Implementation of artificial intelligence and blockchain technology that allows optimizing productive systems of Pymes

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ABSTRACT
Pymes are a fundamental part of the Mexican economy, they are so important that a productive or economic imbalance in them can be catastrophic for the country. Technology is a fundamental resource of the same since they are a tool with which the optimization and improvement of their processes can be achieved. However, the lack of implementation of new technologies in their systems prevents them from developing competitive advantages that facilitate their survival, greatly limiting their productivity and competitiveness. Currently there are two technological innovations that together can provide great benefits to this type of company, these are AI and blockchain, this work aims to propose a new model of Artificial Neural Networks applied to the data analysis of SMEs using blockchain technologies with the in order to optimize their productivity and competitiveness. The research was developed with a deductive methodology and with a quantitative approach in which the collection and analysis of data is used to validate the proposal and on this basis propose the model.

Keywords: artificial neural networks, blockchain, SMEs.

1 INTRODUCTION

Pymes are of great importance to national economies, not only for their contributions to the production and distribution of goods and services, but also for the flexibility to adapt to technological changes and great potential for job creation.

They represent an excellent means to promote economic development and a better distribution of wealth. However, their individualistic characteristics and the lack of implementation of new technologies in their systems prevent them from developing competitive advantages that facilitate their survival, greatly conditioning measure its profitability and competitiveness. So great is this reality that the precariousness of their production processes, their technological backwardness, and the fall of the manufacturing sector have caused 80% of them to be affected in these times where the economic, social, and health crisis is advancing uncontrollably. .

There are two technological innovations that together in the future can provide us with great benefits of this type of company, which are AI and the blockchain, which, used as an idea of a distributed encrypted data registry, will promote the development of companies, mainly the business sector as neglected as are the Pymes. AI is a technology that in a nutshell is the theory and practice of building machines capable of performing tasks that appear to require intelligence. Currently there are several technologies that use this type of intelligence, among which we find machine learning, artificial neural networks and the deep learning.

Meanwhile, the blockchain is essentially a new digital information storage system that stores data in an encrypted, distributed ledger format. Since data is encrypted and distributed across many different computers, this system allows for the creation of highly secure, tamper-proof databases that can only be read and updated by those who have permission to do so.

Although much has been written from an academic perspective on the potential of combining these innovative technologies, real-world applications are scarce at this time.

It is important to mention that this work will be developed in two parts, the first part to carry out an analysis statistics of the main factors that prevent SMEs from emigrating and updating their technologies and how important it is that there is business clustering among them for the transfer of information with all its benefits. The second part will be the proposal of a new model using AI technologies such as Artificial Neural Networks applied to the data analysis of Pymes using blockchain technologies in order to optimize their profitability and competitiveness by proposing appropriate computer tools to achieve this end.

2 METHOD DESCRIPTION

A statistical analysis was carried out of the main factors that prevent SMEs from emigrating and updating their technologies and how important it is that there is a business clustering among them for the transfer of information with all its benefits. This part of the research was developed with a deductive methodology and a quantitative approach in which data collection and analysis are used to subsequently perform a factor analysis, which examines the entire branch of interdependence relationships of the variables that are correlated (Hair, 2015).

The collection of information was carried out through surveys applied to SMEs in the east of the state of Mexico, this sector was chosen because it is a large and underserved area, since it generates more jobs in the manufacturing industry at the state level (INEGI, 2017). 66 small and medium-sized companies in this sector were contacted. Subsequently, a convenience sampling was carried out, since only companies that agreed to participate in this research were surveyed; the survey was applied to high and intermediate management personnel; In addition, a survey per company was applied. Therefore, the sample size was 33 surveys, one for each company, these data were obtained during the period January-July 2019. It is important to mention that all the calculations were analyzed through the SPSS software, so only the results are shown. results obtained.

A survey consisting of three parts was used as a measurement instrument; the first two parts are oriented towards analyzing the profile, the availability of SME participation in a clustering of the sector and the updating of their computer systems; The third section is made up of the five factors that have been identified to respond to the structure of the conceptual management model as part of a clustering of SMEs, which are: location, activity to which it is dedicated, computer systems with which account, business cooperation and transfer of information between them, quality of the flow of information of which 21 questions were raised (variables). A 5-point Likert scale was used, ranging from strongly disagree to strongly agree.

The validation of the measurement instrument was carried out according to the Cronbach criterion, already obtaining that for N elements we have a Cronbach's alpha of 0.0095, which provides us with high reliability in the development of this process.

For the factorial analysis, the Bartlettel test was used, which is a statistic that does not provide the proof that if the 21 samples come from populations with the same variance, making sure that the data matrix has sufficient correlations to justify the application of factor analysis. . There are formal statistical indicators that allow verifying that the factorial model is appropriate, as seen in Table 1.

Table 1. Bartlett AND KMO test performed in SSPS.

		Pruebas realizadas
Sample adequacy measure of Kaiser-Meyer-Olkin		0.745
sphericity test Bartlett	Chi-cuadrado	697.949
	Gl.	210
	Sig.	,000

Source: Own

The determinant of the correlation matrix was, 000, the Bartlett test (X2) of 697.949 and the KMO of 0.742. Under the criterion of Mahlotra (2004) it is concluded that the results are satisfactory; therefore, it is correct to continue with the factor analysis.

This research has 21 variables to analyze, which correspond to each of the survey questions and a total of 33 surveys, so there is a relationship of 1.57 surveys for each variable.

To extract the factors, the principal component analysis method was used because the objective is to condense most of the original information (variances) into a number of factors for prediction purposes. The factors to extract are those with eigenvalues greater than 1.

For the development of the study, 21 variables were analyzed and used to extract the number of factors using the latent root criterion (eigenvalues < 1). The extraction produced four factors that explain 78.45% of the variance of the original data; the others were ignored because they were not significant, since the factors to be extracted are those with higher eigenvalues. The information is presented in Table 2.

Table 2: Values of the variance found, made in SSPS

components	values initials			Sums of squared saturations of extraction	Sums of squared saturations of the rotation
	Total	% of the variance	% Accumulated	% Accumulated	% Accumulated
1	11.435	54.445	54.442	54.442	32.994
2	2.645	12.592	67.035	67.035	61.410
3	1.375	6.547	73.582	73.582	70.638
4	1.023	4.870	78.452	78.452	78.452
5	0.936	4.458	82.910		
.	.	.	.		
.	.	.			
21	0..012	0.058	1.00.000		

Source: Own

The rotation of factors. Comrey indicates that factor loading levels above 0.45 are considered valid, above 0.55 are considered good, above 0.63 are considered very good, and above 0.71 are excellent.

It is necessary to employ a rotational method to achieve simpler and significant factor solutions. For the rotation of factors, the VARIMAX orthogonal rotational method was used, since the number of variables should be reduced to a smaller set of uncorrelated variables, and which correspond to the strategic functions and key activities of the conceptual model, the rotation converged in six interactions Table 3.

It can be seen in table 2 that factor 1 is made up of 11 variables; factor 2 for 7 variables, factor 3 for 2 variables and factor 4 for 1 variable; it is decided to eliminate the latter because it only has one, so variable 9 passes to factor 2 due to the affinity of the variable to the factor. To confirm the decision, the factorial analysis was extracted and rotated again, forcing this analysis to three factors (Table 5), where variable 9 was regrouped in factor 2.

As a way of verifying the results of the factorial analysis, in this the split-half method was used, resulting in a high Cronbach's alpha, both in part one and in part two, table 5. In this way, the factorial analysis carried out proceeds .

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Table 3: Application of the Split-half method, carried out in SSPS

Estadísticos de fiabilidad			
Cronbach's Alpha	Part 1	Values	0.911
		No of elements	11
	Part 2	Values	0.917
		No of elements	10
	N of total elements		21
Shape Correlation			0.908
Coefficient of Spearman-Brown	Equal length		0.952
	Unequal length		0.952
Two halves of Gutman			
The elements 1 are the variables 1,2,3,4,5,6,7,8,9,10,11			
The elements 2 are the variables 11,12,13,14,15,16,17,18,19,20,21			0.952

Source: Own

Once the factorial analysis was completed, the reliability of the resulting measurements was validated through the Cronbach's alpha values, which were found to be acceptable; In this way, it is shown that the proposed measurements have a high level of internal consistency. The information is presented in Table 4.

Table 4. Application of alpha Cronbach reliability tests, carried out in SSPS

Factor	No. De elementos	Alfa de Cronbach
Clusterización empresarial por giro	11	0.945
Actualización de sistemas informáticos	8	0.939
Ubicación Estratégica	2	0.850

Source: Own

Based on these results, our proposal is that Blockchain encryption and AI work very well together. The data stored in a blockchain is by nature very secure thanks to the cryptography inherent in its filing system. This means that blockchains are ideal for storing highly sensitive personal data that, when intelligently processed, can add value and convenience to our lives.

3 DISCUSSION AND RESULTS

In order to characterize the population according to the data obtained and at the conclusion of the research analysis, it becomes evident that the variables to be controlled, such as the rotation and updating of their computer systems for SMEs, are correct because there was no loss of information. , it is only shown to carry out a redefinition of factors for which it is considered that this model could contribute to solving in an integral and strategic way the competitive and productive needs of the SME.

The analysis also shows us the fact that belonging to a cluster of companies dedicated to the same activity brings benefits. One of them consists of shared benefits, which can be: economic benefits derived

from externalities; sociological analysis of industrial districts, which creates an advantage for being located in an environment with certain patterns of social organization; and lastly, from a strategic perspective, the advantages of the shared resources and capacities to which one has access by being in a cluster. This suggests that the companies belonging to a cluster have a better performance because they are located precisely in a territorial environment where they share resources and capabilities among themselves.

On the other hand, the factor Reengineering of business cooperation systems gives us an indication of the potential to achieve a strong Business Cooperation as a strategic alliance. These strategic alliances will provide us with agreements between two or more independent companies that cooperate voluntarily to perfect and improve business activities, either in its entirety or in part of it, in a period of constant information flow. The following results were also found.

Geographic location is one of the factors that will determine the success of a cluster, because an optimal location for an activity is associated with the place where transportation costs are minimized (of raw materials, consumers, labor), or in which the economies of agglomeration of companies of a specific branch concentrated in a certain geographical location are taken advantage of.

The updating of the computer systems of SMEs is a fundamental part since, as a combination of advanced production techniques with intelligent technological operations, they will facilitate and promote the integration of organizations, people and assets. It is important to mention that they are a scheme to which SMEs should necessarily migrate, it is important for companies to have the support of modern communication technologies that allow them to promote their projects towards the improvement and updating of their processes.

There are ample advantages of SMEs using blockchain and AI, beyond current use, Currently not many small and medium-sized companies in the world use this technology, but do

4 CONCLUSIONS

Blockchain technology will be the next digital revolution. The blockchain is based on a verifiable, indelible and immutable record of transactions, open access and based on a decentralized model.

It is precisely this feature that provides special value to its users. "It has interesting practical applications in supply chains, financial transactions or asset management, among others." Some advantages of that small and medium-sized companies can benefit greatly, since this technology will allow SMEs to "compete with large organizations".

This work proposes an encrypted distributed registry that will drive the development of AI and vice versa. AI, which is the term commonly used today to refer to this technology, is, in a nutshell, the theory and practice of building machines capable of performing tasks that appear to require intelligence.

Currently there are several technologies that use this type of intelligence, among which we find machine learning, artificial neural networks and deep learning. Meanwhile, the blockchain is essentially a new digital information storage system that stores data in an encrypted, distributed ledger format.

Since data is encrypted and distributed across many different computers, this system allows for the creation of highly secure, tamper-proof databases that can only be read and updated by those who have permission to do so.

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