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ICT TRAINING FOR THE BUSINESS COMPETITIVENESS OF THE AGRO-INDUSTRIAL SECTOR IN THE CITY OF CUCUTA

库库塔市农业工业部门商业竞争力的信息通信技术培训

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Abstract

Information and communication technologies (ICTs) are considered an essential tool in business strategy to promote the competitiveness of companies, with their implementation becoming more relevant in times of global crisis, such as the one currently experienced during the Covid-19 pandemic. The research objective of this paper was to design an ICT training strategy for business competitiveness in the agro-industrial sector, starting with the descriptive phase provided in this paper. This research is based on a quantitative approach and includes a detailed description of agro-industrial companies' current difficulties in using ICTs. A survey-type instrument with closed questions was carried out. In its application, a sampling plan was made, studying 12 agro-industrial companies from the city of Cúcuta; 242 employees were analyzed. It was identified that agro-industrial companies are at a medium level, scoring 92.9% in ICT use in technology, competitiveness factor, and business education. In conclusion, these companies located at a medium level in terms of ICT use of basic software and hardware for the daily tasks that employees must perform based on the completion objectives proposed by the company. However, in the face of a crisis such as the Covid-19 pandemic, the companies must follow an emergency protocol of migrating to new virtual spaces because these become the main resource for their existence. As a scientific novelty, the research shows that despite the tensions caused by the Covid-19 pandemic, and although ICTs provided support for the survival of agro-industrial organizations, the city companies have not found ways or strategies to take advantage of the ICT benefits in communication processes, competitiveness, and strengthening of human capital.

Keywords: Agroindustry, Company, Information and Communication Technologies, Competitiveness

摘要 信息和通信技术（信息通信技术）被认为是提高公司竞争力的商业战略的重要工具，其实施在全球危机时期变得更加重要，例如目前在新冠肺炎大流行期间经历的危机。本文的研究目标是设计一个信息通信技术培训战略，以提高农业工业部门的商业竞争力，从本文提供的描述阶段开始。该研究基于定量方法，并详细描述了农业工业公司当前在使用信息通信技术方面的困难。进行了带有封闭式问题的调查型工具。在其应用中，制定了一项抽样计划，研究了库库塔市的 12 家农业工业公司；对 242 名员工进行了分析。经确定，农业工业公司处于中等水平，在技术、竞争力因素和商业教育方面的信息通信技术使用得分为 92.9%。总而言之，这些公司在员工根据公司提出的完成目标必须执行的日常任务中，在基本软硬件的信息通信技术使用方面处于中等水平。但是，面对诸如新冠肺炎大流行之类的危机，公司必须遵循迁移到新虚拟空间的紧急协议，因为这些成为它们生存的主要资源。作为一项科学创新，该研究表明，尽管新冠肺炎大流行造成了紧张局势，并且尽管信息通信技术为农工组织的生存提供了支持，但城市公司尚未找到利用信息通信技术优势的方法或策略在沟通过程、竞争力和加强人力资本方面。

关键词: 农产工业、公司、信息通信技术、竞争力

I. INTRODUCTION

Agroindustry is a representative economic sector of Cucuta; however, there is evidence of stagnation in the use of ICTs, especially in the case of companies that make limited investments in essential tools to make their organizations grow. Micro and small enterprises in the agro-industrial sector in Cucuta must improve their capacity to innovate processes, products, and organizations to be more competitive [1]. In other words, ICTs function as tools that complement companies' business strategies and, in turn, allow positioning the company's brand and being more competitive in the market.

Companies have been redesigned and adjusted to the needs; the administrative processes have undergone a metamorphosis in their form of an operation because efficiency and effectiveness are demanded of organizations [2].

Therefore, this paper studies the level of agroindustrial companies in-depth and the ICT tools implemented to improve their productivity. The purpose of the research is to create a strategy that allows companies to invest in technology and obtain results in their favor [1], considering that companies that innovate the most can be the most competitive because they are at the forefront of processes and techniques to develop their production activities efficiently. It is impossible not to mention the relationship between the need to implement ICT-based strategies and the global emergency caused by the COVID-19 pandemic, where the fundamental requirement for companies to move forward and even sustain themselves is to move through different ICT tools. Various experts have noted this on the subject through virtual communication channels, which also support the idea that this crisis can help to speed up the migration to ICT tools and thus facilitate work transformation at all dimensions and levels.

ICTs are crucial in prevention strategies for facing a pandemic such as COVID-19. Given that physical distancing is recommended due to the nature of the virus, collaborative, productivity, and communications tools help maintain economic activities [3].

This research used a quantitative methodology with descriptive analysis; a complex sampling plan was implemented to know which companies and how many employees would participate.

II. METHODOLOGY

This research is based on a positivist paradigm because it focuses on the uniformity of phenomena. This paradigmatic current relegates human subjectivity and seeks to verify facts and their causes [4]. Thus, it helps to examine the

reality of the object of study—in this case, agro-industrial companies—and explain and predict the problems that arise with the lack of use of ICT tools in a real way. This is a quantitative study; the previous author [4] states that in this approach, science is conceived as a description of phenomena that relies on the facts given by sensations and is not concerned with their explanation.

Therefore, it is possible to give a detailed description of the current problem that agro-industrial companies present in ICT use and apply measurement instruments to obtain authentic results in the research. For example, how many ICT tools are used by agro-industrial companies to compete in the market. The study was carried out based on a non-experimental methodological design without deliberately manipulating any variable. The facts were observed as presented in their actual context and at a given time or not and then analyzed [4]. In other words, this design allows using existing variables—that is, the independent (e.g., "ICTs") and dependent (e.g., "agribusiness companies") variables—which are not manipulated or modified; they are only analyzed.

The research type was field research involving data collection directly from the reality in which facts occur without manipulating or controlling variables [4]. Thus, data was collected directly in each company, making revisions in case questions arose. This research has a descriptive level because it aims to analyze realities and expose findings to interpret factual realities. It includes description, recording, analysis, and interpretation of the current nature, composition, or processes of phenomena [4].

Further, it is of a projective level because the research objective is to propose ICT-based strategies that allow a more significant impact on the company at various levels. It implies exploring, describing, explaining, and proposing alternatives for change and not necessarily executing the proposal [4]. Thus, these levels make the research complete and feasible, describing the processes involved in the investigated phenomena and proposing solutions for change that are not necessarily executed.

The research is divided into three phases to solve problems, such as the lack of ICT use, to improve competitiveness in agro-industrial enterprises. First, a diagnosis of the current state of ICTs is made, observing the phenomenon to be investigated and how it acts in its environment; this document is part of this first phase. In the second phase, an analysis of the variables related to growth in business competitiveness is made and the identification of the types of ICT tools used. Finally, an ICT training strategy is proposed; in this phase, subjective decisions will be made to formulate strategies that generate viable alternatives.

The population of this research is finite; an exact figure was obtained from Compite360 of the number of agro-industrial companies in Cucuta related to the Chamber of Commerce, and 352 are registered. Thus, the Chamber of Commerce of Manizales [5] described the agro-industrial sector as engaged in transforming and processing primary sector products. Categorized by the Chamber of Commerce according to the ISIC DANE code (International Standard Industrial Classification - ISIC, Revision 4), Table 1 shows the classification of the agro-industrial companies according to the ISIC DANE code, ending with the total that is taken into account for the target population.

Table 1.
Division 10. Population food process index

Code	Classification	Number of Manufacturing Companies
1011	Processing and preserving of meat and meat products	54
1012	Processing and preserving of fish, crustaceans, and mollusks	2
1020	Processing and preserving of fruit and vegetables	45
1030	Oils and fats of animal or vegetable origin	7
1040	Manufacture of milk-based products	51
1051	Manufacture of grain mill products	22
1061	Coffee threshing	5
1062	Decaffeination, roasting, and coffee grinding	10
1089	Manufacture of other food products n.p.c. Not Previously Classified	115
1072	Panela manufacture	7
1090	Manufacture of prepared animal feed	2
1101	Distilling, rectifying and blending spirits	2
1103	Production of malt and brewing of beers and other malted beverages	1
1104	Production of non-alcoholic beverages and mineral waters, and other bottled waters	29
	Total	352

Table 2.
Description of the sample population by strata, number of workers, and number of companies

Stratum		
Agro-industrial sector	**Number of companies**	**Number of workers**
Activity 1: Decaffeination, roasting, and coffee grinding	1	26
Activity 2: Production of oils and fats of animal or vegetable origin	3	21
Activity 3: Manufacture of other food products	10	126
Activity 4: Manufacture of grain mill products	8	192
Activity 5: Manufacture of milk-based products	2	218
Activity 6: Processing and preserving of meat and meat products	10	149
Activity 7: Processing and preserving fruit and vegetables	6	41
Activity 8: Coffee threshing	1	1
Total	41	774

The sample was delimited on the basis of criteria that allowed having companies with complete information in Compite360 and valid commercial registration in 2017. In this regard, 41 agro-industrial companies were obtained as a sample (Table 2).

This study used mixed probability sampling, consisting of stratified and cluster sampling. Clusters are often internally homogeneous, while the base population is heterogeneous [4]. A strategy of complex samples was used in the research related to ICT in the agro-industrial sector. A random, stratified, multistage, cluster sampling was applied. Thus, the population was divided into internally homogeneous and externally heterogeneous strata mutually exclusive and collectively exhaustive.

Because the sampling frame of the observation units did not exist, cluster sampling was carried out within each of the previously defined strata. First, it was determined according to the number of workers in each company; the more the number of employees, the greater the probability of being chosen. Once the company was selected, a simple random sampling (SRS) was conducted to complete the total number of workers. The selection method was random for primary (companies) and information (subjects) units. The sample was drawn using the SPSS complex sample module, storing in the database the weights, inclusion probabilities, and expansion factors to be used when processing the results. Executing this in each subpopulation in both sectors yielded the quantities is shown in Table 3.

Table 3.
Distribution of the sample according to optimum allocation, number of workers, and number of companies

Stratum	***Ni*** **(comp.)**	***Ni*** **(wks.)**	***ni*** **(wks.)**	***ni*** **(comp.)**
Agroindustrial sector				
Activity 1	1	26	8	1
Activity 2	3	21	7	2
Activity 3	10	126	40	5
Activity 4	8	192	61	4
Activity 5	2	218	69	1
Activity 6	10	149	47	5
Activity 7	6	41	13	2
Activity 8	1	1	12	1
Total	41	774	257	21

Eq. 1 was used to calculate the sample size. This formula allows obtaining the number of subjects necessary to estimate binomial proportions in stratified populations, with an established margin of error and a predetermined confidence level. The following was assumed: maximum absolute error of 5%; confidence level z = 1.96 (95%); maximum indeterminacy in each stratum (pi = qi = 0.50); non-response rate of 25%; and design effect of 1.25. After obtaining the total sample size, its number was distributed according to proportional allocation.

Finally, to determine the number of clusters for sampling, the number of employees required per stratum was divided by the average number of workers in each stratum, which gives a precise estimate of the number of clusters to be chosen. Thus, if one wishes to estimate the proportion of workers who use ICTs with a confidence level of 95% and a maximum permissible error of 5%, 257 employees would be needed for the agro-industrial sector. Now, to make the optimum allocation of this number, which considers the weight of the stratum and its variance, the following is used:

$$\overline{\overline{n}} = \frac{nw_i p_i q_i}{\sum_{i=1}^{H} nw_i p_i q_i} \quad \text{(Ec. 2)}$$

Finally, having determined the number of companies, we selected them as described at the beginning of this document. The selected companies are shown in Table 4.

Table 4.
Sample taken for research to be conducted in the agro-industrial sector

Stratum	Company*	No. of workers	Action	Final *n*
Activity 1	EA1_001	26	Select all	26
Activity 2	EA2_001	10	Select all	10
	EA2_003	10	Select all	10
Activity 3	EA3_001	1	Select All	1

Continuation of Table 4

	EA3_002	10	Select All	10
	EA3_003	1	Select All	1
	EA3_005	10	Select All	10
	EA3_010	4	Select All	4
Activity 4	EA4_001	10	Select all	10
	EA4_006	49	Select 40 at random out of 49	40
	EA4_007	10	Select all	10

Notes: * EA4_008
10
Select all
10
Activity 5
EA5_001
217
Select 120 at random out of 217
120
Activity 6
EA6_001
41
Select 32 at random out of 41
32
EA6_002
10
Select all
EA6_007
10
Select 8 at random out of 10
8
EA6_008
24
Select all
EA6_009
10
Select 8 at random out of 10
8
Activity 7
EA7_001
4
Select all
4
EA7_006
3
Select all
3
Activity 8
EA8_001
1
Select all
10
Total
266[1]

[*] The actual names of companies have not been provided to ensure confidentiality. The researchers handle the original database with the company identification [3]. The final sample size (343) is larger than the calculated sample size (257). This is a strategy to anticipate a higher than expected non-response rate.

The applied technique was a survey to obtain data from several people whose opinions are of interest to the researcher [4]. In this study, the survey was used to obtain data regarding ICT use from agroindustrial companies. Data analysis (documentary review) was conducted in the two review articles, described as scientific research whose search or inquiry is based on the location, registration, retrieval, analysis, and interpretation of bibliographic sources [6]. Therefore, source selection criteria were identified; articles indexed in specialized journals, articles for reflection and postgraduate theses, and master's degrees were defined as bibliographic resources on which the search was oriented, which corresponds to the following combination of keywords: ICT, adoption, impact, company, agroindustry, local, national, and international.

A total of 76 research papers were reviewed and distributed as follows: undergraduate or postgraduate thesis, scientific articles, newspaper articles, magazine articles, government reports, symposiums, and conferences. They were divided as follows: regionally, nationally, and internationally.

III. Result and Discussion

A. Diagnosis of the Current State of the Use of ICTs for Business Competitiveness in the Agro-Industrial Sector in the City of San Jose de Cucuta

Data analysis was carried out following the table of operationalization of variables. Likewise, the project frames three variables: ICT, competitiveness, and training. ICT comprises the first dimension to be analyzed—that is, technology—which allows a company to have, in a fundamental way, the essential tools that help convert manual processes into digital processes, taking advantage of the agility and productivity that these generate.

Table 5 was used to analyze the information obtained. The dimension comprises 114 questions, and a Likert-type scale was used where the lowest value is 1, and the highest is 5. Three response levels were obtained: low (114.0–151.0), medium (152.0–303.0), and high (304.0–570.0), thus identifying the level of the dimension.

Table 5.
Response range scale for the technology dimension

D01: Technology		
Number of items	114.00	
Minimum item score	1.00	
Maximum item score	5.00	
Minimum dimension score	114.00	
Maximum dimension score	570.00	
Dimension range	456.00	
Number of scale categories	3.00	
Scale range	152.00	
Low level	114.00	151.00
Medium level	152.00	303.00

Continuation of Table 5		
High level	304.00	570.00

By performing the analysis in the SPSS software, Table 6 shows that agro-industrial companies are at a medium level in the mentioned dimension, with a confidence interval of 95%—that is, ranging between 90.6% and 97.4%, yielding an estimated value of 95.0% concerning the low level of 3.6% and the high level of 1.4%.

Table 6.
Technology dimension

Sum Technology Dimension 95% Confidence Interval				
		Estimate	**Lower**	**Upper**
% of Total	Low	3.6%	3.0%	4.2%
	Medium	95.0%	90.6%	97.4%
	High	1.4%	0.2%	10.3%
Total			100%	100%

The second dimension to be analyzed, called Competitiveness Factors, allows a company to manage all administrative processes digitally, thus gaining strategic agility. Table 7 was used to analyze the information obtained. The dimension comprises 42 questions; a Likert-type scale was used, where the lowest value is 1, and the highest is 5. As a result of the above information, three levels of responses were obtained: low (42.0–55.0), medium (56.0–111.0), and high (112.0–210.0), thus identifying the level of the dimension.

Table 7.
Response range of competitiveness factor dimension

D02: Competitiveness Factor		
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	
Dimension range	168.00	
Number of scale categories	3.00	
Scale range	56.00	
Low level	42.00	55.00
Medium level	56.00	111.00
High level	112.00	210.00

By performing analysis in the SPSS software, Table 8 shows that agro-industrial companies are at a low level in the mentioned dimension, with a 95% confidence interval—that is, a range between 49.0% and 83.4%. Therefore, there is an estimated value of 68.7% concerning the low level of 2.9% and the high level of 28.4%.

Table 8.
Competitiveness factor dimension

Sum Competitiveness Factor Dimension 95% Confidence Interval				
		Estimate	**Lower**	**Upper**
% of Total	Low	2.9%	2.5%	3.4%
	Medium	68.7%	49.0%	83.4%
	High	28.4%	13.9%	49.2%
	Total	100.0%	100.0%	100.0%

The third dimension to be analyzed is Education, which includes a sub-dimension, "Entrepreneurial Teaching" (all those ICT tools that allow the company to train employees), which allows a company to train its employees effectively digitally. Table 9 was used to analyze the information obtained. The dimension comprises 20 questions; a Likert-type scale was used, where the lowest value is 1 and the highest is 5. Three levels of responses were obtained: low (20.0–25.67), medium (26.67–52.33), and high (53.33–100.0), thus identifying the level of the dimension.

Table 9.
Response range of entrepreneurial teaching dimension

SD07: Entrepreneurial Teaching		
Number of items	20.00	
Minimum item score	1.00	
Maximum item score	5.00	
Minimum dimension score	20.00	
Maximum dimension score	100.00	
Dimension range	80.00	
Number of scale categories	3.00	
Scale range	26.67	
Low level	20.00	25.67
Medium level	26.67	52.33
High level	53.33	100.00

By performing the analysis in the SPSS software, Table 10 shows that agro-industrial companies are at a low level in the mentioned dimension, with a 95% confidence interval—that is, ranging between 90.8% and 97.9%. Therefore, there is an estimated value of 95.6% concerning the mean level of 4.4%.

Table 10.
Entrepreneurial education dimension (Prepared by the authors)

Sum Education Dimension 95% Confidence Interval				
		Estimate	**Lower**	**Upper**
% of Total	Low	95.6%	90.8%	97.9%
	Medium	4.4%	2.1%	9.2%
	Total	100.0%	100.0%	100.0%

It is essential to point out that the subject, in this case, is the total result. It comprises the three variables involved: ICT, Competitiveness, and

Entrepreneurial Education. Table 11 was used to analyze the information obtained. The subject comprises 176 questions, and a Likert-type scale was used, where the lowest value is 1 and the highest is 5. As a result of the above information, three levels of responses were obtained: low (176.0–233.67), medium (234.67–468.33), and high (469.33–880.0), thus identifying the level of the dimension.

Table 11.
Response range scale of the subject

TS: Subject		
Number of items	176.00	
Minimum item score	1.00	
Maximum item score	5.00	
Minimum dimension score	176.00	
Maximum dimension score	880.00	
Dimension range	704.00	
Number of scale categories	3.00	
Scale range	234.67	
Low level	176.00	233.67
Medium level	34.67	468.33
High level	469.33	

B. Information and Communication Technologies Used by Companies for the Competitiveness of the Agro-Industrial Sector in San Jose de Cucuta

The results were analyzed based on the table of operationalization of variables taking the first dimension of Technology, which covers the Information sub-dimension, using the following for the data processing performed by the company: desktop computers, USB memory, scanner, printer, MS Excel, MS Outlook, MS Word, media player, and Adobe Acrobat Reader DC PDF reader. In a second instance, the communication sub-dimension is mentioned where the company uses tools such as Outlook and WhatsApp for communication between employees, suppliers, and customers. Finally, to culminate the data flow sub-dimension, companies use tools such as Google Chrome, the Internet, email, MS Office Suite, and MS PowerPoint to operate properly.

The Business Factor dimension, which includes the Supply sub-dimension, was analyzed. It uses applications that help control and streamline the amount of production. They implement the most common applications: MS Excel, business email, and intranet communications. The second sub-dimension is Demand; this is used for promotion and advertising that the company handles to publicize their products and find a landline, smartphones, email, hardware, software, Internet, and social networks. Finally, this section includes the business strategy sub-dimension, where companies only use email for the administrative management of customer contact.

The above tools used by companies in the agroindustrial sector in Cúcuta have supported their work during their existence. However, many of these tools would not reach 100% with process optimization during a global crisis, such as the COVID-19 pandemic, because the option of face-to-face communication is left aside to migrate to any number of technological options as the only alternative. Therefore, organizations must prepare themselves and move toward new tools that optimize their processes. As stated by different analysts of the subject, many companies are being forced to migrate to virtual models and implement the digital transformation that has been delayed by the inertia that keeps them in traditional models [7].

However, in the Entrepreneurial Education dimension, it was found that companies are not using ICT tools to train employees, exposing business performance [8]. Thus, it is necessary to recognize the importance of employee qualification as part of the continuous action plan in a company and the ease that the use of technological tools would bring in terms of access to information.

Likewise, in view of the urgent migration toward technological platforms and tools, this dimension of corporate education would be an unpostponable requirement because the company must guarantee the qualification of its employees starting with ICT tool training and seek the sustainability of its objectives. Teaching as part of the company's action plan, which focuses on preparing its employees and constantly updating them, must be supported by the new platforms that, given the current situations, allow rapprochement and collaborative teamwork. Tools such as Zoom and Dropbox are experiencing a boom in the workplace because they allow digital communication and collaboration, resulting in an unprecedented adoption of remote work [9].

The results revealed the following: 1) agro-industrial companies are at a medium level in terms of the use of ICT use, since companies implement only basic technological tools, based on obtaining objectives proposed by the company: Software and Basic hardware that is included in the equipment or freely obtained; 2) the companies under investigation invest little in technology, focusing their efforts and investments only on advertising and marketing of their products with the support of ICT, although not with the appropriate technological tools and according to each need, and evidently leaving

behind other fundamental dependencies that help to complement the company and that help to expand in a more productive market; and 3) the dimension of business education is at a low level, being a sector that does not use ICT tools to train its employees, excluding itself from the business vanguard [10], and consequently from the business opportunity to perform in the competition that the global world proposes [11].

The effectiveness of globalization and the active business use of ICT allows the leading industries to have higher growth [12]). Although the COVID-19 pandemic was not contemplated at the beginning of this investigation, it is necessary to take into account the relationship of this situation with the evidenced findings based on the use of ICT tools [13]-[15] all-time, as stated above, companies are not prepared to face an emergency situation like the current one. This confinement worldwide has forced companies to migrate and support themselves from the implementation of new technologies [17]-[20].

Therefore, it could be stated that the situation promptly confirmed the need to implement a training plan for companies concerning the proper use of ICT tools.

IV. Conclusion

The research findings show that despite the tensions caused by the Covid-19 Pandemic, and although ICTs meant support for the survival of agro-industrial organizations in these times, city companies have not found paths or strategies to take advantage of the benefits of ICT in communication processes, competitiveness, and strengthening of human capital. The truth is that crises are a natural element of social and economic systems, so other similar phenomena will affect and limit companies in the future, requiring a renewal of processes, culture, strategies and contingency plans. Of course, technology must be incorporated as a fundamental issue in these dynamics.

Actions and policies are required in the private and public scenarios of the local context so that organizations in the agro-industrial sector can integrate and implement ICTs in their processes as a strategic factor for improving competitiveness. This strategy implies a culture change, a transformation in the organizational horizon plans, the design of a human capital formation strategy and a re-definition of the monitoring and evaluation actions of the processes.

References

[1] HERNÁNDEZ-FUENTES S.N., and SÁNCHEZ-MOJICA K.Y. (2017) Innovation and competitiveness: micro and small companies in the agro-industrial sector in Cúcuta. *Innovation Research and Development Magazine*, 8 (1), pp. 23-33.

[2] RIASCOS, S.Y., and AGUILERA, A. (2011) ICT tools to support human talent management. *Administration Notebooks*, 27 (46), pp.141-154.

[3] HAMBURGER, F.M. (2020) ICTs and the Pandemic. ICTs are crucial in prevention strategies to face a pandemic such as Covid-19 (Internet). Colombia: Briefcase. Available from https://www.portafolio.co/opinion/francisco-miranda-hamburger/las-tics-y-la-pandemia-brujula-538997.

[4] PALELLA, S.Y., and MARTINS, F. (2012) *Quantitative Research Methodology*. Venezuela: Fedupel Edition.

[5] MANIZALES CHAMBER OF COMMERCE. CHARACTERIZATION OF COMPANIES IN THE AGROINDUSTRY SECTOR IN MANIZALES (INTERNET). COLOMBIA. (2015) Available in: http://investinmanizales.org/wp-content/uploads/2017/03/Caracterizaci%C3%B3n-sector-agroindustria.pdf

[6] SUAREZ, N. (2007) *Documentary research step by step*. Merida: Universidad de Los Andes edition, publications council.

[7] GOMEZ, J. (2020) In times of pandemic, ICTs keep human activity alive in Colombia. Available from https://techcetera.co/en-tiempos-de-pandemia-las-tic-mantienen-viva-la-actividad-humana/

[8] IBÁÑEZ, R., SAENZ, F., ROMERO, I., QUINTERO, M., et al. (2017) Instructional design models as the core of digital content development in multiple environments. In: GRATEROL-RIVAS, M., MENDOZA-BERNAL, M., GRATEROL-SILVA, R., CONTRERAS-VELÁSQUEZ, J., and ESPINOSA-CASTRO, J. (Editors) *Information and Communication Technologies and Business Management. Venezuela*. University of Zulia Press, pp. 177-193. Available from http://bonga.unisimon.edu.co/bitstream/handl

e/123456789/2105/TIC%20y%20Gesti%C3%B3n%20E.pdf?sequence=1&isAllowed=y
[9] CASARÍN, J.L. (2020) The role of technology in times of pandemic. Mexico: *The Economist*. Available from https://www.eleconomista.com.mx/opinion/El-rol-de-la-tecnologia-en-tiempos-de-pandemia-20200414-0108.html
[10] AGUILAR-BARRETO, A. (2017) Communication and Technology: the incidence of its development in the Generation of Knowledge. In: GRATEROL-RIVAS, M., MENDOZA- BERNAL, M., GRATEROL – SILVA, R., CONTRERAS-VELÁSQUEZ, J. and ESPINOSA-CASTRO, J. (Editors) *Information and Communication Technologies and Business Management. Venezuela*. University of Zulia Press. Available from http://bonga.unisimon.edu.co/bitstream/handle/123456789/2105/TIC%20y%20Gesti%C3%B3n%20E.pdf?sequence=1&isAllowed=y
[11] FLÓREZ, M., AGUILAR-BARRETO, A.J., HERNÁNDEZ, Y., SALAZAR, J., PINILLOS, A.Y., and PÉREZ, C. (2017) Knowledge society, ICT and its influence on education. *Magazine Spaces*, 38 (35), pp. 39-50. Available from http://www.revistaespacios.com/a17v38n35/a17v38n35p39.pdf
[12] MINASHKIN, V.G., EGOROVA, E.A.Y., and PROKHOROV, P.E. (2021). Digital transformation of dynamics of the Russian economy: an international comparative analysis. *Laplage Em Magazine*, 7, (Extra-E), pp. 75-81. https://doi.org/10.24115/S2446-622020217Extra-E1163p.75-81
[13] ABBAS ALI KHAN, M.D.A, ALI-EMRAN, A.M.D., ALAMGIR KABIR, B., MOHAMMAD HANIF ALI, C., and FAZLUL HAQUE, A.K.M. (2021) Sentiment Analysis Through Machine Learning. *Journal of Southwest Jiaotong University*, 56(3), doi: 10.35741/issn.0258-2724.56.3.32
[14] ALDERETE, M. (2012) Measurement of Information and Communication Technologies in Colombian Service Companies. *Cuadernos de Administración*, 25 (45), pp. 39-62. Available from http://www.scielo.org.co/pdf/cadm/v25n45/v25n45a03.pdf
[15] CORREA ESPINAL, A., GÓMEZ MONTOYA, R.Y, & CANO ARENAS. (2010) Warehouse management and information and communication technologies (ICT). *Estudios Gerenciales*, 26 (117), pp. 145-171. Available from http://www.scielo.org.co/pdf/eg/v26n117/v26n117a09.pdf
[16] GONZÁLEZ, A. (2006) *World of ones and zeros in business management.* Juan Carlos Martínez Coll, Available from https://www.eumed.net/libros-gratis/2006a/mga-01/139.pdf
[17] GUERRERO JAIMES, R. Y ANIDO RIVAS, J. (2007) Small and medium agro-industrial companies in the face of globalization. The case of the Colombo-Venezuelan border. *Aldea Mundo*, 12 (24), pp. 37-49. Available from http://www.saber.ula.ve/bitstream/123456789/27510/1/articulo4.pdf
[18] HAYES, J. D. (2012) *Lazy User Theory And Interpersonal Communication Networks*. Tesis Maestría. Cleveland-Ohio State University, the United States Available from https://etd.ohiolink.edu/rws_etd/document/get/csu1336150484/inline
[19] LLANO NARANJO, N. (2010) *Analysis of the impact of the Digital MSME program of the Ministry of Information and Communication Technologies as a catalyst for the supply and demand of ICT Products and services for Colombian SMEs*. Undergraduate Thesis. National University of Colombia Headquarters Manizales, Manizales, Colombia.
[20] PALELLA STRACUZZI, S. Y., & MARTINS PESTANA, F. (2012) *Quantitative Research Methodology*. FEDUPEL. Caracas, Venez.

参考文:

[1] HERNÁNDEZ-FUENTES S.N. 和 SÁNCHEZ-MOJICA K.Y. (2017) 创新和竞争力：库库塔农业工业部门的微型和小型公司。创新研究与发展杂志，8 (1)，第 23-33 页。

[2] RIASCOS, S.Y. 和 AGUILERA, A. (2011) 支持人力资源管理的信息通信技术工具。管理笔记本，27 (46)，第 141-154 页。

[3] HAMBURGER, F.M. (2020) 信息通信技术和大流行。信息通信技术在应对 新冠肺炎（互联网）等流行病的预防策略中至关重要。哥伦比亚：公文包。可从 https://www.portafolio.co/opinion/francisco-miranda-hamburger/las-tics-y-la-pandemia-brujula-538997 获得。

[4] PALELLA, S.Y. 和 MARTINS, F. (2012) 定量研究方法。委内瑞拉：费杜佩尔版。

[5] 马尼萨莱斯商会。马尼萨莱斯（互联网）农业工业部门的公司特征。哥伦比亚。(2015) 见：http://investinmanizales.org/wp-content/uploads/2017/03/Caracterizaci%C3%B3n-sector-agroindustria.pdf

[6] SUAREZ, N. (2007) 循序渐进的文献研究。梅里达：洛斯安第斯大学版，出版委员会。

[7] GOMEZ, J. (2020) 在大流行期间，信息通信技术使哥伦比亚的人类活动保持活力。可从 https://techcetera.co/en-tiempos-de-pandemia-las-tic-mantienen-viva-la-actividad-humana/

[8] IBÁÑEZ，R.，SAENZ，F.，ROMERO，I.，QUINTERO，M.，等。(2017) 教学设计模型作为多环境下数字内容开发的核心。在：GRATEROL-RIVAS, M., MENDOZA-BERNAL, M., GRATEROL-SILVA, R., CONTRERAS-VELÁSQUEZ, J. 和 ESPINOSA-CASTRO, J.（编辑）信息和通信技术和业务管理。委内瑞拉。苏利亚大学出版社，第 177-193 页。可从 http://bonga.unisimon.edu.co/bitstream/handle/123456789/2105/TIC%20y%20Gesti%C3%B3n%20E.pdf?sequence=1&isAllowed=y

[9] CASARÍN, J.L. (2020) 技术在大流行时期的作用。墨西哥：经济学家。可从 https://www.eleconomista.com.mx/opinion/El-rol-de-la-tecnologia-en-tiempos-de-pandemia-20200414-0108.html 获得

[10] AGUILAR-BARRETO, A. (2017) 通信与技术：其在知识生成中的发展。在：GRATEROL-RIVAS, M., MENDOZA-BERNAL, M., GRATEROL – SILVA, R., CONTRERAS-VELÁSQUEZ, J. 和 ESPINOSA-CASTRO, J.（编辑）信息和通信技术和业务管理。委内瑞拉。苏利亚大学出版社。可从 http://bonga.unisimon.edu.co/bitstream/handle/123456789/2105/TIC%20y%20Gesti%C3%B3n%20E.pdf?sequence=1&isAllowed=y

[11] FLÓREZ, M.、AGUILAR-BARRETO, A.J.、HERNÁNDEZ, Y.、SALAZAR, J.、等. (2017) 知识社会、信息通信技术及其对教育的影响。杂志空间，38(35)，第 39-50 页。可从 http://www.revistaespacios.com/a17v38n35/a17v38n35p39.pdf 获得

[12] MINASHKIN, V.G., EGOROVA, E.A.Y. 和 PROKHOROV, P.E.（2021 年）。俄罗斯经济动态的数字化转型：国际比较分析。拉普拉格杂志，7，（额外的乙），第 75-81 页。https://doi.org/10.24115/S2446-622020217Extra-E1163p.75-81

[13] ABBAS ALI KHAN, M.D.A, ALI-EMRAN, A.M.D., ALAMGIR KABIR, B., MOHAMMAD HANIF ALI, C., 和 FAZLUL HAQUE, A.K.M. (2021) 通过机器学习进行情绪分析。西南交通大学学报，56(3)，土井：10.35741/issn.0258-2724.56.3.32

[14] ALDERETE, M. (2012) 测量哥伦比亚服务公司的信息和通信技术。管理笔记本

，25 (45)，第 39-62 页。可从 http://www.scielo.org.co/pdf/cadm/v25n45/v25n45a03.pdf 获得

[15] CORREA ESPINAL, A., GÓMEZ MONTOYA, R.Y 和 CANO ARENAS。(2010) 仓库管理和信息通信技术 (信息通信技术)。管理学，26 (117)，第 145-171 页。可从 http://www.scielo.org.co/pdf/eg/v26n117/v26n117a09.pdf 获得

[16] GONZÁLEZ, A. (2006) 企业管理中的一和零世界。胡安·卡洛斯·马丁内斯·科尔，可从 https://www.eumed.net/libros-gratis/2006a/mga-01/139.pdf 获得

[17] GUERRERO JAIMES, R. Y ANIDO RIVAS, J. (2007) 面对全球化的中小企业。科伦坡-委内瑞拉边境的案例。 世界村，12 (24)，第 37-49 页。可从 http://www.saber.ula.ve/bitstream/123456789/27510/1/articulo4.pdf 获得

[18] HAYES, J. D. (2012) 懒惰用户理论和人际沟通网络。特西斯大师。美国克利夫兰 - 俄亥俄州立大学可从 https://etd.ohiolink.edu/rws_etd/document/get/csu1336150484/inline 获取

[19] LLANO NARANJO, N. (2010) 信息和通信技术部数字中小企业计划对哥伦比亚中小企业信息通信技术产品和服务供需的影响分析。本科论文。哥伦比亚国立大学总部马尼萨莱斯，马尼萨莱斯，哥伦比亚

[20] PALELLA STRACUZZI, S. Y. 和 MARTINS PESTANA, F. (2012) 定量研究方法。费杜佩尔。加拉加斯，威尼斯。