

Knowledge management and intellectual capital in the business model innovation of Costa Rican manufacturing firms

Gestión del conocimiento y el capital intelectual en la innovación del modelo de negocio en empresas manufactureras de Costa Rica

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Abstract: The purpose of this article is to analyze the impact of knowledge management and intellectual capital on the ability of companies to generate business model innovation. To evaluate the proposed hypotheses, we surveyed a final sample of 100 Costa Rican manufacturing companies and analyzed the data using Partial Least Squares Structural Equation Modeling (PLS-SEM). The results show that knowledge management positively contributes to the development of business model innovations. Similarly, intellectual capital has a direct positive influence on business model innovation. However, the direct contribution intellectual capital depends on the adoption of practices that encourage knowledge management in companies.

Keywords: Knowledge management, intellectual capital, business model innovation, manufacturing industry, Costa Rica.

Resumen: El propósito de este artículo es analizar el impacto de la gestión del conocimiento y el capital intelectual en la capacidad de las empresas para generar innovación en el modelo de negocio. Para evaluar las hipótesis propuestas, realizamos encuestas en una muestra de 100 empresas manufactureras costarricenses y analizamos los datos utilizando el Modelo de Ecuaciones Estructurales por Mínimos Cuadrados Parciales (PLS-SEM). Los resultados del estudio muestran que la gestión del conocimiento contribuye positivamente al desarrollo de innovaciones en el modelo de negocio. De igual forma, el capital intelectual tiene una influencia positiva directa en la innovación del modelo de negocio, sin embargo, esta relación depende de la existencia de prácticas dirigidas a promover la gestión del conocimiento en las empresas.

Palabras clave: Gestión del conocimiento, capital intelectual, innovación modelo de negocio, industria manufacturera, Costa Rica.

1. Introduction

In today's contexts, companies must be able to quickly identify changes in the environment to adapt to new market demands and must have the necessary capacities to tackle emerging challenges. Improving knowledge management implies improving value creation in organizations, which, consequently, creates improvements in business models. Likewise, intellectual capital is a fundamental factor for value creation because it reflects the evolution of commercial practices in new business models (Nielsen, 2018).

One way to generate skills in companies is through the management of their resources and capacities. Nonaka and Takeuchi (1995) state that both the explicit and the tacit components of organizational knowledge play an important role in innovation. More recent work has confirmed that improving knowledge management processes, such as acquisition, creation, exchange, and use, optimize innovation performance (Cheng and Huang, 2009; Nguyen et al., 2020; Kamhawi, 2012; Kuo, 2011; Kumar, 2019; Soto-Acosta et al., 2014). Zhang et al. (2017), point out that managers should benefit from intellectual capital to improve innovation by developing organizational skills and investing in human, social and structural capitals. Han and Li (2015) show that intellectual capital positively affects innovation.

In this sense, the way firms manage both knowledge and intellectual capital can allow them to generate the necessary capacities to be more competitive in the market. The above can be reflected in the development of new products or processes, as well as in the improvement of those that are already commercialized.

Existing studies on the relationship between knowledge management (KM), intellectual capital (IC), and innovation, have been limited to analyze their relationship with certain dimensions of innovation, such as the product (Obeidat, et al., 2017; Zhang et al., 2018), processes (Cabrilo and Dahms, 2018; Kianto et al., 2017), commercialization (Jimenez-Jimenez et al., 2014; Kianto et al., 2017), or management (Amalia and Nugroho, 2011; Huang and Li, 2009). However, there are few studies that try to explain how IC and KM can lead companies to innovate their business model, so firms become able to create or improve the generation of value for different stakeholders.

According to Schiavi and Behr (2018), the theoretical and conceptual bases for disruptive business model innovation are just emerging. Clauss (2017) found that most of the research on business model innovation was primarily from case studies, and that more empirical work was needed. This fact is peculiar since business model innovation has been analyzed for the last 5 or 6 years. In addition, these authors point out that there are quantitative research opportunities since the number of these works is still limited. It is, therefore, relevant to develop further empirical studies that can shed light on the processes or factors that, at an organizational level, affect business model innovation.

This research examines the joint impact of KM and IC on business model innovation and the possible mediating effect of KM in a Latin American context, specifically the case of manufacturing companies from Costa Rica. Literature shows that KM and IC have an impact on other types of innovation, but their impact on the business model innovation has been scarcely analyzed. Ramdani et al. (2019), through a literature review of 219 articles on how companies approach business model innovation, identified key areas of innovation: the value proposition, operational value, human capital, and financial value. In relation to human capital, they included organizational learning, skills, employee competencies, incentives, and training. Following Ramdani et al. (2019), IC has a human

capital component from which skills, competencies, and organizational learning of workers could develop and trigger business model innovation. This study evaluates the impact of IC and KM on business model innovation since most knowledge is tacit and related to human resources. Likewise, this study analyzes how IC allows the generation of the necessary KM practices to successfully innovate the business model of manufacturing companies. To evaluate the proposed hypotheses, surveys were conducted to a sample of 100 manufacturing companies in Costa Rica and Partial Least Squares Structural Equation Models (PLS-SEM) were applied for the analysis.

This research will contribute to companies' understanding of the importance of IC (human, social and organizational capital), and KM (acquisition, integration and use of knowledge) and the establishment of practices for the acquisition, integration and use of knowledge in the generation of business model innovations.

This research also contributes to the lack of studies in the context of Latin America for the model proposed. To our knowledge few studies have analyzed the jointly contribution of knowledge management and intellectual capital on firm capability to innovate the way it creates, proposes, and captures value. Therefore, we extend previous studies by suggesting an integrated model to analyze this phenomenon. The few existing studies we found in this sense have basically focused on European (for example, Spain, Serbia) or Asian countries (for example China, Taiwan, India) (Cabrito and Dahms, 2018; Huang and Li, 2009; Hsu and Sabherwal 2011; Martínez-Cañas et al., 2012; Kianto et al., 2014; and Zhang et al., 2018). However, to portray the complete truth of a certain phenomenon, it is necessary to analyze it in different contexts. To dig into this issue, we look at the connection between intellectual capital and business model innovation while integrating the role of knowledge management in this relationship in the context of manufacturing firms from Costa Rica.

2. Conceptual background and hypotheses

2.1 The concept of business model innovation

Despite the large number of articles that have analyzed the concept of business model, no consensus has been reached on its definition. Euchner and Ganguly (2014) define business model innovation as any innovation that creates a new market or breaks into the market with a competitive advantage. Many times, business model innovation is confused with new sales channel. More than that, business model innovation requires newly built capabilities that break in and alter the competitive dynamics of an industry. Amit and Zott (2012) found that companies whose operating margins had grown faster than their competitors were the ones that emphasized business model innovation over product or process innovation. Similarly, Elia et al. (2017) state that business model innovation is more challenging than a mere product or service and offers superior performance because it introduces changes at a strategic level, including value propositions for customers. Vils et al. (2017) refer to business model innovation as the creation and acquisition of value by companies, based on their internal organization and processes, and on external relationships with customers and suppliers. For companies, innovation alone is not sufficient; their organic structure, human resources, strategies, relations with the external sector, and high hierarchy vision in the company are also relevant. Unlike previous industrial revolutions, the fourth revolution is embedded in intelligence rather than brute mechanical force. Therefore, a paradigm shift is needed for innovation and commercialization processes (O'Gorman and Donnelly, 2020).

According to Teece (2010) the essence of a business model is in defining how the enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit. From this definition we can identify three core elements that may define the business model of a firm: value creation, value proposition and value capture (Clauss, 2017; Matzler et al., 2013; Teece, 2010). Recent studies have used this conceptual approach to interpret a business model innovation as the actions performed by a firm to reinvent their business model by changing or redesigning the way they create, propose and capture value through the different interrelated firm's core elements (Amit and Zott, 2012). For Velu and Khanna (2013), competitive pressures have driven business models innovation: globalization, the intensity of technological advances, and breakthroughs in the frontiers of the industry. Indeed, innovation can create enormous opportunities while threatening traditional means of generating income. Therefore, business model innovation can translate into competitive advantage.

Most technology companies and start-ups' business models are inherently disruptive, and this is where business model innovation must be differentiated from product, service, process, or technology innovations to the point that it is easier to copy product or process innovations than business model innovations (Lindgardt et al., 2009; Amit and Zott, 2012). It is important to emphasize the leading role that business model innovation has played for companies in generating returns above their competitors, creating more sustainable competitive advantages than their competitors, fostering the creation of value, and capturing that value.

2.2 Intellectual capital and innovation

The key definitions and concepts of IC were widely discussed in the late 1990s by different authors who contributed to the first great wave of publications on IC and gave the first conceptualization of the term by combining knowledge and skills in one whole (Roos and Roos, 1997; Stewart, 1997; and Sullivan, 1998). In other words, IC is information, intellectual property and material, knowledge, skills, customer relationships, and experience that can be used to further develop businesses (Stewart, 1997). Intellectual capital comprises a set of intangible resources and capacities referred to different manifestations of knowledge, whether individual, organizational, or inter-organizational, which can offer a competitive advantage. Regarding the dimensions of intellectual capital, in recent years, there seems to be a consensus to divide intellectual capital into three components: human capital, structural capital and relational capital (Montejano and López 2013).

Empirical evidence has shown that IC influences product and process innovation, as well as the development of radical and incremental innovations, including their technological and administrative aspects (Aramburu et al., 2015; Cezlan, 2015; Dost et al., 2016; Han and Li, 2015; Inkinen, 2015; Machado et al., 2017; Altindag et al., 2019; Ramezan, 2011; Subramaniam and Youndt, 2005; Xu et al., 2019; and Zhang et al., 2017). For Subramaniam and Youndt (2005), social capital seems to be the cornerstone of innovation. In a knowledge-based economy, intellectual capital adds more value to an organization (Fan and Lee, 2011). An organization has unique and complex intellectual capital characteristics that are difficult to imitate. Bouncken et al. (2016) studied 299 German service companies and found that business orientation and modularity produce business model innovation. Altindag et al. (2019) mention that IC, correctly used in the

organization, has become a facilitator of innovations. For [Ling \(2013\)](#), studies have shown that IC positively relates to innovation and value creation. [Xu et al. \(2019\)](#) state that IC is related to the creation of value for companies, and, in addition, it can provide a competitive advantage. [Dane-Nielsen and Nielsen \(2019\)](#) show that IC is essential for the creation of value. For example, it was human capital that formulated and launched the commercialization strategy that transformed Skype into the innovative business model for internet calling. In the case of Dell, structural capital was decisive to achieve the logistics of production and delivery of computers that marked the success of its business model; in the case of eBay, it was human capital and social capital. Therefore, IC dimensions such as human, organizational, and social capital can be seen as inducers of business model innovation, as stated in the following hypothesis:

Hypothesis 1: Intellectual capital positively influences business model innovation in Costa Rican manufacturing companies.

2.3 Knowledge management and innovation

KM, according to seminal authors, is the ability of a company to create knowledge, disseminate it through the organization and embody it in products, services, and systems ([Nonaka and Takeuchi, 1995](#)). [Kumar \(2019\)](#), [Obeidat et al. \(2016\)](#) and [Nguyen et al. \(2020\)](#) postulate that the processes through which knowledge is created and used in companies constitute the key and inimitable competence that managers must recognize and develop to create sustainable competitive advantages. Furthermore, there is empirical evidence on the positive effect of the creation of knowledge ([Nonaka and Takeuchi, 1995](#)) and of the flows and stocks of knowledge ([DeCarolis and Deeds, 1999](#)) on company performance.

Literature provides empirical evidence on the influence that knowledge management has on product innovation, processes, marketing, and on incremental, radical and technological management ([Amalia and Nugroho 2011](#); [Andeeva 2011](#); [Cantner et al., 2009](#); [Darroch, 2005](#); [Day, 1994](#); [Fahey and Prusak, 1998](#); [Gonzales-Mohino Sanchez and Donate Manzanares, 2019](#); [Grant, 1996](#); [Jantunen 2005](#); [Kumar, 2019](#); [Nguyen et al, 2020](#); [Obeidat et al., 2016](#); and [Teece, 1998](#)). In their seminal work, [Nonaka and Takeuchi \(1995\)](#) present KM as essential for innovation. As [Alavi and Leidner \(2001\)](#) argue, the source of competitive advantage lies in the application of knowledge rather than knowledge itself.

Other authors highlight KM as a driver of innovation. According to [Nguyen et al. \(2020\)](#), knowledge acquisition contributes to innovation. Similarly, [Kumar \(2019\)](#) points out that the acquisition and distribution of knowledge contribute to organizational innovation in companies in the education sector. But not only is the acquisition and integration of knowledge important. For [Darroch \(2005\)](#), having knowledge in a company and knowing how to use it improve the development of incremental innovations. Therefore, how knowledge is acquired, disseminated, and used is also important ([Jantunen, 2005](#)). [Obeidat et al. \(2016\)](#) demonstrated in an empirical study that knowledge acquisition, exchange and use have a significant impact on organizational innovation. As Business model innovation pays greater attention on the client, on the high number of competitors, on economic changes, on the interconnectivity between markets and on technological changes, organizations are forced to rethink their traditional models and develop new formats to obtain competitive advantages ([Pereira Nunes and Russo, 2019](#)). [Cillo et al. \(2019\)](#), [Nonaka and Takeuchi](#)

(1995), and Nguyen et al. (2020) have recognized the link between innovation and knowledge as deeply related topics and how KM impacts innovation. Nonaka and Takeuchi (1995) and Nguyen et al. (2020) are part of a consensus that recognizes the role of explicit and tacit components of organizational knowledge in innovation. Therefore, KM dimensions such as the acquisition, integration and application of knowledge can be seen as inducers of business model innovation, as stated in the following working hypothesis:

Hypothesis 2: Knowledge management positively influences business model innovation in manufacturing companies in Costa Rica.

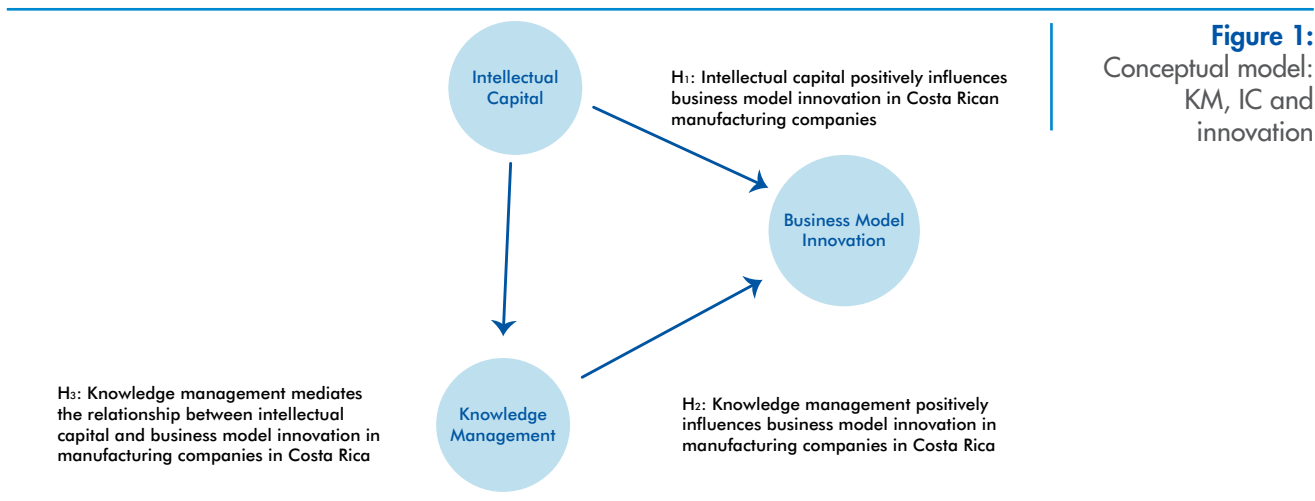
2.4 Knowledge management, intellectual capital, and innovation

Literature shows contradictions when evaluating the relationship between KM and IC, and how they jointly contribute to the innovation of the company's business model. Many authors (Hsu and Sabherwal, 2011; Huang and Li, 2009; Martínez-Cañas et al., 2012; Obeidat et al., 2017; Shih et al., 2010; and Zhang et al., 2018), in their empirical research, found that KM mediation improves the impact of IC on innovation, and that, on many occasions, mediating effect was total. However, a question remains on how IC and KM jointly contribute to innovation in the creation of value for companies and, therefore, in their business model. In this study we will focus on addressing this gap in the literature by assessing the joint effect of IC and KM on business model innovation and the mediating effect of KM.

Previous studies have pointed out the relevance of KM in the relationship between IC and product or process innovations introduced by companies. For example, Obeidat et al. (2017) identified some of the dimensions of knowledge management that have a mediating effect between intellectual capital and incremental and radical innovation: the acquisition of knowledge when it is acquired from outside; the ability of employees to assimilate new information; and the application of knowledge, which is the interaction between tacit and explicit knowledge. These aspects allow companies with intellectual capital to improve organizational innovation processes and show that the application of knowledge contributes to the creation of value in the innovation. For Shih et al. (2010) the creation of knowledge can come from inside or outside the organization, which, at the same time, influences human capital, a relevant component of intellectual capital in the development of organizational innovations. Martínez-Cañas et al. (2012) consider that the acquisition of knowledge fully mediates the relationship between social capital and innovation. Huang and Li (2009) also found that the dissemination of knowledge throughout the organization allows further innovation developments and plays a mediating role between social interaction and technical and administrative innovation. Similarly, Valhondo (2003) points out that KM is a set of processes for the creation, capture, storage, classification, organization, retrieval and use of knowledge in companies. It is important to bear in mind that KM processes carried out in companies will improve the development of business model innovations. Based on the previous arguments, the following hypothesis is proposed:

Hypothesis 3: Knowledge management mediates the relationship between intellectual capital and business model innovation in manufacturing companies in Costa Rica.

In Figure 1, the theoretical model of the study is presented with the proposed hypotheses.



3. Methodology

3.1 Data collection

Micro, small, medium, and large manufacturing company in Costa Rica constitute the unit of analysis of this study, and innovation managers, the reporting unit, except in cases in which, given the size of the company, this figure did not exit. In such cases, production or general managers were interviewed. To identify the reporting unit, the Chamber of Industries of Costa Rica database was used. It consists of 416 manufacturing companies, divided into 22 subsectors.

The study was conducted from August 29th to November 29th, 2019. The research design was non-experimental: random sampling was used, and 100 responses were received in total. Table 1 summarizes the classification of companies according to their number of employees. Large firms represent the highest percentage of the firms in the sample with 38% of the firms, followed by medium-sized companies with 28%, small companies with 22% and micro-companies with 12%.

In our sample, we attend to include firms from the different subcategories of manufacturing, especially those with the largest number of companies. As we can observe in Table 2, the categories with the largest number of firms are food and chemical substances and products, with 22% and 17% of the total sample, respectively. These percentages are very similar to the total number of firms from these categories operating in Costa Rica (24% for food firms and 13.5% for chemical substances and products).

Number of workers	Number of companies	Percentage
from 1 to 10 workers, micro-enterprises	12	12 %
from 11 to 30 workers, small businesses	22	22 %
from 31 to 100 workers, medium-sized companies	28	28 %
more than 100 workers, large companies	38	38 %
Total	100	100 %

Table 1:
Classification of companies according to their number of employees

For analyzing the data, a partial least squares structural equation model (PLS-SEM) was applied using SmartPLS Software. This statistical technique makes it possible to analyze, in a unique, systematic, and integrated way, the measurement model linking latent constructs with their observable variables, and the structural model relating the different constructs to each other; in addition, it allows working with small samples and still achieving high levels of statistical power (Hair et al., 2017). Below the Table 3 shows the technical data of the study.

Table 2:
Number of companies by subcategories that answered the questionnaire

Number of companies that answered the questionnaire		
Subcategory	Number of companies	%
Manufacture of food products	22	22,0 %
Manufacture of products for animals	1	1,0 %
Manufacture of beverages	3	3,0 %
Manufacture of textile products	1	1,0 %
Textile manufacturing except leather garments	1	1,0 %
Manufacture of leather and related products	2	2,0 %
Wood products and manufacture of wood and cork products except furniture; manufacture of articles of straw and other materials	1	1,0 %
Manufacture of paper and products of this material	3	3,0 %
Print	2	2,0 %
Manufacture of chemical substances and products	17	17,0 %
Manufacture of pharmaceutical products	3	3,0 %
Manufacture of rubber and plastic products	4	4,0 %
Manufacture of plastic products	4	4,0 %
Production of non-metallic mineral products	3	3,0 %
Base metal fabrication	5	5,0 %
Manufacture of fabricated metal products, except machinery and equipment	9	9,0 %
Manufacture of computer, electronic and optical products	5	5,0 %
Manufacture of various equipment and machinery	2	2,0 %
Manufacture of motor vehicles	1	1,0 %
Furniture manufacturing	4	4,0 %
various manufacturing industries	7	7,0 %
Total	100	100,0 %

Table 3:
Study technical data

Sample	Costa Rican Manufacturing companies affiliated to Chamber of Industries of Costa Rica
Geographic Scope	Costa Rica, national level
Total Sample	416 companies
Surveys Received	100
Data Collection Method	Face-to-face, email and telephone surveys
Dates	August-November, 2019
Sampling Selection Process	Random Sampling
Response Rate	24%

3.2 Measurements

Knowledge management. It was measured as a second-order construct, consisting of three first-order variables: knowledge acquisition, knowledge integration, and knowledge use. Knowledge acquisition can be achieved by observing other organizations and creating knowledge from internal and external sources, knowledge integration captures how the acquired information is transferred and distributed internally to be used and, knowledge use represents how the firms apply the knowledge generated from different sources (Jantunen, 2005). To measure KM, validated scales from the following authors were used: Obeidat et al. (2016), Huang and Li (2009) and Jantunen (2005)¹.

Intellectual capital. It was measured as a second-order construct, consisting of three first-order variables: human, social, and organizational capital. Human capital refers to the knowledge and skills that reside in individuals. Organizational capital represents the institutionalized knowledge and expertise that resides within the company, and that is used through data. Finally, social capital is the knowledge that firms generated through their interaction with external agents (Subramaniam and Youndt, 2005). To measure IC, we used the validated scale proposed by Subramaniam and Youndt (2005).

Business model innovation. Lindgardt et al. (2009) define business model innovation as one that provides a sustainable competitive advantage; that is, the model must be innovative, permanent, coordinated and sufficiently supported by all employees and very well administered from management. To measure business model innovation, we used an adapted version of the scale employed by Clauss (2017) and Bouncken et al. (2016).

Control variables: we included firm size and industry as a control variable, which may provide possible alternative explanations for our results.

4. Results

4.1 Evaluation of Measurement Model with PLS-SEM

The model estimated consists of three constructs: knowledge management, intellectual capital, and business model innovation. Knowledge management represents a second-order construct made up of three first-order variables: knowledge acquisition (6 items), knowledge integration (7 items), and knowledge use (8 items). Intellectual capital represents a second-order construct made up of three first-order variables: human capital (5 items), social capital (5 items) and organizational capital (4 items). The third construct is business model innovation, a first-order construct with 6 items. Two control variables have been included: the company's manufacturing industry subcategory, and company size: micro, small, medium, and large. Table 4 shows factor loading results.

As it can be observed in Table 4, all items have factor loadings greater than 0.707, therefore, no item was eliminated. This indicates the strong relationships between factors, the latent variables, and their constructs.

¹ A copy of the measurement scale used in the article can be provided upon request. Please send an email to the corresponding author: aalfaro@itcr.ac.cr.

Table 5 shows the reliability and validity of the constructs. Cronbach's Alpha shows values above 0.70 and Composite Reliability shows values above 0.80. Consistency levels were expected based on the use of validated scales. All constructs showed an AVE greater than 0.50. This indicates that, on average, constructs explain more than half of the variance of their indicators (Hair et al., 2017).

	Intellectual Capital	Knowledge Management	Innovation	Subsector	Company size
Knowledge acquisition		0.9215			
Knowledge integration		0.9316			
Knowledge use		0.9456			
Human capital	0.8564				
Organizational capital	0.7746				
Social capital	0.8739				
Bus_Mod_Inn53			0.7273		
Bus_Mod_Inn54			0.8119		
Bus_Mod_Inn55			0.8022		
Bus_Mod_Inn56			0.8085		
Bus_Mod_Inn57			0.7331		
Bus_Mod_Inn58			0.8004		
collaborators					1
Sub category				1	

Note: Bus_Mod_Inn (Business Model Innovation)

	Cronbach's Alpha	Composite Reliability	Average of variance extracted (AVE)
Intellectual Capital	0.7838	0.8742	0.699
Knowledge Management	0.9255	0.9527	0.8704
Innovation	0.8721	0.9037	0.6106

4.2 Evaluation of the structural model in PLS-SEM

Once all measures of the constructs were tested as reliable and valid, the next step addresses the evaluation of the structural model results. The predictive capacity of the model and the relationships between the constructs were examined (Hair et al., 2017).

Figure 2 shows that the relationship between intellectual capital and business model innovation is direct and significant, (0.266, $p < 0.05$), considering the two conditions according to Chin (1998a) and Hair et al. (2017). Therefore, hypothesis 1 is accepted. Figure 2 also shows that KM has a direct and significant impact on business model innovation (0.509, $p < 0.001$), considering both conditions according to Chin (1998a) and Hair et al. (2017). Hypothesis 2 is also accepted.

Finally, to analyse the mediating effect of knowledge management between intellectual capital and business model innovation, it is important to assess the direct and indirect effects of this relationship (Hair et al., 2017). As shown in Table 6, the direct relationship between intellectual

capital and business model innovation is positive and significant (0.266 $p < 0.0457$). Likewise, the indirect effect turned out to be positive and significant (0.414 $p < 0.0001$). Regarding the indirect effect, it should be noted that its coefficient value is almost twice the coefficient value of the direct relationship, which shows the relevance of knowledge management in explaining the contribution of intellectual capital to the development of business model innovations. Hypothesis 3 is supported.

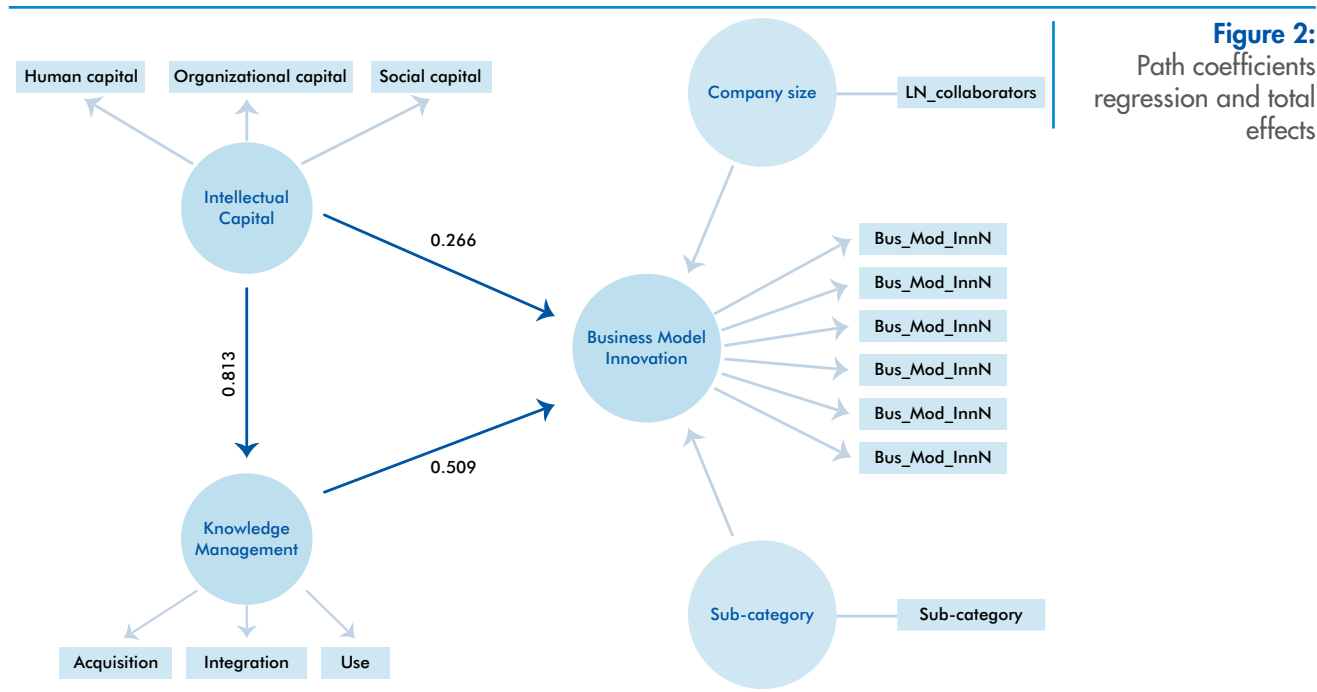


Figure 2: Path coefficients regression and total effects

Kumar (2019), Obeidat et al. (2016) and Nguyen et al. (2020) postulate that the processes through which knowledge is created and used in companies constitute the key and inimitable competence that managers must recognize and develop to create sustainable competitive advantages. In our research we have shown that KM also has a significant impact on business model innovation. Control variables (company size and subsector) do not have a significant influence on innovation.

5. Discussions and conclusions

The purpose of this study was to assess the impact of intellectual capital (IC) and knowledge management (KM) on the capacity of companies to generate business model innovations. Literature on innovation provides empirical evidence of the separate influence of IC and KM on innovation according to its type (product, process, or management) or impact (radical or incremental) (Cezlan, 2015; Han and Li, 2015; Subramaniam and Youndt, 2005; Ramezan, 2011; Aramburu et al., 2015; Inkinen, 2015; Dost et al., 2016; Machado et al., 2017; Zhang et al., 2017; Xu et al., 2019). This study contributes to extend this line of research by highlighting the relevance of both concepts in the development of business model innovations and how this process takes place in an emerging economy context, such as Costa Rica.

Table 6:
p-value and
t-statistics

Direct Effects	Path Coefficient	T-value	P-value	Significance	Hypothesis accepted
Intellectual capital -> Knowledge management	0.8132	25.686	0.0000 ***	Yes	-
Intellectual capital -> Business model innovation	0.266	1.9378	0.0457 *	Yes	Yes
Knowledge management -> Business model innovation	0.509	3.9578	0.0001 ***	Yes	Yes
Subsector -> Business model innovation	-0.0187	0.3046	0.7607	No	-
Company size -> Business model innovation	0.0927	1.6205	0.1052	No	-
Indirect Effects	Path Coefficient	T-value	P-value	Significance	Hypothesis accepted
Capital Intellectual -> Knowledge management -> Business model innovation	0.4139	3.8526	0.0001 ***	Yes	Yes
Total Effects	Path Coefficient	T-value	P-value	Significance	Hypothesis accepted
Intellectual capital -> Knowledge management	0.8132	26.102	0.0000 ***		
Intellectual capital -> Business model innovation	0.6798	11.2807	0.0000 ***		
Knowledge management -> Business model innovation	0.509	3.9375	0.0001 ***		

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Our analysis puts forward several theoretical implications. First, our findings make a significant contribution to the KM and business model literature. Previous studies have shown the relevance of managing knowledge acquisition, integration and use to promote different type of innovations (Inkinen, 2015; Dost et al., 2016; Machado et al., 2017). In the present study we highlight an additional contribution of KM: it provides firms the ability to embed acquired knowledge into their products and services by adopting novel approaches to commercialize their assets and to change the core elements of their business logic.

Second, in relation to the link between IC and innovations outcomes, our study extends this research line by showing that IC is relevant not only to generate new product, process, marketing, or organizational innovations but also to innovate the business model. Furthermore, our results show that IC contributes to the innovation of business model both directly and indirectly through knowledge management. The above suggest that KM is an important factor to understand firms' capability to translate their human, social and organizational capital into new ways of creating and providing value to customers. These findings are relevant since they show that not only having a broad base of institutionalized knowledge, of networks within and across organizations or highly competent human force, are enough for firms to break the barriers to change (Jantunen, 2005) and bring new business models. Instead, firms need to generate, in the first place, the necessary process and mechanisms to overcome the barriers to change and to successfully apply their IC to redesign their business model. For example, a diverse knowledge base provides firms with the sensitivity to recognizing changes in the market and to identify opening opportunities. However,

without the necessary capabilities to transform its knowledge into valuable products or profitable business models, firms will not be able to improve how they create value. Therefore, if firms' purpose is to keep present a high degree of innovativeness in their offer, they need to have in place the practices and reconfiguring capabilities to fully funnel the benefits of a diverse knowledge base to renew their business model.

Taken together, these findings have important implications that can be translated into useful and specific guidelines for managers. Even though the importance of human, social and organizational capital for innovation have been discussed in several studies, our finding suggest that KM practices and routines may have an enabling and supporting role in transforming a diverse IC into a novel value proposition. Therefore, to effectively extract benefits from previous investment in human capital or in external links, it may be imperative for firms to have some KM routines in place. Firms with well-developed knowledge-processing capabilities may be better well equipped to renew their asset base and exploit the assets they already have to challenge existing business models and create new novel value for customers (Jantunen, 2005). In this sense, we believe that decision-makers in manufacturing companies in Costa Rica should motivate their collaborators and workforce to continue improving, not only their IC but also their KM practices if their goal is to keep a innovative business model.

This study is not exempt from limitations which may lead to future lines of research. In the first place, not all the target population answered the survey. Therefore, it was necessary to perform telephone and email surveys to increase the response rate. In that way we obtained 100 fully responses which represents 24% of the target population. However, this data is cross sectional, so it provides a static picture of the problem analysed. In that sense, future studies could test the model introduced in this paper using a longitudinal approach. For instance, it is very likely that the knowledge management and intellectual capital practices implemented in 2019 (reference year for the application of the questionnaire) will influence the distinctive competencies and the innovations introduced in the business model for the following years.

Furthermore, there was only one respondent per company. The robustness test we performed confirmed that our results are not affected for common method bias. However, future studies could consider different respondents for the independent and the dependent variables.

Finally, our study and results are limited to the context of manufacturing companies from Costa Rica. One of the possible lines of research would be to apply the proposed model to other emerging economies and other sectors of activity and see if KM and IC have the same behaviour in the development of business model innovations. At the national level we could investigate the link between knowledge management, intellectual capital, and the innovation of the business model for services, agro-industrial, commercial, and financial industries.

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