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Knowledge Generation to Foster Innovation in Mexico: How Human Capital Matters

Laura Zapata-Cantú

Abstract

The aim of this chapter is to identify those individual skills and organizational factors (OF) that facilitate knowledge generation in firms operating in Mexico. The innovative capacity of organizations depends on how successful they are in the generation of knowledge and how organizational culture, management support, motivation, and personal skills support this process. To validate this phenomenon, a quantitative explanatory study was designed. Data collection was carried out through a questionnaire applied to 211 collaborators who work for firms located in Mexico. Concerning external knowledge acquisition (EKA), for Mexican and foreign firms, only individual skills such as professional qualification, personal motivation, and opportunity to learn are significant compared to internal knowledge creation (IKC) in which organizational factors such as organizational culture, management style, and commitment to learn are predominant. In addition, for knowledge creation in Mexican firms, individual skills are relevant but not for foreign ones. This result could assume that foreign firms in Mexico create their own knowledge based on headquarters' institutionalized processes.

Keywords: knowledge generation, external knowledge acquisition, internal knowledge creation, innovativeness, organizational factors, human capital skills

1. Introduction

Recently, innovation scholars found that in order to innovate, knowledge from a variety of external sources (e.g., suppliers, customers, universities, competitors, and consultants) must be meticulously embedded in a firm's organization and technical systems for better exploitation [1–3].

Organizations are not just knowledge warehouses; their knowledge base can be generated within a social framework, inside and outside organizations' boundaries, improving their existing processes and products and/or services. To generate new knowledge, organizations undertake specific activities and initiatives which involve external acquisitions of knowledge, and the company interacts with other organizations [4–6] and internally creates this intangible resource through the dynamic interaction between individuals and/or between individuals and their environment. In both cases, their success is highly dependent upon the organization's culture and management style.

Knowledge generation is mainly an institutionalized activity, so each organization must be able to establish its own creative routines and human interventions to make this process possible and to be a learning-oriented institution where having a shared vision and a commitment to learning and open-mindedness are key drivers [7]. The challenge is to build systems that collect the learning processes acquired during projects and ongoing activities, capture that knowledge in a database or document, and spread it throughout the entire organization [8, 9]; and that will be useful for innovation strategies. In this sense, there are many studies discussing how knowledge generation is positively related to innovation and performance [10–12]; but the impact of individual skills and organizational factors to generate knowledge is still unexplored [7, 13].

The present research was conducted in Mexico, where innovation capability could accelerate the country's productivity and economic growth to as much as 4% per year over the next 10 years [14]. According to the Global Competitiveness Index in which Mexico is ranked 51 out of 137 countries [15], even when Mexico presented some progress, it has a relatively slower rate than other countries. In this context, our study suggests that the challenge for Mexican firms is that for a dynamic economy where organizations can take full advantage of opportunities to grow and compete more effectively, it requires the foundation of a strong business environment [16] and organizational leverages where knowledge generation could be a pillar to grow and survive rather than to keep competing on a lower cost basis.

The aim of the chapter is to identify the individual skills and organizational factors that support external and internal knowledge generation and show to what extent and in what way these factors differ from those in Mexican and foreign firms with operations in Mexico. This research analyzes a database generated through a survey of knowledge generation activities and how its innovation capability impacts firms operating in Mexico. This chapter is structured as follows: Section 2 exposes the development of a conceptual framework related to knowledge generation, both external acquisition and internal creation, and how this process is supported by individual skills and organizational factors, Section 3 presents the methods used to conduct the empirical study, Section 4 discusses the results, and Section 5 finalizes the research with conclusions and limitations and describes further lines of research.

2. Conceptual background and hypotheses

All successful organizations create and use knowledge as a fundamental tool for interacting with their environments, absorbing information, making informed decisions, and carrying out actions based on the combination of this knowledge and organizational experiences, values, and rules [1, 12, 17]. All of these are activities that make up the knowledge generation process in organizations [18]. The present study posits that knowledge generation requires individual skills and organizational factors that enable external acquisition and internal creation of knowledge.

2.1 External knowledge acquisition

Often, organizations do not have all necessary resources, so they have to acquire beyond organizational limits [19]. Thus, acquiring external resources plays a critical role in determining the performance implications of knowledge creation capabilities [20]. Engaging with market-based partners such as customers and suppliers can help to better specify the market requirement for innovative goods, services, or processes and to spread the costs and risks of the innovative capability [21].

Acquisition of external knowledge implies that an organization interacts with other organizations such as suppliers and customers [4, 6], has strategic alliances, and prefers that its collaborators attend courses and seminars [5]. When companies internalize knowledge gained through external sources, the incorporation or internalization of these individual learnings is necessary to strengthen absorptive capacity of the knowledge base at the organizational level. In contrast, the acquisition of external knowledge can deprive the organization of the opportunity to learn and build its own knowledge. When an organization chooses this option, it is because it does not have the dynamic capabilities for rapid creation, either because such knowledge is often highly tacit or because the creative process takes time and has a high opportunity cost. This opportunity cost is especially high when the company operates in an environment of rapid change [18].

Although individuals may have differing cognitive abilities and processing speeds, the outcome of any individual learning for the organization is dependent on the organizational context where the learning occurs [22]. Another value is open-mindedness to assimilate new knowledge and to adapt to new ways to do things. In that sense, knowledge generation is highly dependent upon the organization's culture and management style. In fact, a culture that promotes intensive communication, accepts new ideas, and is prepared to explore new processes and activities favors the generation of knowledge [23].

Hypothesis 1: Organizational factors such as organizational culture, management style, commitment to learn, and open-mindedness have a positive impact on external knowledge acquisition.

The literature also shows that employees are qualified to handle technical requirements needed to process and integrate new knowledge [7]. They are able to align and combine market knowledge and customers' needs to the organization's strategic goals. Additionally, to develop professional skills, the collaborators' capability to combine external knowledge into internal process is supported by their ability to understand, interact, and recognize other people's abilities and needs [24]. Moreover, their opinions and suggestions are taken into account, which facilitates new knowledge generation.

Hypothesis 2: Individual skills such as professional skills, personal skills, personal motivation, and opportunity to learn have a positive influence on external knowledge acquisition.

2.2 Internal knowledge creation

Companies as social organizations are specialized in creating and transforming knowledge [25], based on the assumption that knowledge cannot exist without human subjectivities and the context that surrounds humans [19]. The creation of internal knowledge is understood as a process that increases knowledge in organizations created by specific individuals and as part of the knowledge network of the company [18]. Knowledge is created through the dynamic interaction between individuals and/or between individuals and their environment, rather than an individual working alone [23]. That is, an organization cannot create knowledge without individuals who generate it, while the business must provide the right environment for individuals to create knowledge [6]. The knowledge created within the organization is especially valuable because it tends to be unique, specifically with a large tacit component. This is what makes it more difficult to be imitated by competitors, which is a strategic advantage for the organization.

Organizational culture is the most significant element that supports knowledge generation: employees are motivated to improve or find new ways of doing their activities. In contrast, management style, personal motivation, and opportunity to

learn are the organizational elements that support this process for manufacturing firms. In these types of organizations, the top management team is aware of how knowledge generation is relevant, providing time and space to seek new ways of doing things and to increase employees' knowledge through learning in action. A learning-oriented culture, along with other factors, promotes receptivity to new ideas and innovation as part of an organization's culture [26].

In terms of knowledge exchange, the interaction among organizational members facilitates dissemination of explicit and tacit knowledge. When the frequency of knowledge exchange within an organization is high, the organizational members have more opportunities to access and acquire knowledge that is different from their own. This will trigger more novel ideas [25]. Moreover, knowledge exchange, as has been discussed, can induce organizational members to combine their existing knowledge with acquired knowledge or recombine their existing knowledge in better ways. For instance, the results of an exploratory study in Mexican firms show that the internal creation of knowledge occurs primarily in meetings that occur within the organization followed by employee self-directed learning [27]. Based on these arguments, Hypothesis 3 is proposed:

Hypothesis 3: Organizational factors such as organizational culture, management style, commitment to learn, and open-mindedness positively impact internal knowledge creation.

To recognize and evaluate the organization's relevant and new knowledge, employees need to hold some prior knowledge base [24]. This expertise and know-how enables employees to recognize the value of new knowledge, and it is helpful to communicate and be cooperative in sharing new knowledge [7]. Social interaction develops the ability for people to exchange and acquire knowledge that is tacit in nature. In the notion of exchange, the assumption that individuals hold different levels and types of knowledge and will engage in teamwork and communication to learn from one another seems to be implicit [28].

Moreover, the dynamic environment in which organizations work currently provides motivation for employees to create new knowledge and the opportunity to learn. Employees feel they can learn from the work they perform and the experience gained in applying their knowledge. The literature shows that employee motivation is essential to create new knowledge and the opportunity to learn about issues of interest motivates employees to seek new ways of doing things, leading to innovation [28]. In addition to that, professional qualifications allow exploration and exploitation of new ways of doing things, and social skills promote cooperation and social interaction among employees, influencing the knowledge creation process inside the firm. This leads to the final hypothesis.

Hypothesis 4: Individual skills such as professional skills, social skills, personal motivation, and the opportunity to learn have a positive influence on internal knowledge creation.

3. Methods

3.1 Sample profile and data collection

The data to identify the relationships between variables was obtained through a questionnaire designed in Qualtrics, a software which allows participants to answer the questionnaire online. The sample comprised 211 collaborators from Mexican and foreign firms operating in Mexico. **Table 1** presents the profile of the respondents. An e-mail was sent to invite organizations to participate in the study, and only 35 firms agreed to participate from May to August 2017.

Demographic characteristics	(%)
Firm	
Nationality	
Foreign	42
Mexican	58
Sector	
Manufacturing	49.1
Service	51.9
Size	
Small (0–49 employees)	15.0
Medium (50–249 employees)	11.1
Large (>249 employees)	73.9
Participants	
Position	
General manager	21.4
Department director	49.8
Project leader	28.8

Table 1.
Profile of the respondents.

Collecting potentially different opinions of various members of each firm concerning the phenomenon under study was especially interesting because individual skills are key variables. In each company, the distribution of questionnaires was carried out to employees at multiple hierarchical levels and functional departments. Knowledge generation is not exclusive to a specific organizational level or department; the occurrence of a key informant bias should be avoided by using a multiple informant approach. The questionnaire was designed in Qualtrics to facilitate its completion. An e-mail was sent to those collaborators who were interested in participating. The final sample includes 211 collaborators, implying between 6 and 7 questionnaires per firm. **Table 1** lists the respondent and company characteristics, including firm size, sector, and collaborator’s position.

A total of 58% of participant firms are Mexican, and 42% are foreign firms operating in Mexico. 49.1% of the participant firms operate in the manufacturing sector, and 51.9% are service firms. Fifteen percent of the firms are small, 11.1% are medium sized, and 73.9% are large. Respondents are mostly in leadership positions or at the top level in their companies (71.2%).

3.2 Measures

For the present study, a questionnaire was designed making use of constructs identified in previous studies related to knowledge generation: external acquisition and internal creation, organizational factors, and individual skills [29]. These constructs were operationalized with different dimensions adapted from those studies and modified for use in the present research. All constructs and dimensions were measured using multiple items and a five-point, Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree). **Table 2** shows a list that includes each construct together with its related dimension and items as well as the studies from which the constructs were derived.

Construct	Dimension/variables	Indicators/items
External knowledge acquisition [23]	External knowledge acquisition activities	<p>KG1—Customer experience is important for the improvement of our activities</p> <p>KG2—It has collaborative agreements with other companies to offer better services to our customers</p> <p>KG3—Information systems are often acquired to support the activities and business processes</p> <p>KG4—Attendance at refresher courses is encouraged among employees</p>
Internal knowledge creation [23]	Internal knowledge creation activities	<p>KG5—It has a library and/or literature to support the development and execution of priority activities</p> <p>KG6—Our organization encourages employee self-directed learning</p> <p>KG7—Attendance at refresher courses is encouraged among employees</p> <p>KG8—Meetings are held to solve problems or to seek solutions or improvements to an ongoing activity or process</p>
Knowledge generation organizational factors [7, 23]	Organizational culture	<p>OR1—The work environment makes it easy to approach the senior management as well as the rest of the members of the company</p> <p>OR2—The senior management can be easily approached to give them points of view on an activity and/or process</p> <p>OR3—An atmosphere of frankness and trust prevails in the organization.</p>
	Management style	<p>MS1—Awareness of the relevance of knowledge generation</p> <p>MS2—Facilitation of knowledge generation by holding meetings that foment the creation of new ways of doing things</p> <p>MS3—Encouragement of the development of employees' initiative and creativity</p>
	Commitment to learning	<p>CL1—Managers basically agree that our organization's ability to learn is the key to our competitive advantage</p> <p>CL2—The basic values include learning as key to improvement</p> <p>CL3—The sense around here is that employee learning is an investment, not an expense</p> <p>CL4—Learning is seen as a key commodity necessary to guarantee organizational survival</p>
	Open-mindedness	<p>OM1—We are not afraid to reflect critically on the shared assumptions we have made about the way we do business</p> <p>OM2—We place a high value on open-mindedness</p> <p>OM3—Managers encourage employees to think "outside of the box"</p> <p>OM4—Original ideas are highly valued</p>

Construct	Dimension/variables	Indicators/items
Knowledge generation individual skills [7, 23]	Professional skills	Collaborators: PS1—Possess excellent market knowledge PS2—Possess excellent company knowledge (e.g., product range) PS3—Possess excellent knowledge about our strategic goals (e.g., business objectives) PS4—Possess excellent skills in analyzing information gained from single customers with regard to its utility for our company PS5—Possess excellent skills in evaluating information gained from single customers with regard to its utility for our company PS6—Possess excellent skills in preparing and documenting information gained from single customers with regard to future purpose
	Social skills	SS1—Is fully able to put themselves in the position of other people SS2—Is fully able to understand the behavior of other people SS3—Is easily able to recognize and understand the demands and needs of other people SS4—Is able to recognize conflicts on time
	Personal motivation	PM1—Employees’ opinions or suggestions are taken into account PM2—The activities carried out in the company allow employees to seek new ways of doing things PM3—Employees like what they do
	Learning opportunity	LO1—The activities carried out within the company provide an opportunity for increasing employees’ knowledge LO2—The activities carried out within the company allow employees to learn how to use new tools LO3—The activities carried out within the company allow employees to learn new ways of doing things

Table 2.
Constructs and items.

4. Results and discussion

To test the hypotheses, partial least squares (PLS) analysis using the SmartPLS 3.0 was performed [30, 31]. The PLS is suitable for early-stage research model construction allowing the interaction between the theory and the empirical data and the small sample condition [32]. In addition, it allows us to test the causal relationships between constructs that feature multiple measurement items [32]. The authors will build a two-stage model to test the measurement model to perform construct, discriminant, and convergent validity and confirm the structural model to test the hypotheses through the significance of the path coefficients.

4.1 Analysis of the measurement model

The measurement model was assessed using a bootstrapping procedure to minimize the standard errors. **Table 3** shows the results of construct reliability based on Cronbach's alpha, and the discriminant and convergent validity to measure average variance was extracted. The reliability of the scale is acceptable because the composite reliability coefficient exceeds 0.7 [33]. In terms of the average variance extracted, all constructs exceed the suggested value of 0.5 [34], indicating that the measure has adequate convergent validity. When the respective average variance extracted is larger than the squared correlation between two constructs, discriminant validity is demonstrated.

4.2 Structural model

The first step was to obtain the goodness of fit of the model hypothesized in **Figure 1**. The normed fit index (NFI: Mexican = 0.874; foreign = 0.876) and the root mean of the index's squared residual (RMSR: Mexican = 0.070; RMSR foreign = 0.62) are within acceptable ranges and correspond to a satisfactory adjustment [35]. This implies a substantial amount of variance in the model [34] and a fit to the model. The second step was to examine the significance of each hypothesized path.

We draw on the significance of the variable's relationship, a t-value higher than 1.96 and a p-value lower than 0.05 and on the effect size (F^2) of a predictable variable on a dependent variable; values of 0.15 can be viewed as a medium effect and 0.02 as a small effect. All hypotheses are significant except Hypothesis 1. **Table 4** shows the results of the measurement model analysis and the hypothesis evaluation, and **Figure 1** illustrates the results of parameter estimation and the structural model.

Regarding Hypothesis 1, this study evaluated the effects of organizational factors on external knowledge acquisition activities, but there is no evidence to support this for both Mexican and foreign firms. This result suggests that organizations have to promote activities or even institutionalize practices in order to generate knowledge from external sources, which favors the opportunity to learn and differentiate themselves. It is also possible that organizations under study do not have dynamic capabilities such as absorptive capacity to respond quickly to their environment with their own knowledge [6].

Variable		Reliability Cronbach's alpha	Average variance extracted	Discriminant dimension	Validity correlation
External knowledge acquisition	Mexican	0.733	0.735	HC-EKA	0.638
	Foreign	0.709		HC-EKA	0.695
Internal knowledge creation	Mexican	0.755	0.750	OF-IKC	0.672
	Foreign	0.745		OF-IKC	0.798
Organizational factors	Mexican	0.887	0.749	OF-EKA	0.638
	Foreign	0.878		OF-EKA	0.653
Human capital (IS)	Mexican	0.848	0.687	HC-IKC	0.683
	Foreign	0.860		HC-IKC	0.740

Table 3.
Results of reliability and validity.

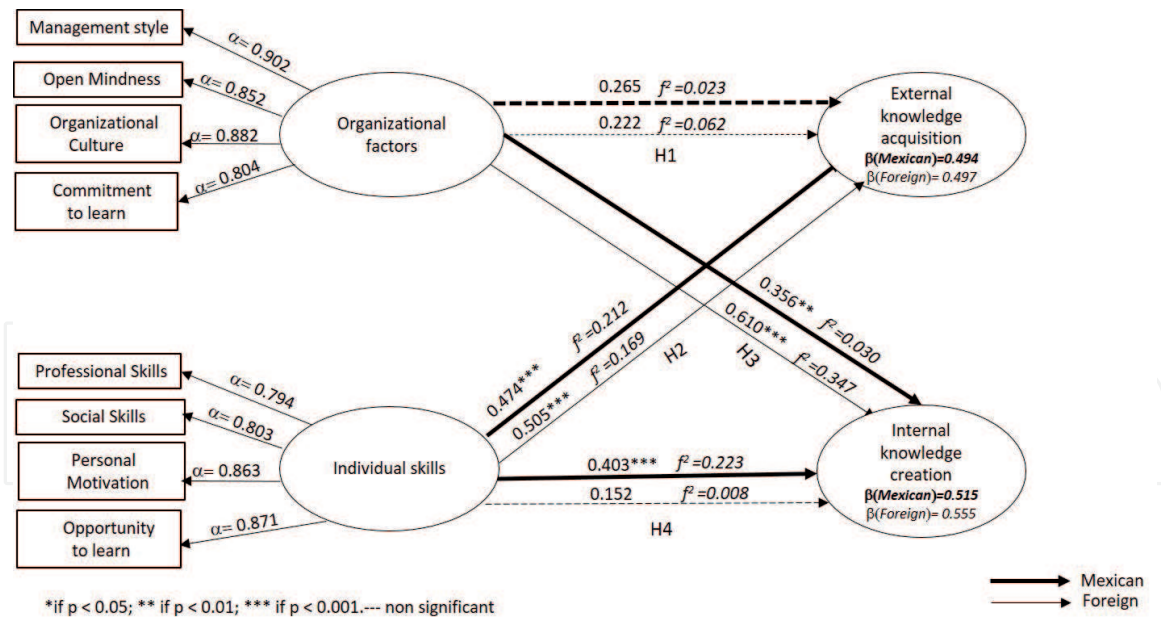


Figure 1.
 Results of PLS estimation.

Variable/ path	Mexican				Foreign				Hypothesis
	Parameter estimate	t-value	p-value	F ²	Parameter estimate	t-value	p-value	F ²	
H1: Org. factors—external knowledge	0.265	1.699	0.089	0.053	0.222	1.513	0.130	0.027	Rejected
H2: Ind. skills—external knowledge	0.474	3.317	0.001	0.171	0.506	3.364	0.000	0.141	Supported
H3: Org. factors—internal knowledge	0.356	3.097	0.002	0.100	0.610	4.009	0.000	0.231	Supported
H4: Ind. skills—internal knowledge	0.403	3.628	0.000	0.129	0.152	0.924	0.359	0.014	Partially supported

Table 4.
 Results of measurement model.

Hypothesis 2 confirmed, for both Mexican (B = 0.474) and foreign (B = 0.506) firms, to a slight extent that individual skills have positive causal relationship when external knowledge acquisition is a latent variable. Organizations operating in Mexico acquire external knowledge by individuals not by organizational factors per se. Activities such as being aware and informed of customer experience and needs, collaborative agreements with suppliers or other companies, and attendance of courses or seminars give Mexican firms the opportunity to generate knowledge [23], through collaborators' skills. This result also addressed on individuals' learning outcomes is promoted by the organizational context [22]. This suggests that what collaborators are able to do is significant because of the organizational support

they have. Individuals not only know what to do but also know how and when to apply that knowledge to achieve organizational goals. Specific attention is required for collaborators in order to generate knowledge externally because they build the blocks of all knowledge-based organizational and social development [36].

Regarding Hypothesis 3, results show that internal knowledge creation is explained by organizational factors for both Mexican firms ($B = 0.356$) and foreign firms ($B = 0.610$), having a higher impact in foreign firms operating in Mexico. For internal knowledge creation activities, organizational factors predominate over individual skills. This is similar to that “an organization cannot create knowledge without individuals who generate it, while the business must provide the right environment for individuals to create knowledge” [25]. The relevant point here is how management style and organizational culture promote thinking differently and facilitate and encourage learning new things and thinking “out of the box” [7].

Hypothesis 4 is partially supported by a coefficient of 0.403 for Mexican firms compared to foreign firms, without a significant coefficient. This points out that Mexican firms create knowledge inside the organization supported by organization factors as well as individual skills compared to foreign firms in Mexico which create knowledge only by organizational factors. It could be addressed to Mexican firms to support their knowledge generation on collaborators skills. Collaborators could be motivated to learn by themselves because they have the opportunity to do so, but that is not enough to create new knowledge that results in organizational innovation. Our research also addressed the aspect of firms’ need to empower their people to create and support the development of their knowledge generation competence [7].

5. Conclusions

In this study, the authors built and validated a model that identified which organizational factors and individual skills influence knowledge generation, external acquisition, and internal creation of knowledge. Given the reality that today’s economy is largely knowledge-based, there is a substantial need for companies to favor the generation of knowledge. The knowledge generated within the organization is especially valuable because it tends to be unique and specific and have a large tacit component. This is what makes it more difficult to be imitated by competitors, which is a strategic advantage for the company.

Organizations must be able to identify both external and internal knowledge generation activities. The challenge is to build systems that collect the new knowledge acquired during projects and ongoing activities with external partners and, once that value is created inside organization, to capture that knowledge in a database or document and then to spread it throughout the entire organization to be useful for innovation strategies.

Regarding managerial implications, managers have to be able to identify what particular external and internal activities support the knowledge generation process in their organization and what organizational elements and individual skills are crucial. For strategy and growth purposes, organizations are not necessarily locked into internally controlled skills and resources but may draw upon external knowledge (e.g., customers) as sources of new ideas and problem-solving capabilities and for flexibility in the assimilation of new skills and resources [37]. The present study results suggest that a learning-oriented organization is key to generate knowledge to foster innovation. The results also imply that more relevant than the identification of external and internal activities to generate knowledge is the need to develop strategic initiatives that systematically promote this process, with a highly involvement of collaborators.

Meetings to solve problems and seek solutions or improvements on an ongoing activity or process, attendance at courses or seminars, and the development of appropriate literature to support the development and execution of priority tasks are activities that allow to the generation of knowledge inside firms. This is possible when organizations believe in learning processes and invest in them.

Regarding public policy implications, the results point out the shortcomings of the educational system will take many years. The average Mexican formal education has only 9 years and few opportunities to get on-the-job training in globally competitive businesses. However, in the short term, Mexico can focus on developing professional skills by upgrading their vocational education, aligning the curricula with employer needs, developing more employer-sponsored training programs, creating rapid training courses, and improving the labor-market matching mechanisms.

Organizations have to include both knowledge generation processes, internal creation and external acquisition, in their strategic planning initiatives. It is new knowledge combined with existent knowledge that will make it possible for organizations to survive in dynamic and uncertain environments.

The main limitations of the study are that only Mexican firms have been analyzed and it is not possible to generalize the results to other contexts. Additionally, we have not identified whether organizations participating in the study are Mexican-born or global enterprises operating in Mexico. It could be significant to analyze whether multinationals from other countries operating in Mexico are more committed to learning to innovate than Mexican-born firms and how different their knowledge generation activities are.

Future research efforts should also address the way in which generation of knowledge in organizations operating in dynamic environments provides a competitive advantage. We believe that the analysis of our model in other settings may raise the identification of other determinants that facilitate the generation of knowledge and contribute to the achievement of a competitive advantage under the study environment itself.


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