The influence of knowledge related to innovative performance

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Abstract

Purpose – This paper aims to assess knowledge relatedness as a possible determinant of business innovation performance. Knowledge relatedness is understood as the degree of similarity between a firm's knowledge and that of its parent, i.e. the company that the entrepreneur leaves to establish his or her own firm. Innovation performance results from the competitive position that the company achieves through its management of new products and services on the market.

Design/methodology/approach – For the empirical work, the authors used a database composed of 356 entrepreneurs who established recently their own business in Costa Rica: people who stopped working in multinational companies in Costa Rica and created their own businesses, and people who created their own businesses simultaneously as the former employees of multinationals.

Findings – This paper reports a positive and significant correlation between knowledge relatedness and innovation performance for a number of young firms.

Originality/value – This paper presents the fact of including knowledge relatedness as a research topic linked to business innovation.

Keywords Entrepreneurial learning, Business innovation, Young firm performance

Paper type Research paper

Introduction

The factors that determine business innovation performance can be grouped into three broad categories: contextual, organizational and personal (Crossan and Apaydin, 2010). There is evidence that many variables related to these categories affect innovation performance. However, understanding all of the factors that affect innovation performance, particularly if we refer to micro and small-sized businesses (which are the most numerous in most countries), remains an open question (Faherty and Stephens, 2016; Fernández *et al.*, 2012). Knowledge relatedness has not been studied as a possible determinant of innovation performance. Knowledge relatedness is understood as the degree of similarity between a company's knowledge with respect to its parent company, i.e. the company that the entrepreneur left to found his/her own company. (Sapienza *et al.*, 2004; West and Noel, 2009). However, knowledge relatedness has been linked to overall business performance (West and Noel, 2009; Sapienza *et al.*, 2004). There are two positions in this correlation. One maintains that there is a positive and linear correlation between the similarity of knowledge and business performance (West and Noel, 2009). The other stance considers that there is a somewhat curvilinear, inverted U-shaped relationship (Sapienza *et al.*, 2004). This may

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imply that there is greater performance when there is no extreme, either of knowledge completely related to the parent company or to the contrary.

This paper aims to assess knowledge relatedness as a possible determinant of business innovation performance. Given that it is an unprecedented approach, it is expected to contribute to the understanding of the factors that affect business innovation performance, particularly in start-ups. The empirical application is performed in Costa Rica, whose economy mainly comprises small and micro businesses; therefore, it is also expected to provide a contribution from that perspective, given that studies on innovation are mainly based on large businesses in developed countries (Faherty and Stephens, 2016).

This issue is relevant because the world is continually moving toward an economy that is governed by knowledge and innovation and there is consensus in various areas that "the generation, exploitation and diffusion of knowledge are fundamental to economic growth, development and the well-being of nations" (Mortensen and Bloch, 2005, p. 3).

Our results show a positive and significant correlation between knowledge relatedness and innovation performance for a number of newly established firms in Costa Rica. It is interesting to note that no differences are found in the results when the assessment is based on the founder's prior business experience and the type of company that he/she left to start his/her own business.

The theoretical framework, methodology, results and conclusions are presented later in the text.

Theoretical framework

The relationship between knowledge relatedness and innovation performance has not been directly studied in the literature. In general, business innovation is a somewhat complex subject that can be studied from different approaches. A first approach is dimension. Dimension can be divided into two perspectives: processes versus results. For example, from the processes perspective, the (individual, group, organizational) level, the (internal versus external) sources and their *locus* (firm or networks), among others, may be analyzed. Additionally, concerning results, the forms (products, services, business models), magnitude (incremental, radical) and type (administrative or technical), among others, may be analyzed. A second approach is to study the determinants, which may be contextual, organizational and personal (Crossan and Apaydin, 2010; Flor and Oltra, 2004). In this section, the literature regarding the determinants of innovation performance and, subsequently, the concept of knowledge relatedness, are reviewed to then connect them in the empirical part of this paper.

The determinants of business innovation performance

As stated above, the factors that determine business innovation performance can be grouped into three broad categories: contextual, organizational and personal (Crossan and Apaydin, 2010).

There are various approaches in the contextual level for attempting to understand the determinants of business innovation. One is the study of geographical areas with a high concentration of innovative companies. These have been examined from various theoretical perspectives with a number of explanatory factors, such as external economies, social relationships, the creation of tacit knowledge and the need for companies to be more flexible and competitive in globalized environments, leading them to create supplier and partner networks that must be close, in addition to organizational routines and path dependency (Simmie, 2005). A second approach is to consider national innovative capacity, understood as the (political and economic) ability of a nation to constantly produce and commercialize a flow of innovative technologies for everyone in the long term (Furman *et al.*, 2002).

According to its proponents, this ability is determined by a common infrastructure for innovation (i.e. human capital, financing, education and training investment, protection of intellectual property, etc.) and the specific environment for cluster innovation (i.e. competitive strategies of firms, demand conditions, related and support industries, etc.) Continuing with the perspective of the environment, another approach is to analyze the determinants of innovation that result from the particular context of firms, with factors such as uncertainty and complexity (Tidd, 2001), relationships or networking with that environment (Chen *et al.*, 2011; Pittaway, *et al.*, 2004), relational capital (Capello 2002) and absorption capacity (Liao *et al.*, 2007; Chen *et al.*, 2009).

The second level of analysis of the determinants of innovation is organizational. In this regard, various determinants have been identified, such as structural capital (Santos *et al.*, 2011), implementation capacity (Klein and Knight, 2005), company size (Camison-Zornoza *et al.*, 2004), technological trajectory (Souitaris, 2002), operational strategy (Alegre *et al.*, 2004) and entrepreneurial orientation (Fernández *et al.*, 2012). At this level of analysis, in a pioneering study, Damanpour (1991) links innovation performance to a number of organizational factors such as specialization, functional differentiation, professionalization, managerial attitude toward change and technical knowledge.

The third level of analysis is personal. In this regard, the determining personal factors of innovation can be grouped into three broad categories according to their origin: factors that result from the individual, from the work environment and from the social environment (Anderson *et al.*, 2014). Some factors arising from the individual as such and that are listed as determinants of innovation are as follows: personality (Raja and Johns, 2010), goals orientation (Hirst *et al.*, 2009; Gong *et al.*, 2009), the values of the individual (Shin and Zhou, 2003), knowledge (Howell and Boies, 2004) and motivation (Yuan and Woodman, 2010). Regarding the work environment, the determinants vary between the complexity of the work (Shalley *et al.*, 2009), the goals and requirements of the position (Ohly and Fritz, 2010; Baer and Oldham, 2006) and rewards (Baer *et al.*, 2003). The factors linked to the social environment are leadership and supervision (Tierney, 2008 cited by Anderson *et al.*, 2014), the influence of customers (Madjar & Ortiz-Walters, 2008), the feedback received (De Stobbeleir *et al.*, 2011) and social networks or contacts (Baer, 2010).

In addition, some studies have sought to simultaneously relate various determinants with innovation performance. For example, Hadjimanolis (2000) attempts to link a number of variables (grouped into three broad categories: the characteristics of the entrepreneur, of the firms and of the environment). He finds that business-related variables [i.e. strategy, expenditure on research and development (R&D), cooperation with external providers] are more related to a better innovation performance than the other two in the case of small and medium-sized businesses in Cyprus. For their part, Guzmán and Martínez (2008) conduct the same study for Spanish micro businesses and find a stronger link between superior innovative performance and the personal characteristics of entrepreneurs versus the contextual determinants of their companies.

Knowledge relatedness

This paper aims to link innovation performance to knowledge relatedness. The latter concept may be defined as the degree of similarity between a company's knowledge with respect to its parent company, i.e. the company that the entrepreneur left to found his/her own company (Sapienza *et al.*, 2004; West and Noel, 2009).

From the theoretical review, it follows that this concept has not been linked to innovation performance. It is interesting to note that the concept of knowledge relatedness somehow refers to two determining factors of innovation, personal and organizational characteristics.

For this reason, the entrepreneur has the capacity to visualize and replicate in his/her company the strategies of the organization in which he/she previously worked as an employee. This is also not implemented alone, given that, in the new organization, this acquired knowledge is applied in accordance with other actors (employees, partners, suppliers, etc.). Accordingly, one can speak of a process of personal entrepreneurial learning that absorbs knowledge from the company in which he/she previously worked and that is expressed in an organizational environment in which strategies, routines and processes are developed (in the new firm created by the entrepreneur) (Rae and Carswell, 2001).

Research on knowledge relatedness as an influential factor in organizational performance has been conducted, although, as noted above, without considering innovation performance. In that regard, there are basically two approaches. One posits that there is a positive and linear relationship between the similarity of knowledge and business performance (West and Noel, 2009). The other view states that the correlation between knowledge relatedness and performance is curvilinear, in the shape of an inverted U (Sapienza *et al.*, 2004). This may imply that there is greater performance when there is no extreme, either of knowledge completely related to the parent company or otherwise (with no relation).

As noted above, the empirical evidence is contradictory. In their study, conducted among US biotech companies, West and Noel (2009) conclude that there is a relationship between knowledge relatedness and performance, understanding the former as the experience that the entrepreneur had, before creating his/her company, working in other similar companies. However, Sapienza *et al.* (2004) study 54 industrial spin-off companies in Finland and find that the relationship between knowledge relatedness and performance in these companies is curvilinear, an inverted U-shaped relationship. The reason is that very little knowledge relatedness hinders the search for new knowledge and its assimilation, but great knowledge relatedness is an obstacle to the creation of new combinations of knowledge.

It is worth noting that knowledge relatedness is a concept that has been defined in various ways. For example, in addition to the approach outlined in this article, it has been defined as the degree of similarity and compatibility between the knowledge of two individuals or organizations (Weber and Weber, 2010) and the degree to which a company with multiple businesses uses common knowledge through its business units (Tanriverdi and Venkatraman, 2005).

Therefore, this paper aims to understand the relationship between knowledge relatedness, that is, the degree of similarity between the knowledge of a company with respect to its parent company and the innovation performance of the new company created by the entrepreneur.

Methodology

Sample

For the empirical work, we used a database composed of 356 entrepreneurs who established their own business basically from two sources: the records of the Foreign Trade Corporation of Costa Rica (Promotora de Comercio de Costa Rica - PROCOMER), on people who stopped working in multinational companies in Costa Rica and created their own businesses and data from the social security regarding people who created their own businesses simultaneously as the former employees of multinationals. The data collection was performed by phone and outsourced to a polling agency.

Variables

The variables under study and their definition are explained below.

The dependent variable is called the Innovation Performance Index (IP Index), which is understood as the competitive position achieved by the company through the management of its new products and services on the market (Akgun *et al.*, 2007). Specifically, for our work, a measurement of a subjective nature by Akgun *et al.* (2007) was used; it consists of four questions that relate the competitive environment of the firm with the following elements: the time of the new product introduction, the perceived novelty of these products on the market, the competitive position and the overall introduction of new products and novel services in a given time range.

The independent variable, i.e. related knowledge, was generated from three sub-indices that compare the degree of similarity between business strategies, logistics-operations and marketing of the new company founded, and the predecessor that the entrepreneur left to establish his/her own company. To that end, the same study question raised by West and Noel (2009) was applied; however, following Sapienza *et al.* (2004), it was raised in the three noted topics.

All questions were based on a Likert-type scale ranging from 1 (minimum) to 10 (maximum). For each case, the values from 0 to 100 were standardized and simple averages were subsequently calculated. In the case of the indices of knowledge relatedness, a General Index of Similarities was additionally estimated by contemplating the average of the three original indices (strategies, logistics-operations and marketing).

Two control variables were considered. One concerned whether the entrepreneur was a former employee of a multinational company based in Costa Rica before creating his/her company. The other was the entrepreneur's previous experience as an entrepreneur in another firm.

The questions used and the theoretical basis of each can be observed in Appendix.

Statistical analysis

To study the relationship between knowledge relatedness and innovation performance, the following two regression models were proposed:

$$IP\_Index = \alpha + \beta_1 S\,.\,Index\_BS + \beta_2 S\,.\,Index\_LO + \beta_3 S\,.\,Index\_MS \quad (1)$$

$$IP\_Index = \alpha + \beta_1 GS\_Index \quad (2)$$

where

IP_index	corresponds to Innovation Performance Index;
S . Index_BS	corresponds to the Similarity Index of Business Strategy;
S . Index_LO	corresponds to the Similarity Index of Logistics and Operations;
S . Index_MS	corresponds to the Similarity Index of Market Strategy; and
GS_Index	corresponds to the General Index of Similarities.

Results

Table I shows some descriptive results of the indices under study. It is interesting to note the relatively low proportion of knowledge relatedness of all of the types presented in the overall sample.

Table II shows the bivariate correlations between the indices under study.

The next step of the analysis was to estimate the impact of the following control variables: previous experience as an entrepreneur and provenance of a multinational company for both cases of the entrepreneurial founder of the company under study. Once the estimates were calculated, only the second, the provenance of the entrepreneurial

founder from a multinational company, was required; it yielded a significant mean difference at the 0.01 level (bilateral).

From this result, a regression analysis was performed, as stated in the methodology but including the control variable: the provenance of the entrepreneurial founder of the company under study from a multinational company as a former employee. Table III shows the results.

The above results show that both the provenance from a multinational variable and the similarity indices are not significant individually; therefore, there is no linear relationship between them and innovation performance.

Based on the above, it was decided that the second regression analysis would be conducted by including only the General Index of Similarities without prior control variables. Table IV shows whether there is a significant correlation.

Here, although R^2 is slightly lower, the model remains significant, and the General Index of Similarities is actually highly significant. According to the value of the coefficient, it can be assumed that there is a positive relationship between innovation performance and the similarities viewed as a whole.

Discussion

This study is conducted with the objective of assessing knowledge relatedness as a possible determinant of business innovation performance. The findings are such that for the companies analyzed in this paper, there is a positive relationship between knowledge relatedness and innovation performance. Knowledge relatedness is understood as the degree

Table I. Descriptive statistics of the indices and sub-indices of innovation performance and similarities

Indices and sub-indices	N	Minimum	Maximum	Average	SD
Innovation performance index	355	0.00	100.00	64.7392	26.76072
Similarity index of business strategy	277	0.00	100.00	32.2904	36.31067
Similarity index of logistics and operations	271	0.00	100.00	31.6113	34.10285
Similarity index of market strategy	262	0.00	100.00	33.5878	35.96049
General index of similarities	296	0.00	100.00	33.1016	31.46563

Source: Own elaboration

Table II. Bivariate correlations of the indices of innovation performance and similarities

Similarity of index	Innovation performance index	Similarity index of business strategy	Similarity index of logistics and operations	Similarity index of market strategy
Similarity index of business strategy	0.253**			
Similarity index of logistics and operations	0.246**	0.647**		
Similarity index of market strategy	0.274**	0.597**	0.685**	
General index of similarities	0.270**	0.872**	0.891**	0.877**

Note: **The correlation is significant at the 0.01 level (bilateral)
Source: Own elaboration

Variables	Non-standardized coefficients B	Typ. error	t	Significance
(Constant)	52.984	4.153	12.757	0.000
Similarity index of business strategy	0.096	0.063	1.524	0.129
Similarity index of logistics and operations	0.083	0.073	1.131	0.259
Similarity index of market strategy	0.091	0.067	1.351	0.178
Provenance from a multinational	2.171	3.983	0.545	0.586
R	0.295[a]			
R^2	0.087			
df	4			
F	5.561			
Significance	0.000			

Note: [a]Predictor variables: (Constant), Provenance from a multinational, similarity index of market strategy, similarity index of business strategy, similarity index of logistics and operations
Source: Own elaboration

Table III.
Regression model for innovation performance from individual similarity indices

Results	Non-standardized coefficients B	Typ. Error	t	Significance
(Constant)	56.694	2.73	0.26	0.000
General index of similarities	228	0.047	4.14	0.000
R	0.270[a]			
R^2	0.073			
df	1			
F	0.23			
Significance	0.000			

Note: [a]Predictor variables: (Constant), General Index of Similarities
Source: Own elaboration

Table IV.
Regression model for innovation performance from the General Index of Similarities

of similarity between the knowledge of a company with respect to its parent company, i.e. the company that the entrepreneur left to found his/her own company. Additionally, innovation performance is viewed as the competitive position achieved by the company through the management of its new products and services on the market.

From the theoretical perspective, this article contributes to identifying possible factors that affect innovation performance. According to the literature, there are three broad categories of influential factors in innovation performance: contextual, organizational and personal (Crossan and Apaydin, 2010). Knowledge relatedness, as defined here, joins the list of factors of a personal nature that may affect innovation performance.

These personal factors that may affect innovation performance are in turn subdivided into individual, labor and social factors (Anderson *et al.*, 2014). This paper identifies knowledge relatedness as a factor that is linked to the individual as such (his/her level of knowledge) and to the social environment in which he/she operates (expressed in the company in which he/she previously worked and acquired knowledge that was applied in his/her own company). For example, these results are in line with

those of Howell and Boies (2004), who establish the individual's knowledge as an influential element of personal innovation performance.

Adding knowledge relatedness as a possible factor affecting innovation performance acquires more relevance in regard to small and medium-sized businesses. Indeed, there is evidence that in such companies (which are the majority in all countries worldwide), the personal factors of the company's entrepreneurial founders are the most relevant when explaining innovation performance (Faherty and Stephens, 2016; Guzmán and Martínez, 2008).

Another interesting theoretical perspective of the results is the link that can be made between the literature on small and medium-sized businesses and entrepreneurship. On the one hand, and as noted above, knowledge relatedness may be considered an influential factor in innovation performance and thus in the overall performance of the company (Ezzi and Jarboui, 2016). Regarding entrepreneurship, one interesting finding is that the entrepreneurial founder's previous business experience and the provenance of the founder of the company under study from a multinational company (control variables) do not affect the relationship between knowledge relatedness and innovation performance. In this regard, the result is striking, given that there is evidence of the impact of entrepreneurs' previous experience on company performance (West and Noel, 2009; Barringer and Jones, 2007). Regarding the provenance from a multinational company, the evidence contradicts what our result provides in one sense of the relationship (Görg and Strobl, 2005; Vera and Dutrénit, 2007, Leiva *et al.*, 2014).

This paper has practical implications as well. For entrepreneurs who establish an organization and do not have access to sources of knowledge relatedness, it is important to attempt to build such knowledge in other businesses or organizations that may take the role of a source of knowledge. We refer to suppliers, partners or members of a network of contacts that may generate a platform for these entrepreneurs from which they can acquire some type of knowledge relatedness that is applicable to their undertaking. On the public policy side, this work reinforces the need to strengthen business ecosystems that enable the creation of communication channels through which new entrepreneurs and such ecosystems (experienced entrepreneurs, partner companies, investors, academy and consultants) may generate and share knowledge.

As with any research, this study has limitations. The sample of selected companies may not be representative and is contextual to a nation such as Costa Rica. This paper does not explain relationships or perform qualitative analyses to understand the nature of the phenomenon; it is only a quantitative perspective.

These limitations delimit possible topics for future research. For example, it would be interesting to explore how knowledge acquisition occurs as well as its subsequent application in the companies created by entrepreneurs. It would also be interesting to study the phenomenon from another perspective that may correspond to the type of company that acts as a provider of knowledge. As shown in this study, no evidence that the type of company (multinational versus another) made a difference was found.

Finally, we wish to emphasize that this article presents the fact of including knowledge relatedness as a research topic linked to business innovation.

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Appendix

Variable	Questions	Theoretical foundation
Innovation performance	On a scale of 1 to 10, where 10 is totally agree and 1 is strongly disagree, how much do you agree with the following statements? 1. In the introduction of new products or services, my company is always among the first on the market 2. Our new products or services are always viewed by consumers as highly original 3. Owing to the new products or services of our company, we always outperform our competitors 4. Compared to our competitors, our company has introduced newer and more innovative products and services in the past five years	Akgun *et al.* (2007)
Similarity index of business strategy	On a scale of 1 to 10, where 10 means totally equal and 1 completely different, to what extent is your business strategy similar to that of the company that you left when you founded your own business?	West and Noel (2009), Sapienza *et al.* (2004)
Similarity index of logistics and operations	Regarding logistics and operations, on a scale of 1 to 10, how similar is your own business to the company you left?	
Similarity index of market strategy	Finally, on the same scale of 1 to 10, how much are your company's marketing activities and sales similar to those of the company you left?	

Source: Own elaboration

Table AI.
Questions and theoretical basis

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