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INFORMATION AND COMMUNICATION TECHNOLOGY INCORPORATION FOR BUSINESS COMPETITIVENESS IN NORTE DE SANTANDER'S MINING SECTOR

北德桑坦德采矿业的商业竞争力信息和通信技术公司

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Abstract

Currently, Information and Communications Technology (ICTs) are considered great allies in chalking up business strategies, and it has been known that thanks to it, different productive and service sectors have been benefiting in different ways such as increased productivity, improvements in the quality of work of employees, and streamlining of processes, among others. This study aims to describe the current situation of the use of ICTs by the mining sector in Norte de Santander (Northeastern Colombia) and the impact on competitiveness. The developed methodology derives from the positivist paradigm, implementing a quantitative approach. This study was based on an analysis carried out by the mining companies of Norte de Santander on the use of ICTs, and the information was collected through the application of surveys. From the results obtained by applying the data from the surveys to the running of companies, it could be inferred that companies in the mining sector of Norte de Santander have shortcomings in terms of including ICTs in business strategies and in the use of these tools for employee training. On the other hand, the use of basic technologies and the competitiveness in the supply and demand of products and services are at a medium level. In conclusion, mining companies fail to take advantage of the potential that ICTs offer in the business world, which today is a necessity for competitiveness in a global context marred with crises like the ones caused by the COVID-19 pandemic.

Keywords: Information and Communication Technology, Competitiveness, Mining Sector

摘要 目前，信息和通信技术被认为是制定业务战略的重要盟友，众所周知，得益于它，不同的生产和服务部门以不同的方式受益，例如提高生产力、提高员工的工作质量 ，以及简化流程等。本研究旨在描述北桑坦德（哥伦比亚东北部）采矿业使用信息和通信技术的现状及其对竞争力的影响。开发的方法源于实证主义范式，实施定量方法。本研究基于北桑坦德矿业公司对信息和通信技术的使用进行分析，并通过调查应用收集信息。根据将调查数据应用于公司运营所获得的结果，可以推断出北桑坦德矿业公司在将信息和通信技术纳入业务战略以及使用这些技术方面存在不足 员工培训工具。另一方面，基础技术运用、产品和服务供需竞争力处于中等水平。总而言之，矿业公司未能利用信息和通信技术在商业世界中提供的潜力，而如今，在充满新冠肺炎 大流行病等危机的全球背景下，这已成为竞争力的必要条件.

关键词: 信息和通信技术、竞争力、采矿业

I. INTRODUCTION

Dynamic social development also implies technological development. Thus, ICTs are great allies when it comes to business strategies, where sustainable companies are those that, apart from funds, rely on receiving training on the proper use of ICTs to optimally exploit these tools. This is because merely having such tools does not set any guidelines for the company and/or its management; instead, it is how they are implemented and made part of a strategy, i.e., they become the medium to conduct the purposes of the company [1]. There is no question that progress in these areas have led to a reconfiguration of the world population in its different aspects [2] such as social, cultural, political, and financial; impacting he ways to interpret citizenship, identities, territories, nations, rights, etc. These companies are also not exempt from them. Nowadays, people have started to use different types of mobile apps for ride-sharing, transport, delivery of food, and so on [3].

The aforementioned purposes refer not only to selling more but also to positioning, expanding to new markets, Therefore the need for creating this article arises, demonstrating that they do not use ICTs in the mining sector, or in contrast, it is very minimal that, if they have been implemented; this sector and being competitive not only regarding production but also quality, price, and service. All this is achieved through the good use of ICTs; however, many companies currently show flaws. This is because, since they do not propose any solutions based on current issues, the potential of the technological era is not being exploited [4]. In addition, a business logic that includes ICTs in its dynamics understands that the world in general is permanently changing, facing new challenges in the social, innovating each of its processes, improving through technology the quality of its products and the work environment of its employees since they leave political, cultural and financial areas, the approach to which will be more bearable when accompanied by science, technology and innovation and thus be able to continue entering the market more and more because it is very well known that a company that does not use ICT may not be able to continue in the market.

II. METHODOLOGY

This article is derived from research based on the positivist paradigm, which perceives the uniformity of phenomena. This paradigmatic current relegates human subjectivity and seeks empirical verification of events and their causes [5]. Therefore, approaching the study's subject-matter from this paradigm helps explain its realities, which, in this case, are the mining companies. It is sought to present and predict the issues resulting from the lack of use of ICT tools really. We cannot ignore the world crisis that broke out in 2019; the Covid-19 pandemic was first detected in Wuhan, China, rapidly escalating and spreading worldwide, and becoming a global infection [6]. It had a significant impact on several commercial sectors in Colombia, especially in the business sector.

The approach is also quantitative; the authors [5] state that this approach understands science as a description of phenomena supported by facts provided by the senses and does not bother explaining them. Therefore, a detailed description of the current issues experienced by mining companies regarding the use of ICTs can be provided.

Also, methodological design is non-experimental since, according to [5], it is done without manipulating any variables deliberately. In other words, the existing variables can be used

with this design. “ICTs” are an independent variable in this project and “mining companies” is a dependent variable, which are not manipulated or modified, only analyzed. The research type is field research, consisting of the collection of data directly from the reality in which events occur, without manipulation or controlling of any variables [5]. Since the data collection is done directly in each mining company, it is necessary to conduct a possible review in case any questions arise.

This article has a “descriptive level,” since it seeks to interpret the realities of fact. It includes description, registration, analysis, and interpretation of the current nature, composition, or processes of phenomena [5]. Furthermore, it is also at a “projective level,” which “tries proposing solutions to a specific situation. It implies exploring, describing, explaining, and proposing alternatives for change, and do not necessarily conduct the proposal” [5]. In short, these levels make the final research complete by describing the process performed with the researched phenomena, such as the use of ICTs in mining companies and obtaining supplies for a proposal of change

It was divided into three phases.

Phase one — diagnosis of the current status of ICTs in the mining sector companies in Norte de Santander. In this phase, the phenomenon to be researched and how it acts in its environment are observed, for diagnosing the current status of mining companies with regard to the use of ICTs.

Phase two — ICT use identification: In this second phase, the variables used for the growth of business competitiveness are analyzed to detect which ICT tools favor the operation of mining companies in the city of Cucuta.

The survey technique was used for this purpose, employing a questionnaire as a tool that contributed to providing a diagnosis of the companies regarding the use of ICTs, taking into account that the population for this research is finite, composed of the companies of the mining sector of Norte de Santander registered with the chamber of commerce. Thus, as shown in Table 1, 766 companies are taken as a sample, divided into 5 subsectors depending on their business activity. On the other hand, to define said population, a comparison was made of the companies dedicated to the Mine and Quarry Operation in Norte de Santander that are registered in entities and associations such as: Einforma Colombia, Asocarbon, Aprocanor, the National Mining Agency, and the information contained in the software “compite360.”

Table 1.
Classification of the mining companies of Norte de Santander

	CIIU	CIIU Description	Sector	Subsector	Number of Companies
Business Activity	0510	Hard coal extraction (Black Coal)	Mine and quarry operation	Black coal and lignite extraction.	629
	0811	Stone, sand, common clay, gypsum, and anhydrite extraction		Other mines and quarry extraction.	110
	0722	Gold and other precious metal extractions		Metal ore extraction.	4
	0990	Supporting activities for other mine and quarry operation activities		Support service activities for mine and quarry operations	23
	0610	Crude oil extraction		Crude oil and natural gas extraction	0
	Total				766

Similarly, the following selective criteria were used for performing sampling: first, the company must have been in operation for at least one year; secondly, the date of renewal must be in 2017 and they must be companies in good standing, meaning that they must not be undergoing a liquidation process; thirdly, the company address must be within the urban center.

The sampling strategy used in the research was a complex sample. Here, random, stratified, multistage, and cluster sampling were applied. To achieve the goals set, the above criteria were considered, resulting in 106 companies from the mining sector.

The procedure is described and the criteria used for such purpose substantiated below:

Stratification was based on the assumption that the population is heterogeneous in the interest variable, meaning, in the use of ICT´s. Additionally, the population was divided in internally homogeneous and externally heterogeneous strata — mutually exclusive and collectively exhaustive. The stratification variables are economic subsectors for the mining area.

Due to the non-existence of an observation

unit sampling framework, cluster sampling was performed within each previously defined stratum. Here, the clusters were the companies themselves, which were selected through probability proportionate to size sampling, determined in accordance with the number of workers in each company, so that, the higher the number of employees, the higher the probability of being chosen.

Once the company was selected, simple random sampling was performed to complete the count of the total number of workers. This procedure was repeated in each chosen cluster, as long as the required size was smaller than the number of employees.

The selection method was random, both for primary units (companies), as well as for information units (subjects). The sample was extracted using the SPSS complex sample module, storing the weights, the probabilities of inclusion, and the factors of expansion to be used at the time of processing results in the database.

To calculate the sample size, (Equation 1) was used. This formula allows obtaining the required number of subjects to estimate binomial proportions in stratified populations, with an established margin of error and a preset confidence level. To that effect, the following was assumed: 1: maximum absolute error of 5%, 2: confidence coefficient z = 1.96 (95%), 3: maximum indetermination in each stratum (pi = qi = 0.50), 4: non-response rate of 25%, and 5: design effect of 1.25. After obtaining the total sample size, the number was distributed according to proportional setting.

Finally, and to determine the number of clusters to sample, the amount of employees required per stratum was divided by the average number of workers in each one, thus obtaining a precise estimate of the number of clusters that had to be chosen. The calculations, equations, and mathematical procedures are shown below.

Table 2.
Description of the sampled population according to strata, number of workers, and number of companies

Stratum	No. of companies	No. of workers
Mining sector		
Sector 1: Support service activities for mine and quarry operation	3	26
Sector 2: Black coal and lignite extraction	83	2038
Sector 3: Metal ore extraction	1	15
Sector 4: Other mines and quarry extraction	19	408
Total	106	2487

The equation for calculating when to use proportional allocation according to Thompson et al. [5] is as follows:

$$n = \frac{\sum_{i=1}^{H}\left(N_i\sqrt{p_i q_i}\right)^2}{\left(\frac{NE}{z}\right)^2 + \sum_{i=1}^{H} N_i p_i q_i}. \quad (1)$$

Applying Equation (1) to each case results in:

$$n_{SM} = \frac{(1244)^2}{\left(\frac{2487\times 0.05}{1{,}96}\right)^2 + 622} = \frac{1\,547\,536}{4025{,}13 + 622} = 333{,}01 \cong 334$$

Therefore, if we wish to estimate the proportion of workers who used ICTs specifically with a confidence level of 95% and a maximum admissible error of 5%, 334 mining sector employees would be needed.

Now, to perform an optimal distribution of this number, both the weight of the stratum as well as its variance are considered. The following equation is used:

$$n_i = \frac{n w_i p_i q_i}{\sum_{i=1}^{H} n w_i p_i q_i}. \quad (2)$$

Executing this each of the sector's sub-populations results in the amounts shown in Table 3.

Finally, and once the number of companies is determined, we proceeded to their selection as described at the beginning of this document. The companies selected are shown in Table 4.

Table 3.
Data for calculation of sample size for mining sector research

Stratum	N_i(comp.)	N_i(work)	w_i	p_i	q_i	$w_i p_i q_i$	$N_i p_i q_i$	$N_i\sqrt{p_i q_i}$
Sector 1	3	26	0,0105	0,50	0,50	0,00	7	13
Sector 2	83	2038	0,8195	0,50	0,50	0,20	510	1019
Sector 3	1	15	0,0060	0,50	0,50	0,00	4	8
Sector 4	19	408	0,1641	0,50	0,50	0,04	102	204
Total	106	2487	1,0000			0,25	622	1244

Table 4.
Sample extracted for research to be performed in the mining sector

Stratum	Company*	No. of workers	Action	Final n
Sector 1	ES1_001	3	Select all	3
Sector 2	ES2_002	85	Select 40 from 85 randomly	40
	ES2_011	250	Select 119 from 250 randomly	119
	ES2_018	60	Select 28 from 60 randomly	28
	ES2_020	15	Select 7 from 15 randomly	7
	ES2_035	250	Select 119 from 250 randomly	119
	ES2_052	131	Select 62 from 131 randomly	62
	ES2_071	52	Select 25 from 52 randomly	25
	ES2_072	55	Select 26 from 55 randomly	26
Sector 3	ES3_001	15	Select all	15
Sector 4	ES4_004	100	Select 40 from 100 randomly	40
	ES4_014	15	Select 6 from 15 randomly	6
	ES4_016	40	Select 16 from 40 randomly	16
	ES4_017	60	Select 24 from 60 randomly	24
Total				530(2)

* The real name of the company is not shown due to confidentiality. The researchers handle the original database with the company identification.

III. Results and Discussion

To develop results, it was necessary to apply the tool to the target population described in the aforementioned sampling plan, we had the support of the ICT Secretary to contact said population, who set up a work table with representatives of the Secretariat of Mines and Energy of Norte de Santander as well as of the Chamber of Commerce and the Departmental Council for Competitiveness, where the project and its benefits for the sector were presented. The support of these entities was necessary to approach the 14 selected mining sector companies of the department. Thus, the secretary of Mines and Energies of Norte de Santander sent the letters requesting the collaboration of said companies to apply the surveys to their employees from the administrative area. The letter was sent digitally by the secretary to each of the 14 companies, of which only 11 accepted to collaborate and 3 rejected the request.

The results obtained in the sector in accordance with the information collected in the applied surveys are described below, distributed as shown below in Table 5.

Table 5.
The distribution of companies participating in the mining subsector survey

Sector name	Total companies sampled population	Total collaborative companies	Total non-collaborative companies
Sector 1: Support service activities for mine and quarry operation	1	1	0
Sector 2: Black coal and lignite extraction	8	6	2
Sector 3: Metal ore extraction	1	1	0
Sector 4: Other mines and quarry extraction	4	3	1

A. Diagnosis of the Current Status of the Use of Information and Communication Technologies for Business Competitiveness in the Mining Sector in Norte de Santander

Following the variable map guidelines, the survey assessed seven sub-dimensions grouped into three Dimensions: ICTs, Competitiveness, and Education. Additionally, to establish the ranges for the low, medium, and high levels, a scale was previously created where the number of items in the tool assessing both dimensions and sub-dimensions were taken into account. The results were thus tabulated using the software SPSS.

Table 6 corresponds to the technology dimension scale, made up by 114 items in the tool. The low level ranges from 114 to 151, the medium level ranges from 152 to 303, and the high level ranges from 304 to 570.

Table 6.
Technology dimension scale

TD1: Total Technology Dimension	
Number of items	114,00
Minimum item score	1,00
Maximum item score	5,00
Minimum dimension score	114,00

Continuation of Table 6		
Maximum dimension score	570,00	
Dimension range	456,00	
Number of categories in the scale	3,00	
Range of scale	152,00	
Low level	114,00	151,00
Medium level	152,00	303,00
High Level	304,00	570,00

Taking the above scale into account, we are presented with the technology dimension, where it is established, as per the results obtained, that the mining sector in Norte de Santander is currently at a medium level regarding the use of technologies for the daily operation of the processes inherent to the sector; additionally, a confidence interval of 95% with a range from 84.3% to 94.2%, where the result of the estimated value is equal to 90.3% in comparison with 2.6% at the low level and 7.1% at the high level. This dimension is divided as well into three sub-dimensions (information, communication and data flow), where the stated results reveal the frequency of use in the sector in more depth (Table 7).

Table 7.
Total corrected technology dimension

		Estimate	95% Confidence Interval	
			Lower	Upper
% of Total	Low Level	2,6%	0,4%	15,6%
	Medium Level	90,3%	84,3%	94,2%
	High Level	7,1%	4,1%	11,9%
	Total	100,0%	100,0%	100,0%

On the other hand, Table 8 corresponds to the information scale, which is made up of 46 items in the tool out of the 114 technology dimension items, which results in a low level ranging from 46 to6 0.33, a medium level of 61.33–121.67, and a high level of 122.67–230.

Table 8.
Scale for the information sub-dimension

TS1: Total information sub-dimension (data storage and processing)		
Number of items	46,00	
Minimum item score	1,00	
Maximum item score	5,00	
Minimum dimension score	46,00	
Maximum dimension score	230,00	
Range of dimension	184,00	
Number of categories in Scale	3,00	
Range of scale	61,33	
Low level	46,00	60,33
Medium level	61,33	121,67
High level	122,67	230,00

Table 9 establishes that, in accordance with the results obtained, the information sub-dimension regarding data processing and storage in the mining sector in Norte de Santander is currently at a medium level, with a confidence interval of 95% as well, the range of which falls between 64.2% and 77.5%, where the result of the estimated value is equal to 71.3% in comparison with 2.6% at the low level and 26.1% at the high level.

Table 9.
Total corrected information sub-dimension (data storage and processing)

		Estimate	95% Confidence Interval	
			Lower	Upper
% of Total	Low Level	2,6%	0,4%	15,6%
	Medium Level	71,3%	64,2%	77,5%
	High Level	26,1%	16,9%	38,0%
	Total	100,0%	100,0%	100,0%

Table 10 corresponds to the scale of sub-dimension communication, made up of 24 items in the tool out of the 114 technology dimension items, resulting in a low level of 24–31, a medium level of 32–63,and a high level of 64–120.

Table 10.
Scale for the communication sub-dimension

TS2: Total communication sub-dimension		
Number of items	24,00	
Minimum item score	1,00	
Maximum item score	5,00	
Minimum dimension score	24,00	
Maximum dimension score	120,00	
Range of dimension	96,00	
Number of categories in Scale	3,00	
Range of scale	32,00	
Low level	24,00	31,00
Medium level	32,00	63,00
High level	64,00	120,00

Table 11 establishes that, in accordance with the results obtained, the second sub-dimension corresponding to the use of ICTs for communication, both in internal (employees) and external (clients, suppliers) level, in the mining sector in Norte de Santander is currently at a medium level, with a confidence interval of 95% as well, the range of which falls between73.7% and 88.2%, where the result of the estimated value is equal to 82.1% in comparison with 10.8% at the low level and 7.1% at the high level.

Table 11.
Total corrected communication sub-dimension

		Estimate	95% Confidence Interval	
			Lower	Upper
% of Total	Low Level	10,8%	6,1%	18,6%
	Medium Level	82,1%	73,7%	88,2%
	High Level	7,1%	4,1%	11,9%
	Total	100,0%	100,0%	100,0%

Similarly, Table 12 shows the scale for the competitive factor dimension, made up of 42 items in the tool; the ranges for the levels are established as follows: low level ranges from 42 to 55, the medium level ranges from 56 to 111, and the high level ranges from 112 to 210.

Table 12.
Scale for the competitiveness dimension

TD2: Total competitive factor dimension		
Number of items	42,00	
Minimum item score	1,00	
Maximum item score	5,00	
Minimum dimension score	42,00	
Maximum dimension score	210,00	
Range of dimension	168,00	
Number of categories of scale	3,00	
Range of scale	56,00	
Low level	42,00	55,0
Medium level	56,00	111,00
High level	112,00	210,00

As previously mentioned, the second dimension assessed was competitiveness, which refers to the frequency with which ICTs are used in mining companies. Thus, in accordance with Table 13, the results obtained establish that the mining sector in Norte de Santander is currently at a low level. They also have a confidence interval of 95%, the range of which falls between 60.0%–79.7%, where the result in the estimated value is equal to 70.8% in comparison with 11.5% at the low level and 17.7% at the high level.

Table 13.
Total corrected competitiveness factor dimension

95% Confidence Interval				
		Estimate	**Lower**	**Upper**
% of Total	Low Level	11,5%	7,2%	17,9%
	Medium Level	70,8%	60,0%	79,7%
	High Level	17,7%	11,1%	26,9%
	Total	100,0%	100,0%	100,0%

Additionally, Table 14 shows the scale corresponding to the last dimension, education, which is made up of 20 items in this tool, where the ranges for the levels are established in this table as follows: the low level ranges from20 to 25.67, the medium level ranges from 26.67 to 52.33, and the high level ranges from 53.33 to 100.

Table 14.
Scale for the education dimension

TD3: Total education dimension		
Number of items	20,00	
Minimum item score	1,00	
Maximum item score	5,00	
Continuation of Table 14		
Minimum dimension score	20,00	
Maximum dimension score	100,00	
Range of dimension	80,00	
Number of categories of scale	3,00	
Range of scale	26,67	
Low level	20,00	25,67
Medium level	26,67	52,33
High level	53,33	100,00

Finally, the last dimension assessed was education, meaning the frequency with which ICTs are used by mining companies of Norte de Santander to provide training to their employees. Table 15 states, in accordance with the results obtained, that these companies are currently at a low level. They have a confidence interval of 95% as well, the range of which falls between 90.6% and 98.0%, where the result in the estimated value is equal to 95.6% in comparison with 4.4% in the medium level.

Table 15.
Total corrected education dimension

		Estimate	**95% Confidence Interval**	
			Lower	**Upper**
% of Total	Low Level	95,6%	90,6%	98,0%
	Medium Level	4,4%	2,0%	9,4%
	Total	100,0%	100,0%	100,0%

B. Information and Communication Technologies Used by Companies for Competitiveness in the Mining Sector in Norte de Santander

Following the diagnosis made on the frequency of ICT use in the mining companies of Norte de Santander, and taking said results into account, the companies showing a greater use were identified. Additionally, the established dimensions and their respective sub-dimensions are taken into consideration.

First, the technology dimension is divided into three sub-dimensions, to wit: the first covers the information part (data storage and processing), in which the mostly used tools were identified as: Desktop computer, Smart phones, Hard Drive, USB Memory, Scanner, Printer, Windows 7 Operating System, Excel, Outlook, Word, Power Point, Avast anti-virus, Media Player device, and the Adobe Acrobat Reader DC PDF viewer. Regarding the second sub-dimension of "Communication," the ICT tools used by the mining companies of Norte de Santander to communicate with clients, suppliers, and staff are Gmail, Outlook, Google+, and WhatsApp. Finally, in the data flow sub-dimension, the ICT tools used the most by the mining companies in Norte de Santander are: Google Chrome, Internet, Email, and Microsoft Office package (Word,

Excel, Power Point, Publisher) etc. According to this, the mining companies of Norte de Santander are at a medium level in this dimension.

On the other hand, regarding the competitive factors dimension (use of ICTs to position themselves in the market);this dimension is divided, in turn, into three sub-dimensions, the first of which is supply (control of products and services offered by the company to the consumer).In this sub-dimension, the mostly used ICT tools were Excel and business email. The second sub-dimension is demand (amount of goods and services that the client wants to acquire), where the following tools were identified: Landline phone, smartphones, Email, Hardware, Software, and Internet. This means that the aforementioned tools are used to communicate with clients to establish priorities for the production of goods and services. The third sub-dimension is a business strategy (connection between ICTs and business results), which is at a low level in this case, which shows that companies do not use ICTs as part as of their strategies.

Regarding the education dimension (or employee training through ICTs), a little use was seen, meaning that the mining companies of Norte de Santander do not use ICTs to train human resources.

In accordance with the above, it is necessary that the mining sector of Norte de Santander incorporates ICTs in their operations on a larger scale as a response to the current needs of the sectors, the market, and today's world. According to Lopez [8], the Colombian mining sector is facing significant challenges derived from a number of controversies due to the impact of mining on the environment, which require the adoption of guidelines to regulate the sector such as those from Global Compact, GRI, Icmm, the World Bank, IFC, ISO 14000 environmental standards, and the AA 1000 Standard. These guidelines include a technological and communicational development perspective.

In this sense, Restrepo [9], points out that the mining sector "has an advantage compared with other economic sectors because the activity is carried out in isolated environments (through machines, in remote areas etc.), which has induced the sector to improve their communication systems between machine, man, and environment," this advantage enables strengthening theICT incorporation plans of mining companies in Norte de Santander.

IV. CONCLUSIONS

To conclude, this study allows us to establish that the mining companies of Norte de Santander are in a medium level of ICT use, they have acquired basic software and hardware for the daily duties performed by the workers to accomplish the goals established by the company, but cannot take advantage of the full potential offered by technology for their operations. This situation compels designing a strategy to strengthen the incorporation of ICTs within the full structure of mining companies [10], [11], [12], [13], 14].

Similarly, it is shown that the mining sector makes little investment in technology. Companies emphasize production and sales traditionally, failing to take advantage of the use of technologies, which can help expand to new markets, thus increasing production and sales and, therefore, their sustainability [15], [16], [17.]. Several studies positively relate technical and technological intelligence with competitiveness in companies, thus highlighting the possibility that they offer for Innovation and the development of technical capacities [18)

Moreover, the education dimension shows a low level of ICT use for employee training.It is also important to point out that the strategy for ICT use is a tool ready to be implemented in business management, where ICTs area means to consolidate the goals and objectives of every company [18], [19], [20]. The advantages offered by inserting ICT in training processes of all kinds are recognized, since it is not restricted to the synchronous meeting and its limitations, but rather contemplates the management of asynchronous interactions in response to the needs of the employees. On the other hand, these tools allow other resources that may be more appropriate to the company's product and that can be configured according to its particularities: software, specialized platforms, among others. [19], [20], [21], [22].

Finally, it is important to value the needs of the context; in this sense, it is critical to have the capacity to respond to potential events of the current world, such as theCOVID-19 pandemic, and ICTs are indispensable for this purpose. Thinking about the challenges of mining companies in aspects such as competitiveness is thinking about using better technology in their operations.

It is unfortunate to identify that for Latin America in general, the context in which the participating population is located; The insertion of ICTs has not generated the expected impacts on productivity and given rise to the social inclusion that comes with it, due to the existing structural diversity in these regions. It is a great

challenge for companies to overcome and move toward the incorporation of complex technologies that seek their use to consolidate a more equitable productive and social fabric and reduce the risk of increasing social and productive inequalities in this country.

In this regard, it is equally convenient to take government measures that focus on supporting this sector and its companies that stimulate more competitive and innovative production systems integrally, naturally incorporating new technologies but also competition in the labor force that will give life to them, thus contributing to a better quality of life and employment.

The line of work of the mining sector in the region studied, indicates pressing needs in relation to the inclusion of ICT in: improvement of the production line, the creation of audiovisual media for its employees, and the implementation of the digitization procedures, among others.

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