coordination staff, a technical consultant, aimed at obtaining a broader understanding of the characteristics of the network, especially regarding information sharing. This coordination perspective had already been used in the study of other business networks in Portugal (Lage & Alturas, 2012). Secondary data, mainly obtained from the network' website, was also used to fulfil the same purpose.

Because of this phase, a brief description of the network under analysis is presented. COTEC SME Innovative Network belongs to a bigger network named COTEC Portugal Network - Business Association for Innovation. The last one is a private, non-profit organization, founded in 2003, in which the President of the Portuguese Republic exerts the role of President of the General Assembly. Its objective is to contribute to the National System of Innovation by promoting the competitiveness of Portuguese companies through the development of a culture and practices focused on innovation. The network was initially formed by large firms, called "Associated Companies" and other organizations of the National Innovation System.

In 2005, COTEC Portugal Network, taking into consideration the importance of the SMEs for the Portuguese economy, created the COTEC SME Innovation Network. COTEC SME Innovative Network has the objective of promoting public recognition of innovative SMEs, establishing cooperation between the Associated Companies and the SMEs and supporting SMEs growth especially concerning the attraction of investment and internationalization.

COTEC SME Innovative Network is composed of more than 30 economic industries represented both technology and knowledge intensive sectors (e.g. ICT and Pharmaceuticals), as traditional ones (e.g. Footwear and Textiles). Thirteen out of eighteen districts of the country are represented. In terms of coordination, the network has a central coordination staff, which provides virtual and face-to-face channels aimed at encouraging the relationship among the SMEs themselves and between them and other actors, such as the large companies. To be able to take part in the network, the firm must have fewer than 250 employees and its turnover should not exceed 50 million Euros or balance sheet value should not exceed 43,000,000 Euros (European Comission, 2012). In addition, firms must have at least an annual turnover of 200,000 Euros, 10 employees, 3 years of operations and a minimal degree of innovation. The last one is measured through an online tool,

called innovation scoring (COTEC Portugal, 2018). The minimum level of innovation is evaluated annually since it must be maintained if firms intend to remain in the network.

Within the network, the SMEs have opportunity to share information about its competences, experiences, successes, failures with each other and to get this kind of information from the big firms called Associated Companies. Despite this fact, the network is especially intriguing since, unlike interorganizational relationships based on common commercial aims, such as strategic alliances or joint ventures or networks composed of companies from the same sector, such as the business associations, COTEC does not present a common commercial purpose and is composed of sectorial and geographically diversified companies. The absence of a common commercial objective and the geographical and sectorial diversity make information sharing more challenging (Tsai & Bendersky, 2016).

3.1.2. Second and third stages: interview and survey with firms belonging to the Network

The second data collection stage was carried out through interviews aiming at identifying the relevant dimensions regarding information acquisition, method which has already been used in other studies (Lage & Alturas, 2013). From October to January, 60 SMEs belonging COTEC SME Innovative Network from diverse sectors were contacted by email to request an interview. Only five agreed to participate. All the respondents held managing positions. The operational time of the SMEs ranged from 10 to 22 years and the number of employees from 13 to 180. The sectors represented were: pharmaceutical (interviewed A), information and communications technologies (interviewed B), environmental consulting, engineering and information systems, and aerospace (interviewed E). Four men and one woman were interviewed. The interviews took on average 40 minutes and were recorded and later transcribed. The main result of this stage was the development

of the conceptual model, as described in the previous section. Moreover, the interviews also contributed to the analysis and discussion of the results obtained in the third phase.

The third phase of data collection aimed at meeting the research questions by questioning all members of the COTEC SME Innovative Network. The questionnaire was validated through theory and by adapting measures used in previous surveys. Also, an evaluation by two network members and three academics was carried out. Among the suggestions, it was decided to disregard the academic rigor and use the two terms - information and knowledge - given the difficulty to standardizing the conceptual framework adopted in the minds of the respondents.

Considering the size of the population and its geographical dispersion, a questionnaire was developed and sent by e-mail to the SMEs, a total of 174 firms, since two of them took part in the pre-test of the questionnaire. According to the website of the network on September 2018, the network was composed of more than 200 SME. Two rounds of telephone calls were made to encourage the respondents. Through those phones' calls, it was found that two firms were in a process of leaving the network. Given the still low number of responses after the calls, the questionnaire in paper format was handed in to some firms personally, with the support of college students. The period of the visits lasted from June to September of 2012. The regions of Lisbon, Centre and North of the country were privileged in terms of visits, given that the largest number of firms are in those regions. The final sample was composed of 60 valid questionnaires, which corresponds to a response rate of 34.9% of 172 firms. One questionnaire was considered invalid since the pattern of responses indicates no understanding or no consideration in relation to the instructions regarding various issues. The final sample was composed of 50% of medium and 50% of small companies, with over 10 years of operational time (74.6%), over 3 years belonging to the network (43.6%) and high technology/knowledge intensity (63%).

3.1.3. Fourth stage: second interview with technical consultant of the Network

The fourth and last stage of the research was carried out with conducting a second interview with the representative of the central coordination staff – the technical consultant - aiming at getting his view on the results of the previous stage. For that, a summary of the results was sent in advance by e-mail to the interviewee.

3.2. Measurement

To meet the first Research Question, the respondents were asked to answer the following question: "Participation in COTEC has contributed for your firm to acquire any relevant information/knowledge from other firms in the network? The respondent should choose between "Yes" or "No". Only in case of a positive answer, the respondent would continue to answer the remaining questions. It is important to highlight that the respondents were free to identify either other SMEs or Associated Companies (large dimensions) as sources of relevant information.

Concerning the conceptual model, Tables 1, 2 and 3 present the items used to measure the dimensions. Five points Likert scales were used, following other investigations concerning the same subject (Wagner & Bukó, 2005; Fritsch & Kauffeld-Monz, 2008; Westerlund & Rajala, 2010).

The volume of relevant information acquisition (Table 1) was measured by one item evaluated according to a five-point Likert scale (1= very low; 2= little; 3= medium, 4= high and 5= very high).

[Insert Table 1]

Regarding the antecedents (Table 2), the respondents were asked to think of up to the five most important information source firms. The limitation of the number of firms follows other studies (Fritsch & Kauffeld-Monz, 2008; Samarra & Biggiero, 2008; Madlberger, 2009). A five-point Likert scale was used (1= totally disagree; 2= disagree; 3= neither agree nor disagree; 4= agree and 5= totally agree) to measure the agreement with 16 statements related to the antecedent dimensions.

[Insert Table 2]

Concerning the consequences (Table 3), the following question was presented: "How much of the volume of information and knowledge acquired helped to". A five-point Likert scale was used (1= very low; 2= little; 3= medium, 4= high and 5= very high). The first four items are related to incremental innovation and the following ones to radical innovation (OECD, 2005).

[Insert Table 3]

In addition to the conceptual model, this research aimed at identifying the volume of information acquired according to its type and characteristics of the relationship between information seeker and source. Tables 4 and 5 present the items used to respond to both objectives. To identify the type of information (Table 4), the following question was presented: "How much of the volume

of information and knowledge acquired is about". A five-point Likert scale was used (1= very low; 2= little; 3= medium, 4= high and 5= very high).

[Insert Table 4]

To identify the characteristics of the relationship between information seeker and source, Table 5 shows the questions that were made. The respondents should answer those questions, about up to the five most important sources of information, both SMEs belonging to COTEC SME Innovation Network or Associated Companies (large firms).

[Insert Table 5]

3.3. Data preparation and analysis

Data preparation was performed through Principal Component Analyses (PCA; results not reported) regarding the antecedents and consequences dimensions. The Cronbach's Alpha was also computed to confirm the internal consistency of the model dimensions. The lower limit for Cronbach's alpha of 0.70 is generally accepted, and this value may decrease to 0.60 in exploratory research (Hair, et al., 2009).

The antecedents learning intention, information protectiveness and trust had their unidimensionality and internal consistency confirmed. Learning capacity presented two dimensions: resources (items 2.1, 2.2 and 2.3) and incentives (items 2.4, 2.5 and 2.6). Concerning

source attractiveness, the PCA results showed two dimensions. Nevertheless, one of the sub-dimensions, composed of items 3.3 and 3.4 did not show acceptable Cronbach's alpha. This dimension was then eliminated and a new PCA was performed with the remaining two items, proving its one-dimensionality (items 3.1 and 3.2).

Regarding the consequences in terms of innovation, the PCA results showed that item 7.1 cross-loaded on the two components and it was omitted from the scale. Thus, two types of innovation were found, grouped according to the content of innovation. They were named: Innovation with internal focus (items 6.2, 6.3, 6.6 and 6.7), i.e., relating to management techniques and organizational processes and innovation with external focus (items 6.4, 6.5, 6.8 and 6.9), i.e., relative to market and consumers. In relation to the volume of information according to its type, a PCA was also carried and two dimensions were identified: management information (items 7.2, 7.3 and 7.6) and technological information (items 7.1, 7.4 and 7.5).

Moreover, reliability properties and convergent and discriminant validity were confirmed (Tables 6 and 7). The composite reliability (CR), which according to Fornell and Larcker (1981) is a measure that estimates the internal consistency of the reflective factor items, indicate the extent to which these items are consistent manifestations of the latent factor (CR>= 0.7). Convergence was evaluated through the average variance extracted measure (AVE), which reflects the amount of variance captured through the latent construct. It is considered satisfactory when above the minimum recommended value of 0.50 (Fornell & Larcker, 1981). Discriminant validity is verified when the square root of AVE for each construct is greater than the standardized correlation of that construct with all other constructs (Anderson & Gerbing, 1988).

[Insert Table 6]

[Insert Table 7]

All dimensions were operationalized by indexes that correspond to the average answers for the items strongly correlated to each dimension. To evaluate the relationship between volume of relevant information acquired and its antecedents and consequences, linear regressions models (OLS-ordinary least squares regression) were performed.

Finally, the characterization of the relationship between the source and seeker of information was analysed through descriptive statistics.

4. Findings and Discussion

Concerning the first research question - the contribution of the participation in the network to the acquisition of relevant information from other firms - a high rate of positive responses was expected, considering the increase importance of cooperative relationships to access resources. Nevertheless, less than half of the firms (29 firms: 48.3%) confirmed that the participation in the network has contributed to the acquisition of relevant information from other firms. On one side, the positive confirmation of the contribution of the network corroborates the literature regarding the benefits of taking part in cooperative relationships (Nahapiet & Ghoshal, 1998; Wijk, Jansen, & Lyles, 2008; Martinkenaite, 2011). On the other side, the fact that more than half of the sample indicated that the participation in the network has not contributed to the acquisition of relevant

information from other firms highlights that the simple binding to potential suppliers of information is not sufficient to ensure such gains (Anand, et al., 2002).

Four factors may be behind this negative result. Firstly, links with other organizations are not immediately rewarding, but time is required to the identification of mutual interests and understanding. Networking is a social process that requires a long-term perspective for the latent ties to be developed into manifest ones (Anand, Glick, & Manz, 2002; Jack, 2005). This fact is reinforced by the relationship found between time of participation in the network and the number of firms that claim that network participation has contributed to information gains (Cramer's V = 0,470), indicating that the longer the presence in the network, the greater the number of firms that claim a positive contribution.

Secondly, firms may have other motivations to take part in the network. Considering two of the explicit objectives of the network - promoting public recognition of innovative SME and supporting SMEs growth phases especially concerning the attraction of investment and internationalization – it is possible that gains of legitimacy (Fhionnlaoich, 1999) or gains of resources that come directly from the participation in the network (and do not require communication with other firms) have attracted the firms to take part in the network. This idea can be corroborated by the view of the technical consultant, according to whom the firms may present a lack of interest in meeting each other and the network cannot replace their own networking or compel them to do so. Although the events (created by the coordination of the network) called by the interviewee as "hygiene factors" allow this opportunity, it does not mean that the companies will use them for this purpose.

Thirdly, the technical consultant also acknowledges the presence of a cultural factor. By visiting events in other countries, along with some members of the network, he observed a very different

relationship dynamic, especially on the part of Anglo-Saxon and northern Europe companies. To the technical consultant, those companies can make contacts and exchange cards in a much faster pace than the Portuguese companies. To illustrate this aspect, the technical consultant cited a comment of one of the members of the network, who said: “In Portugal we are always like a lady who wants to be asked to go dancing but she will not take the first step." According to one interviewee, carried out during the second stage of the research, the absence of a culture of collaboration in Portugal has been a hindrance to formation of partnerships. It is also, according to the respondent, an aspect that the network has been unable to overcome: “It is not exactly a great culture for gathering or collaborating ... apart from some examples, each one is in his/her house doing what they think they are good at. And this extends to the business environment”.

Lastly, according to the firms interviewed during the second stage of the research, the communications channels offered by the network do not allow a rich interaction among the firms. For instance, one interviewed said “I think communication is not the deepest, most effective or prolific, I think it is still largely confined to the events that are organized…”.

The firms that answered “Yes” to the first question were asked about the volume of relevant information acquired Table 8). It is noticed that the mean value (M=2.86) is below the midpoint of the scale (3), indicating that even in the cases where there are informational gains; they also have potential for improvement. Tables 9 and 10 summarize the results concerning the antecedents and consequences (type of innovation) of the volume of relevant information acquisition.

[Insert Table 8]

[Insert Table 9]

[Insert Table 10]

The two highest mean values (learning intention and source´s attractiveness) indicate the agreement of the respondents with the existence of a pre-disposition to learn from the most important firms in the Network and with the attractiveness of such firms. These results are expected, since the network offers potential access to large companies (the Associates) and qualified SMEs. The results of learning capacity for both dimensions indicate that despite being SMEs qualified as innovative by the coordination of the network and being interested in learning from other companies of the network, they recognize not having a learning capacity in terms of resources (people, organizational, financial, logistics), and especially regarding incentives, such as a learning agenda. The presence of information protectiveness by the information' source is also expected, once some sources may be from the same sector and occupy the same position on the value channel or are large companies, which have more power to difficult the access to their information when relating to SME.

In terms of the volume of relevant information that contributed to the generation of innovation, the mean values are below the midpoint of the scale in both types of innovation. Possible explanations are that the information obtained has potential to generate new ideas but do not receive serious consideration or effort to be developed, being prematurely abandoned (Van de Ven, 1986); lack of a systematic management of the process of knowledge acquisition (Inkpen, 1997); or the information acquired is relevant for other reasons, not related to innovation.

Table 11 presents the linear regression results concerning the hypotheses H1, H2 e H3 (antecedents of volume of relevant information acquisition).

[Insert Table 11]

Hypothesis 1a and 1b, concerning the characteristics of the receptor were rejected. There was no empirical evidence that intention and capacity to learn influence the acquisition of relevant information from the partners. These results contradict the literature (Hau & Evangelista, 2007; Martinkenaite, 2011) and indicate that the basis to acquiring relevant information from other firms in the network does not rely on the receiving' firms characteristics. The reason why intention and capacity to learn do not play a role on the acquisition of information among the companies in this network may rely on two set of aspects: firstly, the absence of business relationship between the seeker and source of information. For instance, there is no business relationship with 51.9% of the firms whose contact began after the participation in the network. This absence of business relationship may hinder a more frequent contact between the companies, unless the information source would also have a great desire to share its knowledge with the information seeker. Moreover, the contact between the companies is occasional (less frequent than bimonthly) with most large sources (53.1%) and with the biggest group of SMEs (43.2%). Occasional contact associated with poor communication channels offered by the network (as already mentioned) may hinder the possibility of learning, even in the presence of learning intention or capacity. The opportunities for interaction among the companies are relevant, whether formal or informal. Informal contacts contribute to increased levels of trust, motivation, time and opportunities for the

development of relationships. Formal contacts positively influence the informal ones, indirectly influencing information acquisition (Lawson, et al., 2009). A more intense interaction and richer communication channels facilitate dialogue and the compatibility of cognitive patterns, important factors given the sectoral diversity present on the network.

The second reason is that learning intention may not be strong enough to push the companies to maximizing the frequency and intensity of interactions between them apart from the formal meetings provides by the network, two prerequisites to obtaining advantages in network arrangements. According to the technical consultant, especially in times of economic crisis, the focus of the companies may be on the daily routine, hindering them to have a "broader view" or a more "divergent" thinking.

Regarding hypothesis 2a, source's attractiveness proved to be a negative predictor, although not significant, indicating that the higher the source's attractiveness, the lower the volume of relevant information acquired. If a partner who is perceived as attractive is positively associated with the perception of usefulness of knowledge by the receiving company (Pérez-Nordtvedt, et al., 2008), the same was not observed in terms of the relationship between source' attractiveness and the volume of relevant information acquired. The reason for that may be, firstly, difficulties of a frequent access to the largest companies. Only one event, which takes places every year, was described by the Technical Consultant through which the SME have access to information from the largest companies. A second reason may be related to power asymmetry (Easterby-Smith, et al., 2008). The largest companies can lack any interest in giving further information to the SME. The technical consultant also indicates that the more attractive companies are also the more powerful to put barriers to communication, especially the largest ones. A third reason may be lack of interest of the more attractive firms which are also SME in giving relevant information to

companies from the same industry, once this kind of relationship is more prone to tension between competition and cooperation and risk of misappropriation of information.

Hypothesis 2b, information protectiveness, was found to be a significant negative predictor of the volume of relevant information acquired, confirming theoretical propositions and other empirical studies. This result was expected, especially considering the existence of firms within the same industry and the paradoxical effect of competition and cooperation present in interorganizational relationships (Hau & Evangelista, 2007). The technical consultant highlights that opportunistic behaviours can happen, also encouraged by periods of economic crisis when the market shrinks.

Regarding hypothesis 3, trust proved to be the strongest positive predictor of volume of relevant information acquisition. This result is supported by the literature (Jack, 2005; Bstieler & Hemmert, 2008; Fritsch & Kauffeld-Monz, 2008; Gretzinger, Hinz, & Matiaske, 2010). It means that it is the trust between the source and seeker of information that makes the difference in this network regarding acquisition of information.

Regarding the consequences of volume of relevant information acquisition, hypothesis 4a and 4b were not rejected, according to the linear regression results (Table 12). Results indicate that the volume of relevant information is a positive predictor of the volume of the two types of innovation, aspect that supports the literature on the benefits of interorganizational learning for the generation of innovation (Easterby-Smith, et al., 2008).

[Insert Table 12]

In relation to the fourth research question – volume of information acquired for each type, two types of information were identified: management and products and services technology. The results show that even in the cases where there are informational gains; there are potential for improvement, since de mean values are slightly below the midpoint of the scale (Table 13). Additionally, the volume of information acquired are stronger positive correlated with the volume of information acquired related to products and services technology (Spearman Rho= 0.723) than with the volume of information acquired related to management (Spearman Rho= 0.594). It was also found a positive and moderate relationship between the technological intensity of the firm and the volume of technological information (Spearman Rho= 0.442).

[Insert Table 13]

It is expected that high-tech sectors have a greater focus in the exchange of technological information when in collaboration with other firms. In most collaborative relationships, both involving large companies and SMEs, the partners exchange simultaneously more than one type of knowledge, particularly technological, marketing and management (Samarra & Biggiero, 2008). A research on innovation networks in Germany found that the most commonly exchanged information relates to market conditions, followed by information about competencies of potential partners, management practices and technological information, classified by the authors as knowledge (Fritsch & Kauffeld-Monz, 2008). The ability to combine different types of information and knowledge is the basis for the development of innovation. Non-technological information is increasingly important to enable firms to cope with the interorganizational division

of innovative labour imposed by the increasing technological complexity. Technological information and knowledge enable companies to respond quickly to environmental technological changes (Samarra & Biggiero, 2008). "The intimate connection between the technical and administrative dimensions of innovation is a key part of understanding the management of innovation" (Van de Ven, 1986, p. 592). Thus, the greater the number of mechanisms that support the interactions between the actors, being them formal or informal, the greater the likelihood that there is an exchange of information of multiple types.

Concerning the most important information' sources (fifth research question), it was identified that they have different roles regarding the information seeker: they are clients, service or raw material suppliers, partners in joint projects, firms with which there is no commercial relationship and firms with which there is expectation of future business relationships. For the firms, the different types of relationships requires from them the competence on active relationship management in which they can find an equilibrium between giving and receiving information (Wagner & Bukó, 2005) and that may lead to the identification of more and less effective relationships, restructuring existing relationships and identification of new links (Ebers & Grandori, 1997).

5. Conclusions and Implications

The relevance of intangible resources such as information and knowledge for business competitiveness in the twenty-first century economy, as well as of interorganizational relationships to obtain such resources is already widespread. In this sense, this article aimed at investigating the antecedents and consequences of relevant information acquisition in the context of a Portuguese interorganizational network. Moreover, new insights are generated regarding the type of information acquired and characteristics of the information sources.

The first contribution of this article is on its consideration of the interorganizational information acquisition as a mediator step between antecedents and consequents, a present lack in the empirical researches. Indeed, the volume of relevant information acquired is a positive driver of innovation generation, either internal or external. Additionally, the classification of innovation by the firms not according to the traditional incremental and radical innovation, but according to the target gives a new perspective of innovation that firms may consider in their decisions.

The second contribution is related to the antecedents of the process. This article adds one example to the literature confirming the positive impact of trust and information protectiveness on the information acquired. On the other side, three results were not expected: the absence of impact of the learning intention or capacity and of the source 'attractiveness. The last result is especially interesting since the network under study has "attractiveness" as part of its entrance prerequisites: first for being composed of large companies, second for being composed of SME which must prove a minimum acceptable degree of innovation capacity.

The results highlight that in a network formed without any commercial or concrete business objective that requires the companies to communicate and share with each other, the role of the

information source firm and the network coordination gain relevance. No information can be acquired unless there is willingness by the source firm, which should provide access to information seeker and make the information available. For that to happen, the network coordination must provide an environment that incentives the interaction and strengthen of ties among the firms. It is a big challenge, considering the geographical dispersion, sectorial diversity and absence of a common objective that characterizes the network. This challenge is even bigger if it is taken into consideration the predominance of a casual contact among the firms and the great number of contacts with whom there is no commercial relationship.

The third contribution of this study relates to the two types of information contents identified: management and technology. Further research could relate the type of information with the type of relationship between the firms. The research also identified that less than half of the firms believes that taking part in the network helps the acquisition of relevant information from other firms. Further research should investigate which aspects could be behind this low rate. For instance, lack of interest from the firms to acquire information from other firms in the network, Portuguese culture and characteristics of communication channels offered by the network could be behind this negative result.

This research has also limitations that should be considered when conducting future studies. Variables regarding the structure of the network should be included in future researches, such as form of coordination and communication channels. It would also bring new insights to use the characteristics of the relationship between the firms, especially type of relationship (client/supplier/partner in joint project/without business relations) and size of information supplier firm, as moderator variables between the antecedents of information acquisition and information acquisition. It is expected that, for example, the learning intention of the firms varies depending

on the expectations they have towards one another. Another limitation that should be avoided in future researches refers to the question related to information acquisition itself. To avoid misunderstanding by the respondents, it would be necessary to differentiate between internalization of new knowledge (desire to close a knowledge gap) and exploration of the partner's knowledge (search for efficiency gains). Finally, it is important to emphasize that the small response rate obtained in this study prevents the generalization of the results, but at the same time can trigger future research.

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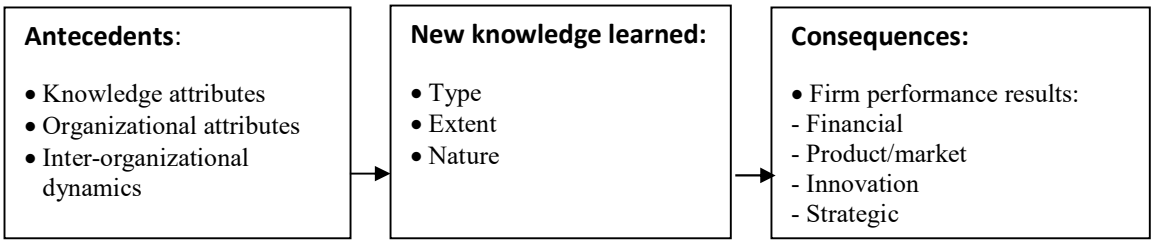
Figure 1: Interorganizational knowledge transfer framework



Source: adapted from Martinkenaite (2011)

Figure 2: Proposed conceptual model – Antecedents and consequences of volume of relevant information acquisition

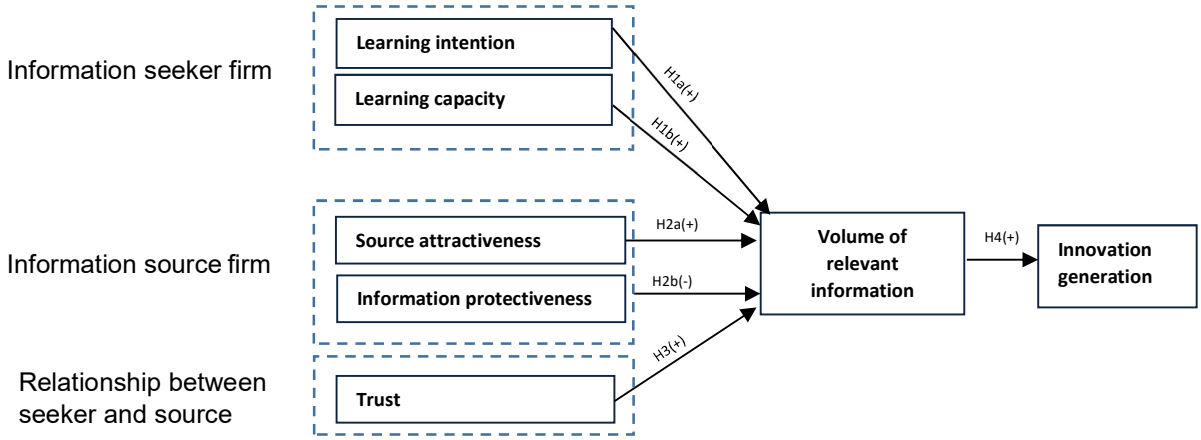


Table 1: Volume of relevant information acquisition

Item	Research
Taking into consideration the most important firms of the network for your firm in terms of information and knowledge, what extent of relevant information/ knowledge volume is acquired from them?	Fritsch and Kauffeld-Monz (2008)

Table 2: Relevant information acquisition antecedents

Item	Research
1 Learning intention 1.1 Our firm has a strong desire, determination and will to learn from these firms. 1.2 Our firm is interested in obtaining a specific knowledge from these firms.	Simonin (2004)
2 Learning capacity 2.1 We have employees committed to activities/contacts with these firms. 2.2 The staff appointed to get knowledge from these firms is highly skilled. 2.3 Our firm has committed physical, organizational, financial and logistical resources to support the pursuit of knowledge from these firms. 2.4 There are well-established incentives and rewards aimed at encouraging employees to learning from these firms. 2.5 There is a learning agenda with these firms defined and communicated to our employees. 2.6 In general, the staff involved with these firms believes they have more to learn than to teach.	Simonin (2004)
3 Source attractiveness 3.1 These firms show superior results. 3.2 The superior results shown by these firms have remained stable over time. 3.3 These firms play a significant role in the development of the knowledge obtained by our firm. 3.4 These firms have knowledge that is valuable to our firm.	Perez-Nordtvedt et al. (2008)
4 Information protectiveness 4.1 These firms are very protective of their own knowledge. 4.2 These firms have intentionally restricted the sharing of knowledge.	Simonin (2004)
5 Trust 5.1 Level of trust. 5.2 Level of closeness in the relationship.	Fritsch and Kauffeld-Monz (2008) Authors' research based on interviews carried out on the second stage and supported by Mattes (2012)

Table 3: Relevant information acquisition consequences

Type of Innovation		Item
Incremental innovation (OECD 2005)	Product/service innovation	6.1 Improvement of existing products/services
	Organizational innovation	6.2 Improvement of existing management methods
	Process innovation	6.3 Improvement of organizational processes
	Marketing innovation	6.4 Expansion of existing markets
Radical innovation (OECD 2005)	Product/service innovation	6.5 Creation of new products/services
	Organizational innovation	6.6 Creation of new management methods
	Process innovation	6.7 Creation of new organizational processes
	Marketing innovation	6.8 Entry into new markets
	Marketing innovation	6.9 Identification of new businesses

Table 4: Types of information

Item	Research
7.1 Technology	Lyles and Salk 1996, Lane et al. 2001, Simonin 2004, Fritsch and Kauffeld-Monz 2008, Sammarra and Biggiero 2008
7.2 Business environment in general	Qualitative research – interviews
7.3 Internationalization/export	
7.4 Production process	Lyles and Salk 1996, Lane et al. 2001
7.5 Product and services development	
7.6 Management techniques	

Table 5: Relationship between source and seeker of information

Questions	Possible answers
Beginning of the contact between the companies	Before COTEC/After COTEC
Type of relationship	The source is client/service supplier/raw material supplier/project partner/no commercial relationship/others
Contact frequency	Weekly/biweekly/monthly/bimonthly/occasional

Table 6: Reliability properties and convergent and discriminant validity

Antecedents of the volume of relevant information	**Cronbach's Alpha (>0,6)**	**CR>0,7**	**AVE>=0,5**	**Max. Shared Squared Var. (MSV)**	**Average Shared Square Variance (ASV)**
Learning intention (LI)	0.664	0.856	0.748	0.246	0.092
Learning Capacity Resource (LCR)	0.796	0.863	0.678	0.246	0.091
Learning Capacity Incentives (LCI)	0.763	0.845	0.647	0.149	0.051
Source Attractiveness (SA)	0.821	0.918	0.848	0.182	0.084
Information Protectiveness (IP)	0.706	0.872	0.773	0.084	0.036
Trust (TR)	0.914	0.958	0.920	0.068	0.029

Satisfactory indications by Fornell and Larker (1981) and Anderson and Gerbing (1988): CR > 0,7; AVE > 0,5; CR > AVE; MSV < AVE e ASV < AVE.

Table 7: Discriminant validity - Pearson correlation matrix

	LI	LCR	LCI	SA	IP
LI					
LCR	0.496				
LCI	0.173	0.386			
SA	0.427	0.153	0.252		
IP	-0.009	0.168	0.065	0.290	
TR	-0.026	0.081	0.078	0.260	-0.253

Table 8: Summary statistics of volume of relevant information acquired

N	Mean	Standard deviation	Minimum	Median	Maximum
29	2.86	0.79	1.00	3.00	4.00

Note: scale from 1 (very low) to 5 (very high).

Table 9: Summary statistics of the antecedents of information relevant volume acquisition

Dimensions	N	Mean	Standard deviation	Minimum	Median	Maximum
Learning intention	29	4.00	0.53	2.50	4.00	5.00
Learning capacity – Resources	28	3.07	0.81	1.33	3.00	4.33
Learning capacity - Incentives	28	2.45	0.71	1.00	2.50	4.00
Source´s attractiveness	29	3.33	0.59	2.00	3.00	5.00
Information protectiveness	28	3.16	0.64	2.00	3.00	5.00
Trust	28	3.23	1.03	1.00	3.00	5.00

Note: scale from 1 (totally disagree) to 5 (totally agree) to all dimensions, except to tie strength whose scale was from 1 (very low) to 5 (very high).

Table 10: Summary statistics of the consequences of information relevant volume acquisition

Dimensions	N	Mean	Standard deviation	Minimum	Median	Maximum
Internal innovation	29	2.36	0.79	1.00	2.25	4.25
External innovation	29	2.53	0.81	1.00	2.50	4.00

Note: scale from 1 (none) to 5 (very high).

Table 11: Regression results for the antecedents of volume of relevant information acquired

Model	Independent variable	Coefficient	Standard error	Standardized coefficient	t-test	Model Quality
1a	Constant	2.362	1.143		2.067 *	F-test $_{(1.27)}$ = 0.195 ^{ns}
	Learning intention	0.125	0.283	0.085	0.441 ^{ns}	R^2 = 0.007
						Standard Error of Estimate = 0.801
1b	Constant	2.925	0.670		4.450 ***	F-test $_{(2.25)}$ = 1.934 ^{ns}
	Learning capacity (resources)	0.288	0.201	0.289	1.434 ^{ns}	R^2 = 0.134
	Learning capacity (incentives)	-0.410	0.228	-0.362	-1.795 ^{ns}	Standard Error of Estimate = 0.777
2a	Constant	4.309	0.828		5.206 ***	F-test $_{(1.27)}$ = 3.147 ^{ns}
	Source attractiveness	-0.435	0.245	-0.323	-1.774 ^{ns}	R^2 = 0.104
						Standard Error of Estimate = 0.761
2b	Constant	4.536	0.720		6.299 ***	F-test $_{(1.26)}$ = 5.650
	Information protectiveness	-0.531	0.223	-0.423	-2.377 *	R^2 = 0.179
						Standard Error of Estimate = 0.742
3	Constant	1.454	0.410		3.544 **	F-test $_{(1.26)}$ = 12.204 **
	Trust	0.423	0.121	0.565	3.493 **	R^2 = 0.319
						Standard Error of Estimate = 0.649

Notes: Dependent variable: Volume of relevant information acquired; *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$; ^{ns} $p > 0.05$

Table 12: Regression results for the consequences of volume of relevant information acquired

Dependent variable (Model)	Independent variable	Coefficient	Standard error	Standardized coefficient	t-test	Model Quality
Internal innovation (4a)	Constant	0.812	0.477		1.702 ^{ns}	F-test $_{(1.27)}$ = 11.316 **
	Volume of relevant information	0.542	0.161	0.543	3.364 **	R^2 = 0.295
						Standard Error of Estimate = 0.672
External innovation (4b)	Constant	1.238	0.529		2.338 *	F-test $_{(1.27)}$ = 6.359 ^{ns}
	Volume of relevant information	0.450	0.178	0.437	2.522 *	R^2 = 0.191
						Standard Error of Estimate = 0.746

Notes: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$; ^{ns} $p > 0.05$

Table 13: Summary statistics of the volume of relevant information acquired for each type

Dimensions	N	Mean	Standard deviation	Minimum	Median	Maximum
Management information	28	2,82	0.76	1.33	2.67	4.00
Technological Information	29	2.69	0.84	1.00	2.67	4.00

Note: scale from 1 (very low) to 5 (very high).