

**PERSPECTIVES OF THE ENTREPRENEURSHIP ECOSYSTEM
FOR THE MANAGEMENT OF THE INCUBATION AND ACCELERATION OF SME'S
IN THE PROVINCE OF SANTA ELENA**

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Título del libro

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ISBN: 978-9942-33-628-6

Publicado 2022 por acuerdo con los autores.

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Guayaquil-Ecuador

Calderón, F., Tomalá, J., Álvarez, R., Freira, M., Olives, J., Castro, D., Pirela, A., Castro, D. (2022) PERSPECTIVES OF THE ENTREPRENEURSHIP ECOSYSTEM FOR THE MANAGEMENT OF THE INCUBATION AND ACCELERATION OF SME's IN THE PROVINCE OF SANTA ELENA. Editorial Grupo Compás

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The entrepreneurship ecosystem for the management of the incubation and acceleration of smes in the province of santa elena, a case analysis

Introduction

In the Latin American region, during the last two decades, entrepreneurship has been one of the key factors for revitalizing local and regional economy, the generation of jobs, reduction of poverty levels and it has therefore become one of the engines of economic growth in the regions (Friar & Meyer, 2013; Toma, Grigore, & Marinescu, 2014).

Historically, large companies have been the most affected in recent economic crises, while start-ups have not suffered much. On the contrary, many of them hired more staff and created strategies to capitalize on these crises and turn them into opportunities (Feld, 2012b; Meyers, 2015).

In this context, governments in different countries started to generate a series of public policies to promote entrepreneurship in their localities, thus achieving a better position for sustained economic growth and poverty reduction. Currently, emerging countries cannot base their economic and social development, job creation and competitiveness on cheap labor and foreign direct investment (Anderson, Chernock, & Mailloux, 2006). Therefore, entrepreneurship and innovation are perceived as the most effective strategies to generate economic development in all types of communities (Atkinson, 2014; CIPE, 2014), including those that have historically had problems generating jobs (Anderson et al., 2006). The clearest example of a development policy based on entrepreneurship and innovation is the Silicon Valley region in California, home to global technology companies such as Apple, Facebook and Google.

Ecuador, an entrepreneurial country

According to information from the Global Entrepreneurship Monitor (GEM, as per its initials in Spanish), Ecuador is considered a highly entrepreneurial country since it is the country with the second highest Entrepreneurial Activity Rate (TEA, as per its initials in Spanish) in the Latin American region, with 36.2%. However, it is worrying to note that almost 80% of Ecuadorian small businesses fail during the initial stage, that is, 3.6 million people.

The TEA constitutes one of the indicators of the GEM, the TEA includes all those people of adult age who began the process of generating an enterprise or have started a business and have not exceeded the threshold of 42 months. The TEA is made up of two types of entrepreneurs: nascent entrepreneurs and beginning entrepreneurs.

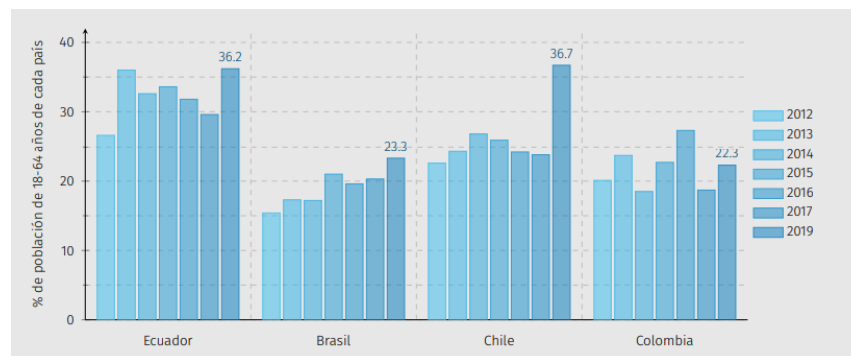


Figure 1 Evolution of Early Entrepreneurial Activity in Ecuador and selected countries

Support Infrastructure for Entrepreneurs

The entrepreneurial ecosystem requires a set of institutions, organizations and business services to support small and medium-sized businesses (SMEs) and to provide specialized assistance to newly created companies.

The support infrastructure for entrepreneurs is oriented towards six important keys support for entrepreneurs such as: business incubators, accelerators, technology transfer offices, specialized organizations (consultancies, business chambers, etc.), industrial parks and technology parks (OECD, 2018).

High-impact Entrepreneurs Selection

In order to have clear data and information on the business ecosystem in which high-impact and representative entrepreneurs live, it is imperative to characterize the entrepreneurs in the province in order to have a clear distinction between traditional SMEs and those high-impact companies. (Blanchflower & Oswald, 1998)

For this, an online survey was structured, and it that was applied directly to businesspeople and entrepreneurs in the province of Santa Elena. This population was defined by entrepreneurs or businesspeople who have a company registered with the Superintendence of Companies and those who have been in the market for three years. This seniority period was applied as a necessary criterion to correctly identify high-impact companies. These "three years" helped to achieve a more detailed analysis of the three defining criteria of "high impact", as well as to include only businesses that surpassed the critical phase of early development (Kantis, Ishida, & Komori, 2002).

Another important aspect mentioned by Morris (2012), entrepreneurs considered to have high impact have in their institutional DNA the intention to collaborate and work in networks. However, in the Latin American region and particularly in Ecuador, this condition does not occur in the SME sector. This implies that, if a close collaboration between them is achieved, this would expand the possibilities for high-impact companies to emerge in the province. This fully justifies this research process in the small business area.

This study presents research and an approach to the study variables that will be under the quantitative approach, which ranges from a consistency analysis of the information gathering instrument, descriptive analysis of the dimensions until the deductive contrast of the hypotheses of the relationship between the variables. For this last process, it is necessary to apply a correlational scope to the research.

The total study population was 678 companies registered in the Superintendence of Companies, belonging to the segment of small and medium-sized companies, during the period 2022. The information gathering technique was a survey. Based on this premise, the instrument was developed in relation to the dimensions described in the conceptualization of each study variable, which are presented as: Training/reasons to start/ participation in business events/ experience in new businesses/ technical assistance from incubators, accelerators/ success in new business proposals/ tax burden of companies and innovation in certain areas of the company.

Using an online data collection technique, the total population was surveyed by sending a link containing the instrument in Google Forms format. Under this approach, a total of 259 valid surveys were obtained.

For a better description and methodological treatment, three phases are detailed below:

The first phase is to demonstrate the statistical confidence of the applied instrument, through the Cronbach's Alpha test.

Cronbach's Alpha is a method that allows determining the reliability and trustworthiness of a data set so that the theoretical construct is as relevant as possible. The result of applying this indicator admits values between zero and one, for values close to one, the greater the internal consistency

of the group of variables and dimensions; and for a lower consistency, for values close to zero (Welch & Comer, 1988).

George & Mallery (2003) suggest intervals based on the result of the indicator, and thereby verify the general condition of the instrument. The values have been named with the following scale: excellent, good, acceptable, questionable, poor and unacceptable.

The second phase corresponds to the descriptive analysis of the main data found in the population that responded to the instrument.

And the third phase is related to checking the correlation between study variables/dimensions/indicators from the results obtained for the study population.

The first phase is related with determining the statistical reliability of the data collection instrument. This phase had to be conducted in the pilot stage, in order to define if the instrument is reliable in terms of the robust results that it is intended to collect. The random selection of 50 pilot samples was conducted under the online survey.

From this instrument, it is necessary to calculate the indicator of Cronbach's Alpha, the details are presented below:

Table 1. *Reliability statistics*

Cronbach's Alpha
0.951

Source: Data processed through the SPSS program based on the data collection obtained from the on-site information.

According to the results, the result of Cronbach's Alpha is greater than 0.8, which indicates that the reliability of each of the questions presented in the instrument is "Excellent", which statistically demonstrates that the results and interpretations derived from this are consistent in providing meaningful information.

During the second phase relevant references were selected to proceed with the descriptive analysis of the results. The process can be evidenced as it follows:

Table 2. *Cross-reference between the variables "Position" and "Training"*

Position in the company	Training						Total	Percentage
	No ne	Hig h School	Tec hnic al	Uni- ver- sity	Ma ste r's	Ph D		
Man- ager	2	42	16	60	16	3	139	53.67 %
De- part- men t head	0	9	2	32	8	1	52	20.08 %
Sec- re- tary	0	0	1	3	0	0	4	1.54%

Other positions worker	3	28	8	25	0	0	64	24.71 %
Total	5	79	27	120	24	4	259	100.00 %
Percentage	1.93 %	30.50 %	10.42 %	46.33 %	9.27 %	1.54 %	100.00 %	

Source: Online information survey, 2022.

According to Table 2, more than 50% of the respondents have the position of managers and around 46% report having university level training. Marked trends can be observed, in which only those who have the position of managers are the ones who invest in better training and specialization with master's degrees and PhD studies. The department heads report having enough with the third level or university level, and the other workers in the role of secretary or and other employees maintain a high school or technical training

Table 3. *Cross-reference between the variables "Company sector" and "Total number of people working in the company"*

Company Sector	Number of people working				Total	Percentage
	Between 1 and 5 people	Between 6 and 10 people	Between 11 and 15 people	More than 20 people		
Agri-culture	3	2	1	5	11	4.25%
Food	13	6	5	7	31	11.97%
Com-merce	49	17	21	22	109	42.08%
Con-struction	9	3	5	0	17	6.56%
Edu-cation	2	0	1	0	3	1.16%
Tour-ism	5	7	4	3	19	7.34%
Ser-vices in	42	7	9	11	69	26.64%

gen- eral						
Total	123	42	46	48	259	100.00%
Per- cent- age	47.49%	16.22%	17.76%	18.53%	100.00%	

Source: Online information survey, 2022.

From the results of Table 3, it can be verified that more than 40% of the surveyed people belong to the commercial sector, followed by general services with 26%. From the population, more than 47% of those surveyed, in their companies have between 1 and 5 people working, and only 18.53% more than 20 employees.

On the other hand, under the cross-reference, there is evidence of a marked trend of companies in the commerce, food, and general services sectors. They have in common a total of people working between 1 and 5 employees; and those with more 20 workers turn out to be those in the agricultural sector.

Table 4. *Cross-reference between the variables "Market to which it sells" and "Date of founding"*

Market to which it sells	Date of founding			Total	Per-centage
	A year ago	Two years ago	More than two years		
Local	14	16	120	150	57.92%

Na-tional	1	3	37	41	15.83%
Local and Na-tional	2	3	51	56	21.62%
Inter-national	0	1	11	12	4.63%
Total	17	23	219	259	100.00%
Per-centage	6.56%	8.88%	84.56%	100.00%	

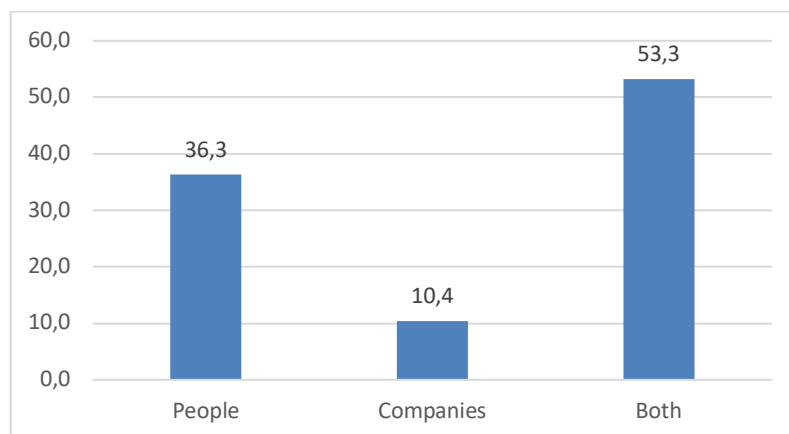
Source: Online information survey, 2022

Based on the information in Table 5, it can be noted that a large part of the companies (57%) has the local market as sales coverage for their products and only 4% the international market. On the other hand, more than 84% of the companies in the population have been founded for more than two years.

Under the cross-reference above, trends can be seen such as companies that have been founded for more than two years, specializing in the sale of their products both in the local and national markets; while those that have only been created for a year need to enter the local market first, and then, with experience, would escalate to the national coverage market.

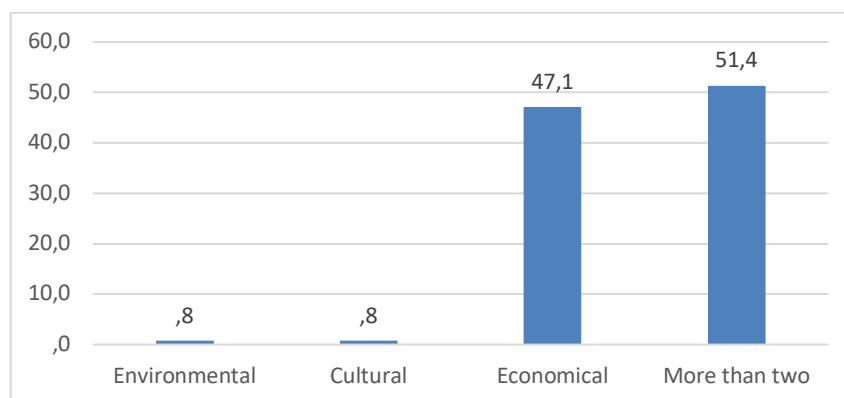
Among other univariate datum, following information is presented:

Figure 1. Relative frequency of the variable "Type of customers"



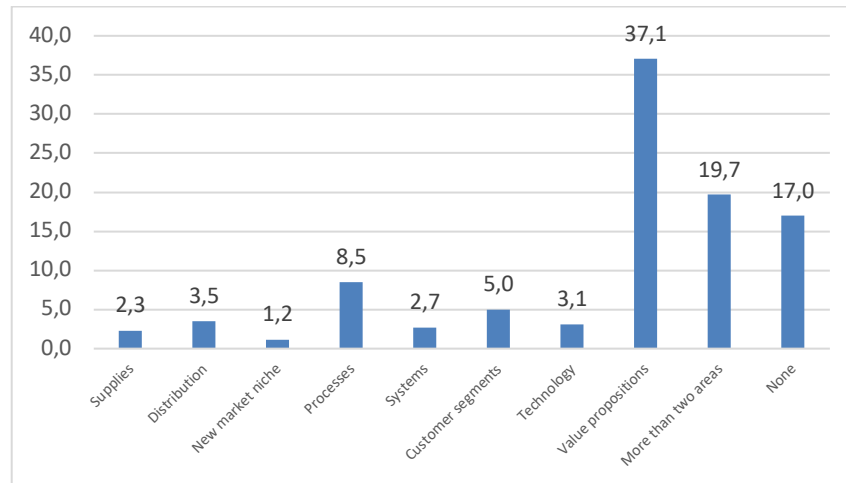
Source: Online information survey, 2022.

Figure 2. Relative frequency of the variable "Impact area of the company"



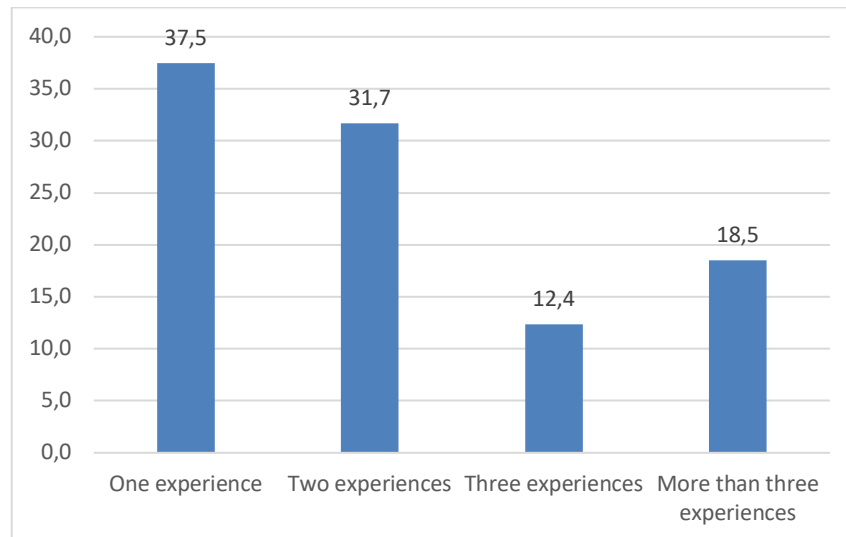
Source: Online information survey, 2022.

Figure 3. Relative frequency of the variable "Area of the company where it was innovated"



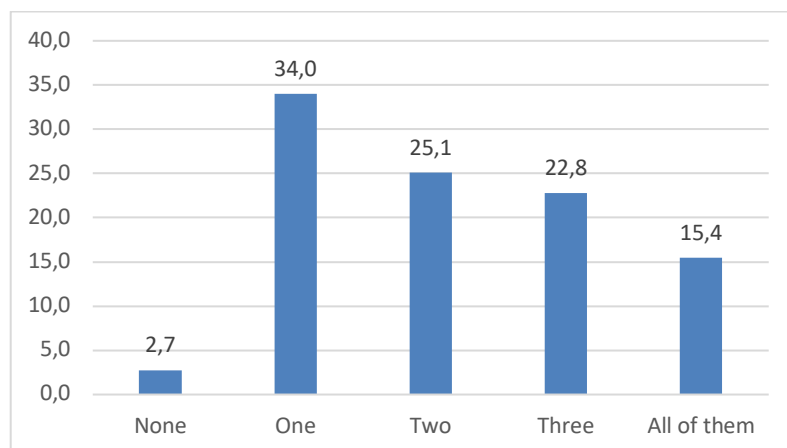
Source: Online information survey, 2022.

Figure 4. Relative frequency of the variable "Entering new businesses"



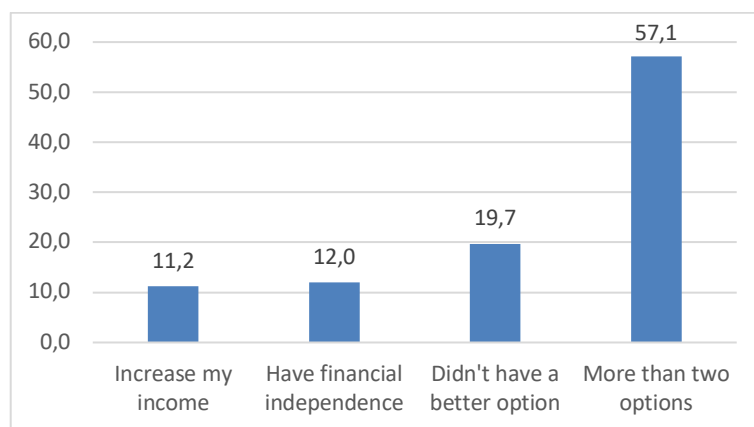
Source: Online information survey, 2022.

Figure 5. Relative frequency of the variable "Experience entering into new businesses"



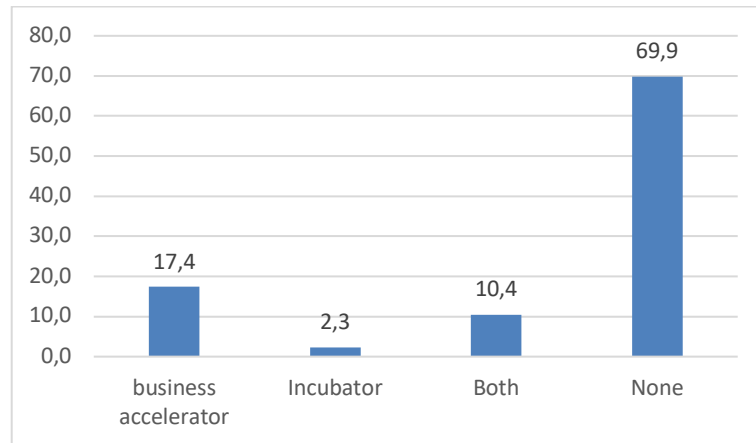
Source: Online information survey, 2022.

Figure 6. Relative frequency of the variable "Reasons to start a business"



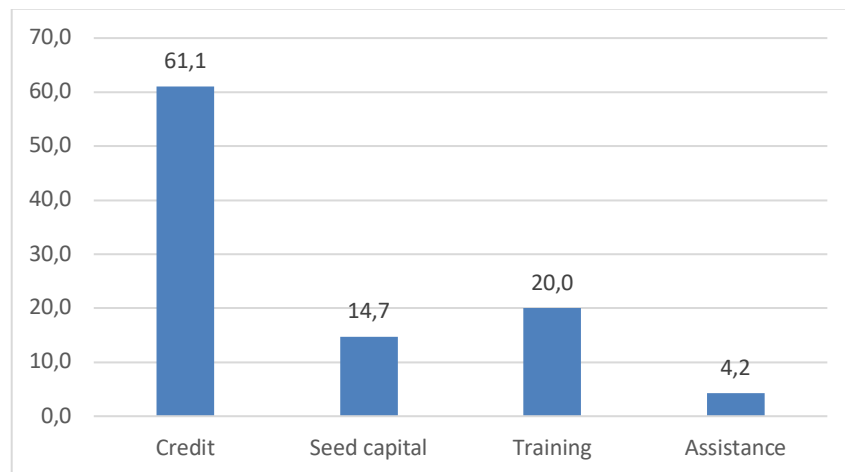
Source: Online information survey, 2022.

Figure 7. Relative frequency of the variable "External assistance"



Source: Online information survey, 2022.

Figure 8. Relative frequency of the variable "Access to financial and non-financial aid"



Source: Online information survey, 2022.

According to the data in Figure 1, more than 50% of the surveyed companies do business with both cases, people and companies, in the public and private sectors. In Figure 2, it is evident that more than 90% of the companies have a generalized impact on the conurbation where they are located, this being of an economic, environmental and cultural nature.

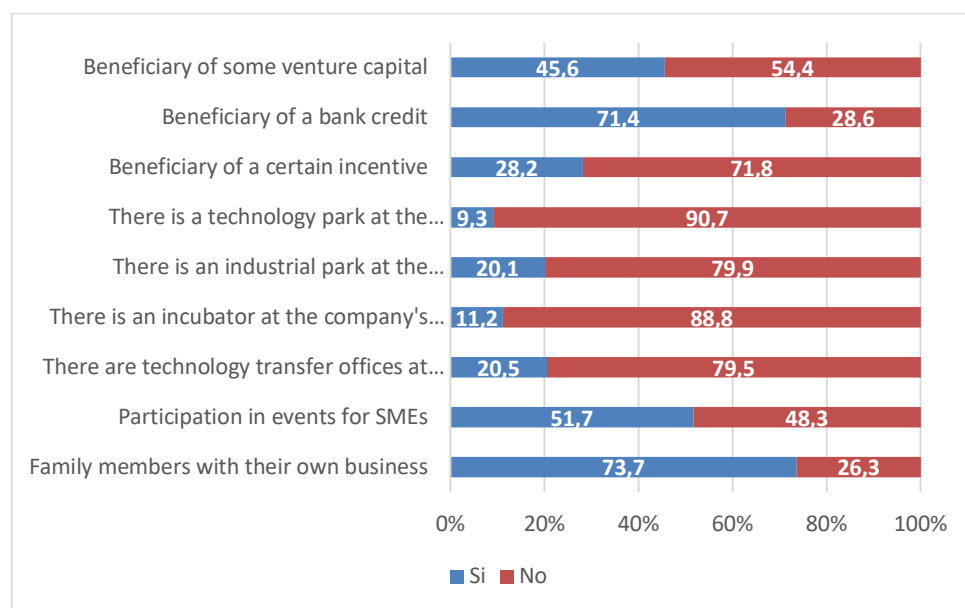
On the other hand, Figure 3 shows a majority trend with 37% of the companies reporting that the area where they have carried out some type of innovation turns out to be in the value propositions of the products, followed by a combination of areas (with 19%) between: new niche and processes, systems and technology, distribution and new customer niches. It is important to mention that approximately 17% of the companies under study have not conducted any type of innovation.

Figure 4 shows that more than 37% of the companies have ventured into other types of businesses, while around 63% of these invested in portfolio businesses. According to this information and from the data in Figure 5, only 2.7% of the companies did not have any type of success, while the difference, 97.3%, had a greater chance of success with the incursion of another type of business rather than a business portfolio.

In Figure 6, more than 57% of the surveyed people mention that the main reasons that resulted in the creation of a new business was to increase their income and maintain economic independence. Only 19.7% report that they had no other option to invest their capital.

Finally, Figure 7 reveals that more than 69% of the companies surveyed have not received any type of external aid, not even from a business accelerator, incubator, among others. And of those that have received financial and non-financial aid, about 60% of the companies had access to credit through financial institutions.

Figure 9. Relative frequencies of variables associated with "Benefits, Existence of external aid and Reasons to start a business"



Source: Online information survey, 2022.

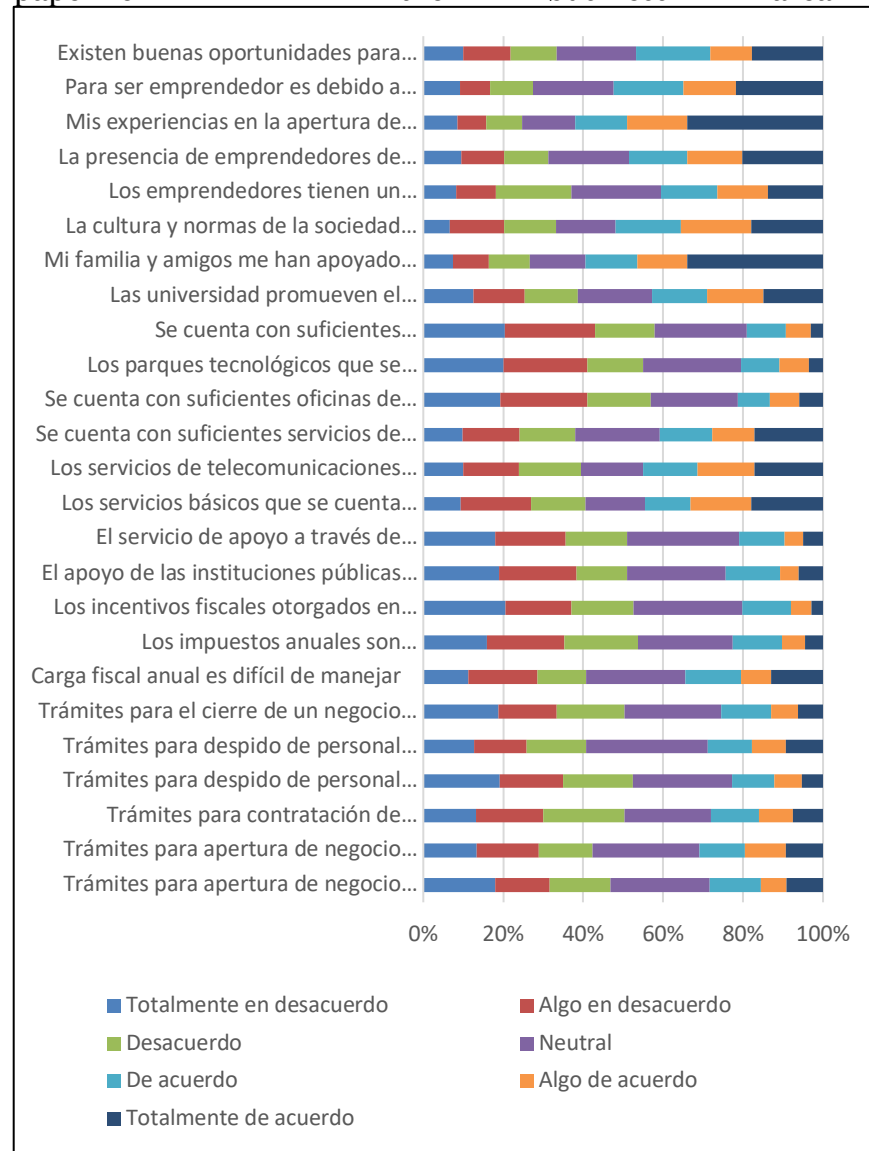
Based on the results evidenced in Figure 9, there are several marked trends concerning to the various benefits received by companies related to external aid and in their reasons for starting a business. Most of the companies declared receiving credit from the financial sector and almost 50% invested under capital risks.

There is a scarce existence of industrial and technology parks, incubators and business accelerators around the territorial conurbation of the surveyed companies, causing the insufficient prevalence of innovation and improvement in the services and quality of the products offered in the market. Also, there are no regular events to motivate or increase the participation of entrepreneurs and SMEs, in which new

positions and continuous improvement in business management could be stimulated.

It is also evident that a large part of the managers and people in charge of the companies also have at least one member of their family circle who is immersed in the managerial and/or entrepreneurial field.

Figure 10. Relative frequencies of variables associated with "Opportunities, experiences, places of transfer, and paperwork in the business area"



Source: Online information survey, 2022.

According to the data in Figure 10, the registration of results was conducted through Likert scale, trends are verified in terms of opportunities, experiences, places of transfers and paperwork in relation to the business area. Here are the references:

As for the opportunities to create and develop innovative businesses, there is a range of answers, where there is no uniform criterion in terms of their stage, so it is inferred that this irregularity is caused both by the lack of accompaniment and advice spaces.

The category or label of “an entrepreneur” has been linked from the need to improve personal income due to the scarce job opportunities in the market. The experience to undertake and venture into new businesses has affected the improvement of business skills. The existence of the spirit of entrepreneurship in the territorial context has been a great opportunity to also decide to undertake a certain business idea. Entrepreneurs do not necessarily have a high status, but rather the textual focus of the word is evidenced in the actions, behavior and decision to take advantage of the opportunities, that is, more than a status, it results in principles. On the other hand, the social and cultural context influences several aspects at the time of conducting certain activities because where there are favorable conditions, the business risk tends to be lower. One of the aspects that has contributed to improve entrepreneurship in the form of starting new businesses comes from family support to adequate support from the university through research projects.

A little or no existence of places for the transfer of experiences and/or business knowledge affects in some way the dynamism of the idea and business maturation, since there are no spaces dedicated to potentiating, at the higher management levels, the way of treating clients, innovation, distribution, and development of more efficient production processes.

On the paperwork side, there are strong limitations regarding the management that must be followed to open a business, maintain or close a business; so, if there is not a clear guideline, it is possible that the idea of a new business or maintain the current one over time would be abandoned. Limitations in technological access, basic services, tax burden, support from the government and the private sector mean that business management tends to reduce its effect on ventures and even more on new business trends.

All this evidence a limitation in several areas, for managing and potentializing new ideas or business portfolios, for which a comprehensive monitoring is imperative to improve its management and innovation.

For **phase three**, which corresponds to hypothesis testing, it is verified which variables/indicators theoretically correlate with each other, to verify if they maintain this behavior in the context of the study. Here are some references:

The instrument was designed from items that turn out to be nominal and ordinal, so to verify the relationship between variables/indicators, it is not necessary to verify the normality of their series. Under this premise, it would only be decided to verify if the test corresponds to Chi square or Spearman. The first case is applied for nominal variables; and for ordinal variables and/or combination with nominal, Spearman would be applied.

First reference:

Dimension 1: Training.

Dimension 2: Reasons to start a business.

H₀: There is no relationship between the Training dimensions and the Reasons to start a business; Significance > 0.05.

Ha: There is a relationship between the Training dimensions and the Reasons to start a business; Significance < 0.05.

Table 4. Spearman's correlation test

Variable 1	Criteria	Variable 2
		Reasons to start a business
Training	Spearman's rho	0.005
	Significance	0.938
	N	259

Source: Data processed through the SPSS program based on data obtained from companies, 2022.

According to the results, the significance of Spearman's Rho is accepted, the null hypothesis (Ho) is accepted, that is, there is no relationship between "Training" and "Reasons to start a business", so it is not necessary that there is a high-level of training specialty for the promotion of key reasons to start new business ideas, establishing this existence rather by the very need to cover a need in the market and/or individuals.

Second reference:

Dimension 1: Participation in business events.

Dimension 2: Experience in new businesses.

Ho: There is no relationship between the dimensions Participation in business events and Experience in new businesses; Significance > 0.05.

Ha: There is a relationship between the dimensions Participation in business events and Experience in new businesses; Significance < 0.05.

Table 5. Spearman's correlation test

Variable 1	Criteria	Variable 2
		Experience in new businesses
Participation in business events	Spearman's rho	0.504
	Significance	0.001
	N	259

Source: Data processed through the SPSS program based on data obtained from companies, 2022.

According to the results of the significance of Spearman's Rho, the null hypothesis (Ho) is rejected in favor of the alternative hypothesis (Ha), that is, there is a medium direct relationship between the dimensions "Participation in business events" and "Experience in new businesses"; which indicates that, to promote the experience of creating new business ideas, it is important for entrepreneurs to regularly attend innovation and business management events.

Third reference:

Dimension 1: Technical assistance from incubators, accelerators, among others.

Dimension 2: Success in new business proposals.

Ho: There is no relationship between the dimensions Technical assistance by incubators, accelerators and Success in new business proposals; Significance > 0.05.

Ha: There is a relationship between the dimensions Technical assistance by incubators, accelerators and Success in new business proposals; Significance < 0.05.

Table 5. Spearman's correlation test

Variable 1	Criteria	Variable 2
		Success in new business proposals
Technical assistance from incubators, accelerators, others	Spearman's rho	0.682
	Significance	0.036
	N	259

Source: Data processed through the SPSS program based on data obtained from companies, 2022.

According to the results of the significance of Spearman's Rho, the null hypothesis (Ho) is rejected in favor of the alternative hypothesis (Ha), that is, there is a medium direct relationship between the dimensions "Technical assistance

by incubators, accelerators” and “Success in new business proposals”; which indicates that, to guarantee the success of new business proposals, there must be technical assistance from incubators, business accelerators or both references.

Fourth reference:

Dimension 1: Tax burden of companies.

Dimension 2: Innovation in certain areas of the company.

Ho: There is no relationship between the dimensions Tax burden of companies and Innovation in certain areas of the company; Significance > 0.05.

Ha: There is a relationship between the dimensions Tax burden of companies and Innovation in certain areas of the company; Significance < 0.05.

Table 5. Spearman's correlation test

Variable 1	Criteria	Variable 2
		Innovation in certain areas of the company
Tax burden of companies	Spearman's rho	-0.782
	Significance	0.0264
	N	259

Source: Data processed through the SPSS program based on data obtained from companies, 2022.

According to the results of the significance of Spearman's Rho, the null hypothesis (Ho) is rejected in favor of the alternative hypothesis (Ha), that is, there is a median indirect relationship between the dimensions "Fiscal burden of companies" and " Innovation in certain areas of the company"; which indicates that, for the promotion of innovations in the various areas of the company, it is significant that the annual tax burden incurred for the fiscal year of the executed year would be reduced.

It was established that there is no relationship *between training and reasons to start a new business*, this implies that it is essential to have a highly specialized educational offer for the promotion of key reasons to undertake new business ideas. There is a direct medium-range relationship between the dimensions of *participation in business events and experience in new businesses*. This means that, in order to promote the experience of creating new business ideas, it is important for entrepreneurs to regularly attend innovation and business-related management events. The dimensions *technical assistance by incubators and/or accelerators and success in new business proposals* have a medium direct relationship with each other. This means that in order to guarantee the success of new business proposals, specialized technical assistance is required from incubation centers and/or business accelerators, or from both references. Finally, the study shows a medium and indirect relationship between *the tax burden of companies and innovation in certain areas of the company* dimensions. This result implies that, in order to promote innovation in the various areas of the company, a reduction in the annual tax burden is necessary to stimulate innovation in the SMEs in the province of Santa Elena.

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Data Science and Predictive Analytics strategies for business management: a state of the art

Introduction

The data science is a relatively new science, from the point of view of scientific research, although the data as such have been used and analyzed from various scientific disciplines throughout human history.

It was precisely the technological innovations unleashed after World War II (marked by a "boom" in the production of data and documentary information as a result of the war) that gave a great boost to computer science, operations research and the need to organize, process and systematize these large volumes of data and information. [18].

In 1962 Tukey [20] encouraged a profound change in the field of statistics and pointed out a recent science that revolved around "learning" or data analysis. This science had four overriding factors: *i.* The theoretical basis of statistics. *ii.* Accelerated development of computing and emergence of devices for information visualization. *iii.* The challenge of handling increasingly large data sets, and, *iv.* Emphasis on quantification in an increasingly wide variety of fields of knowledge. Chambers, J. M. (1993) [5], The classical statistical approach to statistics overcame its theoretical limitations. Breiman, L. (2001) [4], proposed that instead of statistical inference, which was widely used at the time, emphasis should be placed on prediction. Cleveland, W. (1985) [9] later used the name "data science" in the scientific community.

This was followed by significant contributions from experts from various disciplines and some renowned universities such as the University of Michigan, UC Berkeley, MIT and NYU, which developed academic programs and initiatives on "data science".

Data science and big data strategies in business

The business world is highly dynamic, and this ecosystem is where new start-ups or companies emerge in response to specific needs or business opportunities, or sometimes as a temporary fad or triviality [11].

Companies enter into a spiral of accelerated growth, especially startups, which in some cases tend to have an exponential rate of development and when they reach the peak, they begin to decline rapidly and most of them tend to disappear in a short period of time, in less than three years [10]. According to ECLAC data “in underdeveloped countries, between 50% and 75% cease to exist during the first three years of life”. [13]

The trends in business intelligence lead us to a capitalization of knowledge, to a greater or lesser degree. Companies are focusing on this new trend. Companies are aware of the need to compete intelligently, adapting to the new rules of the market, to the needs of customers, who are becoming more and more informed and demanding, to the conditions and standards of state control and regulation, and data analysis becomes a competitive advantage. The success or failure of companies will depend on the level of understanding, adaptation, and capacity to respond to these data, to convert them into information and then into knowledge, this process is defined as the knowledge cycle. See fig. 1.

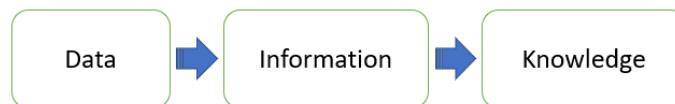


Fig. 1. Cycle of knowledge

The definition and scope of data science and predictive models have been the subject of discussion and input from various scientific disciplines and subject to technological advances, and are therefore constantly evolving [2].

For Jägare (2019) [15], data science represents a method of collecting highly relevant data, which reflects the needs of an organization, this data requires a deep and multidimensional treatment: storage, treatment, extraction and loading, security and IT support, processing, visualization and communication, ethics and privacy, among others.

Data science encompasses several components or elements that constitute it and are interrelated, as a subsystem, with a greater or lesser development or inter-action, as can be seen in Fig. 2. Among them are artificial intelligence (AI), machine learning (ML), Big Data (BD), big data analysis (BDA), visualization and business intelligence and analysis (BI & A), mathematics, computer science and programming skills, and domain knowledge. [1].

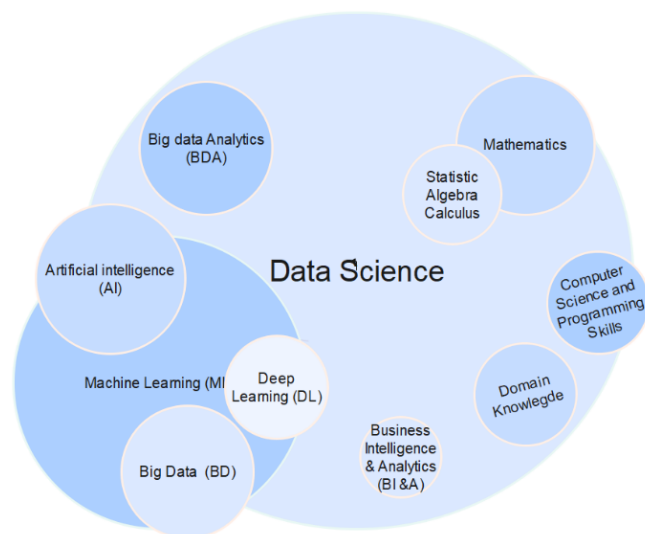


Fig. 2. Data Science constituents.

PD: The size and shape of each circle, in Fig. 1 is only representative, drawn in convenience to adjust the text and not indicative of any weightage to the ‘Data Science Constituents.’

Data Science Strategy (DSS)

Based on the above, the data science strategy is oriented to the overall strategy of an organization towards a significant investment in data science, including the provision of technological infrastructure, professional skills, training, development of specialized software, development of strategic options, compliance with local and international regulations, data strategy (data management includes data management, data acquisition, storage, security, privacy, ethics and data governance). [16].

Literature review on data science and bigdata strategies in business

Data collection. At the time of executing the search in WoS , Scopus and Dimensions, 21,536 documentary references were retrieved, on the topics of data science strategies and predictive models, in the period from 1988 to July 22, 2022 and covered the following databases: Science Citation Index Expanded (SCI-Expanded), Social Sciences Citation Index (SSCI), Arts & Humanities Citation Index (A&HCI), Emerging Sources Citation Index (ESCI), Conference Proceedings Citation Index - Science (CPCI-S), Conference Proceedings Citation Index - Social Sciences & Humanities (CPCISSH), Book Citation Index- Science (BKCI-S) and Book Citation In-dex-Social Sciences & Humanit

ies (BKCI-SSH).

The journals with the highest number of publications and volume of citations in the analyzed subject were the following:

Table 1. *Most cited journals according to search criteria*

No.	Name	Publications	Citations	Citations mean
1	Journal of Business Ethics	3,313	187,283	56,53
2	Journal of Business Research	2,615	104,069	39,63
3	Industrial Marketing Management	2,526	118,063	46.74
4	The International Journal of Human Resource	2,034	75,185	36.96
5	Strategic Management Journal	1,977	336,302	170,11
6	Research Policy	1,867	183,336	98.20
7	Management Decision	1,721	49,907	29.00
8	Journal of Retailing and Consumer Services	1,500	47,338	31.56
9	Technovation	1,386	72,381	52.22

10	International Journal of Operations & Production	1,330	74,932	56.34
11	Journal of Business and Industrial Marketing	1,328	28,624	21.55

Publications by year. **Fig. 2 shows the scientific production on the subject analyzed in the period 1998-2022**

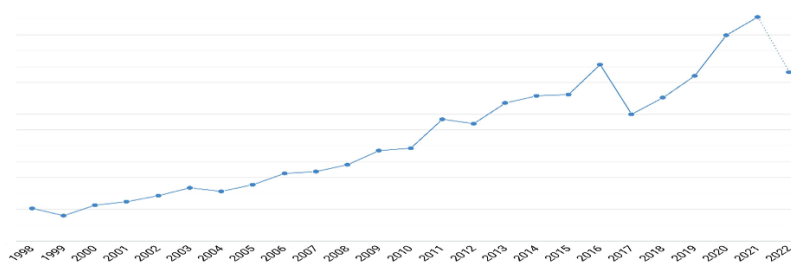


Fig. 3. Publications by year (1998-2022)

Research Categories. The categories with the highest scientific production in the subject analyzed were centered on commerce, business management, tourism and services (18,948), Philosophy and Religious Studies (1,657), Economics (1,057) and Human Society Studies (537).

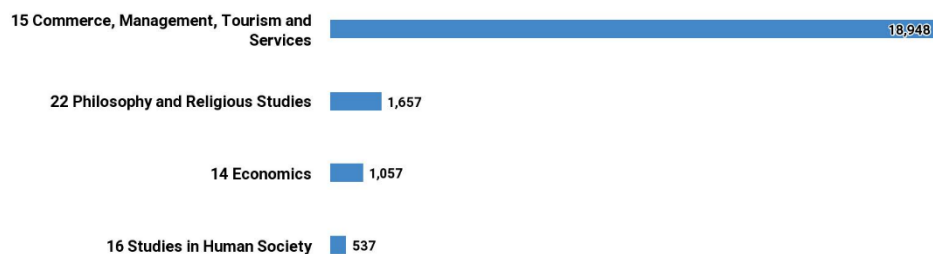


Fig. 4. Research Categories

Publications by Sustainable Development Goals.

To relate the degree of contribution of scientific publications on data science strategies and predictive analytics in business to the 17 sustainable development goals set by the United Nations in 2015. A global master plan that aims to achieve a sustainable future for all the world's inhabitants. Everyone and we are completely interrelated. This challenge includes the fight against poverty, inequality, climate, environmental degradation, prosperity, peace and justice. The plan foresees the achievement of these goals by 2030. See fig 4.

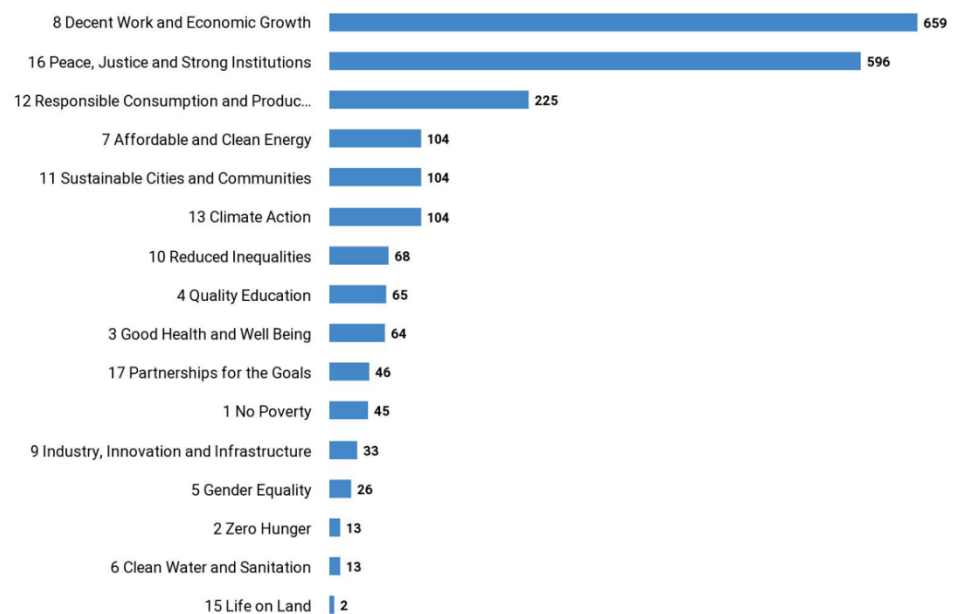


Fig. 5. Publications by Sustainable Development Goals

PD: The bars show the number of publications in each research category.

Co-author analysis. Of the 47 researchers with the highest scientific production on the topic of data science strategies and predictive analytics in the business world, these

belong to 11 research clusters, through 320 co-authorships. See Fig. 6.

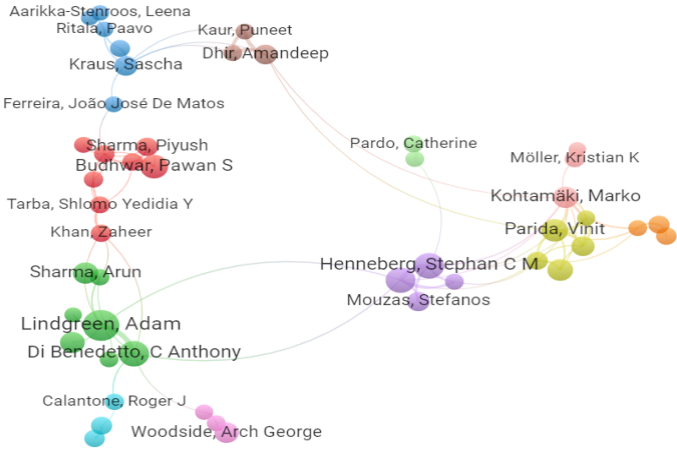


Fig. 6. Researchers: Co-author analysis (1988-2022)

Citations analysis. In terms of citations, a total of 5,235 citations were obtained through 1,280 citation links, and 7 research clusters, worldwide, in the study period 1998-2022. See Fig. 7.

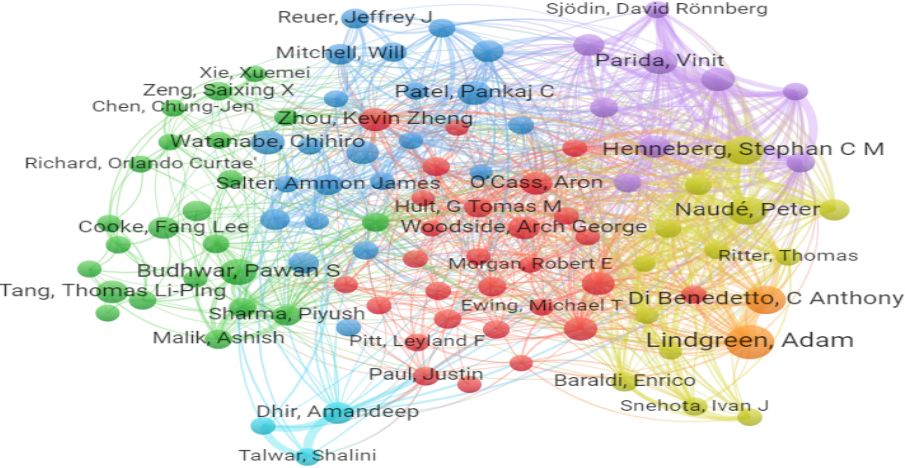


Fig. 7. Researchers: Citations analysis (1988-2022)

PD: The relatedness of researchers is determined based on the number of times they cite each other.

Prediction models

Conceptually, predictive modeling is understood as an advanced process to create scenarios and behaviors in the near or immediate future. This model can create forecasts and trends, very useful in business, involving economic, financial, social, environmental and human behavioral factors. [3].

A predictive model is made up of a series of predictors that have the ability to influence a behavior or an expected outcome. As an example, in the sales area of an organization, customer factors such as gender, age and purchase history or repeat purchases can help executives predict future sales behavior [7].

These prediction models are based on bias, search criteria, data quality, and with sophisticated statistical models or not (which can use from simple equations to complex neural networks), they build predictive scenarios and the consequent validation of these models [8].

The McKinsey model [6], yielded revealing results on the adoption of data science and predictive analytics strategies in leading-edge companies, and these have contributed significantly to accelerated business growth and a reduction in business competitiveness levels, with high process effectiveness, including efficiency and optimal intelligent and appropriate use of resources [22]. See fig. 8.

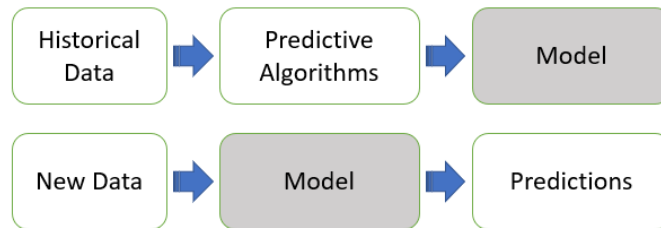


Fig. 8. Predictive Analytics Models That Support in Businesses Challenges

Predictive modeling has an intensive use especially in information and communication systems and technology. For example, these models help technicians to identify the probabilities that messages received by users in general constitute a threat to the organization (spam).

In business, predictive models extract patterns from historical and transactional data to identify risks and opportunities [12].

Predictive models are able to assess risks on financial investments or other commercial operations, based on a series of actual or simulated conditions [17].

Predictive models can also be highly functional and can provide probability scores on an individualized basis, i.e. for each customer, product, patient, machine, equipment, supplier, department or functional area of the company, component with the purpose of generating early warnings on different strategic, tactical or operational decisions, related to promotional campaigns, risk assessment in credit bureaus, timely detection of fraud, defects or failures in manufacturing processes, health status of employees and operations with public sector entities [14].

Business model evolution. Business models have undergone a series of changes and trends from the previous century to the present day [22]. From models based on mass production (1900-1950), distribution and marketing

1950-1990), internet and e-commerce (1990-2010), customer-centric (2010-2025) and now models based on data science and prediction. See Fig. 9. The latter is due to two predominant factors:

a) The ILO's nowcasting model is a good example, related to the analysis of the effects of the Covid pandemic on labor statistics (loss of working hours), for the whole world. [19].

b) Improving consumer analytics using psychometric methods

These two elements described above open up infinite possibilities for the relationship between companies and their stakeholders (customers, suppliers), it is possible to model ways to trap customers, to create a kind of "pleasure bubble" in order to increase the levels of loyalty or repurchase, in the case of customers.

The Cambridge Analytica scandal in the United States about the use of AI associated with psychometrics provides an example of the real possibilities of its use, and at times it sounds frightening to misuse it.

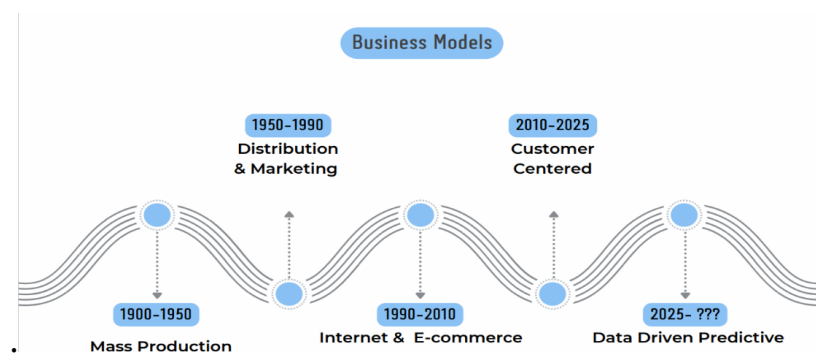


Fig. 9. Business model evolution

The success lies in the quantity and quality of the data obtained and that have relevant characteristics about the

clients or consumers, and in the investment and correct use of the technologies described above.

The fields of application are multiple and infinite, and are not limited only to the commercial or business level, this serves as a breeding ground for the creation, increasingly wide of new companies dedicated to data science and predictive modeling, and profiles of new professionals, which will undoubtedly have a broad competitive advantage over those companies of conventional products or services.

Conclusions

Data science applied to the management of organizations has had a remarkable and accelerated development in recent years. The problem is that most companies, although they may have the technological conditions to be able to collect key data related to the behavior of their customers, in reality few can really benefit from this data, due to the complexity involved in the analysis, with a technical criteria and capabilities to understand in advance the phenomena, which are mostly derived from human behavior, perceptions, etc., highly complex to predict, but not impossible.

Data science also derives most of its value from the quantity and quality of information and knowledge that is produced and analyzed, in the scientific way of finding patterns, interpreting the results and making timely decisions, and ultimately responding to the world with business intelligence.

Predictive modeling, as an emerging field, is contingent on scientific advances in data processing power, database technology and big data management tools. Predictive analytics is a set of advanced technologies that enable organizations to use data, both stored and real-time, to move from a historical and descriptive view to a forward-looking perspective of what is to come. As data science-related technology continues to evolve, companies are increasingly providing new products and services that include predictive analytics

for cost intelligence and optimization of the different processes in their value chain.

This reality, in which both real and simulated company data converge, will contribute to a higher level of competitiveness and strategic business differentiation.

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Determinants of Entrepreneurial Intention and the role of entrepreneurial education: an analysis in the Ecuadorian university context

Introduction

This study arises as one of the products of the project on innovation management and technology transfer through incubation systems and sustainable business acceleration in the province of Santa Elena, implemented by the School of Administrative Sciences of the Peninsula University of Santa Elena. The objective of this project is to create an ecosystem for the creation of startups in the university context and increase the competitiveness of microenterprises through disruptive innovation (products and/or services, processes, and business models) within a culture of high-value entrepreneurship.

Entrepreneurship and innovation have been preferred allies for Ecuadorians when facing difficult economic situations. It is not surprising therefore that Ecuador is considered one of the most entrepreneurial countries in the world, its rate grew by 4.7% due to the pandemic, especially in the digital transformation and innovation segments. AEI (2021).

Entrepreneurship has represented one of the great challenges for the economic development of a country. Although it may seem that entrepreneurship has an implicit relationship with people who possess innate qualities, however, its development has been possible thanks to university education, with its curricula and study plans at all levels of education (Arango-Boyer et al., 2020)

In order to strengthen the process of conversion of university students to become entrepreneurs, it is necessary to analyze in greater depth the determining factors associated with entrepreneurial intention in different contexts (Ozaralli & Rivenburgh, 2016). In this regard, there are some theories that demonstrate entrepreneurial intentionality

under the influence of socio-cultural aspects that can and should be strengthened. (Fragoso, R., Rocha-Junior, W., & Xavier, A. 2019).

It should also be noted that, with regard to the study of entrepreneurial behavior, several authors have focused on the analysis of the intention to become self-employed. (Bird, 1988; Davidsson, 1995; Douglas, 1999; Krueger y Carsrud, 1993; Reitan, 1996; Robinson, Stimpson, Huefner y Hunk, 1991; Shapero y Sokol, 1982).

Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB), by Izek Ajzen (1991), contributes to the ways of predicting, understanding and positively modifying people's behavior, since behavior can be planned. This theory is a successor to the theory of reasoned action, and it was because it was discovered that behavior was not entirely voluntary and under control that this gave rise to the variable of perceived behavioral control, a fundamental element of the TPB, and is closely linked to entrepreneurial intention.

Intention relates to antecedents and subsequent behavior (Kautonen et al., 2011). According to the theory of planned behavior, both intentionality and the different behaviors assumed by a person have three basic determining factors: personal, social context and perceived control.

In the words of Al-Jubari et al. (2019), TPB is oriented to explain and predict human behavior as its basic purpose. There are other theories based on this analogy and characteristics, such as the model proposed by Shapero and Sokol. (1982), set forth below.

Enterprise Event Model (EEM)

Shapero and Sokol's Business Event Model (1982), and it refers to entrepreneurial self-efficacy and is undoubtedly one of the most cited models in the field of

entrepreneurship (Al-Jubari et al., 2019; Bandura, 1977; Veciana et al., 2005; Sharahiley, 2020). This model comprises three key elements that have a direct or indirect degree of influence on the entrepreneurial intention of university students to start a business: a) perceived desirability, which refers to the interest that a university student may have in starting a business or startup. According to Tarrats-Pons et al. (2015), this factor is associated with the level of perception of a university student or student about the way of thinking and acting of people representing their closest social circle, in terms of the possibility of starting a business, this gives them a sense of emotional support.

In this regard Sharahiley (2020), added that the *propensity to act* is the inclination and preferences of the students to start their own entrepreneurship, taking as a reference the perceived viability and self-confidence, which will serve as an impulse for the action of entrepreneurship.

It is important to note that TBP has been characterized by various meta-analyses in some countries and were encouraging, such as that attitudes, subjective norms and perceived behavioral control had an impact of 39% variation in terms of entrepreneurship intentions (Schlaegel and Koenig, 2011).

In this regard, Kautonen, et al. (2013) carried out a work on the prediction of intentions and behavior in relation to the creation and implementation of microbusinesses with time series (2006 and 2009) in the economically active population in Finland and as a result it was obtained that both attitude, subjective norms and perceived control of behavior were considered as predictors of high significance in business intention

There is much other research done regarding the validity of the prediction of intentions and behaviors when the variable of business education and training exists (Bae, T.J., S. Qian, C. Miao & J.O. Fiet, 2014).

Combined model

For the purposes of this study, a model oriented to entrepreneurial intention-action will be built, combining the different variables of the TPB model of planned behavior as developed by Maluk O (2018) and the variables of the Shapero and Sokol's business event model (1982) will be the one that best fits the different combinations that are identified in the measurement models. See figure 1.

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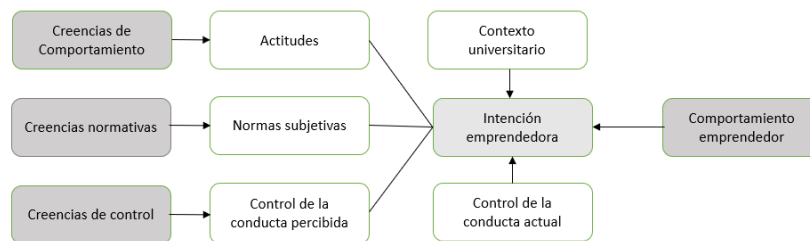


Fig. 10. Combined model adapted from Ajzen (1991); Shapero y Sokol (1982).

Education for the development of entrepreneurship

Undoubtedly, one of the definitions that best fit entrepreneurship is what is considered a highly critical activity that encompasses the discoveries, identification, evaluation and use of opportunities with certain productive factors oriented to the production process, in an established period. [14].

It has been evidenced the influence that formal business education tem-prana has on students, their attitudes, the choice of their career to follow and their intention to undertake. This type of early education allows the development of capacities, skills and abilities, through knowledge and training. Students are more likely to access the business world early and an extension of the labor market is achieved with it (Rauch & Hulsink. 2015).

However, some authors question the effectiveness of academic programs, due to inconsistencies and problems of relevance in the contents (Soria-Barreto et al. 2016; Among the difficulties found are the methodologies used (Westhead et al., 2001) This scenario represents a dilemma for researchers and calls into question the role of entrepreneurial education, that is, whether or not entrepreneurship can be taught.

This research has a quantitative approach, ranging from the identification of the variables, the analysis of the consistency of the data collection instrument, descriptive analysis of the dimensions, and even the deductive contrast of the hypotheses of the relationship between the variables. For this last process, it is necessary to apply a correlational type of scope in the research.

The total study population was 8,500 students at the Peninsula Santa Elena State University (UPSE, for its acronym in Spanish) during the period 2021-2. Accordingly, a probabilistic sampling was applied, since it seeks to generalize the results obtained from the sample, in order to circumvent the limitations that exist when it is necessary to collect information from the entire population through a census. Starting from a population with homogeneous characteristics, the selected sampling technique was Simple Random Sampling (SRS).

Being quantitative research, the technique applied was the on-line survey. The instrument elaborated from this premise, was elaborated in relation to the dimensions described

in the conceptualization of each study variable, which are: *University context, Entrepreneurial attitude, Perceived control, and Entrepreneurial intention.*

For a better description and methodological treatment, three phases are required:

The first is to demonstrate the statistical confidence of the instrument applied, by means of Cronbach's Alpha test.

Cronbach's Alpha is a method for determining the reliability and trustworthiness of a set of data so that the theoretical construct is as relevant as possible. The result of applying this indicator admits values between zero and one; for values close to one, the higher the internal consistency of the group of variables and dimensions; and for a lower consistency, for values close to zero, the higher the internal consistency of the group of variables and dimensions (Welch & Comer. 1988).

For authors such as George & Mallery (2003), suggest intervals based on the result of the indicator, and thus verify the general condition of the instrument. The values have the following scale: excellent, good, acceptable, questionable, poor and unacceptable.

The second phase provides statistical evidence of the relationships or not of the study dimensions, through the application of the Pearson or Spearman correlation test, depending on the parametric normality or not of the variables described in the data collection instrument.

The hypotheses to be formulated for the parametric or non-parametric contrast of the data are as follows:

Ho: Data derived from the survey instrument are from a normal distribution (parametric).

Ha: Data derived from the survey instrument are not from a normal distribution (non-parametric).

Based on the significance, if it is greater than 0.05, the null hypothesis (Ho) is accepted; if it is less, the alternative hypothesis is accepted (Ha).

To evaluate the relationship between the study variables, tests are applied based on the normality results. If the data are parametric, Pearson's test is applied, but if the data turn out to be non-parametric, Spearman's test is applied.

The hypotheses to be formulated for the contrast of the relationship between variables are as follows:

First reference: University Context and Entrepreneurial Intention.

Ho: There is no relationship between the dimensions University Context and Entrepreneurial Intention; Significance > 0.05 .

Ha: There is a relationship between the dimensions University Context and Entrepreneurial Intention; Significance < 0.05 .

Second reference: Entrepreneurial Attitude and Entrepreneurial Intention.

Ho: No relationship between the dimensions Entrepreneurial Attitude and Entrepreneurial Intention; Significance > 0.05 .

Ha: There is a relationship between the dimensions Entrepreneurial Attitude and Entrepreneurial Intention; Significance < 0.05 .

Third reference: Perceived Control and Entrepreneurial Intention.

Ho: No relationship between the dimensions Perceived Control and Entrepreneurial Intention; Significance > 0.05 .

Ha: There is a relationship between the dimensions Perceived Control and Entrepreneurial Intention; Significance < 0.05.

Based on the significance, if it is greater than 0.05, the null hypothesis (Ho) is accepted; if it is less, the alternative hypothesis (Ha) is accepted.

The third phase, the aim is to develop a logistic probability model (logit) that determines the probability in which the conditions of the *university context, entrepreneurial attitude*, perceived control explain a tendency for the student to have a *higher entrepreneurial intention*

To determine the sample before collecting information, it is necessary to apply the MAS technique. The following are the results:

The following are the results:

$$n = \frac{N * Z^2 * p * q}{e^2 * (N - 1) + Z^2 * p * q} \quad (1)$$

Where:

N; Population: 8,500

Z; Z-value of normal distribution: 1.96

P; Probability of success: 0.5

Q; Probability of failure: 0.5

E: Statistical error: 0.05

The result of applying formula (1) is 368 university students. To guarantee the representativeness of the sample and therefore minimize the error at the moment of generalizing population data, it is necessary to distribute the selection of the sample elements randomly by careers. In addition, since this was an on-line survey, the responses exceeded this number as a sample, which also guarantees this generalizing context.

According to the first phase, where the statistical consistency of the data collection instrument is evidenced, it is necessary to determine the Cronbach's Alpha indicator. The results are as follows:

Table 1. Reliability statistics

Cronbach's Alpha
0.953

Source: Data processed through the SPSS program based on the data obtained in the in-situ data collection.

According to the results, the value of Cronbach's Alpha is greater than 0.8, which indicates that the reliability of each of the questions in the instrument is "Excellent", which statistically demonstrates that the results and interpretations derived from the instrument will be consistent, providing significant information.

In the second phase, the correlation test of variables will be applied. For this purpose, it is determined whether the instrument data are parametric or non-parametric, since

this depends on the type of test to be applied. The following are the results:

Table 2. *Normality test*

Variables	Kolmogorov-Smirnov	
	Statistical	Significance
University context	0.256	0.000
Entrepreneurial attitude	0.145	0.000
Perceived control	0.115	0.000
Entrepreneurial intent	0.112	0.000

Source: Data processed through the SPSS program based on the data obtained in the in-situ data collection. The Kolmogorov-Smirnov test is applied when data are equal to or greater than 50.

According to the results, the data derived from each item of the information gathering instrument turn out to be non-parametric, since the null hypothesis (Ho) is rejected in favor of the alternative (Ha), that is, they do not come from a normal distribution, since the significance of the two variables under study is less than 0.05.

Since the results do not come from a normal distribution, to contrast the correlation between the variables under study, Spearman's test analysis is applied. The following are the results:

First reference: University Context and Entrepreneurial Intention.

Table 3. Spearman correlation test

Variable 1	Criteria	Variable 2
		Entrepreneurial intent
University context	Spearman's Rho	0.540*
	Significance	0.000
	N	1,078

Source: Data processed through the SPSS program based on the data obtained in the in-situ data collection.

* The indicator is a value between 1 and -1, the closer it is to 1, the higher the positive-direct correlation; if it is close to -1, the higher the negative-indirect correlation.

According to the results of the significance of Spearman's Rho, the null hypothesis (Ho) is rejected in favor of the alternative hypothesis (Ha), i.e. there is a medium direct relationship between the variables "University context" and "Entrepreneurial intention"; which indicates that, if the university context is strengthened, with projects with an entrepreneurial approach, it can be positively stimulated by increasing the intention of students to become entrepreneurs.

Second reference: Entrepreneurial Attitude and Entrepreneurial Intention.

Table 4. Spearman correlation test

Variable 1	Criteria	Variable 2
		Entrepreneurial intent
Entrepreneurial attitude	Spearman's Rho	0.731*
	Significance	0.000
	N	1,078

Source: Data processed through the SPSS program based on the data obtained in the in-situ data collection.

* The indicator is a value between 1 and -1, the closer it is to 1, the higher the positive-direct correlation; if it is close to -1, the higher the negative-indirect correlation.

According to the results of the significance of Spearman's Rho, the null hypothesis (Ho) is rejected in favor of the

alternative hypothesis (Ha), that is, there is a direct medium relationship between the variables "Entrepreneurial attitude" and "Entrepreneurial intention"; which indicates that, if actions are proposed to stimulate good entrepreneurial attitude, this will cause the student's intention to become an entrepreneur to increase.

Third reference: Perceived Control and Entrepreneurial Intention.

Table 5. Spearman correlation test

Variable 1	Criteria	Variable 2
		Entrepreneurial intent
Perceived control	Spearman's Rho	0.732*
	Significance	0.000
	N	1,078

Source: Data processed through the SPSS program based on the data obtained in the in-situ data collection.

* The indicator is a value between 1 and -1, the closer it is to 1, the higher the positive-direct correlation; if it is close to -1, the higher the negative-indirect correlation.

According to the results of the significance of Spearman's Rho, the null hypothesis (Ho) is rejected in favor of the alternative hypothesis (Ha), i.e. there is a direct medium relationship between the variables "Perceived control" and "Entrepreneurial intention"; which indicates that, if a perceived control in entrepreneurial matters is adequately strengthened, the entrepreneurial intention of the student will increase significantly.

Finally, in the third phase, the main logistic probability model is determined. The following are the references:

Based on Novales A. (2005), Binomial Logit models are linear references between a dependent variable and one or more independent variables in which, according to their significance, they would explain the dependent variable. The relationships between this system do not refer to magnitudes but only to the direction of forces or direction of action, which is evidenced by the sign of the independent variable. As long as it has a positive sign, it is suggested that the greater the incidence of this variable, the higher the value of the probability of occurrence of the dichotomous dependent variable increases, and if it has a negative sign, the relationship is contrary to this statement.

In this sense, a binomial logistic probability model is used to explain the behavior of the dimensions under study.

Dependent variable: Entrepreneurial intent

Coding: 1: Has entrepreneurial intentions; 0: No entrepreneurial intentions.

Coefficient estimates:

Table 6. *Estimates of the coefficients of the independent variables*

		Coefficients	Sig.
Variables	University context	0.45	0.03
	Entrepreneurial attitude	0.63	0.00
	Perceived control	0.419	0..12

Source: Data provided by the IBM SPSS for Windows program for the development of the binomial logistic probability method for the Entrepreneurial Intention dimension.

As mentioned in the methodology reflected in, in the probability models the coefficients do not reflect the magnitudes of change on the dichotomous dependent variable, but only the relationship between them, i.e. direct or indirect (positive or negative).

According to the results, the three dimensions contribute significantly to increase the probability that students have the intention to become entrepreneurs (dependent variable).

For the calculation of the probabilities, the initial data of the dimensions and the coefficients of the equation must be replaced in the exponential transformation expression 2.

$$Prob \left(\frac{p}{1+p} \right) = \frac{\exp \left(\frac{p}{1+p} \right)}{1 + \exp \left(\frac{p}{1+p} \right)} \quad (2)$$

The results:

Table 7. *Estimates of the coefficients of the independent variables in probabilities*

		ln(p/1+p)	Probabilities
Variables	University context	-0.254	0.437
	Entrepreneurial attitude	-0.744	0.322
	Perceived control	-0.590	0.357

Source: Data provided by IBM SPSS for Windows for the development of the binomial logistic probability method for the Entrepreneurial Intention dimension.

Based on the results, the following main conclusions can be drawn:

The three dimensions analyzed throughout this research contributed in a relevant way to an increase in the probability that students have a greater intention to undertake are, in their order:

The "university context" contributed with 43.70%, "perceived control" with 35.70%, "entrepreneurial attitude" with 32.20%.

This indicates that, if the university context is strengthened, with projects with an entrepreneurial approach, it can be positively stimulated by increasing the students' entrepreneurial intention. Likewise, if a perceived control in entrepreneurial matters is adequately strengthened, the student's entrepreneurial intention will increase significantly and finally, it is concluded that if actions are proposed to stimulate a good entrepreneurial attitude, this will cause the student's entrepreneurial intention to increase. 2) The validity of the combined model (Theory of Planned Behavior -TPB and Enterprise Event Model -EEM) was reinforced as the basis for explaining the intention of the behavior in this study.

University entrepreneurship education can have notable effects on entrepreneurial intention, but it will have a greater initial response in students with certain proactive characteristics. Therefore, a previous diagnosis of the students can help predict the real impact of the contents, especially of the entrepreneurship subjects, on entrepreneurial intention.

This study aims to provide certain valid guidelines for the development of appropriate training programs in

entrepreneurship and innovation, with a hybrid modality, which promotes the development of individual and collective capacities, abilities and skills in entrepreneurship and innovation, with a comprehensive approach, not only from an economic, administrative and/or accounting point of view, but also considering all the contexts: social, cultural and technological.

The reflections derived from the results of the study indicate that the most important way in the model is the one that goes from attitudes towards entrepreneurial intention

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Disruptive technologies and businesses: towards an accelerated transformation of society and the market

Introduction

This chapter introduces and analyzes the terms of disruptive technology and business with innovation as a cross-cutting axis, its history, and describes how they are applied in our society and the market.

Today, society and the market, at the global level, face serious challenges, because of the accelerated transformation in their structures. Its ability to respond to variables such as: technological advances, unsustainable globalization, demographic changes, and environmental balance will depend to a large extent on whether this becomes an opportunity or a limitation for their development.

These variables interrelation with each other. For example, we see how new technologies (including disruptive technologies) intensify and facilitate globalization, which in turn energizes international trade and the creation of global markets, this means producing more goods and services.

Globalization in business also encourages new global digital transformation processes to be more cost-effective, through innovations. There is therefore an intrinsic relationship between the digital revolution and globalization. Technical progress is one of the determinants of rising life expectancy, just as aging societies or low birth rates encourage automation as a strategy to address labor shortages in some countries.

The transformation or digital revolution is given rise to new business models (rapidly expanding technology startups), new forms and working relationships (telework, new relationships with internal and external stakeholders (customers, suppliers, regulatory and control state

institutions), new legal regulations (rights of data protection to consumers, such as individual ownership and privacy), new production methods, i.e., a new society, and a new economy [2].

Technology is an excellent power transformer element, its use has been increasingly intensive for process optimization, automation of services, making more efficient the meeting between supply and demand or eliminating intermediaries, and that promises new benefits in the coming years, causing disruptive innovation.

As stated, countries must properly and balancedly manage changes in such a way that economic growth meets new individual and collective needs.

It is worth emphasizing that some societies are likely to do better than others, due to multiple factors, such as their availability of economic resources, technological infrastructure, access to economies of scale, legislation that encourages investment and allows equity and efficiency to feed back to each other [31]. To achieve this, we must bet on new technologies, and do so with an inclusive purpose that allows our societies and companies to generate more wealth and distribute it better, progress socially and harness the enormous potential offered by the digital revolution.

Business and social adaptation to technological advancement

Over time, society's adaptation to technological change and development has been a gradual and desperately slow process in the first technological revolution.

If we look at the story a little, we see that at the beginning when technologies appeared, such as printing, then steam engine, electrification networks, the use of oil and derivatives, fixed telephony, both air and land communication systems, to name a few, from their appearance to wide use by consumers, it lasted a long time and even more so to those

less favored strata of society. However, since the advent of the internet network, the cost of adopting technologies by businesses and society has been drastically reduced.

In this regard, Kurzweil R. (2014) [27], in Figure 1, not only shows how quickly the Web became hooked, but also shows a larger trend of increasingly rapid adoption of new technologies in the last century and a half. Kurzweil argues that the pace will continue to accelerate until, sometime around 2045, human and artificial intelligence merges and "the knowledge and skills embedded in our brain will be combined with the much greater capacity, speed and ability to exchange knowledge of our own creations." In other words, "a global, immersive, invisible and networked computing environment" will be generated [19].

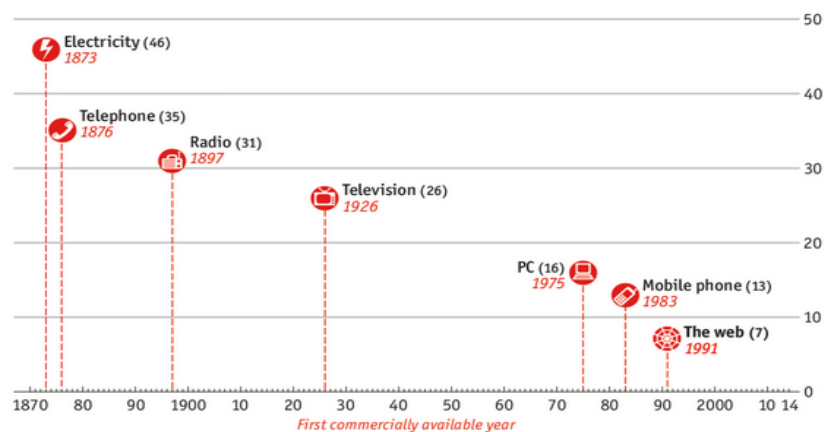


Fig. 11. Technology adoption Years until used by one-quarter of American population. [27]

To expand this analysis, and to emphasize that innovations happen with greater acceleration. Hargroves and Smith (2005) [21], identify six waves of innovation and represent it with overlaps in a timeline. The first wave that started the industrial revolution, with the use of hydraulic energy and mechanical constructions, from 1785 to the middle of the 19th century.

The second wave characterized by steam energy and steel, lasted until the end of the century, and the third wave arises with the combustion engine and electricity and is maintained until 1945.

World War II, left a legacy the beginning of the fourth wave, with the emergence of electronics, the era of computers and space exploration, then in the 1980s, the fifth wave appears, that of digital networks, information technology, and biotechnology [37].

Finally, the sixth wave, which coincided with the beginning of the new millennium, gave way to nanotechnology, renewable energies, and sustainability. (see Figure 2).

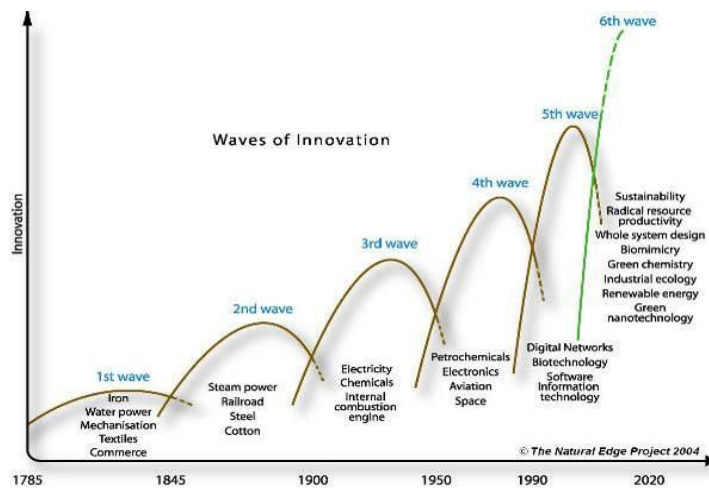


Fig. 12. Waves of Innovation. [16]

Improving well-being in society is conditioned by the economic growth of a country or region. But it is not enough if there is no distribution of wealth generated with equity.

At the same time, new disruptive technologies and globalization are increasingly interrelated, resulting in

greater interconnection between labor markets in different advanced and emerging regions of the world.

In this context, we see that innovation has played a key role in the growing development of society and business. The concept of innovation is directly related to exploring successful ideas that can generate profitable products, cost-effective processes, services, or business practices [41].

To develop a process of systematic continuous innovation, a company or society, it must expand its field of view not only in relation to the market, but also itself [14]. That should also maintain a systematic learning process that allows new ideas to be leveraged. Companies that do this stand out because they manage to understand the dynamics of innovation in their markets, capturing and responding to changes and signals that arise from the environment [43].

In other words, when a product changes significantly compared to its previous version, it jumps significantly forward, usually driven by technological advances (Utterback, 1996). These discontinuities create the need for companies to seek innovations that enable competitive leaps (Tushman & O'Reilly, 1996) and require organizations to reconsider their products and processes, as well as the impact of technology on their field of operation [42].

There are some innovations that have certain peculiarities to develop simultaneously in very different social and economic environments. Consider the case of the adoption of mobile phones in certain countries, where there are more mobile phones than their number of inhabitants, this implies greater access to a wider range of services, as there are also less developed regions or countries with highly sophisticated online banking services that exceed even developed countries.

Technological advancement in artificial intelligence, to algorithms related to the use of massive or large databases (big data), in conjunction with machine learning and deep

learning, help solve problems in the field of image recognition, voice and sound; texts are translated; chatbots and virtual assistants such as Siri, Alexa, Cortana or Google Assistant are created [29].

In robotics, there are advanced humanoid prototypes such as *Sophia* or *Amelia*, which has a capacity to interact with humans, and have continuous learning. In the automotive field, vehicles with full range have been created.

New technologies have contributed not only to the field of computing or mobility, but also to biology (biotechnology), medicine, aviation, nanotechnology, renewable energy, and new materials.

When it relates to the social aspect, one of the greatest benefits of new technologies and innovation is the increase in life expectancy, which is not only numerical data, but implicit quality of life, meeting needs.

For example, it should be noted that the aging of our societies or low birth rates encourage automation in companies, in industry, as a strategy to face the shortage of labor in some countries.

A socially important impact of innovations and new technologies is that which have allowed individuals around the world to travel longer and in less time. This also impacts countries' domestic and external trade and thus relocates some of the production of primary goods or manufacturing to other, mainly emerging economies.

This production process has by no means been linear, since there have been setbacks like the one that took place in the 20th century, during the interwar period, but globalization and innovation have advanced since the second half of the 19th century in such a way that in the last 170 years the world economy has grown as never before in the history of mankind.

Disruptive technologies and innovations & new business models

A couple of decades have passed since Bower J. and C.M. Christensen (1996) [6], coined and popularized the terms "disruptive technologies" and "disruptive innovations". Disruptive technologies are considered those that can create a coup, a "break" in the existing market structure and with them will affect all companies that have dominance in that market. These technologies are often more affordable, lower cost, and even better suited to customer needs than mainstream technologies [12].

It is important to consider that, at first, he referred to all this as disruptive technology, a little later it was called disruptive innovation, they argued that many of the technologies are not disruptive or inherently sustainable. It is *the business* model, which technologies help define and create, it's the one that has the biggest disruptive impact. [5]

For the authors, there are two types of innovation: sustainable and disruptive. Sustainable innovation is one that is integrated into large companies with a long history, whose objective is to optimize their offer of products and services, and has a solid base of current clients, who generate a permanent return of your investment.

Disruptive innovation is instead geared towards creating products or services, with special features, are cheaper, more user-friendly in use, and their production costs are lower. These particularities make small businesses the ones that demand this type of innovation, and create new markets and marketing channels that can even be replaced by existing ones, sometimes abruptly. This type of (disruptive) innovation focuses especially on the future needs of consumers.

This corroborates the idea that disruptive innovation does not necessarily have to be completely new or difficult to

adopt technology. There are two characteristics that usually appear, as can be seen in *Figure 3*.

Start-ups that launch a product or service to market, with different performance (attributes, features or even the same technology), which customers do not yet value at this stage.

Features that are known to today's customers improve so quickly that the product ends up invading the established market.

And it is precisely at this stage that the use of the product or service (with the technology incorporated in its design, production, or marketing) has already been extended by customers, that its competitors and even suppliers will also want to emulate them, but already the market has already been dominated by the pioneers of the new technology.

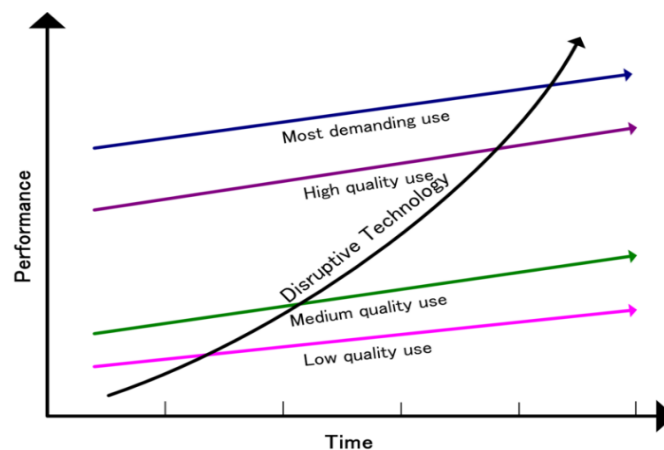


Fig. 13. Experience of disruptive technology. [10]

In ventures, the word disruption is very commonly used. Startups, those companies of rapid expansion and growth, thanks to the creation of new markets and services, base their success on disruptive innovation. What sets a startup apart from an SME is the measure of time, as the former is

at an early stage and its business nature revolves around the application digital technologies and scalability. Once you have reached a maturation phase you will no later than have the startup name. Temporality, scalability, and exponential growth generally define these types of ventures, which awaken greater investors.

Some giant companies in the Facebook, Google, Airbnb, or Uber industry had their beginnings as startups. These companies share these characteristics of the startup, of integrating technology that allows the product to be distributed exponentially, with sales with nonlinear patterns.[40].

To succeed, these companies had to incorporate and develop disruptive innovations, focused not only on breaking paradigms, deconstructions, basic concepts of reengineering, but finding new total and radical ways to get things done. The ways of always managing the same business do not allow you to think beyond [11].

The new managers are the new entrepreneurial ecosystem, eager for knowledge, which allows them to drastically change businesses without the definitive eradication of them. Here is a question, but why do big companies stay on the road and lose the fight against these disruptive businesses? The answer is simple, these disruptive technologies and innovations demanded a new business model that can be used to market the portfolio of products and services to create value for all stakeholders. Some of them can be seen in Figure 4.

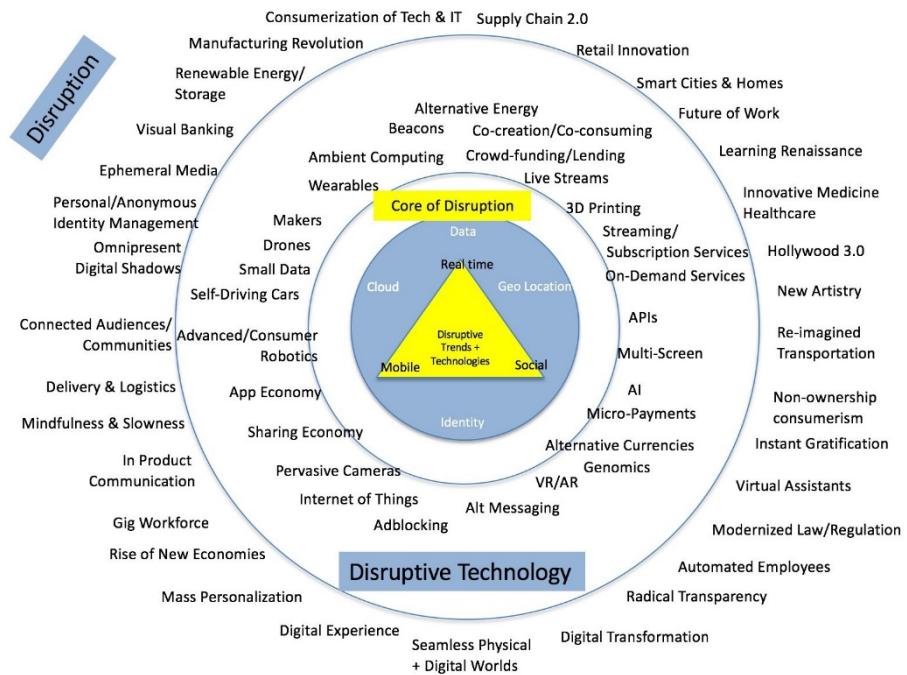


Fig. 14. Disruptive technologies, [38]

These new technologies and disruptive innovation are what have allowed today the emergence and development of new business models that undoubtedly respond to a certain dynamic:

It corresponds to a scientific advancement, materializes in a new technology, and is subsequently adopted in the business world, and changes economic and/or social organization.

These business models are disaggregated into four blocks:

- a) Business models that derive from the digital transformation of companies: which must be redesigned and restructured so as not to be left behind with the digital world around them. This includes AI onboarding, big data analytics, etc.

b) The economy of platforms: that is, those businesses based on platforms, apps, the cloud, etc., which are responsible for building a bridge between seller/customer. Within this block we can find subdivisions of business models such as the collaborative economy (Airbnb), the access economy (Uber) and the economy on demand (Postmates and other delivery services).

c) The decentralized model: where the business is based on the P2P interaction (from person to person), that is, the customer and the seller do not need any intermediary. For example: crowdfunding and blockchain-based businesses.

d) The pop-up economy and superfluous markets: this thanks to the technologies that have allowed the rapid creation of startups that can carry out tests, analyses and obtain results in real time, which leads them to grow rapidly or proliferate.

Disruptive innovation as a catalyst for ecosystem-based business models

Throughout this chapter, we are focused on the two components of disruption (disruptive technologies and disruptive business models). It should be noted that there is still a lack of clarity of concepts, which prevents a solid literature on the subject (Danneels, 2004; Govindarajan and Kopalle, 2006; King and Baatartogtokh, 2005) [17]. For his part, Markides (2006) considers that these inaccuracies are since there is no clear distinction about the types of disruptions, with respect to technology, producers/services, and business models.

Apart from the conceptual aspects of disruptive innovation, another challenge it faces is the dynamic nature of the entire information technology environment that is highly changing and evolving [18].

The role of the new managers is to prepare and develop organizational capacities to initiate the transition to the

business model based on disruptive ecosystems. It is therefore a need to develop formal and standardized frameworks and tools that allow us to visualize the current and potential technological landscape. There is certainly room for improvement in the development of these types of resources for managers.

Servitization, a response to the interaction between technology and business models

Ito and Howe, (2016) [22] argued that “technology means nothing. You need an interaction between technology and business models. By various ecosystem actors, who adopt and disseminate the technology in its structure”.

This requires a business model perspective as it provides insight into how companies can create and capture value for themselves and their ecosystem partners [36].

As a response to this interaction between technology and business models, servitization arises, as a process of enhancing the capabilities of a company to offer a greater experience for the final consumer, based on disruptive technology [20].

Rong, Patton and Chen, 2018; Adner, (2017)[34] point out that, in the past, some manufacturers were guilty of failing to care for end customers; their top priority was to create the product, leaving it to third parties to take care of customer service. However, this process just opened a market for other companies to succeed in this stretch.

Servitization ecosystems make it possible to offer complex solutions to an increasingly diverse, informed, and demanding customer base. It involves a transition from the control and close management of their value chains to the attraction, integration, and coordination of various actors in a wider ecosystem [24].

For Massa, Tucci and Afuah, (2017) [30], these ecosystem-based business models have a more dynamic nature and open to technological changes, are therefore more competitive with respect to the competition (with linear and static supply chains).

In these business models they face challenges and disadvantages, according to Bock and George, (2018) who consider these disruptive business models to be notoriously more complex and difficult to sustain and scale over time.

Adner and Kapoor, 2016; Laczko, et al. (2019), propose that the potential benefits of the formation of these ecosystems far outweigh the related challenges.

Towards a theory of business model adaptation

In a challenging and highly competitive world, mentioned at the beginning of this chapter, companies and organizations concentrate their efforts on achieving a competitive advantage over their rivals. It is a motivation towards innovation at a pace that sometimes goes faster than the needs of your customers.

This phenomenon generates distortions in the market since companies offer products with high levels of sophistication and are not customer friendly. All this for the sake of a "sustainable innovation", very much in vogue in these times, which is still in a theoretical-experimental phase. It should be noted that these strategies also enhance the development of disruptive innovation [28] .

Talking about a theory of adaptation of business models, which explains how to design and innovate these ecosystem-based models, is possibly precarious [26], although there are currents of thought, contrary to this position, that state that it is precisely these disruptive technologies that we use daily as Internet of Things (IoT), Artificial Intelligence, Real-Time Analysis [18].; Mas and Gómez, 2021) who have

unleashed new processes of transition towards new ecosystem-based business models. [44]

Added this to the scarce literature on the subject, which limits having the guidelines on which technologies should be used and how these should be integrated throughout organizational processes and especially that they are used throughout the life cycle of the ecosystem and business environment. Parida et al., (2019); Kohtamäki et al., (2020) [24] agree that while there are many theories about the role technology plays in helping the development, management and continuous innovation of ecosystem-based business models, there is still a long way to go in practice.

Business Model Adaptation (BMA)

The literature on disruptive business models has managed to arouse interest in the characteristics of this construct [46].

In a more formal way, Teece (2010) [39] refers to the business model as "the design or architecture of the mechanisms of creation, delivery and capture of value" of an organization (p.172). this is corroborated by (Chesbrough and Rosenbloom, 2002; Teece, 2010; Zott and Amit, 2007) [9]. They state that hay two key dimensions in a business model: value creation and value capture [45]

One of the ways that have been considered as a facilitator of the adoption and assimilation of disruptive business models is the dynamics of capabilities. (Teece, 2010) it conceives it as "that ability that the company has to integrate, build and reconfigure internal and external competencies to position itself quickly in a changing business environment" or also defined as [...] the potential of the company to solve problems in a systematic way, due to its propensity to detect opportunities and threats to make marketing decisions just in time and plan the change of its resources [...]

Cozzolino, et al (2018) [13], contribute to the development of a process model (Figure 5) that identifies two distinct parts of disruptive innovations (disruptive technologies and disruptive business models) and presents their consequences. We find that the two parties represent the drivers of a possible adaptation process: in fact, they arise at different times in time, have different implications, and induce different responses from the headlines. More specifically, disruptive technologies are likely to precede the emergence of disruptive business models because new technologies often open new markets and require new models to benefit from them effectively [10].

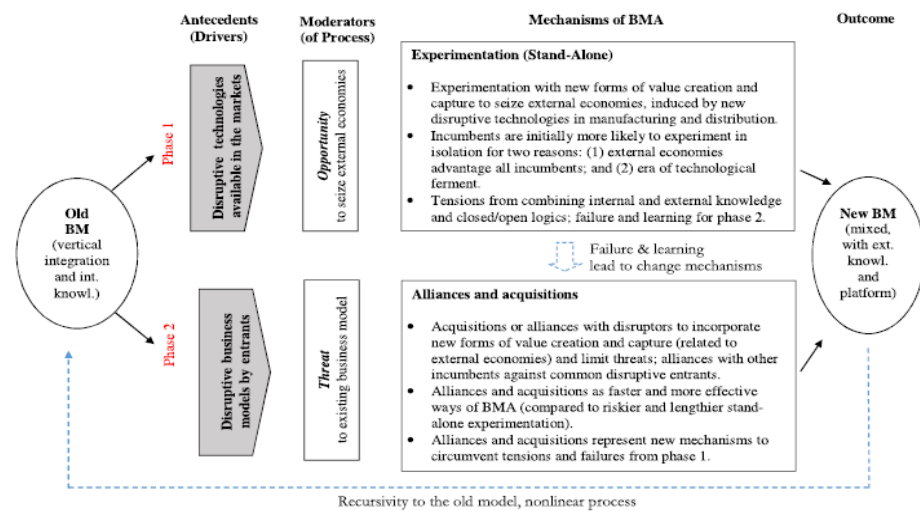


Fig. 15. A simplified process of incumbants' BMA after disruption [13]

The disruptive power of the sharing economy

Disruptive technologies and innovation, and ecosystem-based business models, have led to the creation of a new type of economy, the collaborative economy, a model based on open collaborative technologies that allow the sharing of

assets, private and dispersed, largely underutilized for collective use [3].

The sharing economy is based on three components: access economy, platform economy, and community economy (see Figure 6). Next, we define each organizing core and explain how they relate to the promises and paradoxes of the sharing economy [25].

(a) The economy of access. This economy relies on underutilized asset sharing actions aimed at maximizing efficiency and proper use.

(b) The economics of the platform. It bases its action on intermediation through digital platforms.

(c) The community-based economy. In this economy, the forms of interaction have unique characteristics, since they are not contractual, hierarchical, or monetarily based.

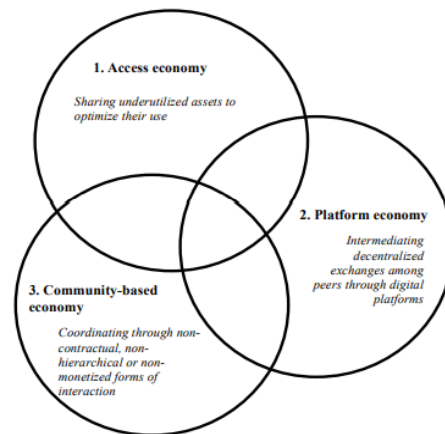


Fig. 16. Three organizing Cores of the Sharing economy.[1]

Each of the three organizing cores forms a foundation of the sharing economy [7]. While our framework is intended to make sense of the sharing economy rather than imposing a restrictive definition, it should be noted that "single-core

initiatives", those that are based solely on a prevailing logic, can be extreme cases and their membership in the sharing economy is more likely to be questioned. [1]. See Figure 7.

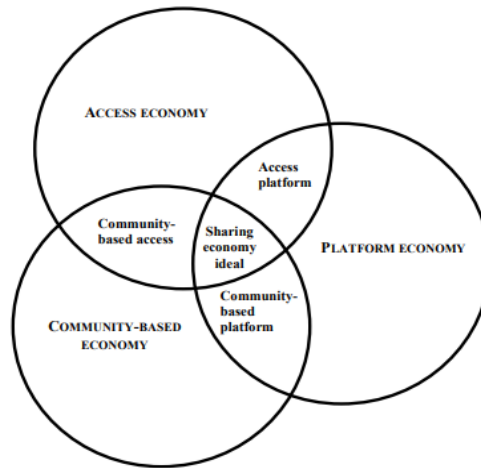


Fig. 17. Three organizing Cores of the Sharing economy [1]

The collaborative economy to be realized that it presents many advantages for its dynamism and innovation with and for the actors of the ecosystem, also faces many barriers or limitations, with still low levels of reliability on the part of customers, with means of payment in line with reliable banking processes, the limitations to technological access, and since these new services are consumed digitally and is therefore associated with a technological culture, which implies having basic digital knowledge and access to mobile technology. Being a nascent industry and in the process of consolidation requires an adequate legal framework [23].

Management in techno-economics, new roles of disruptive leaders

In the current times the techno-economy has prevailed and tends to consolidate itself in a highly digitized and therefore globalized world with intense processes of liberalization that has altered the rules of the game [15].

Without a doubt, this will be a new reality, very different from the one we know now. New consumers (prosumers in consequence) will have at their disposal technologies with augmented reality that will allow them to enter completely virtual scenarios. Telemedicine that would take medical science to another level of practice also virtualized. The industry will experience significant changes in the new liquid-digitized context [8].

This scenario requires new leaders, who can adapt to dynamic environments and exponential changes, increasingly difficult to predict. Technology companies will require a different leader, an XXI century leader, a techno-manager. A new manager profile will be required. A manager who understands technology, who can capture opportunities and turn them into business models, who contribute ideas and technological concepts of advanced, with high disruptive potential and reconfigure the markets. This will involve the analysis of large volumes of data and information, in real time, through electronic terminals, networks, sensors and applications.

Some authors [4] provide input on the specific qualities of disruptive leadership. These include, but are not limited to, a combination of variables such as disruptive mindset (driven by innovation), visionary and entrepreneurial skills (creativity), cognitive preparation and critical thinking (mental agility), resilience and adaptability (agility of change), empathy and social skills (agility of people), driving for success (agility of results). See Figure 8.

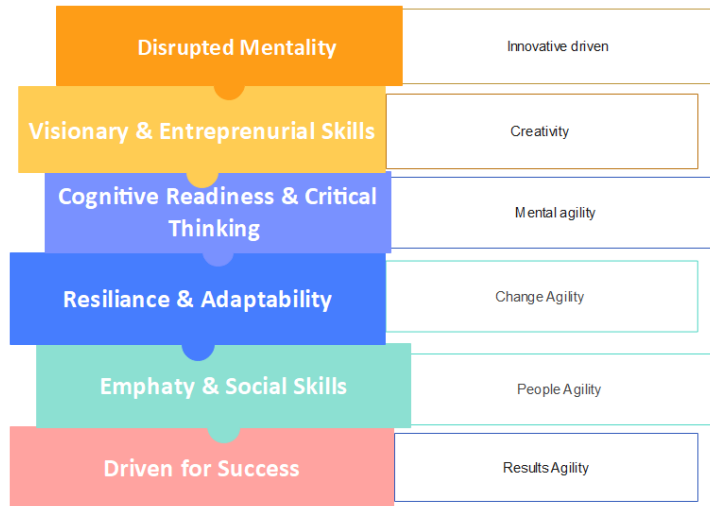


Fig. 18. The Disrupted Digital Leader Competences. [4]

The leaders of the future will live in a world dominated by technology, in all its forms and dimensions, the new manager must understand applied technology and the disruption, especially, of its interaction with the human being.[35].

In this chapter we have presented various elements that make up disruptive technologies and innovations as a strategic ally in the development of new businesses.

Disruptive innovation is highly positive and necessary for the economic development of nations and will continue to define great changes in the future. Technology is bringing about new disruptive business models that are changing the rules of the game. Disruptive innovations allow a growing customer (user) base to access products and services in a simple, friendly, and relatively low-priced way, through technologies. Disruption brings new balances, but we need to adapt quickly to the challenges it presents [41]. \

Disruptive innovation is socially necessary, since to achieve a process of transformation it is necessary to incorporate and make them participate in the citizens, which allows them to identify their needs, how to build them and make

them accessible. This is social innovation. Given the advance and exponential expansion of disruptive businesses, and their survival in highly competitive and aggressive markets, these require new leaders, disruptive leaders, with great vision and ability to adopt innovative solutions, for the sake of business competitiveness.

With the dizzying development of technology companies, and the growing immersion of the world in digital media, it is necessary to adopt a new profile of manager-tech manager. This new archetype involves a manager who understands, in its true dimension, the advances and application of technology, its potentialities and also its evolutionary nature. The tech manager will have the ability to turn technological opportunities into new business models. It should also be surrounded by ecosystems of contribution of ideas and new technological concepts, and intuit the disruptive and reconfiguration potential of the market that new technologies have.

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Multivariant and geo-statistical analysis of the effects of the COVID 19 pandemic of the microenterprise business segment in Ecuador (Province of Santa Elena Case)

Introduction

The Coronavirus outbreak crisis (Covid-19) that originated in Wuhan, China in December 2019 has spread globally to more than 200 countries, including Asia, Europe, America, and Australia.

This outbreak has been classified as a pandemic by the World Health Organization (WHO, 2019) a growing human infection (Qiu, Rutherford, Mao & Chu, 2017) which caused more than 200,000 deaths within three months of the start of the outbreak (OMS, 2020). In fact, Covid-19 recalled high infection rates and deaths compared to other outbreaks of coronaviruses such as MERS-CoV, SARS-CoV and Influenza (Liu, Gayle, Smith & Rocklov, 2020; Peeri, et al, 2020).

The effects of Covid-19 are altering the world's economies. The pandemic has disrupted tourism, global value chains and labour supply, affecting trade, investment and total production in countries leading to widespread damage to economic growth (Alonso, 2020).

Undoubtedly, the main victims of the COVID-19 outbreak are micro, small and medium-sized enterprises (SMEs) because SMEs, compared to large enterprises, are more complex in that SMEs do not have adequate and sufficient resources, especially financial and management, and are therefore not prepared to address this problem beyond what is expected (Bartik et al., 2020; Prasad et al., 2015) In Latin America, SMEs account for 99.5% of enterprises in the region, employ 60% of the economically active population and account for 25% of regional GDP (IADB, 2020).

Small and medium-sized enterprises (SMES) are the backbone of the economies. In Ecuador, SMEs have been identified as the drivers of the economy to their ability to stimulate productivity, provide employment opportunities and improve people's well-being (Abosedo & Onakoya, 2013; Ariyo, 2005).

Most small and medium-sized enterprises can be considered dependent on their daily business operations and a limited number of recurring customers (Williams & Schaefer, 2013).

For Ecuador, a country of just 17.5 million inhabitants, with a business fabric of more than 900 thousand companies in all sizes, which hosts about 3,150,000 workers with formal employment (INEC, 2019), the situation becomes extremely critical, the forecasts made by chambers of commerce, production, economic analysts and international bodies, they estimate an unemployment rate of 21% at the end of 2020, this would mean a projected loss of more than 510,000 jobs by the end of 2020, as the risk rises more and more for employees and employers, by reducing their productive equipment, which at the moment still has about 65% of semi-paralyzed business units, in a bleak picture. Unfortunately the layoffs do not stop, sales are almost nothing, without allowing to achieve the balance points for the sustainability of organizations and businesses. From what has been researched so far, it is felt and observed that the Ecuadorian businessman is already in the intensive care room, with a reserved prognosis (Ponce J, Palacios D, Palma A and Salazar G, 2020).

The Santa Elena province, one of the 24 provinces of Ecuador, has a vulnerable situation, with a population of 308,000 thousand inhabitants, 11,662 registered companies, with a multidimensional poverty rate of 38% and poverty per income of 25% and the unemployment rate is 6% (INEC, 2020a). The Santa Elena province before the pandemic, as of December 2019, despite being a tourist destination par excellence, it reported a share of business

structure (productive enterprises) of just 1% nationally, 0.7% in the share of global sales, 1% in the employment generation registered with the Institute of Social Security and the last place in the number of companies per ten thousand inhabitants (INEC, 2020b).

In this context, some studies offer some addresses for understanding and sizing the crisis from the micro-business approach. According to (Katz et al., 2020) they consider that the Covid-19 pandemic has brought challenges to the global socio-economic system and emphasize the role of digital technologies used to counteract isolation, disseminate prophylactic measures and facilitate the operation of the economic system in isolation, distancing and definitive exit.

The Zwanka & Buff (2020) study predicts that the impact of the pandemic will bring changes in consumer behavior and point out that online shopping will be a recurring practice during and after this public health problem.

In order to determine how Covid-19's confinement measures impact the economic activities of small and medium-sized enterprises in Santa Elena province, it is proposed to develop a study of the impact of the Covid-19 pandemic on small and medium-sized enterprises, in order to determine on the basis of the appreciation of SMEs in the agro-related sectors, trade, industry, services, ICT and other technological services, what is their situation in the face of the COVID-19 crisis and to size their degree of impact.

To fulfil this purpose and to check the proposed assumptions explaining the effects of the pandemic versus a system of indicators related to telework conditions, capacity of the company's response, adaptability, industrial relations, and motivation and working climate in SMEs, four phases were developed. The first, a descriptive analysis of the application of the survey technique; the second item refers to an econometric analysis of the pandemic variable.

The third phase presents the correlational hypothesis test analyzes; and finally, the geostatistical model was carried out.

This research has a methodology consisting of three phases:

1: Descriptive analysis of the application of the survey technique: At this stage, a univariate and bivariate analysis of the results is applied, where response trends are verified, and which factors have the greatest weight can be identified in a possible system of variables that explain the behavior of the ventures through Covid-19.

2: Econometric analysis of the Pandemic variable: Once the univariate trends of responses have been analyzed, it is important to identify in a single system which variables (independent) turn out to be significant at 95% confidence and that they can explain to the dependent variable (Pandemic Covid-19). A model is established with variables that identify the effects dependent on entrepreneurship under the effects of Covid-19.

3: Correlational hypothesis test analysis: At this stage, it is intended to verify the independent correlational effect of established socio-economic parameter indicators, such as: Telework; Responsiveness; Adaptability; Industrial relations; and Job motivation. This section includes variables that in a multiple linear regression system were both significant and non-significant.

4: Geostatistical model: Finally, the georeferencing process of micro-undertakings together with a covid-19 contagion model will show the areas with the highest degree of affectation in terms of the processes of: Transmission, Contagion, based on socioeconomic variables.

The data were collected cross-cuttingly in October 2020. It was applied to entrepreneurs, micro-entrepreneurs, managers and delegates of ventures and medium-sized

industries located in Santa Elena province. Through the survey technique, a total of 376 primary data were collected

1 Development and Results.

Phase 1: Descriptive analysis of the application of the survey technique.

- Within the sample raised, there were 62.77% of companies whose economic activity focuses on commerce, 26.86% dedicated to services, and minimum values related to the sectors: industrial, agricultural, technological, among others.
- The economic sectors most affected by the Covid-19 pandemic in Santa Elena proved to be commercial, services, agriculture, aquaculture, and the industrial.
- The economic sectors that, despite the crisis caused by the Covid-19 pandemic, were not significantly affected were food and technology. This result is to be expected, since with the isolation of the families, it was necessary to adequately supply food, which was a casual demand for these products accelerated to the point of feeling a shortage effect, so the food industry had to increase its production, this achieves this effect. On the other hand, for the same reason of isolation, technological resources such as computers, laptops, cameras, and the internet increased exponentially, managing to keep this economic sector active.
- According to the results between variables such as the effects of the Covid-19 pandemic and the time of the ventures, it is evident that the closure and drop in sales caused by confinement affects a young business in the same way as one that has been in the market for some time. Basically, in Santa Elena, no establishment anticipated this condition, so the experience turned out to be indifferent under these circumstances.

- As for the normal functioning of the ventures, more than half continue to advance despite the pandemic but under slowed effects, with almost zero sales.
- More than half of the ventures, although they have computer media, were not prepared to be used in telework or telecommunication. Currently, despite low sales, some invested in adequate technology to ensure that they did not disappear into competition and be viewed through digital media. The same response trend is evident in the use of specialized computing applications for these two virtual modalities.
- The administration and planning of the ventures did not incorporate risk events related to biological aspects, so from the beginning of the confinement coupled with the new modalities involved training in new uses and modalities of work and trade.
- These new work modalities did not have the expected effects, both the entrepreneurship and the execution of work from home was slowed down by external factors, from the company by new technological adaptations and at home by environmental distractions such as: family, friends, emergency situations, purchase planning under conditions of vehicular restriction and traffic lights, among others.
- It was clear that both businesses and households did not have the technological infrastructure of Wifi networks to adequately cope with all their planning under this new normal. The effect turned out to be more significant in homes, as they went from basic to premium internet service packages to better cope with all the activities carried out from home such as: tele-education, telework, entertainment and so on.
- Despite all these pandemic effects, what is expected in each of the undertakings is a slight improvement as the months go by, if the biosecurity measures referred to by the

main national health security agencies exist and are followed.

- An expected time, according to the ventures to stay under these growth parameters, is at least six more months.

- Among the main parameters of management decisions to better cope with the evolution of ventures are: Family support, support among entrepreneurship partners, and partner with other entrepreneurs. These elections have managed to keep the undertakings running, waiting for their recovery through a possible economic revival.

- Support from the authorities on duty has been scarce, slow, and insufficient. So, the internal decisions between entrepreneurs have been the union, training and a momentary forgiveness of credits and interest in arrears.

- Among the main conditions and strategies suggested by entrepreneurs to stay active under pandemic conditions are: Expert training, subsidies to finance wages, seed capital contributions, deferment of tax obligations, and in case of dismissal or completion of activity agile access to public unemployment insurance.

- One of the fundamental pillars of economic revival suggests entrepreneurs, which restrict foreign consumption to increase the domestic market, energizing the economic sectors through the projection of aggregate demand.

Phase 2: Econometric analysis of the Pandemic variable.

Econometric analysis is a mathematical modeling that guarantees, under concepts and applications of statistics and linear algebra, the significant identification of variables that explain each other under conditions of elasticity, determining a dependent variable and several independent ones. The method applied for this phase will be to estimate models under ordinary least squares (OLS) criteria.

The regression model established as a dependent variable "Impacts of Covid-19 on ventures" versus a system of indicators related to telework conditions, company response capacity, adaptation capacity, labor relations, and motivation and work environment

Table 2. *Table 3. The regression model*

Model summary				
Model	R	R square	Corrected R square	Standard error
1	,475 ^a	0,226	0,191	0,665

a. Predictor variables: (Constant), Labour regulatory facilities (employers' contributions, remote work regulation), Households do not have a quality and capacity internet connection, how do you think your entrepreneurial activity will evolve in the coming month?, Based on your projections and speculations, how long can you keep your entrepreneurship active?, What impacts is the Covid-19 crisis having on your entrepreneurial activity? , we have tools (computers) to work remotely, strengthen and facilitate access to unemployment insurance

Table 2. Coefficients ^a

Model	Non-standardized coefficients		Typed coefficients	t	Sig.
	B	SD	Beta		
(Constant)	3,333	0,418		7,974	0
What effects are the Covid-19 crisis having on your entrepreneurial activity?	-0,251	0,081	-0,237	-3,1	0,002
Do we have tools (computers) to work	0,282	0,116	0,19	2,428	0,016
Households do not have a quality and capacity internet connection	0,319	0,116	0,214	2,741	0,007
How do you think your entrepreneurial activity will evolve in the coming month?	-0,1	0,046	-0,165	-2,162	0,032
Based on your projections and speculations, how long can you keep your entrepreneurship active?	-0,088	0,041	-0,155	-2,136	0,034
Strengthen and facilitate access to unemployment	-0,135	0,071	-0,232	-1,904	0,049
Labour regulatory facilities (employers' contributions, remote work regulation)	-0,162	0,073	-0,269	-2,221	0,028

a. Dependent variable: What extent is the current Covid-19 crisis negatively impacting the mood and motivation of the entrepreneurial team?

Depending on the econometric conditions of the model, they establish a square r close to 50%, in other words, the generated model maintains a relevant significance condition between the dependent variable and the explanatory variables that were significant.

Applying a methodology from the general to the particular in terms of eliminating variables that turned out to be statistically insignificant (significance less than 5%), seven variables prevail that meet adequate conditions to remain in the system estimated under OLS. Here is his explanation:

The negative sign of the variable “Effects of the pandemic” establishes that as adverse conditions to the normality that we were used to present arise, these effects negatively condition the enterprise and its operation.

The positive sign of the variable "Tools to work (computers)" highlights the importance of having the electronic means necessary for the free exercise of an enterprise, to the point that if these are overcrowded, the impacts of the pandemic in micro-enterprises.

The positive sign of the variable "Internet at home" establishes the basic and efficient condition of connectivity, as houses are affected by connection, this increases the possibilities of overloading the impact of the pandemic on businesses.

The negative sign of the variable "Evolution of entrepreneurial activity" inversely conditions the negative effects of the pandemic, since if there are favorable contexts of economic reactivation, the impacts of the pandemic on businesses are significantly reduced.

The negative sign of the variable “Estimated time of activity of the enterprise” refers to the fact that as stability policies and economic reactivation of the enterprise are maintained, the impacts on them due to the pandemic will be less and less.

The negative sign of the variable "Access to unemployment insurance" inversely conditions the negative effects of the pandemic on businesses, because as there are guarantees of access to unemployment insurance, companies and / or businesses can be activated by temporarily reducing personnel, until an ideal state is achieved, to rehire the dismissed personnel, meanwhile it is guaranteed that the worker receives a proportional monthly income.

The negative sign of the variable "Labor regulations" also establishes an inverse condition against the impacts of the

pandemic, because by knowing adequately the interpretations of regulations and laws under health emergency conditions, the enterprise may be subject to benefits that help to form a field of economic reactivation from the state.

Phase 3: Correlational hypothesis test analysis.

The variables to be contrasted are qualitative cross-sectional, or at least a quantitative-qualitative combination, therefore the technique to verify the existence of a relationship between them turns out to be Pearson's Chi-Square.

The Chi-Square technique involves the formulation of two types of hypothesis, the null and the alternative. To test hypotheses and define which is accepted and rejected, specialized statistical software (SPSS) will be applied.

According to the statistical process, if the value of significance (bilateral) turns out to be greater than 0.05 (95% confidence), the null hypothesis is accepted, confirming the non-existence of some type of relationship; but if it turns out to be lower, the null hypothesis is rejected in favor of the alternative, that is, if there is a relationship between the study variables. Here are the results:

H₀: There is no relationship between the variables "Covid-19 impacts on SMEs" and "Business time".

H_a: There is a relationship between the variables "Impacts of Covid-19 on SMEs" and "Business Time".

Table 4. *Chi-square test A*

	Value	gl	Asymptotic Sig. (bilateral)
Pearson's Chi-square	23,674 ^a	12	0,023
Likelihood ratio	27,049	12	0,008
Linear-to-linear association	0,717	1	0,397
N of valid cases	376		
a. 5 squares (25.0%) have an expected frequency of less than 5. The minimum expected frequency is .43.			

According to the test data and significance, the null hypothesis is rejected in favor of the alternative, that is, “there is a relationship between these variables”, which implies, according to the data, that despite the existence of years of experience and learning economies of entrepreneurship, this if it can be affected by the pandemic.

Ho: There is no relationship between the variables "Impacts of Covid-19 on SMEs" and "Telework".

Ha: There is a relationship between the variables "Covid-19 impacts on SMEs "and "Telework".

Table 5. *Chi-square test B*

	Value	gl	Asymptotic Sig. (bilateral)
Pearson's Chi-square	21,463 ^a	12	0,003
Likelihood ratio	22.365	12	0,007
Linear-to-linear association	0,423	1	0,321
N of valid cases	376		
a. 5 squares (25.0%) have an expected frequency of less than 5. The minimum expected frequency is .43.			

According to the test data and significance, the null hypothesis is rejected in favor of the alternative, that is, there is a relationship between these variables, which implies, according to the data, that the telework conditions that are generated within the enterprise do affect positive or negative, so an adequate teleworking and communication environment from home must be guaranteed.

Ho: There is no relationship between the variables "Covid-19 impacts on SMEs" and "Adaptability".

Ha: There is a relationship between the variables "Impacts of Covid-19 on SMEs" and "Adaptability".

Table 6. *Chi-square test C*

Chi-square tests		
Value	gl	Asymptotic Sig. (bilateral)
58,056 ^a	18	0,0000
56,676	18	0,0000
29,277	1	0,0000
376		
a. 15 squares (53.6%) have an expected frequency of less than 5. The minimum expected frequency is ,06.		

According to the test data and significance, the null hypothesis is rejected in favor of the alternative, that is, there is a relationship between these variables, which implies, according to the data, that if the appropriate adaptation conditions are met within the enterprise, this will cause a contraction of the negative conditions of the pandemic, improving the good administrative and commercial performance of the enterprise, as long as spaces are created for adaptation and institutional survival.

H₀: There is no relationship between the variables "Impacts of Covid-19 on SMEs" and "Motivation and Working Climate".

H_a: There is a relationship between the variables "Impacts of Covid-19 on SMEs" and "Motivation and Working Climate".

Table 7. Chi-square test D

Chi-square tests			
	Value	gl	Asymptotic Sig. (bilateral)
Pearson's Chi-square	28,648 ^a	12	0,004
Likelihood ratio	30,758	12	0,002
Linear-to-linear association	0,503	1	0,478
N of valid cases	376		
a. 5 squares (25.0%) have an expected frequency of less than 5. The minimum expected frequency is .45.			

According to the test data and significance, the null hypothesis is rejected in favor of the alternative, that is, there is a relationship between these variables, which implies, according to the data, that if the conditions of economic reactivation are guaranteed under parameters of motivation and stimulus of the work environment within the enterprise, it will be possible to reduce the impact related to the pandemic.

Phase 4: Geostatistical analysis.

For Covid-19 geostatistical contagion analysis, socioeconomic variables are established that are significant to explain the state of contagion or not in the population, especially SMEs.

To do this, a logistical probability model (logit) is first established that shows what variables explain a population's contagion trends in each territory.

The econometric model to be tested is as follows:

$$P(y = 1|x) = \lambda(++++.....+\beta_0\beta_1x_1\beta_2x_2\beta_kx_k) \quad (1)$$

Where:

$P(y = 1) = \lambda$ Probability that a person will be infected

$P(y = 0) = (1 - \lambda)$ Probability that a person is not infected

Being the variables:

$\beta_1 = \text{Overcrowding}$; Significance: 0.02

$\beta_2 = \text{Does not have public insurance}$; Significance: 0.043

$\beta_3 = \text{Can not read or write}$; Significance: 0.08

$\beta_4 = \text{Population over 65 years}$; Significance: 0.001

$\beta_5 = \text{Work outside the locality}$; Significance: 0.098

$\beta_6 = \text{Informal work}$; Significance: 0.03

The database that was applied is the one determined under the projections of the INEC (2020) for the cross-sectional provincial territory. Following the methodology from the general to the particular, variables that did not turn out to be significant to explain the socioeconomic conditions of contagion were eliminated. Therefore, the variables that must remain in the model are (significance less than 0.05): Overcrowding, not having public insurance, population over 65 and informal work.

This resulting model only determines which variables explain the contagion condition or not of a population, a dichotomous stage, therefore, to calculate the level of probability, based on the variables present in the territory where the micro-enterprises are located, it is applied the following transform reference:

$$\lambda(z) = \frac{\exp(p)}{1+\exp(p)} \quad (2)$$

The value of (p) is the result of replacing variables that turned out to be significant in the main logit model, present in the territorial context of census micro-undertakings. By replacing them in expressions (2), values between 0 and 1 are obtained, which reflect the probability of being infected under the parameters set in each territorial context.

By possessing, for each data raised from the undertaking, its probability of contagion based on the territory, is elaborated by means of a frequency table to establish more detailed ranges of probabilistic contagion scenarios, below the reference values:

Table 8. *Probabilistic contagion scenarios*

Range (%)	Probability status
81 – 100	Very high probability
61 - 80	High probability
41 – 60	Median probability
21 – 40	Low probability
0 – 20	Very low probability

The values, for a better territorial understanding, through the application of vector layers, and multi-criteria over position methodology, are generated by means of a GIS software heat maps references under the territorial context of the ventures, the result below:

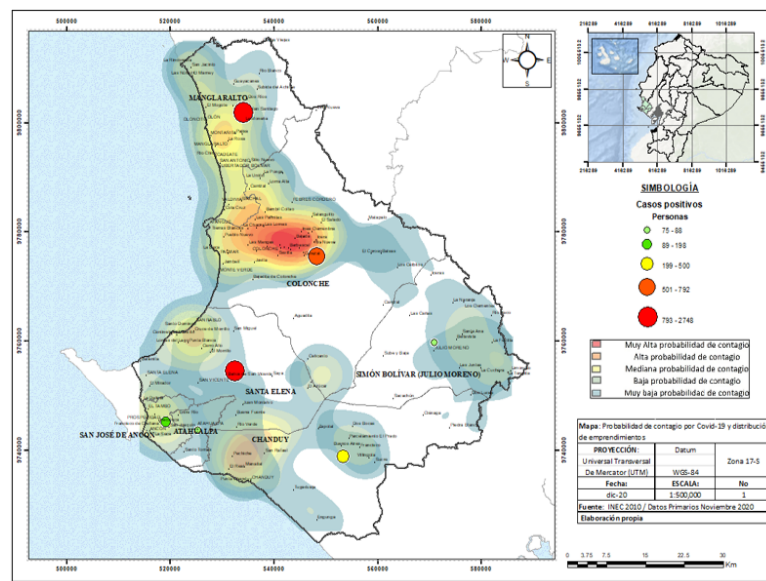


Fig. 19. Geostatistical Map.

Values with a larger scale of reds have a higher tendency to contagion by Covid-19, while a larger scale of greens results in lower risk.

According to the locations of the SMEs translated into heat map colors, those that have, according to their geographical location, a greater tendency to contagion and therefore impact on their business development, marketing and sales of their products turn out to be the ones located in the centers of the cantonal and parochial capitals; those close to tourist places such as the beach; located in shopping centers; and concentrations of informal trade demonstrations.

All the SMEs close to these territorial conditions are those that have, under the multicriteria model and heat maps, the greatest probability of being affected in terms of their administrative, commercial, and human talent development. So yes, at the beginning of 2021, management policies that address continuous improvement and biosafety measures are not incorporated under the parameters of the variables that turned out to be significant in the logit model, the enterprise will have fewer and fewer opportunities for its activation. and economic recovery over time.

The study determined that there is a relationship between COVID-19 and the variables (hypotheses) determined in phase 2, namely:

a) Time of permanence of the SMEs in the market, which involved that despite the experience generated over time since its creation and knowledge of the business acquired, it can be directly affected by the pandemic.

b) Telework, in other words, although the teleworking conditions and environments were modeled based on a positive or negative impact of COVID-19, an adequate teleworking and communication environment from home must be guaranteed.

c) Adaptability. Today SMEs should aspire to implement new management models that promote resilience, accept failures, value differences, and encourage the expression of what is new and critical analysis of what is current as the only formula not to succumb to the dramatic changes they face today. accelerated by COVID-19, such as digital transformation, automation, and new skills

d) Motivation and the working climate. Motivation is dynamic, it is in constant flux, it is a state of perpetual growth and decline. The crisis caused by the pandemic further accentuated this aspect. Motivation also implies a qualitative change, along with a pleasant and proactive environment where its members feel fulfilled and assume the values of

the brand, for all this, motivation in times of crisis, and at any other time, is a good investment for SMEs.

The geostatistical analysis carried out in phase 4 allowed the identification of geographic areas with greater or lesser exposure to contagion by Covid-19, in the population, especially SMEs. This will allow the generation of public policies for a better handling of the crisis. Since if social distancing is required to be maintained for a considerable period, then a profound transformation of the business cycle dependent scheme is required towards an intertemporally sustainable and crisis-proof economy; that is, the construction of a resilient economy. (Lange and Santarius, 2020)

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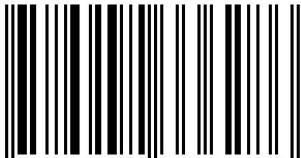
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ISBN: 978-9942-33-628-6



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