


**HUMAN CAPITAL AND ABSORPTION CAPACITY IN THE MAQUILADORA INDUSTRY
IN NORTHEASTERN MEXICO: THE EFFECTS ON INNOVATION**

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ARTICLE INFO	ABSTRACT
<p>Article history: Received: April, 22nd 2024 Accepted: June, 21st 2024</p>	<p>Objective: The objective of this study is to investigate the effect of human capital and absorption capacity on innovation in the maquiladora industry in the northern region of Mexico.</p>
<p>Keywords: Human Capital; Absorptive Capacity; Innovation; Northeast Mexico.</p> 	<p>Theoretical Framework: Potential and realized absorptive capacity play different yet complementary roles (Demuner-Flores et al., 2018; Leal-Rodríguez & Albort-Morant, 2015; Zahra & George, 2002). Cassol et al., (2016) confirmed the mediating role of absorptive capacity in the relationship between intellectual capital and innovation and determined that there is a positive relationship between intellectual capital and innovation.</p> <p>Method: The hypotheses and the model proposed have been tested with a quantitative explanatory research design that involves the application of a questionnaire. The technique for data analysis is SEM. The statistical software used was AMOS and SPSS version 24. The sample was composed of 127 companies.</p> <p>Results and Discussion: Human capital was found to have a positive and significant effect on absorption capacity. However, the human capital variable in its specificity dimension had a positive effect, but not significant in innovation, contrary to the effect of the value dimension, which had a positive and significant effect on innovation. Absorption capacity had a positive effect on innovation.</p> <p>Research Implications: The companies under study focus on encouraging the performance of routine activities, not on developing innovative products and processes through the absorptive capacity.</p> <p>Originality/Value: It was the first study carried out in a national context on the constructs (human capital, absorptive capacity and innovation) in the maquiladora industry, contributing to identify human capital as an investment.</p> <p>Doi: https://doi.org/10.26668/businessreview/2024.v9i7.4761</p>

**CAPITAL HUMANO E CAPACIDADE DE ABSORÇÃO NA INDÚSTRIA MAQUILADORA NO
NORDESTE DO MÉXICO: OS EFEITOS NA INOVAÇÃO**

RESUMO

Objetivo: O objetivo deste estudo é investigar o efeito do capital humano e da capacidade de absorção na inovação na indústria maquiladora na região norte do México.

Referencial Teórico: A capacidade de absorção potencial e a realizada desempenham papéis diferentes, mas complementares (Demuner-Flores et al., 2018; Leal-Rodríguez & Albort-Morant, 2015; Zahra & George, 2002).

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Cassol et al. (2016) confirmaram o papel mediador da capacidade de absorção na relação entre capital intelectual e inovação e determinaram que existe uma relação positiva entre capital intelectual e inovação

Método: As hipóteses e o modelo proposto foram testados com um desenho de pesquisa quantitativa explicativa que envolve a aplicação de um questionário. A técnica para análise de dados é SEM. Os softwares estatísticos utilizados foram AMOS e SPSS versão 24. A amostra foi composta por 127 empresas.

Resultados e Discussão: Verificou-se que o capital humano tem um efeito positivo e significativo na capacidade de absorção. Contudo, a variável capital humano na sua dimensão especificidade teve um efeito positivo, mas não significativo na inovação, ao contrário do efeito da dimensão valor, que teve um efeito positivo e significativo na inovação. A capacidade de absorção teve um efeito positivo na inovação

Implicações da Pesquisa: As empresas estudadas focam no incentivo ao desempenho de atividades rotineiras, e não no desenvolvimento de produtos e processos inovadores por meio da capacidade absorptiva.

Originalidade/Valor: Foi o primeiro estudo realizado em contexto nacional sobre os construtos (capital humano, capacidade absorptiva e inovação) da indústria maquiladora, contribuindo para identificar o capital humano como investimento.

Palavras-chave: Capital Humano, Capacidade de Absorção, Inovação, Nordeste do México.

CAPITAL HUMANO Y CAPACIDAD DE ABSORCIÓN EN LA INDUSTRIA MAQUILADORA EN EL NORESTE DE MÉXICO: LOS EFECTOS EN LA INNOVACIÓN

RESUMEN

Objetivo: El objetivo de este estudio es investigar el efecto del capital humano y la capacidad de absorción sobre la innovación en la industria maquiladora de la región norte de México.

Marco Teórico: La capacidad de absorción potencial y realizada desempeñan roles diferentes pero complementarios (Demuner-Flores et al., 2018; Leal-Rodríguez & Albort-Morant, 2015; Zahra & George, 2002). Cassol et al. (2016) confirmaron el papel mediador de la capacidad de absorción en la relación entre capital intelectual e innovación y determinaron que existe una relación positiva entre capital intelectual e innovación.

Método: Las hipótesis y el modelo propuesto han sido contrastados con un diseño de investigación explicativo cuantitativo que implica la aplicación de un cuestionario. La técnica para el análisis de datos es SEM. El software estadístico utilizado fue AMOS y SPSS versión 24. La muestra estuvo compuesta por 127 empresas.

Resultados y Discusión: Se encontró que el capital humano tiene un efecto positivo y significativo sobre la capacidad de absorción. Sin embargo, la variable capital humano en su dimensión de especificidad tuvo un efecto positivo, pero no significativo en la innovación, contrario al efecto de la dimensión valor, que tuvo un efecto positivo y significativo en la innovación. La capacidad de absorción tuvo un efecto positivo en la innovación

Implicaciones de la investigación: Las empresas objeto de estudio se centran en incentivar el desempeño de actividades rutinarias, no en desarrollar productos y procesos innovadores a través de la capacidad de absorción.

Originalidad/Valor: Fue el primer estudio realizado en el contexto nacional sobre los constructos (capital humano, capacidad de absorción e innovación) en la industria maquiladora, contribuyendo a identificar el capital humano como una inversión.

Palabras clave: Capital Humano, Capacidad de Absorción, Innovación, Noreste de México.

1 INTRODUCTION

During the COVID-19 pandemic, most industries are trying to transform in the face of the need to innovate (Lyu et al., 2022). Therefore, innovation is considered a key factor for the successful development of enterprises, regions, and countries. However, innovation is a phenomenon that occurs most frequently at the enterprise level (Bjerke & Johansson, 2022). Hence, it is a determining factor to address the challenges arising from globalization, such as

differentiation, competitiveness, integration of new technologies, scarcity of resources and the growing demand for products and services (Jiménez & Geldes, 2019).

In addition to the above, knowledge is fundamental in the field of social sciences because it represents a source of competitive advantage. Therefore, companies face the problem of retaining human capital, the most valuable intangible asset, as it is responsible for assimilating this knowledge. In this sense, the effectiveness of organizations will be measured depending on the way they manage their human capital, by adapting their capacities and skills to the processes and projects of the organization (Aguado, 2021).

This, in order that, by investing in human capital through training, the company is competitive in its processes and allows to face operating obstacles in organizations and generate innovations. In these circumstances, knowledge external to companies acquires relevance because it cannot be generated completely internally, so capacities must be built that facilitate its adoption and incorporation into the internal process of value creation to transform the knowledge base, is applied and can generate innovations, so a capacity called absorption capacity is required (Cohen & Levinthal 1990; Zahra & George, 2002).

In relation to the above, the importance of this study in determining the effect of human capital on innovation through the mediation of absorption capacity is evident. Below, it is shown because the study will be conducted in Tamaulipas, specifically in the cities of Reynosa, Matamoros and Nuevo Laredo. In addition, arguments for choosing the maquiladora industry are mentioned.

Historically, the maquiladora industry has been regarded as a labor-intensive, mostly low-rated sector, with low capital investment and very low or non-existing innovative activity. However, since the early 2000s, the industry has experienced some changes that for some authors marked the beginning of a new stage that involves the development of a different production model or a new generation of maquiladoras and entails considerable changes in workforce training (human capital), innovation and the coordination of activities (Carrillo, 2014). Some of these changes are associated with the upgrading that has occurred in some industries, which has necessarily led to more advance worker training and participation in new sectors of greater technological complexity, such as aerospace and software (Moreno-Brid et al., 2020).

Tamaulipas, one of Mexico's northern border states, is very attractive for foreign direct investment and is a perfect location for the maquiladora industry. Important clusters of plants, mainly belonging to the electric-electronics and auto-part sectors, have been set up at the northern border of this state (Secretaría de Desarrollo Económico, 2016-2022). In 2022,

Tamaulipas had foreign direct investments worth \$978.5 million USD, representing 2.7% of the national total. Most of it comes from the USA and focuses on manufacturing, specifically on the maquiladora export industry. It should be noted that the category that attracts the largest volume of foreign investment is transportation equipment manufacturing (Secretaría de Economía, 2023).

In summary, this study aims to determine the effect of human capital and absorption capacity on innovation in the maquiladora industry in Tamaulipas. Therefore, in this new stage of development of the maquiladora industry, the central question this research aims to answer is: Do changes in human capital and absorptive capacity influence innovation in the maquiladora industry in Tamaulipas. To this end, the paper is structured in three parts. The first one presents the literature review and the research hypotheses. This is followed by the research design and the presentation of results and, finally, the discussions and the main contributions of the study.

2 THEORETICAL FRAMEWORK

2.1 RELATIONSHIP BETWEEN HUMAN CAPITAL AND INNOVATION

Currently, there are business resources and capabilities that interact with each other, facilitating and increasing innovation. Certainly, human capital represents the most valuable intangible asset that companies possess and is represented through a set of knowledge, skills and abilities that workers have and use which is indispensable today and more for modern organizations (Mičiak, 2019).

Innovation, as a knowledge-intensive activity, benefits from human capital because people with high levels of education, intelligence, imagination, creativity, competences, and experience invest more time, energy and resources in perfecting their skills, which directly benefits organizational processes as well as the promotion, development and application of innovation (Hernán & Villegas, 2020; Leyva et al., 2020).

Empirically, Del Río-Cortina et al. (2022) revealed that the management of human capital and innovation has an impact on organizational performance, being able to generate competitive advantages for companies. On the other hand, Armatli & Ecerala (2015) demonstrate that human capital is the main source of knowledge and skills in the innovation

process. For their part, Alegre et al. (2006) consider that innovation is not possible without valuable human capital, which is positively associated with product innovation.

In their study of the impact of human capital on product innovation, López-Cabrales et al. (2009) considered the value and uniqueness of workers' knowledge as dimensions of this construct. They determined that the uniqueness of knowledge is positively and significantly associated with product innovation, unlike its value dimension. Therefore, taking into consideration the previous literature review and empirical studies, the following hypothesis can be formulated:

H₁: Human capital has a positive and significant effect on innovation.

To validate the first hypothesis, the following research hypotheses are proposed:

H_{1a}. The value of knowledge has a positive and significant effect on innovation.

H_{1b}. The uniqueness of knowledge has a positive and significant effect on innovation.

2.2 RELATIONSHIP BETWEEN HUMAN CAPITAL AND ABSORPTIVE CAPACITY

The ability of companies to learn and absorb new knowledge depends on their internal capacities such as human capital, which is a source of accumulation and creation of tacit knowledge, which is in turn the main input used by companies to innovate (Bilgili et al., 2016). In this regard, Chatterjee (2016) has found that deliberate investments in human capital, such as training, improve companies' capacities, including their knowledge absorptive capacity.

Absorptive capacity depends on companies' knowledge stock, which is reflected in their products, processes, and human capital. Companies' product innovation capacity depends on their absorptive capacity, which is a function of their level of prior knowledge, which is in turn determined by their investment in basic research (Martínez-Senra et al., 2013). Therefore, the company's knowledge base plays a role in their innovation as well as absorptive capacity.

However, although there is no considerable research works that consider both concepts (human capital and absorptive capacity), it is argued that there is a positive relationship between human capital factors and assimilated absorptive capacity (Minbaeva, 2005). In this sense, the acquisition, assimilation and exploitation of knowledge are first influenced by structural capital, followed by human capital, while the transformation of knowledge is influenced by structural and human capital and ultimately by social capital (Machado et al., 2017).

Absorptive capacity has two dimensions: potential absorptive capacity (hence PACAP), which focuses on the acquisition and assimilation of knowledge, and realized absorptive

capacity (hence RACAP), which centers on the transformation and exploitation of knowledge. PACAP allows the company to be receptive to external knowledge, i.e., to be able to acquire, analyze, interpret, and understand it. Meanwhile, RACAP is the company's ability to transform and exploit new and previous knowledge to incorporate it into its operations. Companies cannot apply external knowledge if they have not acquired it. Similarly, certain organizations may develop skills to acquire and assimilate external knowledge, but cannot be able to transform and apply it, because they cannot translate this knowledge into competitive advantages (Zahra & George, 2002).

On the other hand, Canto et al. (2012) have established that there is a positive relationship between human capital and assimilated absorptive capacity. However, there is no relationship between human capital and acquired absorptive capacity. Consequently, considering the previous literature review and empirical studies, a second hypothesis can be formulated:

H₂: Human capital has a positive and significant effect on absorptive capacity.

In order to validate this second hypothesis, the following four specific hypotheses have been proposed:

H_{2a}. The value of knowledge has a positive and significant effect on PACAP.

H_{2b}. The uniqueness of knowledge has a positive and significant effect on PACAP.

H_{2c}. The value of knowledge has a positive and significant effect on RACAP.

H_{2d}. The uniqueness of knowledge has a positive and significant effect on RACAP.

2.3 RELATIONSHIP BETWEEN ABSORPTIVE CAPACITY AND INNOVATION

Companies need to apply and exploit knowledge to be able to innovate. Therefore, based on their absorptive capacity, companies will be able to acquire, absorb and make use of external knowledge, which will facilitate the process of innovation (Santoro et al., 2018). Then, the importance of knowledge absorptive capacity has been revalued as a determining factor for innovation (Aguilar-Olaves et al., 2014). Along this line, Versiani et al., (2021) who have shown that external knowledge is significantly associated with absorptive capacity and the latter with innovation.

There are empirical studies that have examined the relationship between absorptive capacity and innovation. Albort-Morant et al. (2018) point out that PACAP and RACAP are positively related with the performance of product and process innovation. Likewise, Chen et al. (2009) have demonstrated that higher levels of absorptive capacity enable manufacturing

companies to improve the quality of new products they introduced to the market, and the productivity of their processes.

Additionally, the results obtained by Bhatti et al. (2021) indicate that business model innovation depends significantly on the capacity to absorb knowledge, agility, and mindfulness of senior management. These findings are of paramount importance because companies need to make changes to business models to improve their competitive advantage and company performance.

Meseguer-Martinez et al. (2018) analyzed this relationship by considering two types of absorptive capacity, demand-pull, and science-push, and found that both are positively related to product and process innovation output. On the other hand, Harris et al. (2021) indicates that the effects of absorptive capacity on product innovation are positive. However, it depends on the ability of companies to absorb external knowledge.

Limaj et al. (2016) have demonstrated that the combination of social information systems (SIS) and absorptive capacity has a positive and exploratory impact on innovation performance. Further, absorptive capacity of farmers also has a positive effect on innovation (Gellynck et al., 2015). Specifically, in the manufacturing industry in Uruguay, the assimilation dimension of knowledge absorption capacity is essential (Silveira et al., 2021). Consequently, it can be said that both the government and entrepreneurs must be motivated to establish policies that promote the capacity to absorb knowledge, which will consequently have a positive impact on the generation of innovations in various industrial sectors.

In addition, Leal-Rodríguez et al. (2014) have also determined that PACAP and RACAP influence innovation outcomes. Additionally, Guerrero-Sánchez (2021) determined that the potential absorption capacity of external knowledge fosters the results of innovation in marketing in tourism companies.

Ali et al. (2016) established that the acquisition, assimilation, and exploitation of knowledge are key factors in organizational innovation, including product, process, and administrative innovation. However, González-Campo & Hurtado (2014) demonstrated that absorptive capacity is not a determining factor in innovation in Colombian SMEs. Finally, PACAP and RACAP play different yet complementary roles (Demuner-Flores et al., 2018; Leal-Rodríguez & Albort-Morant, 2015).

Taking into consideration the previous arguments, we have proposed a third research hypothesis:

H₃: Absorptive capacity has a positive and significant effect on innovation.

From this hypothesis, the following specific hypotheses can be derived:

H_{3a}: PACAP has a positive and significant effect on innovation.

H_{3b}: RACAP has a positive and significant effect on innovation.

H_{3c}: PACAP has a positive and significant effect on RACAP.

2.4 MEDIATING EFFECT OF ABSORPTIVE CAPACITY ON THE RELATIONSHIP BETWEEN HUMAN CAPITAL AND INNOVATION

In relation to today's knowledge-based economy, Kianto et al. (2017) have proved that organizations can significantly increase innovation performance by implementing knowledge-based human resource management practices, through their employees. Likewise, according to Huang et al. (2015), absorptive capacity acts as a mediating mechanism in the relationship between R&D investment and innovation, because innovation cannot be generated without knowledge transformation by human capital.

Several research studies have considered absorptive capacity as a mediating variable (Guisao et al., 2017). For example, Rodrigo et al. (2014) analyzed whether absorptive capacity measures the relationship between the cognitive social capital and tendency to innovation of firms and concluded that firms can increase their tendency to innovation if they are able to take advantage of those resources through their knowledge absorptive capacity.

Ferreras-Méndez et al. (2015) proposed using absorptive capacity as A mediating variable to determine the relationship between the depth and breadth of external knowledge search and innovation and performance and suggested that high levels of absorptive capacity enable firms to reach higher innovation performance levels. In short, to be able to innovate, firms must possess absorptive capacity, whose development requires knowledge generation through personnel training, recruitment of qualified professionals and internal R&D (Van-Aduard et al., 2016). In contrast, Roy (2018) considers that human capital does not determine the absorption capacity at the company level or its relationship with innovation.

Recently, Cassol et al. (2016) confirmed the mediating role of absorptive capacity in the relationship between intellectual capital and innovation and determined that there is a positive relationship between intellectual capital and innovation, which is better explained by the mediating role of absorptive capacity. However, there is a noticeable absence of research on the effect of the mediating role of absorptive capacity on the relationship between human capital and innovation. Therefore, this article aims to fill the gap in the literature by establishing the

mediating role of absorptive capacity in the relationship between human capital and innovation in the maquiladora industry located in the northern border region of Tamaulipas, Mexico. In short, based on the previous empirical studies and arguments, a fourth research hypothesis has been formulated:

H4: Absorptive capacity mediates the relationship between human capital and innovation.

From this hypothesis, the following specific hypotheses derive:

H4a. PACAP mediates the relationship between value of employee knowledge and innovation.

H4b. PACAP mediates the relationship between uniqueness of employee knowledge and innovation.

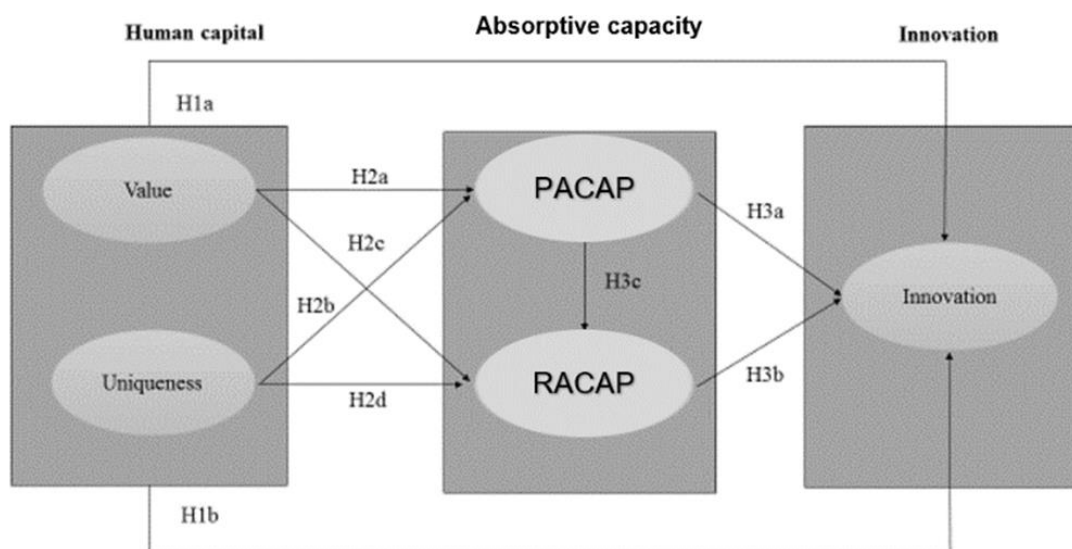
H4c. RACAP mediates the relationship between value of employee knowledge and innovation.

H4d. RACAP mediates the relationship between uniqueness of employee knowledge and innovation.

The following research models have been established based on the previous theoretical framework:

Figure 1

Model of study



3 METHODOLOGY

The hypotheses and the model proposed have been tested with a quantitative explanatory research design that involves the application of a research instrument (questionnaire) to managers of maquiladoras operating in Mexico's northern border region. Due to the explanatory scope of the study, the technique selected for data analysis is Structural Equation Modeling (SEM), which is useful for testing several relationships simultaneously (Hair et al., 2104). In addition, it is one of the most used techniques in the social sciences (Soriano & Mejia, 2021). At last, the statistical software used was AMOS and SPSS version 24.

A contact, sending and follow-up questionnaire method was adopted for data collection. In this way, the final validated sample was composed of 127 companies, of which 53.1% are consolidated (more than 15 years in the industry), 32.8% are mature (7-15 years old), and 14.1% are emerging (less than 7 years). According to the number of employees, most surveyed firms, 27.3%, are large sized (more than 500 employees) and 20.3% are medium sized (251 to 500 employees). Regarding the distribution of the sample of maquiladoras according to manufacturing sector, 38.3% belong to the electrical-electronic sector; 23.4% to the food sector; and 10.2% to the automotive parts industry.

4 RESULTS AND DISCUSSIONS

Two steps can be identified in Structural Equation Modeling: the development of the measurement and the structural models. The measurement model allows researchers to test the suitability of the selected indicators in the measurement of constructs, while the structural model analyses the effects and relationships between latent variables. Below are the results obtained in each of these steps, followed by the testing of the mediating effects.

4.1 MEASUREMENT MODEL

The measurement of human capital constructs, absorptive capacity and innovation was developed considering the findings of the literature review (Jansen et al., 2005; Murovec & Prodan, 2009; Nieves, 2014). The questionnaire was composed of 21 items, whose answers were evaluated using a five-point Likert scale, ranging from totally disagree (1) to totally agree (5).

Table 1 shows the items that make up each construct as well as their factorial weights, all of which are greater than 0.700, and are considered acceptable (Hair et al., 2014). This table also presents the reliability of the construct measurement scales, tested using Cronbach's alpha, the composite reliability index (CRI) and the average variance extracted (AVE). The Cronbach's alpha and CRI tests yielded values greater than 0.700, which meet the minimum requirements (Nunally & Bernstein, 1994). In the case of the AVE, all values exceed the minimum acceptable of 0.50 (Maynez-Guaderrama & Vargas-Salgado, 2019).

Table 1

Validation of measurement scales

Latent variable	Item Description of variable	Factorial weight	Cronbach's Alpha	CRI	AVE
PACAP	ACQ3 knowledge by industry	0.764	0.799	0.800	0.572
	ACQ4 knowledge by stakeholders	0.733			
	ACQ5 knowledge by external advisors	0.769			
RACAP	TR2 new knowledge storage	0.832	0.911	0.914	0.641
	TR3 utility of new knowledge	0.778			
	TR4 review of market trends	0.747			
	EX3 integrating knowledge into applications	0.815			
	EX4 continuous review of acquired knowledge	0.827			
Value of human capital	EX5 sharing common language	0.800	0.879	0.882	0.716
	HC2 workers with knowledge needed for innovation	0.780			
	HC4 workers' quality-assurance skills	0.816			
Uniqueness of human capital	HC5 workers' process skills	0.935	0.812	0.813	0.592
	HC10 workers' experience	0.802			
	HC12 workers' skills hard to imitate by competitors	0.743			
Innovation	HC13 workers' specialization	0.763	0.940	0.942	0.730
	INN5 products' market penetration	0.776			
	INN7 improvement in production equipment	0.852			
	INN8 process changes	0.875			
	INN9 improvement of productive flexibility	0.883			
	INN10 process-based cost reduction	0.871			
	INN11 response speed	0.862			

As part of the validation of the model, the discriminant validity was tested to determine to what extent one construct is different from another. Table 2 shows the results of the comparison of the AVE with the squared correlations of each construct, being the AVE higher than the correlations, which guarantees the discriminant validity (Maynez-Guaderrama & Vargas-Salgado, 2019).

Table 2

Discriminant validity

	PACAP	RACAP	Value	Uniqueness	Innovation
PACAP	0.572				
RACAP	0.341	0.641			
Value	0.094	0.468	0.716		
Uniqueness	0.134	0.256	0.182	0.592	
Innovation	0.317	0.382	0.187	0.123	0.729

The testing of the validity of the measure was followed by the evaluation of the structural model. According to Hair et al. (2014), the fitness indicators for the structural model were adequate as they achieved an overall Goodness of Fitness Index (GFI) of 0.862, and a Root Mean Square Error of Approximation (RMSEA) of 0.049. On the other hand, a good incremental fit was achieved with CFI and TLI values of 0.969 and 0.964, respectively. Finally, about the Parsimonious Normed Fit Index, determined with CMIN/DF, it was established that values lower than 2 would reflect an adequate fit, a requirement that was met in this model, which yielded a value of 1.306.

Table 3

Results of the structural model, direct effect

HYPOTESIS	Endogenous Variable			Estimate	Q	DECISION
H1a	Innovation	<---	VHC	0.353	0.002	Supported
H1b	Innovation	<---	UHC	0.219	0.066	Not supported
H2a	PACAP	<---	VHC	0.240	0.037	Supported
H2b	PACAP	<---	UHC	0.300	0.019	Supported
H2c	RACAP	<---	VHC	0.487	0.001	Supported
H2d	RACAP	<---	UHC	0.255	0.003	Supported
H3a	Innovation	<---	PACAP	0.301	0.005	Supported
H3b	Innovation	<---	RACAP	0.599	0.001	Supported
H3c	RACAP	<---	PACAP	0.319	0.001	Supported

Table 3 shows the results of the parameter estimates of the structural model and their significance, in their direct effects, which allows us to confirm hypotheses 1, 2 and 3. As for the direct effects of the uniqueness of human capital (UHC) on innovation, there is a positive but not significant effect (H1b), which contrasts with the significant effect of the value of human capital (VHC) on innovation (H1b). Likewise, it is observed that the two dimensions of human capital (uniqueness and value) have a positive and significant effect on the potential and realized dimensions of absorptive capacity (H2a, H2b, H2c and H2d).

Regarding the effect of absorptive capacity on innovation, a positive and significant effect was detected in its two dimensions (H3a and H3b). Likewise, the relationship between PACAP and RACAP was also positive and significant (H3c).

4.2 MEDIATION ANALYSIS

According to Calvo (2020), a mediating variable (also known as mediator) intervenes in the causal relationship between a dependent variable and an independent one, generating an indirect relationship. In this research, absorptive capacity intervenes as a mediator between the response of human capital to the generation of innovation.

Table 4 presents the results of the mediation generated by PACAP and RACAP. As shown, PACAP has a full mediation effect on the relationship between human capital in its value dimension and innovation (H4a). However, the assessment of the significance of mediation with the Sobel test is not significant, with a p-value of 0.093. On the other hand, RACAP has a full mediation effect on the relationship between the value of human capital (VHC) and innovation (H4c), with a high significance level, reflected by a p-value of .002 in the Sobel test.

Table 4

Mediation effect of absorptive capacity on the relationship between human capital and innovation

MEDIATING VARIABLE: PACAP								
Hypothesis	Variable		C	a	b	c'	RELATION	Sobel Test
H4a	UHC	parameter	0.219	0.300	0.301	-0.005	INDIRECT	
		sig.	0.066 NS	0.019 *	.005 **	0.969	RELATIONSHIP	
H4b	VHC	parameter	0.353	0.240	0.301	-0.006	FULL	1.676
		sig.	0.002 **	0.037 *	.005 **	0.961	MEDIATION	sig 0.093
MEDIATING VARIABLE: RACAP								
Hypothesis	Variable		C	a	b	c'	RELATION	Sobel Test
H4c	UHC	parameter	0.219	0.255	0.599	-0.005	INDIRECT	
		sig.	.066 NS	.003 **	.001 ***	0.969	RELATIONSHIP	
H4d	VHC	parameter	0.353	0.487	0.599	-0.006	FULL	3.0371
		sig.	.002 **	.001 ***	.001 ***	0.961	MEDIATION	sig 0.002**

The mediation effect of PACAP and RACAP on the relationship between uniqueness and innovation was not supported, as only an indirect relationship (H4b and H4d) was observed, because uniqueness of human capital does not have a direct and significant effect on innovation.

4.3 DISCUSSION

First of all, this research tried to verify the direct effect of human capital on innovation. However, this correlation was not confirmed as human capital was measured considering the dimensions of uniqueness and value, and only the value dimension received empirical support (H1a).

Contrary to most results found in the literature review, a significant effect of the uniqueness of the knowledge of human capital on innovation could not be demonstrated. This result is supported by the fact that the poor innovation performance of Latin American countries, including the one under study, is related to poor investment in human capital (Danquah & Amankwah-Amoah, 2017). Similarly, Subramaniam & Youndt (2005) point out that an employee's individual expertise on its own is not conducive to innovation and that having experts who are reluctant to share their knowledge with their colleagues will often be counterproductive for organizations.

The results support the positive and significant effect of human capital on absorptive capacity, which is in line with the findings of Minbaeva (2005), who indicates that employees' unique tacit skills, which are developed through acquired experience as a result of the functions performed, guarantee the acquisition and assimilation of external knowledge, which enables its transformation and exploitation. The possible explanation for this outcome is that absorptive capacity is determined by the knowledge and skills that employees possess (Cohen & Levinthal, 1990).

By determining the effect of absorptive capacity on innovation, as dependent variable, it was possible to find that both PACAP and RACAP have a significant accelerating effect on innovation. Therefore, PACAP and RACAP represent different yet sequential roles. In other words, they complement each other to achieve an innovative performance, so knowledge cannot be transformed and exploited if it has not been previously acquired and assimilated. From another perspective, it may be the case that a firm is capable of acquiring and assimilating knowledge but is incapable of generating new knowledge for commercial purposes, which is the true purpose of the absorptive capacity (Leal-Rodríguez & Albort-Morant, 2015).

Finally, in relation to the main objective of this article, which is to test whether absorptive capacity, in its two dimensions (potential and realized), mediates the relationship between the value of knowledge and innovation, it can be said that there is evidence of the mediation of absorptive capacity between human capital and innovation. The statistical results

are highly significant for the mediation of absorptive capacity between the value of knowledge and innovation. However, the uniqueness of knowledge does not qualify as mediator because it does not have an acceptable level of statistical significance.

This may be because most of the human capital recruited for the maquiladora industry operating in Mexico's northern border region is not highly skilled, but in fact has a mid-level educational and perform routine activities of productive chains that do not require advanced competencies nor lead to knowledge specialization (Brito et al. 2013). However, this industry tends to value their work force's response capacity to ensure process quality efficiently and effectively; and it is this dimension of human capital (value) what firms require to enhance innovation. Thus, the value of knowledge, which implies that employees have the necessary capabilities to carry out the production process efficiently and effectively, is positively and significantly related to employees' ability to acquire, assimilate, and transform knowledge to subsequently generate process innovation, which implies that absorptive capacity mediates this relationship between human capital and innovation (Cepeda-Carrión et al., 2012; Zhang & Wei-Ping, 2013).

Furthermore, limitations of the study and possible directions for future research are discussed. It is essential that both the results and the discussion are based on solid evidence and that they contribute significantly to the advancement of knowledge on the topic addressed.

5 CONCLUSION

At present we live in an environment based on knowledge, which is why it is of importance that the industries based on such an invaluable resource understand the results of studies that consider relationships between variables that allow them to appropriate external knowledge and thus be able to generate innovations. In this way, the contribution of this research is that a model was analyzed that allows to measure the relationship that exists between human capital, absorption capacity and innovation, for which the dimensions that make them up and the indicators to be used were identified be able to measure them.

One of the main conclusions of this research is that in Mexico's northern border region innovation does not unfold in products and processes because the maquiladora export industry is basically engaged in processes and does not innovate in products. This is because maquiladoras are foreign-owned subsidiary companies dedicated to the assembly of parts, i.e.,

product innovation is generated by the transactional company, which has r&d departments that invest in human capital and not in the mexican territory.

In this sense, regarding the impact of human capital on innovation, the existence of such a relationship is rejected, in response to the lack of business culture that does not allow employees with valuable and unique knowledge and skills to feel an important asset for the organization and are considered essential to create process improvements, which contributes to obtaining specific applications. Therefore, the fact that employees have certain knowledge and skills does not guarantee that innovations will be generated without a company culture that enhances their contribution in this regard. It was found that only the value dimension of human capital, which refers to employees' ability to carry out a process efficiently and effectively, is related to the capacity to acquire, assimilate, and transform knowledge and to influence process innovation in organizations. Thus, absorptive capacity in its two dimensions becomes a significant mediator between the value of knowledge and innovation. A contribution for those in charge of managing the human capital that is available in the export maquiladora industry is that they become aware of the need to identify which strategies allow them to consider it as an investment, since in the industries it has only been considered as part of the input indicators to innovation processes.

The results of this research suggest new approaches to carry out future lines of research. In this sense, we should delve into the study of human capital as a generator of innovation, incorporating new variables, such as human resources management practices. Similarly, it would be interesting to include more objective metrics to measure the variables used in this research.

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