



# Corporate entrepreneurship: An influential factor in companies' business intelligence

*El emprendimiento corporativo, un factor influyente en la inteligencia de negocio de las empresas*

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Received October 29, 2019; accepted January 28, 2021

Available online August 24, 2023

## Abstract

The objective of the research is to analyze the influence of corporate entrepreneurship on the business intelligence of companies in Guanajuato, Mexico. The methodology used in the research was quantitative, explanatory, and transversal. Likewise, structured instruments were used to measure the variables through 503 entrepreneurial leaders of corporate companies. An SEM model was designed whose goodness-of-fit indices were found to be satisfactory. The results show that corporate entrepreneurship positively and significantly influences companies' business intelligence, industrial integrity, industrial analysis, trade and service, business intelligence formality, and utility. The findings are relevant because they support the same corporate entrepreneurship models that provide an alternative to the study approach, particularly in the state of Guanajuato, which has the largest number of sciences, technology, and innovation parks in the country.

*JEL Code:* M12, M14, M51

*Keywords:* : corporate entrepreneurship; business intelligence; integrity and industrial analysis; SMEs

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La revisión por pares es responsabilidad de la Universidad Nacional Autónoma de México.

<http://dx.doi.org/10.22201/fca.24488410e.2021.2762>

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## Resumen

El objetivo de la investigación radica en analizar la influencia que ejerce el emprendimiento corporativo sobre la inteligencia de negocio de las empresas en Guanajuato, México. La metodología empleada en la investigación fue cuantitativa, explicativa y transversal. Asimismo, se emplearon instrumentos estructurados para medir las variables a través de 503 líderes emprendedores de empresas corporativas. Se diseñó un modelo SEM cuyos índices de bondad de ajuste resultaron ser satisfactorios. Los resultados muestran que el emprendimiento corporativo influye positiva y significativamente en la inteligencia de negocio de las empresas, integridad industrial, análisis industrial, comercio y de servicio, formalidad de la inteligencia comercial y la utilidad. Los hallazgos son relevantes debido a que apoyan a los modelos de emprendimiento corporativo mismos que brindan una alternativa en el enfoque de estudio, particularmente el estado de Guanajuato que cuenta con el mayor número de parques científicos, tecnológicos y de innovación en el país.

*Código JEL:* JEL: M12, M14, M51

*Palabras clave:* emprendimiento corporativo; inteligencia de negocio; integridad y análisis industrial; PyMEs

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## Introduction

Currently, corporate entrepreneurship (Zahra, 1991) plays an important role (Cavazos-Arroyo & Giuliani, 2017) in business intelligence (Caseiro & Coelho, 2018) because it promotes significant changes in management and learning in companies. This concept enables organizations to be sufficiently innovative and agile (Chebbi, Yahiaoui, Sellami, Papasolomou, & Melanthiou, 2019; Denning, 2017) to attain a greater chance of responding to the demands of a highly competitive market.

Hence, the business sector must generate strategies that enhance the transformation of companies by identifying areas of opportunity through innovation (Boukamcha, 2019), considering corporate entrepreneurship as one of the main factors that will promote business intelligence (Caseiro & Coelho, 2019) and consequently the competitiveness, development, and growth of companies (Beh & Shafique, 2016), thereby generating a competitive advantage (Schindehutte, Morris, & Kuratko, 2018) in achieving the viability, sustainability, and renewal of organizations (Lumpkin & Dess, 1996; Zahra, 1991).

Nevertheless, due to Mexico's alarming entrepreneurship failure rate, these entrepreneurial approaches to generating new business initiatives have not strengthened the entrepreneurial ecosystem. Indeed, the National Institute of Statistics and Geography (INEGI) and the Center for the Development of Business Competitiveness (INADEC) have stated that many micro, small and medium-sized enterprises (MSMEs) in Mexico fail in the first two years and account for 75% of all failures (Aspiria, 2020; FailureInstitute, 2020).

It should be noted that the causal factors for the high failure rate of MSMEs in Mexico are multifactorial (López-de-Alba, Zavala, De la Garza, López-Lemus, & Ramos, 2016). Nonetheless, the

Failure Institute believes that the main causes of entrepreneurship failure lie specifically in management, marketing, and finance (FailureInstitute, 2020). To ensure the success of entrepreneurship, the Center for the Development of Entrepreneurial Competitiveness considers that entrepreneurs' strategies should be focused on business intelligence, i.e., corporate entrepreneurship strategies should be aligned to business measures and technologies through market and business analysis (INADEC, 2020).

Given the relevance of business intelligence measures in corporate entrepreneurship, it is necessary to generate business strategies that contribute to achieving success in MSME entrepreneurship in Mexico, given that they represent one of the main engines for regional and national economic development (Donkor, Agyekum, Kankam-Kwarteng, & Aidoo, 2018; Obi et al., 2018). Consequently, the present study may be considered relevant and of great value. Currently, there is little empirical research in the business intelligence literature on the factors that affect the rollout of success (Ahmad, 2015; Di-Vaio, Palladino, Hassan, & Escobar, 2020) and its relation with corporate entrepreneurship in a Mexican context.

The main objective of this research is to understand and analyze the influence of corporate entrepreneurship on the business intelligence of MSMEs and larger organizations in Mexico. It also seeks to generate strategies for decision-making in corporate entrepreneurship in the companies and to identify business measures that contribute to achieving better results through business intelligence.

## **Theoretical framework**

### **Corporate entrepreneurship**

In recent decades, researchers and scholars have paid attention to corporate entrepreneurship due to its influence on productivity, returns, and economic development in the business sector (Turró, Urbano, & Peris-Ortiz, 2014; Zahra, 1991), as well as to the economic development and growth of nations (Donkor, Agyekum, Kankam-Kwarteng, & Aidoo, 2018; Obi et al., 2018).

In the face of the various denominations that corporate entrepreneurship (CE) has had, such as "corporate entrepreneurship," "corporate venturing," and "intrapreneurship" (Covin & Slevin, 1988; Lumpkin & Dess, 1996; Miles & Covin, 2002; Zahra, 1991; Martín-Rojas, García-Morales, Garrido-Moreno, & García-Sánchez, 2020), Zhara (1991) defines it as the process in which companies revitalize themselves by generating new business ventures from existing ones, intending to enhance business returns improving their profitability and competitiveness as the strategic renewal of the existing company or business unit (Zahra, 1991; Zahra, Neubaum, & El-Hagrassey, 2002).

To this end, CE promotes generating areas of opportunity for renewal or creation of business units (Martín-Rojas, García-Morales, & García-Sánchez, 2011) through innovative products and services that increase the development of intelligent business strategies arising from industrial, commercial, and service analysis in a highly competitive market (Caseiro & Coelho, 2018; Caseiro & Coelho, 2019). From this perspective, a virtuous circle is generated between corporate entrepreneurship (Zahra, 1991) and business intelligence as essential factors for future ventures that contribute to promoting companies' profitability and competitiveness (Caseiro & Coelho, 2018).

In this dynamic generated by CE, companies promote their entrepreneurial intensity due to the influence exerted on their returns (Yunis, Tarhini, & Kassar, 2018; Zahra, 1991; Zahra, Neubaum, & El-Hagrassey, 2002). Given the relevance of CE in the business sector, business leaders from various sectors adopt a strategic vision (Morris, Van, Cornwall, & Scheepers, 2009) based on the combination of corporate entrepreneurship (Jong, 2012; Morris, Kuratko, & Covin, 2011) and business intelligence in order to achieve competitive advantages over their competitors and thereby position new business units in a highly competitive market (Sarooghi, Libaers, & Burkemper, 2015).

Likewise, companies that exercise corporate entrepreneurship are typically viewed as dynamic, agile, and flexible (Chebbi, Yahiaoui, Sellami, Papasolomou, & Melanthiou, 2019; Denning, 2017) because they develop competencies to take advantage of the new business opportunities they have identified (Busenitz et al., 2014; Davidsson, 2015; Jong, 2012) through renovation or the creation of new business units through innovation (Morris, Van, Cornwall, & Scheepers, 2009; Morris, Kuratko, & Covin, 2011). Thus, there is a higher probability of achieving success for the entrepreneurial company (Urban & Wood, 2017).

Similarly, Ling et al. (2008) and Morris, Kuratko, and Covin (2011) consider that the success of corporate ventures lies in the innovation that is promoted in business activities, such as in the products and services that the firm offers to the market (Yi-Ying, Che-Yuan, & Chung-Wen, 2017). Therefore, corporate entrepreneurship and innovation are complementary factors that contribute to the success of companies. That is, CE promotes business intelligence in entrepreneurial companies and vice versa, as pointed out by Giménez-Figueroa, Martín-Rojas, and García-Morales (2018) and Martín-Rojas, García-Morales, Garrido-Moreno, and García-Sánchez (2020).

Lumpkin and Dess (1996) consider that the competitive environments of national and international markets must be faced through a strategy that generates business competitiveness. For this, the strengthening and promotion of CE are extremely important because it is considered a generating source of sustainable competitive advantages and renewal, catalyzing innovations (Urban & Wood, 2017; Caseiro & Coelho, 2019) in organizations. Likewise, one of the main objectives of corporate

entrepreneurship is to generate, develop, and introduce goods and services to new markets and create user needs by companies positioned in the market to generate new economic business units.

Therefore, Sakhdari (2016) considers CE one of the primary activities continuously encouraged within organizations. In this sense, CE is a function of strategic renewal, profitability, innovation, and growth of MSMEs (Morris, Kuratko, & Covin, 2011). Following this perspective, Guth and Ginsberg (1990) and Zahra (1991) signal the relevance of the constructs that make up CE in the business sector. In particular, the authors point out that CE is centered on two dimensions, one of which refers to the company's activities regarding risk and innovation factors related to developing new businesses within existing companies. The second dimension refers to strategic renewal, which consists of generating wealth through new combinations of business resources (Guth & Ginsberg, 1990).

Similarly, Van and Adonisi (2012) conceptualize corporate entrepreneurship in three dimensions. The first strategy is seen as the birth of new business activities within existing companies, the second as the transformation or rebirth of organizations through a renewal of key business areas (Zahra, 1991), and the third as innovation and renewal within an existing organization (Van & Adonisi, 2012; Zahra, 1991).

Accordingly, organizations in the business sector continuously seek their transformation in order to identify the needs of their consumers by incorporating new business management measures in conjunction with strategies focused on the analysis of industry, commerce, and service (Caseiro & Coelho, 2019; Kimball, 2011). In this way, necessary information is obtained for decision making that will impact the economic development and positioning of the venture through innovation in the companies (Morris, Kuratko, & Covin, 2011; Zahra, 1991; Zahra, Neubaum, & El-Hagrassey, 2002).

The decisions that entrepreneurs make about CE are of utmost importance because they will influence the economic development and positioning of the corporate entrepreneurship of the companies established in the market (Morris, Kuratko, & Covin, 2011). Likewise, ventures emerging from companies promote competitiveness and business returns (Yunis, Tarhini & Kassar, 2018; Zahra, Neubaum, & El-Hagrassey, 2002).

Hence, corporate entrepreneurship is a factor of utmost importance because it fosters the creation, development and transformation of new business initiatives based on business intelligence (Kimball, 2011) due to the use and management of information, knowledge (Davenport & Prusak, 2000), and innovation (Corbett, Covin, O'Connor, & Tucci, 2013; Morris, Kuratko, & Covin, 2011), which influence business returns (Caseiro & Coelho, 2018) and thus contribute to the success of MSME entrepreneurship (INADEC, 2020).

## **Business intelligence**

Competitiveness in MSMEs in domestic and international markets has increased in recent years, making the business sector improve its operational efficiency and cost reduction (Berndtsson, Gudfinnsson, & Strand, 2015) through innovation of new ventures through market analysis that will promote increased profitability and entrepreneurial competitiveness (Caseiro & Coelho, 2019) to achieve the success of MSMEs as large organizations.

One of the main business strategies that promote business success lies in business intelligence (BI) because it provides several fundamental business management tools that enable the consolidation of relevant information for decision-making within MSMEs and organizations in general. Business intelligence systems support planning, control, and diagnosis by offering a comprehensive perspective of the company and strategically generating knowledge of the market and clients (Chang, Hsu, & Wu, 2014).

Therefore, business intelligence has been used by different authors as the grouping of a series of strategies that permit the detection of business opportunities in highly dynamic scenarios (Caseiro & Cohelo, 2019), while corporate entrepreneurship is the actions taken by organizations to improve results and innovation (Boone, Lokshin, Guenter, & Belderbos, 2019; Zahra, 1991).

Kimball (2011) defines business intelligence as a generic term that describes leveraging information resources and knowledge generated by MSMEs to make better business decisions (Van-Dyk & Conradie, 2007). Likewise, Caseiro and Coelho (2018) define BI as the ability of organizations to manage information in their favor to turn it into a competitive advantage through a participatory process that involves the firm's interest groups, also known as stakeholders.

In this sense, business intelligence contributes to corporate decisions focused on the financial, accounting, commercial, operational, and administrative areas, clients, distribution and sales channels, suppliers, products and services, associates, unions, and governmental supervisory and control institutions. It can also include social networks to manage the public's opinions about their products, or the customer service in which processed strategic knowledge is generated to make the company competitive.

Given the relevance of information in the business sector, Martín-Rojas, García-Morales, Garrido-Moreno, and García-Sánchez (2020) state that information processing is an important factor because it generates the necessary knowledge to apply to a business plan or strategy. This strategy is highly relevant for MSMEs already positioned in a market since, from the information, processing, and analysis, it will be possible to generate corporate entrepreneurship (Zahra, Neubaum, & El-Hagrassey, 2002) that will influence their business intelligence (Caseiro & Coelho, 2019; Kimball, 2011). This approach would help in the achievement of business objectives in companies of any size and, thus, success.

It is important to note that business intelligence is a construct focused on the conscious and methodical transformation of business economic units by analyzing the industrial, trade, and service environment to influence the returns of the business company (Wu, Barash, & Bartolini, 2007). Therefore, the use of information and new technologies focused on knowledge management and generation promotes the development of strategies that will transform, incorporate, and position the companies in today's market (Sakhdari, 2016). Accordingly, business intelligence represents a competitive advantage for MSMEs.

The business advantage originating from BI enables organizations to leverage the ability to take advantage of information about the market, clients, and commercial operations to generate business opportunities. This approach is extremely important because, as Gangadharan and Swami (2005) point out, business intelligence contributes to organizational development to transform and optimize operations by analyzing data and information to make sound decisions to improve performance (Wanda & Stian, 2015). Therefore, it represents a strategy for identifying new business opportunities through corporate entrepreneurship. (Berndtsson, Gudfinnsson, & Strand, 2015)

According to Caseiro and Coelho (2019), business intelligence is a construct made up of four factors: (1) Industrial integrity, (2) Commercial and service analysis, (3) Formality of business intelligence, and (4) Perceived Usefulness, which are described below.

**Industrial integrity:** It is defined as the anticipated return according to the type of company and the strategic level of uncertainty, which is used to identify whether the new business firm is an independent initiative or is part of a company already positioned in the market (Covin & Miller, 2014).

This concept is strongly associated with corporate entrepreneurship because organizations expand the operations of their parent companies into new industries to enhance their learning about new markets and technologies (Dhliwayo, 2014). Corporate entrepreneurship (Zahra, 1991; Zahra, Neubaum, & El-Hagrassey, 2002) with industrial integrity is more likely to have greater resources, knowledge, and skills, which enables it to conduct itself in an integrated manner with other companies. Similarly, industrial integrity improves companies' awareness of competitive forces, as well as their opportunities and threats (Herath & Mahmood, 2014). Based on the above, the following hypothesis is established:

H<sub>1</sub>: Corporate entrepreneurship (CE) positively and significantly influences industrial integrity.

**Industrial, commercial, and service analysis:** This concept provides insight into the competitive environment in which the business units operate, allowing them to consider a wide range of data concerning their current competitors. It also permits the analysis of the industrial, commercial, and service sectors to evaluate the competition in national and international markets (Hoppe, Hamrefors, & Soilen, 2009).

Given the relevance of analyzing the industrial, commercial, and service sectors, business managers can focus on identifying new opportunities and threats that may impact their companies' ability to succeed. Therefore, the competitive conditions, and the selection and execution of corporate entrepreneurship strategies will promote business performance by alerting managers and entrepreneurial leaders to the upcoming industrial, commercial, and service changes (Molina, Del Pino, & Rodriguez, 2004). In this way, companies can react promptly to changes related to technologies, the regulatory environment, and social, cultural, and market trends. Following the above, the following hypothesis is established:

H2: Corporate entrepreneurship (CE) positively and significantly influences industrial, commercial, and service analysis.

Formality of commercial intelligence: It is defined as gathering information through formal and informal sources about commercial and business strategies employed by business competitors. Given that most companies have limited sources about their competitors, entrepreneurial managers and leaders employ informal means to gather information needed to generate competitive strategies (Madhok & Marques, 2014). These sources may include information on rivals' strategies, sales, market shares, and products. The formality of commercial intelligence permits business companies to stay in touch with clients, suppliers, venture capitalist consultants, and bankers to gather various competitive data informally and efficiently (Diaz-Chao, Sainz-Gonzalez, & Torrent, 2016; Guzman, Gutierrez, Cortes, & Ramirez, 2012).

It should be noted that the formality of commercial intelligence will facilitate the development of strategic planning that will influence the generation of strategies that promote value in new business initiatives (López-Lemus & De la Garza, 2020). Therefore, the necessary information will be analyzed to identify areas of commercial opportunity representing a competitive advantage (Peng, 2012; Fern, Cardinal, & O'Neill, 2012). Based on the above, the following hypothesis is established:

H3: Corporate entrepreneurship (CE) positively and significantly influences the formality of commercial intelligence.

Perceived usefulness: this factor is focused on analyzing and evaluating the indicators that the business manager and entrepreneurial leader have established to achieve organizational objectives and thus achieve business returns through profits based on the analysis of clear and objective information for decision-making, generating business value.

The essential objective of business intelligence is to continuously support decision-makers in companies by using a set of techniques and strategies that, through data measurement and analysis, seeks to support this decision-making forcefully in order to achieve objectives, providing benefits and generating value (Foster, Smith, Ariyachandra, & Frolick, 2015). Thus:



H4: Corporate entrepreneurship positively and significantly influences perceived usefulness.

It should be noted that business intelligence is a strategy that improves the overview of the information collected, provides a broader organizational vision, reduces uncertainty, and increases the possibilities of quick and effective maneuvering for decision-making. It is important to keep in mind that business intelligence has an impact on the decision-making process. Likewise, it influences the activities of the organization's stakeholders in creating and sharing knowledge to create and implement business strategies and competitive advantages (Shollo & Galliers, 2015).

Nevertheless, companies need to be able to differentiate themselves, attract and retain clients, and obtain information that enables them to develop strategies to identify new business opportunities and thus make decisions. Business intelligence is designed for this purpose because it promotes the development and growth of the organization in a competitive market. In this way, a smart business commits itself to research, development, and technological innovation and, at the same time, involves its strategic clients in value-creation processes, thereby increasing their capabilities and competencies to generate competitive and sustainable advantages that benefit both (Pellissier & Nenzhelele, 2013).

Figure 1 shows the hypothetical model used to evaluate the hypotheses established in this research.

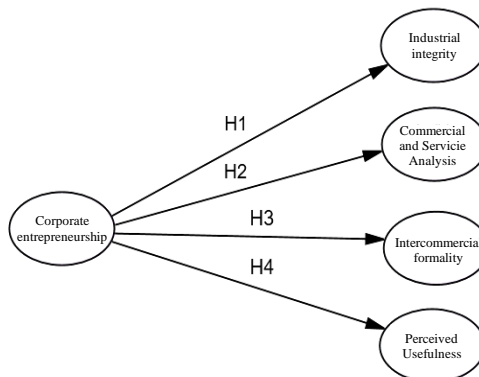


Figure 1. Hypothetical SEM model proposed

Source: created by the authors

Note: The figure shows the hypotheses established in this research according to their order

## Method

The methodological framework was quantitative because questionnaires were used to measure the variables selected for the analysis of the phenomenon. It was also of an explanatory type since it was intended to use a general and approximate approach with the selected variables, in this case, the business

intelligence of entrepreneurs from MSMEs in Guanajuato (see Figure 1). On the other hand, it was also observational since the aim was to describe the phenomenon without intervening in the research development. Finally, it was cross-sectional since the questionnaires were applied at a single time to the research participants to analyze the variables statistically. The location of the geographical study area is shown in Figure 2.

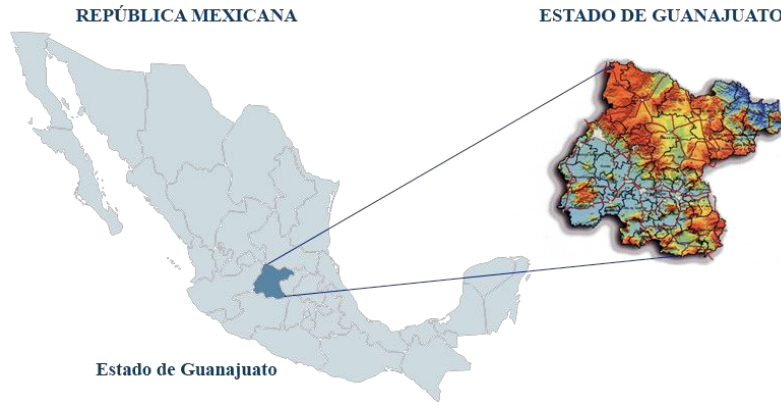


Figure 2. Geographical location of the state of Guanajuato in Mexico

Note: The figure refers to the location of the state of Guanajuato in the Mexican Republic, where the information for the study analysis was collected.

## Sample

The type of sampling applied in the research was non-probabilistic purposive due to the “causes related to the characteristics of the research or the researcher’s purposes” (Hernández-Sampieri, Fernández-Collado, & Baptista-Lucio, 2014, p. 176), i.e., it was required to have the largest number of participants possible in the study. Inclusion criteria were leaders, professionals, presidents, CEOs, executive general managers, and chiefs (Boukamcha, 2019; Hellström & Ramberg, 2019; Chen & Lin, 2020) of MSME corporate ventures in the state of Guanajuato, Mexico (see Figure 2). For the collection of information, a platform was designed and hosted on an Internet server where the study subjects entered to answer the instruments for the quantitative analysis of this research. In the event, a sample of 503 participants was obtained, as described in Table 1.

Table 1  
 Descriptive statistics of the sample

	Sample (n)	Percentage
Population (N)	503	100%
Men	246	48.9%
Women	257	51.1%
	Age	
Less than 30 years old	410	81.5%
31 to 40 years old	45	8.9%
41 to 50 years old	33	6.6%
Over 50 years old	15	3.0%
	Education	
Undergraduate	148	29.4%
Bachelor's Degree	320	63.6%
Postgraduate	35	7.0%
	Business sector	
Commerce	217	43.1%
Industrial	103	20.5%
Services	183	36.4%
	Company size	
Micro	248	49.3%
Small	109	21.7%
Medium	43	8.5%
Large	103	20.5%

For the descriptive statistical analysis of the data obtained, SPSS Statistics v.25 statistical software was used, and for the testing of the established hypotheses, a structural equation model (SEM) was developed using AMOS v.21 statistical software.

Once the information had been collected, a correlation was made between the latent variables studied. Thus, it is shown that there is a positive and significant relation ( $r=0.69$ ) (Bonett & Wright, 2000; Pearson, 1929; Pearson, 1931) between the latent variables corporate entrepreneurship and business intelligence of MSMEs, measured through Pearson's correlation coefficient, as shown in Table 2 and 3.

Table 2  
 Descriptive statistics: Averages, standard deviation, variance, and correlation of constructs

Variables	Median	S.D.	Variance	1	2
Corporate entrepreneurship	5.09	1.39	1.94	1.00	
Business Intelligence	3.68	0.77	0.59	0.69**	1.00

\*\*  $p < 0.001$

Note: Table 2 shows the descriptive statistics and the correlation between corporate entrepreneurship and business intelligence. It can be seen that the correlations between the variables are positive and significant ( $r=0.69$ ).

Table 3

Descriptive Statistics: Averages, standard deviation, variance, and correlation of Corporate Entrepreneurship and Business Intelligence factors

Variables	Median	S.D.	Variance	1	2	3	4	5
Corporate entrepreneurship	5.09	1.39	1.94	1.00				
Industrial integrity	3.87	0.82	0.68	0.65**	1.00			
Industrial, commercial, and service analysis	3.61	0.83	0.69	0.52**	0.55**	1.00		
Formality of commercial intelligence	3.77	0.98	0.97	0.62**	0.60**	0.48**	1.00	
Perceived Usefulness	3.66	0.89	0.79	0.56**	0.55**	0.48**	0.63**	1.00

\*\*  $p < 0.001$

Note: Table 3 shows the descriptive statistics, as well as the correlation between the variable's corporate entrepreneurship, industrial integrity, industrial, commercial, and service analysis, commercial intelligence formality, and perceived usefulness. It can be seen that the correlations between the variables are positive and significant.

## Reliability and validity of the instruments

According to the data analyses of the mediator variables of the constructs, they did not follow a normal distribution. Nevertheless, Bollen and Stine (1992), as well as Hair *et al.* (2017), argue that bootstrapping techniques represent a means to correct, on the one hand, problems in sample size situations and, on the other hand, that the data do not follow a normal distribution. Likewise, bootstrapping techniques provide a significance value ( $p$ ) without assuming sample normality and correct the probabilistic value provided by the maximum likelihood method to contrast the overall fit (Davison & Hinkley, 1997; Efron & Tibshirani, 1993; Hair *et al.*, 2017).

For the validity of the instruments used, construct validity was considered because it is the predominant type. For this purpose, “construct validity is the unifying concept that integrates content and criterion validity considerations into a common framework for testing hypotheses about theoretically relevant relations” (Messick, 1980; p.1015). Likewise, Cronbach (1984) considers that “the ultimate goal of validation is explanation and understanding and, therefore, this leads to the conclusion that all validation is construct validation” (p.126). The indicators and scales used are described below. Similarly, convergent validity was evaluated through factor loadings to verify that the standardized factor loadings ( $\lambda$ ) of the manifest variables are greater than 0.40 (Jöreskog & Sörbom, 1981).

Corporate entrepreneurship. Zahra (1991) developed the corporate entrepreneurship scale to measure this construct. This instrument comprises 9 items and uses a 7-point Likert scale, where 1 represents “little emphasis” and 7 “greater emphasis.” Cronbach's alpha ( $\alpha$ ) (Cronbach, 1951; Hair, Hult, Ringle, & Sarstedt, 2017; Tavakol & Dennick, 2011), McDonald's Omega ( $\Omega$ ) (Hayes & Coutts, 2020; McDonald, 1999), and the Dillon-Goldstein composite reliability ( $\rho_c$ ) (Dillon & Goldstein, 1984) were used to assess the reliability of this instrument. According to the reliability results of the instrument

( $\alpha=0.95$ ;  $\Omega=0.94$ ;  $\rho_c=0.94$ ) they proved to be satisfactory (Cronbach, 1951; Dillon & Goldstein, 1984; Hair, Hult, Ringle, & Sarstedt, 2017; Hayes & Coutts, 2020; McDonald, 1999; Tavakol & Dennick, 2011).

Regarding construct validity, a confirmatory factor analysis (CFA) of the questionnaire developed by Zahra (1991) was developed using a structural equation model with the bootstrapping technique and the maximum likelihood (ML) method by resampling 1,000 bootstraps. For the validation of the SEM, the goodness of fit indices of the model were considered ( $\chi^2=52.25$   $gl=23$ ; CFI=0.99; NFI=0.99; TLI=0.98; GFI=0.98; AGFI=0.96; RMSEA=0.05; SRMR=0.01) so it was found to be satisfactory (Jöreskog & Sörbom, 1981; López-Lemus & Zavala, 2019; Muthén & Muthén, 2010; Rigdon, 1996; Tucker & Lewis, 1973). Likewise, convergent validity was tested through the standardized factor loadings ( $\lambda$ ) of the manifest variables whose loadings were higher than 0.40 (Hair, Hult, Ringle, & Sarstedt, 2017; Jöreskog & Sörbom, 1981) with a high level of significance, see Table 4.

Table 4  
 Standardized factor loadings and Cronbach's alpha ( $\alpha$ ) of Corporate Entrepreneurship  
 Latent Variable: Corporate Entrepreneurship

Manifest Variable	Factorial Loading ( $\lambda$ )	Reliability									
		$\alpha$	$\Omega$	$\rho_c$							
CE1. Implementing new programs to improve innovation throughout the company in the last three years.	0.793**	0.95	0.94	0.94							
CE2. Encouraging employee creativity and innovation.	0.818**										
CE3. Requesting ideas from employees for new products and processes.	0.772**										
CE4. Rewarding employees for creativity and innovation.	0.778**										
CE5. Establishing a unit or department responsible for innovation and corporate development.	0.843**										
CE6. Looking for business opportunities developed outside their company.	0.771**										
CE7. Training supervisors and managers in creativity and innovation techniques.	0.897**										
CE8. Designating managers as leaders of new ideas or innovations.	0.832**										
CE9. Emphasis on innovation in their company compared to their competitors.	0.845**										
$\chi^2$	$gl$	CFI	NFI	GFI	TLI	AGFI	RMSEA	SRMR	$\alpha$	$\Omega$	$\rho_c$
52.25	23	0.992	0.99	0.98	0.988	0.96	0.03	0.01	0.95	0.94	0.94

\*\* $p < 0.001$

Source: Model based on Zahra (1991)

Note: Table 4 shows the factor loadings in 1st order for the Corporate Entrepreneurship construct. The 1st order factor loadings of the latent variable range from 0.771 to 0.897. All factor loadings of the Corporate Entrepreneurship construct are positive and significant. Likewise, the internal consistency of the instrument measured through Cronbach's Alpha ( $\alpha$ ), Omega ( $\Omega$ ), and Dillon-Goldstein composite reliability ( $\rho_c$ ) ( $\alpha=0.95$ ;  $\Omega=0.94$ ;  $\rho_c=0.94$ ) proved to be satisfactory. The goodness of fit indices of the model ( $\chi^2=52.25$   $gl=23$ ; CFI=0.99; NFI=0.99; TLI=0.98; GFI=0.98; AGFI=0.96; RMSEA=0.05; SRMR=0.01) were acceptable.

**Business intelligence.** To analyze this questionnaire, the scale of Zahra *et al.* (2002) was used and validated by Caseiro and Coelho (2018). This instrument is made up of 4 dimensions: (1) Industrial Integrity, (2) Industrial, commercial, and service analysis, (3) Formality of commercial intelligence and (4) Perceived profit.

This scale comprises 16 items and uses a 5-point Likert scale, where 1 represents “Strongly disagree” and 5 “Strongly agree.” To assess the reliability of this instrument, Cronbach’s Alpha ( $\alpha$ ), Omega ( $\Omega$ ), and Dillon-Goldstein composite reliability ( $\rho_c$ ) were used for the dimension industrial integrity ( $\alpha=0.89$ ;  $\Omega=0.89$ ;  $\rho_c=0.89$ ), industrial, commercial and service analysis ( $\alpha=0.71$ ;  $\Omega=0.72$ ;  $\rho_c=0.72$ ), commercial intelligence formality ( $\alpha=0.88$ ;  $\Omega=0.72$ ;  $\rho_c=0.72$ ), and perceived usefulness ( $\alpha=0.81$ ;  $\Omega=0.79$ ;  $\rho_c=0.79$ ), likewise calculated for the instrument overall ( $\alpha=0.91$ ;  $\Omega=0.97$ ;  $\rho_c=0.97$ ). According to the reliability results of the instrument, they proved to be satisfactory (Cronbach, 1951; Dillon & Goldstein, 1984; Hair, Hult, Ringle, & Sarstedt, 2017; Hayes & Coutts, 2020; McDonald, 1999; Tavakol & Dennick, 2011).

Regarding the validity of the business intelligence instrument, a CFA of the questionnaire developed by Caseiro and Coelho (2018) was developed through an SEM using the bootstrapping technique and the ML method by resampling 1 000 bootstraps. For the validation of the SEM, the goodness of fit indices of the model were considered ( $\chi^2=334.84$  gl=82; CFI=0.94; NFI=0.92; TLI=0.93; GFI=0.91; AGFI=0.90; RMSEA=0.07; SRMR=0.04) so it proved to be satisfactory (Jöreskog & Sörbom, 1981; López-Lemus & Zavala, 2019; Muthén & Muthén, 2010; Rigdon, 1996; Tucker & Lewis, 1973). Likewise, convergent validity was tested through the standardized factor loadings ( $\lambda$ ) of the manifest variables whose loadings were higher than 0.40 (Hair, Hult, Ringle, & Sarstedt, 2017; Jöreskog & Sörbom, 1981) with a high level of significance, see Table 5.

Table 5  
 Standardized factor loadings and Cronbach’s alpha ( $\alpha$ ) of Business Intelligence  
 Latent Variable: Business Intelligence

Variable	Factorial Loading ( $\lambda$ )	Reliability		
		$\alpha$	$\Omega$	$\rho_c$
Industrial Integrity				
ID1.- Covering small and large competitors	0.687**			
ID2.- Covering the main resources and capabilities of the competition	0.741**			
ID3.- Covering competitors’ strengths and weaknesses	0.847**	0.89	0.89	0.89
ID4.- Covering competitors’ strategy	0.782**			
ID5.- Covering competitors’ operations	0.767**			

ID6.- Covering domestic and foreign competitors	0.718**										
Industrial, Commercial, and Service Analysis											
ACS1.- Covering competitors in other industries, commerce, and services	0.786**										
ACS2.- Examining competitive trends in industry, commerce, or service	0.809**	0.70	0.71	0.71							
ACS3.- Usually limited to the company's primary operations	0.463**										
ACS4.- Carried out informally	0.420**										
Formality of commercial intelligence											
FIC1.- Are backed by the company's top executives (or owners)	0.855**										
FIC2.- Are well supported financially by the company's senior executives	0.860**	0.88	0.72	0.72							
FIC3.- Generating reports and analyses that match the information needs of executives	0.824**										
Perceived Usefulness											
UP1.- Usefulness is frequently assessed to ensure that they match the information needs of managers.	0.832**	0.81	0.79	0.79							
UP2.- Generation of usefulness reports in a comprehensible and relatively easy-to-use manner	0.826**										
UP3. Hostile to the client or user	0.554**										
Second Order Confirmatory Factor Analysis											
Factor	Latent Variable	Loading	P-value								
Business Intelligence	Industrial Integrity	0.889**	<0.001								
	Industrial, commercial, and service analysis	0.914**	<0.001								
	Formality of commercial intelligence	0.857**	<0.001								
	Perceived Usefulness	0.869**	<0.001								
$\chi^2$	gl	CFI	NFI	TLI	GFI	AGFI	RMSEA	SRMR	$\alpha$	$\Omega$	$\rho_c$
334.84	82	0.945	0.92	0.914	0.91	0.90	0.07	0.04	0.91	0.97	0.97

\*\*p<0.001

Source: Based on Caseiro and Coelho (2018)

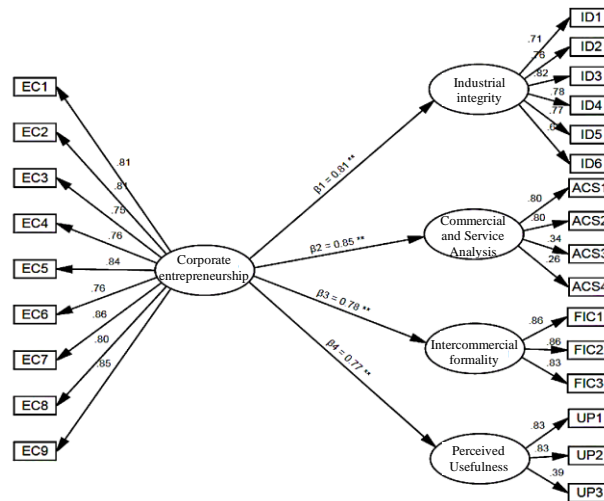
Note: Table 5 shows the factor loadings for the business intelligence construct in 1st and 2nd order. The 1st order factor loadings of the latent industrial integrity variable range from 0.687 to 0.847. For the industrial, commerce, and service analysis, the factor loadings range from 0.420 to 0.809, while the loadings of commercial intelligence formality range from 0.824 to 0.860, and the loadings of perceived usefulness are 0.826 and 0.832. All factor loadings of the four dimensions of the business intelligence construct were positive and significant.

As for the 2nd-order factor loadings, industrial integrity (0.889), industrial, commercial and service analysis (0.914), commercial intelligence formality (0.857), and perceived usefulness (0.869) were found to be positive and significant. Similarly, the internal consistency of the instrument measured through Cronbach's Alpha ( $\alpha$ ), Omega ( $\Omega$ ), and Dillon-Goldstein composite reliability ( $\rho_c$ ) were satisfactory for

each of the dimensions (1) industrial integrity ( $\alpha=0.89$ ;  $\Omega=0.89$ ;  $\rho_c=0.89$ ), (2) industrial, trade and service analysis ( $\alpha=0.71$ ;  $\Omega=0.72$ ;  $\rho_c=0.72$ ), (3) commercial intelligence formality ( $\alpha=0.88$ ;  $\Omega=0.72$ ;  $\rho_c=0.72$ ), and (4) perceived usefulness ( $\alpha=0.81$ ;  $\Omega=0.79$ ;  $\rho_c=0.79$ ) as for the overall business intelligence instrument ( $\alpha=0.91$ ;  $\Omega=0.97$ ;  $\rho_c=0.97$ ). The goodness of fit indices of the model ( $\chi^2=334.84$   $gl=82$ ; CFI=0.94; NFI=0.94; TLI=0.93; GFI=0.91; AGFI=0.90; RMSEA=0.07; SRMR=0.04) were acceptable.

## Results

To evaluate the hypothetical structural equation model (SEM) in question, the following goodness of fit indices were considered: Chi-square ( $\chi^2=593.57$   $gl=260$ ), so the Chi-square test ( $\chi^2 / gl = 2.28$ ;  $p < 0.01$ ) proved satisfactory, the Comparative Fit Index (CFI = 0.96), normalized fit index (NFI=0.93), the Tucker-Lewis index (TLI=0.95), Goodness of Fit Index (GFI=0.91), Adjusted Goodness of Fit Index (AGFI=0.90), Root Mean Square Error Approximation (RMSEA= 0.05), and Standardized Root Mean Square Residual (SRMR=0.05), so the model was found to be acceptable (Bollen, 1989; Jöreskog & Sörbom, 1981; Rigdon, 1996; Muthén & Muthén, 2010; Tucker & Lewis, 1973). See Figure 3.



\*\* p < 0.001.

Figure 1. Standardized structural loads of the SEM model.

Source: created by the authors.

Note: In Figure 3, the standardized structural loadings of the exogenous variables on the endogenous variables of the SEM model are shown, and based on the loadings ( $\beta$ ), each is analyzed to evaluate the



hypotheses established in the research. Corporate entrepreneurship positively and significantly influences industrial integrity ( $\beta_1=0.81$ ;  $p<0.001$ ), industrial, commercial and service analysis ( $\beta_2=0.85$ ;  $p<0.001$ ), formality of commercial intelligence ( $\beta_3 = 0.78$ ;  $p<0.001$ ), and perceived usefulness ( $\beta_4= 0.77$ ;  $p<0.001$ )

Based on the results obtained through the structural loads of the SEM model (see Figure 3), an evaluation of the hypotheses established for the present investigation was carried out. To evaluate  $H_1$ , that corporate entrepreneurship positively and significantly influences industrial integrity, the structural loading  $\beta_1$  of the SEM model was evaluated. Thus, sufficient statistical evidence affirms that corporate entrepreneurship has a positive and significant influence ( $\beta_1= 0.81$ ;  $p<0.001$ ) on industrial integrity. Therefore, hypothesis  $H_1$  is accepted.

To evaluate hypothesis  $H_2$ , that corporate entrepreneurship positively and significantly influences commercial and service industrial analysis, the results of the structural loading  $\beta_2$  of the SEM model were analyzed. According to the statistic, it is proven that corporate entrepreneurship positively and significantly ( $\beta_2= 0.85$ ;  $p<0.001$ ) influences commercial and services industrial analysis. Therefore, hypothesis  $H_2$  is accepted.

To evaluate hypothesis  $H_3$ , that corporate entrepreneurship positively and significantly influences the formality of commercial intelligence, the structural loading  $\beta_3$  of the SEM model was evaluated. Sufficient statistical evidence affirms that corporate entrepreneurship has a positive and significant influence on the formality of commercial intelligence ( $\beta_3= 0.78$ ;  $p<0.001$ ). These facts lead to the acceptance of hypothesis  $H_3$ .

Next, hypothesis  $H_4$ , that corporate entrepreneurship positively and significantly influences perceived usefulness, was evaluated. The structural load  $\beta_4$  of the SEM model was analyzed to evaluate the stated hypothesis. Based on the statistical result, it is found that corporate entrepreneurship positively and significantly ( $\beta_4= 0.77$ ;  $p<0.001$ ) influences perceived usefulness. Therefore, hypothesis  $H_4$  was accepted.

Regarding the explanation of the total variance of the model through the constructs, according to the results obtained through the SEM model, industrial integrity explains 65% ( $\Delta R^2=0.65$ ) of the variance, industrial, commercial and service analysis explains 72% ( $\Delta R^2=0.72$ ), commercial intelligence formality explains 60% ( $\Delta R^2=0.60$ ), and perceived usefulness explains 59% ( $\Delta R^2=0.59$ ) of the total variance. Therefore, the industrial, commercial and services analysis is the indicator that provides the best index concerning the explained variance.

## Conclusions

The findings obtained in the present research may be considered an important contribution to the literature on corporate entrepreneurship (Sakhdari, 2016; Schindehutte, Morris, & Kuratko, 2018; Yunis, Tarhini, & Kassar, 2018; Zahra, Neubaum, & El-Hagrassey, 2002) given that there are no previous studies in the Latin American context. Concerning business intelligence, a relation was also established in various types of organizations, which constitutes an alternative for the development of the sector (Caseiro & Coelho, 2018; Caseiro & Coelho, 2019; Kimball, 2011; Shollo & Galliers, 2015; Wanda & Stian, 2015).

One of the findings of the present study lies in the relation between corporate entrepreneurship and business intelligence. This is the process in which companies revitalize themselves by generating new ventures from existing ones in order to enhance business returns and improve their profitability and competitiveness, or the strategic renewal of the existing company (Zahra, 1991; Zahra, Neubaum, & El-Hagrassey, 2002). It is also related to the ability to manage information in their favor to turn it into a competitive advantage through a participatory process that involves all areas of the business (Caseiro & Coelho, 2018; Caseiro & Coelho, 2019; Kimball, 2011).

Another relevant finding of this study is that corporate entrepreneurship is an influential factor in business intelligence. In other words, the experience and knowledge of companies already positioned in a market that decide to generate new business units from corporate entrepreneurship is an influential factor in using information resources and knowledge of the organization to make better business decisions. Given the strong relation between the variables, this finding generates a virtuous circle where corporate entrepreneurship will influence business intelligence and vice versa.

Giménez-Figueroa, Martín-Rojas, and García-Morales (2018) propose a model where they point out that business intelligence and corporate entrepreneurship are mediated by knowledge management, organizational learning, and technological capabilities. Similarly, in another study by the same authors, they state that business intelligence and corporate entrepreneurship are mediated by technological capabilities (Martín-Rojas, García-Morales, & García-Sánchez, 2011; Martín-Rojas, García-Morales, Garrido-Moreno, & García-Sánchez, 2020).

The findings of the studies conducted by Martín-Rojas, García-Morales, Garrido-Moreno, and García-Sánchez (2011; 2018; 2020) in contrast to those obtained in the present study are relevant and of great value since the results of all these studies support the literature on corporate entrepreneurship (Zahra, 1991; Zahra, Neubaum, & El-Hagrassey, 2002) and highlight the relation that exists between corporate entrepreneurship with business intelligence (Caseiro & Coelho, 2018; Caseiro & Coelho, 2019; Kimball, 2011).

Nevertheless, among the relevant findings obtained in this study is the statistical verification of the relation between corporate entrepreneurship and business intelligence. Likewise, the influence between both constructs is bidirectional. This evidence was tested in different companies of different types and sizes, highlighting the applicability of the concepts studied and the results obtained.

Therefore, corporate entrepreneurship positively and significantly influences business intelligence. In the same way, corporate entrepreneurship influences industrial integrity, industrial, commercial, and service analysis, commercial intelligence formality, and perceived usefulness, which are the main findings obtained through the present study.

Corporate entrepreneurship is being addressed using different approaches that have generated various models that contribute to the literature and new perspectives of analysis that are adjusted to the new trends emerging from national and international areas. In particular, Guanajuato (Mexico) represents one of the ideal states for the study because it has the country's largest number of science, technology, and innovation parks.

It is important to mention that when generating corporate entrepreneurship (Zahra, Neubaum, & El-Hagrassey, 2002), it is necessary to consider several factors that enable top management, leaders, and entrepreneurs (Hellström & Ramberg, 2019; Yi-Ying, Che-Yuan, & Chung-Wen, 2017) to promote business intelligence (Caseiro & Coelho, 2019; Kimball, 2011). This will strategically position the new business unit in the market (López-Lemus, De la Garza, & Zavala, 2016), achieving profitability and sustainable business competitiveness (Nasri, 2012; Prajogo, 2016).

That is why corporate entrepreneurship (Zahra, Neubaum, & El-Hagrassey, 2002) plays an extremely important role in business intelligence (Caseiro & Coelho, 2019) in organizations because it contributes to obtaining information and knowledge of the organization's environment focused on integrity, industrial, commercial, and services analysis, commercial intelligence formality, and perceived usefulness, which represent some key factors in achieving a competitive advantage (Ahmad, 2015), and hence the success of the entrepreneurial company (Wanda & Stian, 2015; Yi-Ying, Che-Yuan, & Chung-Wen, 2017; Zahra, 1991).

Another major finding of this study is the influence of corporate entrepreneurship on industrial, commercial, and service analysis. One factor that promotes corporate entrepreneurship is analyzing competitive trends, as well as competitors and other industries, commerce, or services. The above implies that this type of analysis enables companies not to limit themselves to core operations to achieve their returns (Ahmad, 2015; Chen & Lin, 2020; Foster, Smith, Ariyachandra, & Frolick, 2015; Lukman, Hackney, Popovič, Jaklič, & Irani, 2011). It is necessary to promote actions strategically (Peng, 2012).

It should be noted that the industrial, commercial, and services analysis is the indicator that most significantly contributes to explaining the model due to the explained variance obtained statistically. This

concept implies that this activity should be one of the main actions for developing corporate entrepreneurship. Managers and administrators of organizations should identify the opportunities in the environment and develop strategies that generate a competitive advantage.

Another finding is the importance of industrial integrity in corporate entrepreneurship since this factor facilitates a strategic analysis of competitors by identifying their strengths and weaknesses and their business strategies, as well as the analysis of competitors' operations, resources, and capabilities (Koryak et al., 2015; Richards, Yeoh, Chong, & Popovic, 2019; Yin & Ping, 2020). The analyzed factors can be transformed into strategies that will provide the companies with information and knowledge to make decisions for their business management.

Correspondingly, the perceived usefulness indicator and its relation to corporate entrepreneurship is another of the main findings of the study since corporate entrepreneurship should be frequently evaluated for its usefulness to ensure that it responds to the informational needs of managers to create innovations and generate competitive advantages (Díaz-Chao, Sainz-González, & Torrent, 2016; Prajogo, 2016). It must be emphasized that reports that are understandable and relatively easy to use should be generated to identify potential clients or users to improve organizational strategy (Chongwatpol, 2016; Wanda & Stian, 2015; Yi-Ying, Che-Yuan, & Chung-Wen, 2017; Yin & Ping, 2020) and thereby improve their business returns.

Finally, the formality of business intelligence makes it possible to analyze whether the company's top executives financially support collaborators to boost employee creativity and innovation (Caseiro & Coelho, 2018; Real, Roldán, & Leal, 2014) and thereby generate products and services conducive to the generation of new business entrepreneurship from the identification of business opportunities (Davidsson, 2015; De Jong, 2013; Martín-Rojas, García-Morales, Garrido-Moreno, & García-Sánchez, 2020; Yin & Ping, 2020).

The model proposed in this research potentiates corporate entrepreneurship to promote organizations' business intelligence, which represents a strategy to promote a competitive advantage (Maune, 2014). Therefore, these two factors can achieve potential business returns through business intelligence that will provide organizations with sufficient information and knowledge to be assertive in decision-making, promoting the performance and sustainability of the new business units generated by MSMEs.

It should be noted that corporate entrepreneurship is a factor that potentiates innovation (Prajogo, 2005; Yunis, Tarhini, & Kassar, 2018) to promote business intelligence through knowledge, learning in management, and quality of products or services (Ooi, 2014; De la Garza, Zavala, & López-Lemus, 2016) to identify then areas of opportunity to open new markets (Dy & Agwunobi, 2019; Kuratko, Hornsby, & Hayton, 2015), both national and international.

Business intelligence in organizations represents one of the resources which companies can develop and explore to obtain available information to establish tactical and operational objectives that enable them to position themselves in the highly competitive market (Berndtsson, Gudfinnsson, & Strand, 2015; Yunis, Tarhini, & Kassar, 2018) in an agile way. That is why business intelligence is essential in corporate entrepreneurship because it contributes to the entrepreneurial company being more innovative, proactive, competitive, and agile (Denning, 2017) to respond to the needs (Davidsson, 2015; Maune, 2014) of a dynamic market.

Finally, a model is proposed to guarantee the success of corporate entrepreneurship through business intelligence, which will allow the implementation of strategies that contribute to the development and growth of the companies through knowledge generated by analyzing the industrial, commercial, and service markets, as well as the competition. This knowledge will promote business intelligence development and represent a competitive advantage for the corporate entrepreneurship the company is developing.

The results obtained in the present study are relevant and of great value since there is currently not enough research focused on the variables analyzed, especially in emerging markets. This study is one of the few that analyzes the relation between corporate entrepreneurship and business intelligence in the Mexican context. It also identifies and analyzes the relevant factors that can support the different models of entrepreneurship developed in the literature, offering an alternative approach to their study, which is adjusted to the new trends emerging from national and international environments, particularly in the state of Guanajuato (Mexico), which is a major state because of its economic activity in the country's agribusiness, manufacturing (especially automotive), and service sectors.

## **Acknowledgments**

Thanks to the University of Guanajuato, Instituto Tecnológico de Celaya and Universidad Iberoamericana León, as well as to the Department of Research and Postgraduate Support (DAIP) of the University of Guanajuato and the Program for the Professional Development of Higher Education Teachers (PRODEP), for providing with financial and material resources, as well as the facilities, to make this article possible.

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