

Volume 3, Issue 5 — July — December — 2019

**Journal-Macroeconomics
and Monetary economy**

ISSN-On line: 2524-2040

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RINOE Journal-Macroeconomics and Monetary Economy

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Presentation of Content

As a first article we present, *SWOT analysis and its interaction with strategic planning in companies* by ALMANZA-SERRANO, Ma. Leticia, CARMONA-GARCÍA, Nérida and RAMÍREZ-BARAJAS, Alejandro, with adscription at Universidad Tecnológica del Suroeste de Guanajuato, in the next article *Augmented reality and CMMS as mechanisms to increase productivity in smart factories* by TORRES-TINOCO, Anahí Montserrat, SANCHEZ-DURAN, Ricardo Miguel and LÓPEZ-SEGURA, Teresita with adscription at Universidad Tecnológica de León, in the next article *Analysis of the productivity of the distribution process of the company DICONSA in Villahermosa Tabasco, for the generation of a proposal for improvement* by MARTÍNEZ-GUTIÉRREZ, Ana Cecilia, LOPEZ-VALDIVIESO, Leticia, TORRES-TORRES, Adán and ELISEO-DANTÉS, Hortensia with adscription at Tecnológico Nacional de México/ Instituto Tecnológico de Villahermosa, in the next article *Strategies for the incorporation of SMES to digital markets* by ÁLVAREZ-GARCÍA, Mónica, GUERRERO-IBARRA Carlos and LARIOS-CALVA, Margarita with adscription at Universidad Tecnológica de Nezahualcóyotl.

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SWOT analysis and its interaction with strategic planning in companies**El análisis FODA y su interacción con la planeación estratégica en las empresas**

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DOI: 10.35429/JMME.2019.5.3.1.6

Received July 27, 2019; Accepted December 14, 2019

Abstract

Strategic planning allows organizations to visualize and build their future and can be conceptualized as an important process to help determine the major purposes of an organization. Therefore, the case study presented is referred to a company in the telecommunications sector, considered as a small company because of the number of people working in it, but due to the wide market it would be considered within the medium-sized company, it started operations Without considering strategic planning, therefore the growth phase in which it is located, is representing a serious problem, since it has not been able to determine the areas of opportunity it has to achieve the goal of staying in the market and continuing to be part of the supply chain for regional companies. Therefore, one of the fundamental parts of strategic planning is precisely the situational analysis, also known as SWOT analysis, which allows the collection and use of data, which makes it possible to know the operating profile of an organization at a given time, since it favors the development and execution of formal planning, from there an objective diagnosis is established for the design and implementation of strategies that help improve the competitiveness of said company.

Resumen

La planeación estratégica permite a las organizaciones la visualización y construcción de su futuro y se puede conceptualizar como un importante proceso para ayudar a determinar los mayores propósitos de una organización. Por ello, el estudio de caso que se presenta es referido a una empresa del sector telecomunicaciones, considerada como una pequeña empresa por el número de personas que trabajan en ella, pero por la amplitud de mercado se consideraría dentro de la mediana empresa, inició operaciones sin considerar una planeación estratégica, por lo tanto la fase de crecimiento en la que se encuentra, está representando un grave problema, ya que no ha podido determinar las áreas de oportunidad que tiene para lograr la meta de mantenerse en el mercado y seguir formando parte de la cadena de suministros para las empresas regionales. Por lo tanto, una de las partes fundamentales de la planeación estratégica lo constituye precisamente el análisis situacional, también conocido como análisis FODA, el cual, permite la recopilación y el uso de datos, lo que hace posible conocer el perfil de operación de una organización en un momento determinado, ya que favorece el desarrollo y ejecución de la planeación formal, a partir de ahí se establece un diagnóstico objetivo para el diseño e implementación de estrategias que ayuden a mejorar la competitividad de dicha empresa.

Planning, strategies, SWOT analysis

Planeación, estrategias, análisis FODA

Citation: ALMANZA-SERRANO, Ma. Leticia, CARMONA-GARCÍA, Nélica and RAMÍREZ-BARAJAS, Alejandro. SWOT analysis and its interaction with strategic planning in companies. RINOE Journal-Macroeconomics and monetary economy. 2019. 3-5: 1-6.

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Introduction

Strategic planning, also called formal planning, is considered an administrative effort in order to provide conditions for the future with which present decisions are made through a document that we call the Strategic Plan; Although many companies are accustomed to developing plans, they face certain problems in collecting and ordering information that refers to operating conditions and the resources available to businesses, which directly affects the adoption of competitive strategies and therefore the elaboration and execution of a plan.

In many cases, the plans do not reflect the actual operating conditions, caused that they are only a list of good intentions and that their contribution is ultimately not appreciable or representative.

One of the tools that helps in the process of analyzing the operations of companies is precisely the situational analysis also known as DOFA diagnosis, because it is an appropriate tool through which, the real conditions prevailing in the company are known, which facilitates a good diagnosis and evaluation in the strategic planning process, and given that importance is that an application of this diagnosis is presented in this case study conducted to a telecommunications company located in the state of Guanajuato.

This paper presents the relationship of Strategic Planning, SWOT analysis and interaction with the company, establishing the importance of a company's environment for the preparation of a situational diagnosis, the variables included in the SWOT analysis are identified, the general considerations for its elaboration are explained, the conclusions and proposals that can help the entrepreneur in the decision making process are established.

Strategic planning and the importance of DOFA analysis

(Steiner, 1995), affirms that strategic planning consists in the systematic identification of opportunities and dangers that arise in the future, which combined with other important data, provide the basis for a company to make better decisions in the present. This implies, among other things, the elaboration of multiple plans to achieve your vision and your mission.

Therefore, strategic planning allows an organization to describe the visualization and construction of its future, so it allows to determine the major purposes of the organization and the strategies that must guide the acquisition of resources, for their use and control in the Achievement of your goals.

The SWOT analysis or situational diagnosis by its acronym (strengths, opportunities, weaknesses and threats), is a tool that gives the possibility to know and evaluate the real operating conditions of an organization, based on the analysis of these four variables, to propose actions and strategies for the benefit of organizations, since it is the appropriate tool to know the real conditions of action of the company, facilitating a good diagnosis and evaluation in the strategic planning process. This diagnosis is most important if you want the proposed strategies to relate to the competitiveness of the organization.

The DOFA analysis and its interaction with the company in strategic planning

Administrators must take into account the environment that prevails in the company, to know its elements and try to relate them to each other and visualize how they can affect the performance of the organization. In general, the authors always talk about the existence of two environments that affect a company, on the one hand the existence of an internal environment is established and on the other hand an external environment. The first emphasizes those elements that are directly related to the structure and operation of the company, including both the available resources and the functional areas, since the strengths and weaknesses of the organization derive there, which are under your control. On the other hand, the external environment is integrated by broad-spectrum components that are associated with variables of global influence such as economy, politics, culture, technology, legal regulations and the regulatory framework, to name a few, to this environment belong both opportunities such as potential threats that haunt companies. Therefore, it is said that these variables are beyond the reach and control of organizations. Thus, people who manage an organization should visualize both the opportunities and threats and their strengths and weaknesses in a timely manner.

	Positive	Negatives
Internal	Strengths	Weaknesses
External	Opportunities	Threats

Table 1 Components of a SWOT analysis

Source: self made, 2019

Case study development

For the development of this case study, information was used from a company dedicated to the services and integration of information and communication technologies, with more than 27 years in the market, located in the city of Irapuato, Gto., Which seeks to comply and exceed customer expectations.

Vision:

Satisfy the needs of the Information Technology and Telecommunications market, promoting comprehensive products and services of high quality and technological innovation, to achieve total customer satisfaction.

Mission:

To be a leading national company in the Information Technology and Telecommunications market with products and services always at the forefront. Below is each stage of strategic planning that was developed for this company.

SWOT matrix development

The following table establishes the results obtained in the situational analysis performed on the company, in which the strengths, opportunities, threats and weaknesses were determined

With the previous information, the SWOT strategy matrix was developed, with the purpose of proposing proposals to elaborate the strategies that the company must follow to achieve its objectives.

SWOT matrix	
Strengths	Weaknesses
<ul style="list-style-type: none"> Responsible staff Fast customer service by phone / mail Teamwork Staff commitment to the services they perform Positive image to consumers Proactivity in customer management / search It has a customer tracking record Good working environment Good communication system 	<ul style="list-style-type: none"> Lack of technical training High prices on quotes Lack of liquidity to conclude a service Lack of liquidity to make field visits Dependence on the other areas to conclude a customer service Take responsibility for other areas Lack of time management to fulfill certain activities of other departments
Opportunities	Threats
<ul style="list-style-type: none"> Creation of new companies Location of the favorable company. 	<ul style="list-style-type: none"> Increase in competitors Competitors with lower prices Bad relationship with suppliers Credit conditions with customers

Table 2 SWOT Analysis

Source: self made, 2019

	Strengths	Weaknesses
	<ol style="list-style-type: none"> Good work environment in the company. Good product quality and service. Motivated and happy human resources. Quality technical and administrative processes. High level service provided by workers. 	<ol style="list-style-type: none"> Lack of training. Bad financial situation. Inability to see errors. Market recognition Price of product and service by suppliers.
OPPORTUNITIES	SO (MAXI - MAXI)	WO (MINI - MAXI)

1. Market poorly served. 2. Product need. 3. Competitive advantage 4. Favorable trends in the market. 5. Strong purchasing power of the target segment.	* Through upsell and crossselling strategies, the company intends to publicize and strengthen the service, as well as to arrive in front of a very poorly attended market with many competitors. * Create a marketing network with prospects to have a sales and referral base that will grow the company.	D4 - O4. Work as a team with other companies that have a similar market, but are not competent to find new opportunities with minimal effort generating strategic alliances. D5 - O2. Determine the matter of the needs of customers and adjust the price of products according to agreements with suppliers.
THREATS	ST (MAXI - MINI)	WT (MINI - MINI)
1. Changes in legislation. 2. Very aggressive competition. 3. Increase in product price. 4. Market segment contracted. 5. A lot of direct and indirect competition 6. Financial situation of customers.	* Although the size of the company is medium, this gives a lot of adaptability in case of market fluctuations. * In case of changes in commercial legislation, the company intends to be in the commercial society of greater convenience according to its needs.	D5 - A4 Market recognition vs contracted market segment recognize the position that the company has in the points of sale. -D2 - A3 Low sales for high product prices by suppliers, the solution to find suppliers with fixed prices and increase sales more. -D1 - A6 the causes of low wages in the country with a threat to the financial situation of customers, the company will adapt the price to wages.

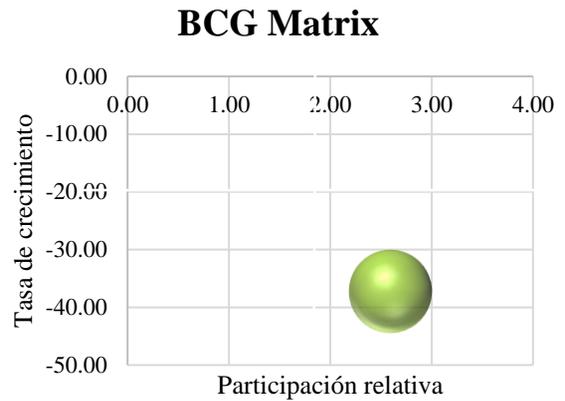
Table 3 SWOT strategies
Source: self made, 2019

BCG matrix application

This matrix will be used to verify in which quadrant the company is located, taking into account the participation in the market and the growth rate for each year, this in order to know in what situation the company is currently.

Compan y name	Sales 2016	2017 sales	2018 sales	Sales 2019
	\$7,798,996.36	\$4,885,490.94	\$118,565.54	\$97,124.29
Market share	26.00	16.28	0.40	0.32
Growth rate	-37.36	-97.57	-18.08	

Table 4 BCG Matrix
Source: self made, 2019



Graphic 1 BCG Matrix
Source: self made, 2019

The BCG matrix of the company gave a location result in the dog quadrant, emphasizing that its relative market share is low and its growth rate is equally low, however, the numbers are gradually decreasing, giving negative results.

MPC matrix application

This matrix was used to have a measuring range that will show that competition is stronger and weaker, in addition to verifying in what position the company in the case study is to measure the level, know if it can improve or will have to apply strategies and tactics to increase your position.

Weighing			
0	The zero trend is nothing important.	1	The tendency to one is very important
Value			
1	Major weakness	3	Minor Fortress
2	Minor Weakness	4	Major Fortress

Table 5

3. Matrix of the competitive profile

From the previous analyzes, the direct competition of the company was selected, obtaining the key factors to be evaluated, it will be possible to observe which is the company that has some of these factors stronger or weaker, having in itself a relative weight according to the importance and hence apply the most convenient are strategies or benchmarking.

	Key factors	My business			Competition 1 (Security)	Competition 2 (Softeck)		
		Relative weight	Qualification	Weighted weight	Qualification	Weighted weight	Qualification	Weighted weight
1	Market share	0.20	2	0.40	2	0.40	2	0.40
2	Prices	0.02	1	0.02	3	0.06	3	0.06
3	Financial position	0.30	1	0.30	3	0.90	2	0.60
4	Product quality	0.10	3	0.30	4	0.40	4	0.40
5	Customer loyalty	0.10	3	0.30	2	0.20	2	0.20
6	Company image	0.10	4	0.40	3	0.30	3	0.30
7	Plant location	0.08	2	0.16	1	0.08	2	0.16
8	Innovation	0.10	4	0.40	2	0.20	2	0.20
Diagnostic Result		1.00		2.28		2.54		2.32

Table 6 MPC Matrix

Source: *self made, 2019*

Through the analysis of the competitive profile, it follows that the company is at a very low level, its diagnosis reflects that it is the weakest company in the market, affected by the price and the financial position that is taken, taking into account that CONDUMEX is the strongest company on the economic side being world-class has more market share and is more recognized having 60 years in the market.

Methodology to be developed

The following methodology was carried out for the development of this project:

1. A situational analysis of the company was carried out to know the situation that prevails within the main administrative areas.
2. The analysis criteria were identified, that is, to consider the most relevant factors in the performance of an organization.
3. Determination of the real conditions of action in relation to the internal and external variables of the analysis.
4. The SWOT analysis and its strategies were performed.
5. The BGC Matrix was applied to know where the company is located in relation to market share.

6. The MPC Matrix was applied, with the intention of knowing the competitive profile of the company.

Results

Based on the provisions of this project, the results obtained when developing the strategic plans were favorable based on the marketing that was managed, based on an analysis of the environment in which the company was and how it changed according to the strategies that were proposed for the increase of sales and profits of the company. Analyzing the different factors that cause the company to have a deficit in the area of ICT sales, it was possible to detect the areas of opportunity where strategies were proposed to improve them and grow as a company, choosing to make a BCG matrix which helped to know in what quadrant was found and from this generate the relevant strategies for a better result, in addition to this a competitive profile was developed in order to know which was the strongest competition in question of the ICT Sales department and with it apply the best options of strategies enhancing the profits of the company, as well as its market. To develop strategies according to the cost, it is necessary to take into account the situation of the company, in addition to the prices that are available, this to improve the financial analysis and increase sales, as well as customers, which is why they were analyzed the prices of both suppliers and competition, leading to the development of internal and external costing strategies, so that the company does not have a mismatch according to prices and budget, but that more profits are obtained, so that investments can be made and financing sought for have a cash flow in cash with assets and liabilities for a better economic situation. Not only what is mentioned above is needed, but also a strategic planning made up of matrices, strategies in plans A, B, C, analyzing well the market to which it focuses and seeing the vision every day of the company how far it wants to go.

Conclusions

In general, the company has favorable and unfavorable, profitable and risk aspects. With the analysis completed, conclusions that reflect the general diagnosis of the situation of the organization regarding the variables studied and that will serve as a basis for making proposals for competitive strategies that are consistent, relevant and appropriate should be issued.

1. The DOFA analysis is a valuable tool that supports the strategic planning process of the company. Its importance consists in the evaluation made of the strengths and weaknesses that prevail within its internal and external environments.
2. The Opportunities, strengths, threats and weaknesses that were included in the diagnosis, are a representation of the company under study and according to each business scenario, therefore they are unique in their operation and results, so it is not They must generalize.
3. The information that was collected in the SWOT diagnosis is objective, flexible and relevant, which should cause changes or adjustments in the planning process.
4. The proposals that were made for improvement are made with the purpose of orienting to reduce weaknesses and to strengthen and maintain the strengths to look for suitable opportunities according to the capacity of the company.
5. The use of the BCG Matrix, supports the company to verify in which quadrant it is, being that the participation in the market and the growth rate for each year are taken into account, this in order to know How much growth is having year by year.
6. The use of the MPC Matrix, used to have a measuring range that shows that competition is stronger and weaker, in addition to verifying in what position it is in relation to direct and indirect competition.
7. In turn, it is established that in order to facilitate the design and implementation of the strategies derived from both the DOFA analysis, the BCG matrix and the MPC matrix, it is proposed to have professional advice at a very low cost if you make strategic alliances with universities and specialized training centers in the sales area.

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Augmented reality and CMMS as mechanisms to increase productivity in smart factories**La realidad aumentada y los CMMS como mecanismos para aumentar la productividad en las fábricas inteligentes**

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DOI: 10.35429/JMME.2019.5.3.7.13

Received August 19, 2019; Accepted December 18, 2019

Abstract

Augmented reality is one of the technologies that with a high frequency is involved in the theme of Industry 4.0 for its benefits, however, it is applied more frequently in entertainment areas, when it is a tool that allows to show data, pieces, statistics, technical data sheets of industrial equipment thus revolutionizing the manufacturing industry and to another way to show of data in this field. This article shows the exploration of the combination of augmented reality, with a CMMS with the purpose of serving as a strategic information system for decision giving the manufacturing company the concept of intelligent factory in the ecosystem of the industry 4.0. The CMMS is developed first, then the augmented reality application is created and finally the study is done to verify if they are compatible and if the presented information is useful for the company. The contribution of this study is to propose a methodology for the development of a new type of strategic information system 4.0 in which a new way of displaying data (AR) and an information system such as CMMS is mixed.

Resumen

La realidad Aumentada es una de las tecnologías que con una alta frecuencia se ve involucrada en el tema de Industria 4.0 por sus beneficios, sin embargo, se aplica con mayor frecuencia en áreas de entretenimiento, cuando es una herramienta que permite mostrar datos, piezas, estadísticos, fichas técnicas de equipos industriales revolucionando así la industria manufacturera y en gran medida la presentación de datos en este ramo. En este artículo se muestra la exploración de la combinación de la realidad aumentada, con un CMMS con la finalidad de servir como un sistema estratégico de información para la toma de decisiones dando a la empresa manufacturera el concepto de fábrica inteligente en el ecosistema de la industria 4.0. Se desarrolla primero el CMMS, posteriormente se crea la aplicación de realidad aumentada y finalmente se hace el estudio para verificar si son compatibles y si la información presentada es útil para la empresa. La contribución de este estudio es proponer una metodología de desarrollo de un nuevo tipo de sistema estratégico de información 4.0 en la que se mezcle una nueva forma de mostrar datos (AR) y un sistema de información como el CMMS.

CMMS, Realidad Aumentada, industria 4.0

CMSS, Augmented Reality, Industry 4.0

Citation: TORRES-TINOCO, Anahí Montserrat, SANCHEZ-DURAN, Ricardo Miguel and LÓPEZ-SEGURA, Teresita. Augmented reality and CMMS as mechanisms to increase productivity in smart factories. RINOE Journal- Macroeconomics and monetary economy. 2019. 3-5: 7-13.

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Introduction

From the moment the internet ceased to be only information for people due to sensors in machines and robots, or what we know as the internet of things, industries have been concerned with applying these strategies in new areas of This disruptive way.

Industrial maintenance is an important element in the production process in companies, since it provides mechanisms so that production remains safe and cost-effective. The Centralized Maintenance Management System (CMMS) are useful information systems for storing data from the management of the maintenance department from the registration of machinery to the registration of preventive plans. This need for management decision-making information is what drives many companies to use systems that have a high impact. However, the way of presenting the information is sometimes not the clearest for the user. Multimedia strategies such as virtual tours, augmented reality are strategies that can be applied to systems in order to display information differently.

The concept of industry 4.0 was first heard in Germany, in an event of industrial innovation, when they referred rather to the topic "Smart Industry" in which the definition mentioned the use of multiple sensors, robotics and information systems that They allow new models to organize the industry, which led to the talk of the fourth industrial revolution. [Kagermann, 2017].

This document proposes the possibility of linking a CMMS with augmented reality to present useful reports in decision making in such a way that a better user experience is generated that responds to usability and accessibility. The use of Augmented Reality, with a CMMS system is the added value, since it contributes to the pillars of industry 4.0.

The first topic of this document presents the development of intelligent factories, as well as of industry 4.0 from the perspective of several authors starting from their origin to the elements and tools of the same.

The second topic presents a compilation of applications in the industry in which augmented reality facilitates processes.

The CMMS concept is defined in the third topic of this document, as well as the system developed for the company that facilitated the development. The methodology section briefly describes how the architecture proposed here was developed, from the development of the CMMS, as well as the integration with Unity until reaching the application of Augmented reality with Vuforia. Finally, the results and conclusions generated after this investigation and implementation are presented.

Smart Factories and Industry 4.0.

First world countries are looking for strategies that help put their industries at a level that allows global competition, including Germany, Korea and the United States. The gathering of information technologies, the application of sensors and robotics to make way for the internet of things, is not the only thing these companies care about, but also pay attention to the needs of customers, since it seeks the customization and creation of new products and / or services with quality and that provide a better consumer experience. That is why Industry 4.0 is based on ICT, as it is what allows intelligence in the same factories.

The intelligent factory or Smart Industry or connected Industry, is represented by the type of CPPS systems, which are information systems with sensors, machinery and some other equipment used in production with an interaction that makes operators only get involved for maintenance tasks. This exceptional communication between the machines and the systems allows them to configure themselves to adapt in real time to the needs of the client, improving their experiences in all the life cycle processes of these products or services. In these smart factories, all systems are interconnected in agent networks that make their own data-based decisions.

Apart from smart factories, industry 4.0 has other fundamental pillars such as: cloud computing, big data, internet of things, robotics, security protocols and augmented reality. The latter allows a type of systems in which, digital information is superimposed over real-time vision, useful information is shown for decision making or about work procedures.

It is intended that with this tool there are systems that, through augmented reality lenses, employees can perform an increased repair, thus increasing safety and efficiency. [Del Val, 2015]. The exponential production and sale of mobile devices, from wearables, has allowed us to see more and more this technology in professional life. Also 3D modeling and virtual reality has allowed to recreate spaces, models, products, people and machines in a virtual mirror model of a real world.

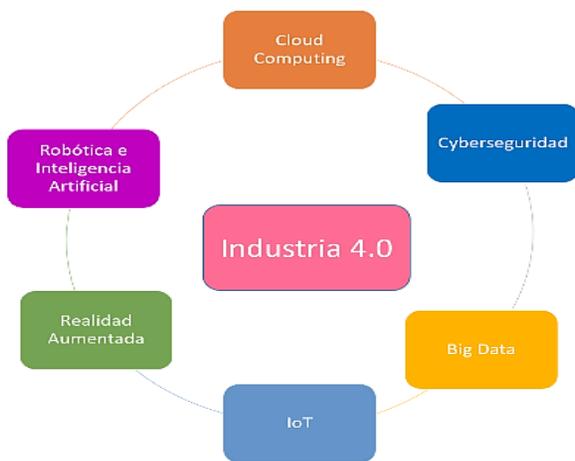


Figure 1 The pillars of Industry 4.0

We can define the benefits that large corporations enlist in this fourth revolution in 4 fundamental aspects: an added value is given to the company, a stabilizing effect is generated in the administrative management and production of the company, profits are multiplied, production, sales, customers etc, and this helps to generate more exports and imports. However, the most important thing that when using the aforementioned technologies, companies will move from mass production model to mass customization and above all leads companies to think about new business models in which manufacturing may be Distributed and largely allow efficiency in operations to mention, sustainability, security, inventories, customer service and without a doubt productivity. [Ramon and Cajal, 2016]

Augmented Reality applied in the industry

Augmented reality has been of great impact in recent times when users are betting on all those more visual and interactive applications. Its use is very varied, from academics, medicine and industry.

Speaking of the industry, through the use of Augmented Reality (RA), manufacturers or service personnel, using I or T mechanisms can identify an object, equipment or machinery to obtain any information from the enterprise resource planning system. Building the best connection between the information systems and the RA, the technician will have immediate access to the specifications, inventory, location and delivery times of the object. Augmented reality is a very powerful tool for the development of personnel training, since it is possible to access the technician or operator to the instructions and manuals that provide operational details. It is also possible to run videos while working on a process, which facilitates the specialization of personnel, for example, this can be used in an assembly line since personnel with little knowledge can learn when performing the process without the employee requires a degree of specialization; All this is achieved because with the RA the information or instructions can be superimposed. Specifically in the maintenance area, this becomes useful for checking at what time the machines or equipment are working correctly or preventing maintenance for observed details. The technician will see the real problem before approaching the machine, since, thanks to the I or T, the sensors of the machine will have sent advance information, which saves time and money when diagnosing failures. Also the augmented reality can help in the industry in the realization of tests of quality in the pieces since, if they present a deficiency, it could be determined if they are salvageable or should be replaced. [Olive 2018]

In order to create augmented reality, it is necessary to know the options for this, which by the way are increasingly more than one would think and many of them without knowing any programming, among them we find Aumentaty, Google also has its contribution with ARCore, Metaverse and Vuforia, the latter is a software for more prepared developers more advanced users and who have previous knowledge of programming and computing.

In general, as mentioned before, the uses of augmented reality in the industry improve the user experience by making activities more and more immersive, so we can see systems such as the DMG solution for Industry 4.0 of the company SCS Concept Group, which is an augmented reality system for manufacturing processes, that is, it includes a complete guide for the operator on how to assemble a device, in case you make a mistake, the augmented reality system marks a message. There is also another RA system that, connected to an information system, is able to mention the inventory of available parts, how many are available to fill orders, etc. The Paccar company also made use of augmented reality, building an application that allows defining the characteristics of a trailer, from the definition of headlights, the chest and the box. Mercedes Benz is another brand that is betting on this technology using an application that trains users in the chassis assembly of some of their cars. Tecnalía is a software based on this technology that helps in the training for the assembly of computers mentioning step by step that must be armed. There are also many equipment manuals made in 3D and that with augmented reality show their characteristics. There are other applications in which you can define technical information about different equipment.

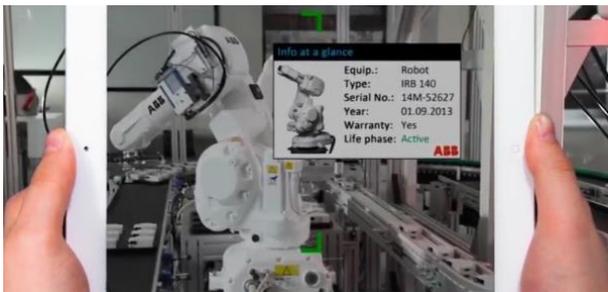


Figure 2 Manuals in Augmented Reality

CMMS

Maintenance is a very important point in the industries because it aims directly to boost production or affect it, this means a constant search for new and innovative ways to increase the reliability, availability and useful life of plants, that is to say, to implement the concept of intelligent plants.

The automation and use of technologies has allowed the planning and programming of maintenance work on large volumes of equipment, machinery and facilities, which marks the need to use large information systems such as CMMS Business Planning Maintenance Systems. This type of systems allows the classification and characterization of information, so that it is grouped and consulted according to the specific requirements of each user, which facilitates the processes of analysis and decision making, so important in the areas of costs and reliability. An essential feature in CMMS is that they can provide data such as the average time in which the equipment fails, or the time it is maintained. This average failure time indicator measures the time in which a device can be operated without failures, that is, work continuously, which allows reliability in the equipment. Another important indicator in a CMMS is the average time at which the equipment or Mean Time To Repair (MTTR) is repaired, which is nothing other than the measure of the distribution of the repair time of an equipment or system. This indicator measures the effectiveness in restoring the unit to optimal operating conditions once the unit is out of service due to a failure, within a certain period of time. The measurement of faults and their analysis is a characteristic of an optimal maintenance system, which means that the values of the equipment in question must be recorded at all times during its useful life. [Amendola, 2017]

In this document we want to mention the development of a CMSS for a Leon company dedicated to the manufacture of dyes and paints. They had the need to manage maintenance and thus be able to have accurate information about the failures. It was developed by teachers and some students [Hernandez, 2018].

It was developed using project management methodologies with CMMI and PMBOOK practices. 3 iterations were performed.

It was developed with HTML, Bootstrap, JavaScript client-side programming, Ajax and server-side programming using PHP and MySQL database. In addition to having an MVC architecture.

This CMMS includes the sections of: Catalogs (Equipment, Tools, Supplies, Technicians, Profiles, Locations and Users), Service Management, Corrective Maintenance Management, Preventive Maintenance Management and Reports. This system includes permission management, sessions by type of user. Packages such as Data table were used that allow the visualization of data in self-manageable reports by the user, allowing the export to Excel, pdf, copy and paste etc.



Figure 3 CMMS screen developed

This system is currently in use and already has real records, the company has given a value to the system and this is the only way to record its maintenance-related operations. Among the needs currently marked by the client is to add a section of reports that give a clearer perspective of data such as failures, attention time, hours paid for staff etc. This information is used so that management can make decisions, so it is proposed that this section be the one shown with augmented reality.

Methodology to be developed

The development of this CMMS application and augmented reality is defined in 3 phases, in the first one the information system is built that will allow the registration of the necessary data about maintenance. Several stages of analysis were defined for the collection of software requirements, subsequently the stage of modeling use cases was mainly developed, database diagramming and application wireframes.

DETALLES DE CASO DE USO	
ID DE CASO DE USO	CU_RF03
NOMBRE DE CASO DE USO	Proceso Catálogo de Técnicos.
DEPENDENCIA	N/A.
DOCUMENTOS RELACIONADOS	CuestionarioBase.doc, Requerimientos.xlsx,
RESPONSABLE	Anahí Torres Tinoco
ACTORES	Encargado de mantenimiento -Administrador de la Aplicación
DESCRIPCIÓN GENERAL	Permitirá almacenar en el sistema CMMS los técnicos que integran el departamento.

Table 1 Use case detail

The coding stage was attended by modules, the catalogs were first made, then the service management and finally the corrective and preventive maintenance management section. Each of these stages carried out a verification with the company.

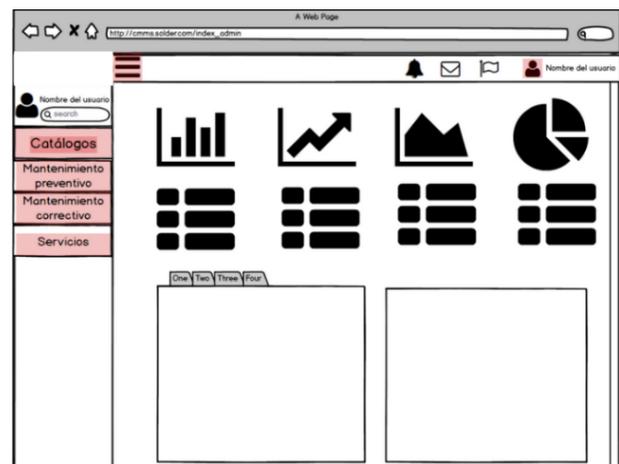


Figure 4 CMMS wireframe

This first stage was evaluated in each delivery, that is, at the time of delivering each module the user performed tests and the development team performed functionality and performance tests previously. As mentioned earlier, CMMS is already in use.

The second stage of this methodology is to develop the communication environment with the augmented reality system. In this stage the first thing that was done is to select the development environment for the virtual application that in this case is Unity, the connection that would be made is to a server since there are the MySQL databases it is important that this server already It is placed on the internet, however, a suite like WAMP that does a local service can work. The database is created, in the case of the application mentioned here, the database used by the CMMS will be used. Subsequently it is necessary to create a PHP file that includes the connection to that database.

Achieving communication it is necessary to bring the data to be displayed, in this case it is the data resulting from maintenance reports. In Unity you must create a script that includes interface elements, adding the `UnityEngine.UI` class. It also makes use of the `IEnumerator` class that allows you to use the `www` object and will receive the URL of the PHP file that achieves the connection to the server as a parameter. From PHP we will return a string that includes all the data to display, when receiving them in Unity objects will be created that represent the bar graphs in which you only have to change the scales according to the values that come from the database. Finally, these elements are displayed in Vuforia so that when reading the CMMS tags you can throw the graphics in augmented reality. The last stage of this methodology is the performance of the corresponding usability, functionality and performance tests.

Results

There is currently a CMMS Se in iteration 1, 2.3 on a remote server owned by the company; It is not possible to share any content, because it is private property protected by confidentiality agreements. It includes n real data of the company, in which it is necessary to make the relevant changes to have a better functioning of the augmented reality section. The company that requests the development is committed and interested in the implementation of these new technologies. The Augmented Reality implementation phase is still under development since it depends on the reports requested by the company and especially on the generation of tags to show augmented reality.

Acknowledgments

We thank the company Grupo Solder of the City of León Guanajuato, who kindly requested the services of the professors and research professors of the Virtual Environments and Digital Businesses career to develop this application and rely on our performance. Also to the Technological University of León for providing research hours for the realization of this type of projects and finally to all our students who somehow participated in the realization of this project, from section modeling, programming and testing.

Conclusions

From the point of view of teachers, with a research profile some of the benefits can be described when participating in this project: the vital importance of working with a company motivates the teaching staff to remain updated in the knowledge of process architecture; to be able to propose more business scenarios not so much as simulations inside the classroom; It is a time to see the use of the technologies seen in the classroom implemented in the industry and above all by paying for this 4th industrial revolution.

This project of linking a CMMS with Augmented Reality demonstrates that RA applications are not only used for entertainment, but have a high impact on the industry. Industries seek to obtain greater benefits using technologies representative of industry 4.0. but they know that it is necessary to have strategic plans in which they set goals that they intend to reach.

Finally another important change will come in the workers since they will have to learn to live with different ways of interaction with the environment and the machines due to the physical cyber systems, and on the other the consumers, the relationship with the company and the way of buying, Will be affected.

Higher levels of customization will be obtained, and shorter wait times will be required in the same way.

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The role of the pepenadores and their relationship to sustainable development: A proposal for municipalities**El rol de los pepenadores y su relación con el desarrollo sustentable: Una propuesta para municipios**

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Received July 20, 2019; Accepted December 10, 2019

Abstract

The problem of urban solid waste (RSU) is one of the concerns of contemporary society and a global challenge to public management, the transition from rural to urban, changed consumption patterns. This research aims to disseminate what occurs daily in solid waste landfills, and to publicize another vision regarding the final disposal of municipal solid waste, such as the municipality of Xalisco, Nayarit; in this regard, it is relevant to raise the work of the pepenadores in the framework of a formalized exercise, in which they are guaranteed equal opportunities, work-based remuneration, job stability, social security, training and Rest.

Resumen

El problema de los residuos sólidos urbanos (RSU) constituye una de las preocupaciones de la sociedad contemporánea y un desafío mundial para la gestión pública, la transición de lo rural a lo urbano, modificó los patrones de consumo. La presente investigación tiene como objetivo divulgar lo que acontece a diario en los vertederos de residuos sólidos, y dar a conocer otra visión referente a la disposición final de los residuos sólidos municipales, como es el caso del municipio de Xalisco, Nayarit; en este sentido, es pertinente plantear la labor de los pepenadores en el marco de un ejercicio formalizado, en el que se les garantice la igualdad de oportunidades, la remuneración acorde al trabajo, la estabilidad laboral, la seguridad social, la capacitación y el descanso.

Pepenadores, Sustainable Development, Proposal**Pepenadores, Desarrollo sustentable, Propuesta**

Citation: MURRAY-NUÑEZ Rafael Martín, OROZCO-BENITEZ, María Guadalupe and NÁJERA-GONZALEZ, Oyolsi. The role of the pepenadores and their relationship to sustainable development: A proposal for municipalities. RINOE Journal-Macroeconomics and monetary economy. 2019. 3-5: 14-25.

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Introduction

Solid waste management (RS) problems, particularly their final disposal, can be considered from the time when human beings began to congregate in tribes, villages and communities. The accumulation of waste became a consequence of life, in remote times this did not pose a significant problem since the population was small and the amount of land available for the assimilation of waste was large (Careaga, 2000).

However, currently the problem of the generation of RS and its corresponding management and final disposition, does not escape any population in the world and is more acute in the large urban centers and growing cities. The majority of the population worldwide is concentrated in urban areas, presenting increasing challenges to solve the urban-environmental problems, especially in the metropolis as a result of a great acceleration in the urbanization initiated since the middle of the industrial revolution, that formed cities that were not prepared for the demographic explosion and its growth acquired a disorderly character (Jordan, 2003; SEDESOL, 2011; Aponte, 2007).

Mexico is a country with an urban population of 72%, concentrated in 383 cities with more than 15,000 inhabitants. The current urban anomalous projection in the country is estimated to reach 121 million people in the next 18 years, who will live in urban areas with more than one million inhabitants in 2030 (SEDESOL, 2011).

Said growth and concentration will require various inputs for its maintenance such as water, energy and materials, as well as the adequate disposal of waste, where the inadequate discharge of RS in water and soil, alters the quality of these resources, as well as their impact on health Human and in ecosystems. Demographic growth, concentration in urban, metropolitan areas and productive methods have not complied with environmental regulations, to this it is possible to add the economic model that has a negative cause in the consumption habits of the population (De Valle, 2005; Zaman and Lehmann, 2011; Zaman, 2014; Vij, 2012). The issue of urban solid waste (MSW) is one of the concerns of contemporary society and a global challenge for public management (AIDIS, 2006).

This problem of the generation of MSW, where the highest levels correspond to countries with high economic income, as is the case in the North American region, consisting of Mexico, the United States and Canada (UNEP, 2004).

In Mexico, the transition from rural to urban, modified the consumption patterns of a society that mainly produces organic waste, to one that produces inorganic waste (IR) derived from the consumption patterns of urban industrial societies (SEDESOL, 2011).

In 2010, the country generated 109,750 tons of RS daily, of which 64% were deposited in landfills, 9% in landfills controlled, and the remaining 27% in open-air dumps. The third part of the RS ends in uncontrolled places, this practice has generated environmental problems that affect the health of the localities near the open air dumps (INEGI, 2010). In Mexico, the average daily RS per capita generation at 0.9 kg, in rural areas with 0.4 kg and in cities of 1.5 kg. (INE, 2010). The management of MSW in developing countries lies with the local authorities (Chen et al., 2010; Kanat, 2010; Okot-Okumo and Nyenje, 2011). The case of Mexico does not escape this condition, the "Political Constitution of the United Mexican States" indicates that it is the commitment of the municipal authorities to manage and collect them (SEDESOL, 2005).

However, in our country the management is insufficient due to the little progress that the landfill projects have had and their progress in the matter of legislation; product of the vision that was had on the RS and the lack of capacities to provide an adequate infrastructure, together with insufficient financial resources by the municipalities to address this problem (Gutiérrez, 2006; GTZ, 2003). The management of SR in our country has gone through three moments in its history: it begins in the year of 1964 with a focus on sanitary regulation, later in the years 1988 with the creation of national environmental legislation there is a basic management of waste, the last period in 2003, this was due to the creation of the General Law for the Prevention and Integral Management of Waste (DOF, 2003), this proposal goes beyond the previous ones, incorporating aspects of the sustainable management of MSW (Zaman and Lehmann, 2014; Ezeah and Roberts, 2014; Menikpura et al., 2013; Dálisa et al., 2012; Marshall and Farahbakhsh, 2013; Pires et al., 2011).

The separation of MSW is the commitment and responsibility of citizens that arises from the knowledge of the negative impacts produced by incorrect management of MSW. The formulation of comprehensive public policies for the benefit of recyclers, must be supported in the knowledge of the positive environmental impacts contributed by this activity and the dissemination of these among the whole society. In this way, it will be feasible to incorporate the collective, the authentic assessment by those who recycle materials.

In this sense, it is pertinent to consider the work of the recyclers in the framework of a formalized exercise, in which they are guaranteed equal opportunities, remuneration according to work, job stability, social security, training and rest necessary. Because the transport of the recovered materials represents a great cost in the process, it is essential that the institutions support initiatives aimed at modernizing motorized vehicles. The purpose of this research is to disseminate what happens daily in landfills and to publicize another vision regarding the final disposal of municipal solid waste, considering the area of influence of the elements involved and how to attack the origin of the conflict in The decrease of this problem.

From the experiences reviewed, it should be noted that in the municipality of Xalisco, Nayarit Mexico and in much of the country there are no recognition actions, creation of inclusion policies, in favor of the population of pepenadores. There is also a delay in efforts to dignify and recognize the economic and environmental benefits generated by the recycling activity of these groups; The municipal administration does not have a register of the people who work in the landfill, nor do fiscal control actions that prevent the participation of third-party personnel that have not traditionally exerted as a recycler *ex officio*. At present, the commercialization of recovered materials is linked to the needs of raw materials for the development of new products, so intervention from multilateral organizations is necessary, to create cooperation mechanisms that facilitate the articulation between groups of recyclers that inhabit near the garbage dump, to carry out activities that reduce the volume of inputs such as plastic bottles and contribute positively to avoid depletion of natural resources and the impact on the environment.



Figure 1 Separate and packed plastic bottles. Municipal landfill of Xalisco, Nayarit. Taken with mobile phone camera

An additional element is the role played by the global market context of recycled or recovered materials and their impact on the income level of recyclers. In this regard it is important to emphasize the need to articulate governments with research and society to develop research on alternative uses or conditioning, which allow a better use of materials with low demand in the market.

Regarding the participation of citizens, as an indispensable element for the correct separation at the source, the experiences reviewed demonstrate the need to raise awareness about the issue permanently and in the long term and even complement it with stimuli in the rate of provision of the cleaning service that motivates adherence to environmental sustainability practices.

In this sense, the dissemination of clear information on the environmental benefits that are perceived by waste management in an inclusion framework for waste pickers, results in the improvement of the living conditions of society in general, as a result of coherent policies with the social dynamics and the needs of the recycling population, in what would constitute an example of application of the premises of sustainable development.

Currently, you can see a larger picture of research on recycling and recyclers. It is possible to find research that includes the social, economic, environmental and health development context of recyclers, as well as analysis of municipal initiatives that have not addressed such problems in terms of public policies.

Explanation of the sections of the chapter

Studies on recycling and recyclers have been developed over the past few years around various issues, including the environment of groups engaged in the recycling activity in terms of their social and economic context and the occurrence on their health, the interaction between municipal public policies NGOs and social organizations, the influence of the world economy on such activity and on recyclers considered within the lowest socioeconomic level and the incidence of such activities on sustainable development. Research trends account for the transformation of solid waste recycling issues, which at the beginning was restricted to the environmental impact of the recycling activity, without comprehensively addressing the consequences of the work of the pepenador of who exercise this activity of high degree of risk on the lives of the recyclers, from an integral perspective of sustainable development.

1. Waste pickers and their social and economic context.

In recent years, the growth of urban areas with the consequent displacement of inhabitants of rural areas throughout the world, has partly derived as a result of the poverty conditions that prevail this imposes the development model which focuses solely on the economic growth, and has influenced the emergence of the practice of collecting waste materials for marketing as a livelihood.

This activity, primarily carried out by marginal groups that embrace the possibilities offered by open-air dumps, causes the emergence of safety and protection networks among those who work in the trade.

When investigating the problem of the generation of SR in rural areas, it becomes clear how this process is inherent in the presence of humanity itself and the way it is associated with social organization and the concepts that have emanated collectively on the consumption, well-being, and the satisfaction of society-environment relationship needs.

Referring to the background, Medina (1999), recounts the practices of recycling materials in different eras and regions of the world: In Rome III and VI centuries BC. , bronze was recycled, in Mexico prior to the colony, wastes from human metabolism were recycled for use in agriculture; between the eleventh and eighteenth centuries in Spain, urine was recycled, for textile use in papermaking; between the seventeenth and mid-nineteenth centuries in Japan human feces was recycled as a fertilizer for agriculture.

Recycling has become an alternative for marginal groups of the population characterized by a low level of income, which are dedicated to the collection of materials in open-air dumps with commercialization possibilities and return to the productive cycle.

Its practice is a subsistence alternative for some segments of this population whose socioeconomic conditions are precarious. In this regard, Yepes (2005) states: "The factor that borders them is extreme poverty that forces many to be employed in recyclers or informal pepenadores in order to survive."

Hartman (2012) describes the conflicts that occur between the pepenadores or recyclers themselves in landfills in urban areas, who perform their work in an open-air sanitary landfill; Factors such as location and distances to materials define the occurrence of tensions among marginal people dedicated to this work.

It is for this reason that the recycling activity has been neglected by the government sector due to its direct impact on global trends that influence local actions; However, the majority of the population ignores the importance of the work of the recyclers and even hinders their performance.

Recycling activity prevails as a labor option in the so-called developing countries or with unstable economic systems such as our country, with marked socio-economic differences of low income among its inhabitants and which are referred to as "developing countries" (2011); Scheinberg and Anschutz (2005), researchers who highlight the need for RS reception transfer spaces for the community.

Different studies carried out by Oteng-Ababio (2011) indicate the sectors in which there is efficiency in the management of MSW in conditions of poverty, while highlighting the environmental and economic impacts produced by the activity of the recyclers, to support the recycling processes and guarantee economic benefits. Hayami and Mishra (2006) expose the situation of the recyclers, highlighting their valuable contribution to society, highlight the environmental benefits of the economy by disposal costs in landfills and conservation of resources and indicate the way out of poverty through Public initiatives to improve their income level and quality of life, this warns about the low remuneration of workers in the landfills.

Bidegain (2011) determined that within the process involved in the activity of pepenadores they obtain the lowest economic benefits, Gill (2007), who studied the relationships between sellers (recyclers) and buyers, of recycled materials, denounces serious disadvantages in transactions.

Tahir and Tahir (2012) analyze the situation of the informal sector, especially for women, showing how the petty level of income and lack of studies, the lack of contraceptive methods, high birth rates and conditions of marginality, influence the Difficulty accessing decent and formal work. They are also considered in Bonner and Spooner (2011) who warn of the great opportunities that could arise for informal women recyclers under solidarity forms of organization.

In contrast to the reports where few investigations can be identified, it is the case of first world countries the level of middle and high income, as is the case in Canada, where Gutberlet, Tremblay, (2009) study the conditions of social marginality of the pepenadores, while highlighting the importance of offering them possibilities of inclusion through citizens' policies and participation.

In the same country, but in St. John's, Newfoundland and Labrador, Porter (2015), it is proposed to promote community interaction with the pepenadores, giving them the RS properly separated, as a condition that favors the process of inclusion of this population and that allows proper management of the MSW, this in our country is not carried out, instead the RSs collect in a general way in a truck.

Global economy and its influence on recyclers

The circumstances of the global economy have led to the mobilization of large segments of the population from rural areas to large cities. The low levels of schooling and income of those who arrive in the cities have generated the need to resort to the exercise of recycling as a form of livelihood.

Puncher (2005), describes how rapid population growth and the consequent generation of MSW are conditions for inhabitants in third world cities to devote themselves to recycling, as a form of livelihood; It also analyzes the difference between recyclers and buyers of materials and makes a characterization by income levels and sites of origin. Choudhary (2003) recommends ensuring adequate means of production, working conditions and stable union forms of organization.

Dimarco (2013) conducted a study regarding recycling focused on Latin America and refers to the importance that the issue of environmental impact, the changes produced from the market and the concept of trade in order to achieve dignification achieved in the last half century; Both situations affected the formation of recycling organizations, as well as groups that have gradually gained recognition.

Discarded materials such as RS and then recovered and recycled to return to the productive flow and the globalized market, are prioritized or rejected according to global fluctuations in supply and demand, which determines their price and high availability allows a place for mediation of the groups of pepenadores dedicated to the recycling RSU; An example of this, Nading (2011) mentions the influence of the market for aluminum recycling, as a raw material in the manufacture of soda and beer bottles. Grant and Oteng-Ababio (2016), describe the recycling of electrical and electronic equipment parts, called urban mining, as the activity that replaces the demand for raw materials in countries, which are dedicated to the manufacture of electronic devices such as computers. They propose a comprehensive sustainable system that facilitates the processes of exploitation and recovery of raw materials, based on a planned project for the recycling of devices and devices that facilitate the separation of essential materials to obtain their parts.

Kuppinger (2013) describes the deterioration in the living conditions of the population of recyclers in the city, as a result of the implementation of MSW management designs.

The Recycling Activity and Health Impacts

In addition to market pressure, the development of the recycling activity leads to the exposure of various factors that intervene on the health of recyclers; Thus, the conditions in which the collection, separation and selection of recovered waste is traditionally carried out, influence the state of health and physical deterioration of the recyclers. Notably, the task of recycling is an activity that represents occupational hazards due to postures, exposure to substances, increased exposure to diseases, occurrence of injuries and in many cases, working between heavy machinery Gutberlet and Baederb (2008).



Figure 2 Occupational risk in the landfill. Municipal landfill of Xalisco, Nayarit. Taken with mobile phone camera

In the same vein, Alvarado et al (2008) refer to how recyclers represent a population whose activity invariably exposes them to the *Toxoplasma Gondi* parasite, the effect of eating contaminated food and low education conditions to avoid contracting it. Vearey (2011) analyzed HIV AIDS carriers, who have migration patterns and in many cases, end up carrying out the recycling activity as a livelihood.

Sustainable Development and Recycling

Sustainable development was defined as “one that guarantees the needs of the present, without compromising the possibilities of future generations to meet their own needs” (Brundtland Commission, 1987,).

The recycling activity is consistent with this concept: the return of materials to the production cycle, avoiding the consumption of resources, favoring the integration of marginal recyclers into the economic model. In this regard, Roberts (2004), highlights the importance of sustainable strategies, for excluded workers, such as *pepenadores*, who become workers in environmental services, through the management of MSW.

This position is associated with the approach of Ciptet (2014), who emphasizes the right to recognition that marginalized recyclers have (women, *pepenadores* and indigenous people). For its part, De Medeiros, (2012), defends recycling as an activity of sustainability to the consumption model of today's society, highlighting environmental benefits.

Benefits of recycling waste materials

Several authors have made inquiries in which, based on the reality of the recyclers and based on the clarification of the aspects that must change in the welfare conditions, they have disclosed the positive environmental impacts of the recycling exercise.

From the environmental approach, the recycling (collection, transport and final disposal) of raw materials by the use of material prepared for reuse, increased the useful life of the equipment used by the managers of MSW, this it causes the increase of the useful life of the landfill, and the reduction of contaminants in soil and water that are generated in case of a misuse of MSW (Sepúlveda, 2003).



Figure 3 Bottle and PET recycling product. Take with mobile phone camera

In the same investigation, a characterization is made about income, previous work and family group; raising the need to assume forms of organization that allow benefits for those who perform this trade.

Recycling: Public policy and social organizations

The intervention of the state in the creation of conditions that benefit the recognition of the groups of recyclers for the positive impact at economic and environmental level of the activity that they carry out, is incipient and referred to the incidence in the formulation of public policies with approaches that are adjust to exposed diagnoses from the understanding and clarity about the exercise of recycling.

Sepúlveda (2003) shows how the figures that reveal poverty reduction between the decades of the 1970s and 1990s in Latin America are followed by a high degree of income inequality. It presents the need for an excessive share of solidarity towards the pepenadores by the society and to set up diagnoses from all dimensions that affect the recycling work. The aspects cited by Corredor (2010) that are decreasing the profits of the recuperators are, among others, the absence of a set of techniques aimed at improving this work and the lack of social work programs in relation to the recycling of landfills.

In other scenarios, Terraza (2009) assumes what is necessary to intervene for the benefit of the groups of recyclers; for execution and technical preparation that supports the correct measures regarding waste management; the scarce coverage for areas far from the cities, and identifies them as their great weaknesses in the issue of final disposal and zero minimization, informal separation and limited recycling. The professionalization of the recycler trade, based on better living conditions for recyclers, would be a solution for obtaining clean cities, are the proposals of Scheinberg and Anschütz (2005), in what they call ecological and environmental modernization of the RSU in developing countries, in order to achieve sustainability. Bonner and Spooner (2011), suggest partnerships between informal recyclers and Non-Governmental Organizations (NGOs) to achieve recognition of the work of the pepenadores to improve their working conditions.

Methodology to be developed

The analysis was carried out in the municipality of Xalisco, Nayarit; where the landfill of this town is currently one of the solid waste concentration points, which, as in the rest of the country, does not have a good organization, therefore the management of these is unconventional and inappropriate, since only The municipal government is limited to transferring them to an open-air dump without having any infrastructure or respecting the current legislation, depositing them in these places without mediating the impact that the waste can cause on the environment.

In this paper some of the conceptualizations about conditions in which the work of the pepenadores or recyclers of plastic and paper bottles, leaving evidence of the economic and environmental benefits are related. It was developed from searches of scientific articles in databases in the Spanish and English languages, with the greatest number of documents prevailing; field work and visits to the landfill in the years 1999 to 2019 in which 52 tons of daily waste are generated. The purpose was to review the issue of recyclers, landfills, landfills and open-air dumps, from the various approaches that are related to the concept of sustainable development.

Once the scientific consultation texts were chosen, we proceeded to group them by countries with topics relevant to recyclers. In this way the categories listed with the titles of the present work were defined, a coincidence was built between the investigations of the landfills and recyclers and the themes or methodologies used, however, the coincidences were not those expected for their different cultural and socio-level generalizable economics between different countries on the issue of recycling. (Example: Pepenator and recycler is the name assigned depending on the socioeconomic level of the country in question).

In general, it is noted in all the articles and writings reviewed, a trend that integrates the benefits of this type of work with the exhortation to promote conditions of life improvements for the pepenadores who have traditionally performed this difficult job of recycler.

Initially, the data of some researchers related to the condition how the trade is performed, the level of income of the recyclers and their direct relationship with the association of different recycled materials in the productive cycle of supply and demand within the market are presented. The document presents some research directed from the perspective of occupational health and occupational hazards of recyclers, caused by the activity of recycling without adequate equipment and protocols within a sanitary landfill.

Since sustainable development is an institutionally accepted concept worldwide, although on a smaller scale depending on the different societies, it is tried to expose the essential idea of optimizing current resources to guarantee their access to future generations, it is materialized and exemplifies recycling within landfills implemented under parameters of social cohesion, equity, and environmental responsibility. The benefit of recycling addresses the level of progress in the formulation of public policies, as well as interventions from the perspective of trade union and social organizations. The trends that are considered, allow to define some necessary inputs to exercise the job of recycler as an activity focused in an integral way, which positions the human being as an actor of an alternative development form framed in sustainable development.

Process of formalizing the population of the Recycler

The proposed study highlights the importance of effectively containing the population of pepenadores in the management of urban waste, which has a remarkable performance in the open air dumps of the city Xalisco, Nayarit in which they have not promoted legislation that integrates and includes these workers gradually, they are granted rights, benefits and recognition. The groups of RSU material pepenadores should be included in the processes for the management of solid waste in the municipality. The decision originates in response to a lawsuit that claims to be disadvantaged to participate as providers, in front of traditional grooming organizations.

The objectives of the different administrations for the fulfillment of the requirements can be summed up in: incorporating the citizenship through permanent training about the recycling process; definition of areas for service provision; adequacy of collection points and inclusion of the population of recyclers. Peppenadores' right to health and legal benefits, particularly with the agreement to have social security and be willing to pay taxes, all as a new demand for the lack of inclusion of recyclers in the service delivery process Toilet.

Peppenadores participate in environmental services, favor the decrease of the volume of sanitary landfills of the municipality giving them a longer life, this intervention is by workers (peppenadores) in the Municipality of Xalisco, Nayarit, Mexico.

Conclusions

The research on recycling and the different theoretical approaches, indicate in the first instance that the process of selecting, collecting, transporting, classifying, marketing the discarded materials so that they are returned to the productive cycle, is carried out in a pyramid scheme, in which the recyclers-peppenadores constitute the lower level on which the whole process is supported. Then marginal population groups are involved and work characterized by low cultural levels, income, poor school education and socio-economic situation of exclusion as a livelihood alternative.

The articulation between government, in its role of formulator of public policies and entities such as NGOs in their function of proposing alternatives for sustainable development, enable the contribution of recyclers and identify elements that contribute to the improvement of their quality of life. This will be achieved in fair working conditions, with a higher level of income and access to better markets.

Likewise, training in business management, the appropriate conditions regarding occupational health, inclusion within the communities, the best locomotion, articulation with traditional waste management systems and the role in public policies contribute to this end.

In experience, the population is unaware of the problem of workers who work in sanitary landfills and open-air dumps, it is perceived by the majority of society ignorance of the benefits that recyclers bring to the environment, economic and social. This reality translates into the lack of support for the basic exercise of separation at the source, which constitutes the first link in the efficient recycling chain, which hinders the task of the recycler, reduces the availability of materials and contributes to the depletion of resources. natural.

The formulation of comprehensive public policies for the benefit of recyclers, should be supported in the knowledge of the positive environmental impacts contributed by this activity and dissemination of these among the entire society. In this way, it will be feasible to incorporate the collective, the authentic assessment and appreciation for those who recycle materials.

In this sense, it is pertinent to consider the work of the recyclers in the framework of a formalized exercise, in which they are guaranteed equal opportunities, remuneration according to work, job stability, social security, training and rest necessary. For its part, the municipality of Xalisco, is presented as a municipality without proposals on waste management, without the participation of recyclers, however, it is necessary to implement fiscal control actions that prevent the participation of people who have not traditionally exercised as a trade recycler and do not pay taxes, which are intended to be passed as recyclers.

Since the commercialization of recovered materials is linked to the needs of raw materials for the development of new products, it is necessary the intervention of multilateral organizations to create cooperation mechanisms that facilitate the articulation between groups of recyclers around the planet, which in turn allows to meet the demand for inputs and contribute positively to avoid the depletion of natural resources and the impact on the environment produced by their extraction.

Regarding the participation of citizens as an indispensable element for the correct source separation, the experiences reviewed demonstrate the need to raise awareness on the subject permanently and in the long term and still complement it with stimuli in the rate of provision of the cleaning service that motivate adherence to environmental sustainability practices. In this sense, the dissemination of clear information on the environmental benefits perceived by a waste management in an inclusion framework for the recyclers-peelers, it would result in the improvement of the living conditions of society in general, as a result of policies consistent with the social dynamics and needs of the recycling population, in what would constitute an example of application of the premises of sustainable development.

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Strategies for the incorporation of SMES to digital markets**Estrategias para la incorporación de las SMES a mercados digitales**

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DOI: 10.35429/JMME.2019.5.3.26.33

Received August 25, 2019; Accepted December 14, 2019

Abstract

This document is the result of the analysis of the situation of micro and small enterprises (SMEs) in Mexico, a documentary review and a quantitative, descriptive investigation was made showing some of the characteristics of the SMEs as economic units and the use of the WEB and social networks for the sale and commercialization of their products or services, a proposal is developed that could support their permanence in the market, as well as allowing them to be more competitive by incorporating new markets with marketing means supported by innovative technologies and digital marketing practices (e-commerce), such as the development of its WEB page, use of social networks and Marketplaces platforms, as well as CRM (Consumer Relation Ship Management).

SMES, Digital, Markets**Resumen**

El presente documento es el resultado del análisis de la situación de las micros y pequeñas empresas (SMEs) en México, se realizó una revisión documental y una investigación cuantitativa, descriptiva donde se muestran algunas de las características de las SMEs como unidades económicas y el uso de la WEB y redes sociales para la venta y comercialización de sus productos o servicios, se desarrolla una propuesta que podrían apoyar a su permanencia en el mercado, además de permitirles ser más competitivas al incorporar nuevos mercados con medios de comercialización apoyados por innovadoras tecnologías y prácticas mercadológicas digitales (e-commerce), como el desarrollo de su página WEB, uso de redes sociales y plataformas de Marketplaces, además del CRM (Consumer Relation Ship Management).

SMES, Mercados, Digitales

Citation: ÁLVAREZ-GARCÍA, Mónica, GUERRERO-IBARRA Carlos and LARIOS-CALVA, Margarita. Strategies for the incorporation of SMES to digital markets. RINOE Journal-Macroeconomics and monetary economy. 2019. 3-5: 26-33.

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Introduction

The following lines present the results of an investigation into the situation in which SMEs are currently, within a changing market in the country, some statistics on the behavior of electronic commerce, social networks and a Proposal (e-commerce) of how SMEs could use these technologies to expand their market and increase their sales.

SMEs are very vulnerable and being part of a changing market, has caused their average life in it to be 7 years; This coupled with their limited resources, lack of vision, quality and clarity in their value chain, prevents them from having the growth they would like.

The disappearance of the SMEs due to lack of competitiveness, is a problem that afflicts the national economy, because these are the ones that generate 82% of employment in our country. When disappearing, important and numerous sources of employment are lost. Technological tools are proposed, which can be incorporated, to generate new marketing practices, which the current user is requiring.

SMEs must understand that the digital era has arrived and that customers move in that area. The traditional user (customer, buyer) has mutated. Now it has become much more demanding and requires prompt and accurate answers. SMEs must take on new consumer characteristics and reorient their marketing processes, both in advertising, sales and customer service. Traditional advertising has gone to second term, currently the common user, is bombarded by media such as social networks and video channels.

Sales have changed to such an extent that the current consumer before acquiring a product or service, researches the companies that offer it online, makes an evaluation and decides; You no longer have the need to move to a physical store to make the purchase, just press a couple of keys to purchase the required product or service. In the same way, as it uses the network to investigate the best seller or supplier, it also requires attention and prompt responses, which is an important weakness for SMEs, which most of their efforts are dedicated to the production process and distribution, even when the current user requires high quality customer service.

To achieve total satisfaction of the new consumer or user, SMEs must incorporate new marketing practices and improve their customer service, for this there are computer tools in the market that will allow them to maintain and grow, in addition to reaching a higher level of competitiveness.

Method

To carry out this project, a documentary investigation was first made and on the Internet, through various sources, a descriptive quantitative investigation was subsequently carried out, where the problems faced by SMEs are analyzed; The selected sample was 120 SMEs from a database of 900 companies (study universe) with the following characteristics: shops from 0 to 30, services from 0 to 50 and industries from 0 to 100 employees, located in Mexico City and the Metropolitan Area, the database was provided by the Linking Area of the Technological University of Nezahualc6yotl, where students make their stays.

To calculate the sample, the normal distribution curve formula for finite populations was used, the standard error of $\pm 9\%$, 95% confidence interval and the probability values in favor and against 50% were used.

A structured questionnaire or form with 10 closed questions was designed, it was validated in advance to avoid errors in the reliability of the data obtained. The information was collected through the Google SurveyMonkey platform with the owners, administrators or managers of the companies, this tool is easy to use and free up to 10 questions of the questionnaire. It has great advantages, among them; It allows saving time and expedites the submission of the form via email to the interviewee; At the same time it allows visualizing the responses received directly on a platform where the data is already captured and plotted.

To select the sample, non-probabilistic sampling by trial was used where the companies were selected for a natural randomness, given that the form was sent to the 900 companies and the self-selection was given by the availability and contribution provided by the entrepreneurs to answer and send the questionnaire

Likewise, the descriptive analysis was made in which the conditions and use of technologies by the SMEs are evaluated in order to determine strategies according to their needs. The results were provided by the database obtained through Google's SurveyMonkey, subsequently, the information was plotted and interpreted. For the purposes of this investigation, SMEs are considered, those companies that have up to 30 employees in the case of shops and 50 in services. (See table 1)

Estratificación de empresas publicada en el Diario Oficial de la Federación 30 de diciembre de 2002			
Tamaño	Sector		
	Clasificación según el número de empleados		
	Industria	Comercio	Servicios
Micro	de 0 a 10	de 0 a 10	de 0 a 10
Pequeña	de 11 a 50	de 11 a 30	de 11 a 50
Mediana	de 51 a 250	de 31 a 100	de 51 a 100

Table 1 Classification of SMEs by turnover and number of employees

Reference Framework

In Mexico there are 4 '048,543 companies (INEGI 2015), of which 3' 952, 422 are micro and 79,367 are small, indicating that both make up 99% of total companies, while only 1% corresponds to medium And big companies. The data is of the utmost importance because according to a study carried out by specialists from the Accounting School of the National Autonomous University of Mexico (2017 Conference), according to which nine out of ten SMEs small and medium sized companies in Mexico are seen forced to close the doors during the first five years of its existence, the situation reveals an important problem for the Mexican economy.

It is imperative not to forget that SMEs are responsible for providing work for 10,225,939 workers. But even more important for this study is to recognize that microenterprises support the employment of 8 '675,103 workers, that is, they absorb 82% of the country's workforce, without considering large companies.

Personnel Employed by Type of Company



Graphic 1 Personnel employed

Source: INEGI

Likewise, INEGI (2015) pointed out that the last update of the Directory of Economic Units revealed that from 2010 to 2015, one million six hundred and thirty thousand companies closed for various reasons, while a total of two million two hundred and twenty five emerged in this same period.

Likewise, INEGI (2015) pointed out that the last update of the Directory of Economic Units revealed that from 2010 to 2015, one million six hundred and thirty thousand companies closed for various reasons, while a total of two million two hundred and twenty five emerged in this same period. INEGI also highlights that the average life expectancy for a company in our country amounts to 7.7 years, alarming data that researchers should use to find strategies or alternatives that allow SMEs greater permanence and growth in the market.

For a company to implement digital business strategies, it must start from the application of E-commerce. Cisneros considers that it is that economic activity based on the offer of products or services, either for the purchase or sale through digital media such as the internet (Cisneros E. D., 2017).

The actors involved in e-commerce are: buyer, company, company employees and the administrator, the fusion of the different activities carried out by each of them leads to the success of electronic commerce. Navárez cites the e-commerce concept of the Mexican Internet Association (AMIPCI) that defines it as the "Exchange of goods and services carried out through information and communications technologies, usually with support of standardized platforms and protocols" (Navárez J., 2014).

There are different e-commerce models, (Cisneros E. D., 2017). Classified in 5

1. Business-to-business (B2B) participants are companies, which end up doing big business.
2. Business-to-consumer (B2C), is the most conventional, ensures a more immediate influx of customers and allows the relationship to be more direct with the producer.
3. Consumer-to (C2B), this model is aimed at Internet users end up offering something to organizations.
4. Mobile commerce (m-commerce) transactions and e-commerce activities conducted in a wireless environment (mobile banking).
5. E-government, this model is currently used mostly to make the services that the state provides to citizens more accessible.

Cisneros also mentions that the main advantages of e-commerce lie in access to global markets, the possibility of attracting customers online and offline, low development and implementation costs and a more efficient and constant update of the organization's product catalog.

Results

This section presents the results:

As can be seen in graph 2, more than half of this type of companies in Mexico City and the Metropolitan Area are trade, while 3 out of 10 are dedicated to services.



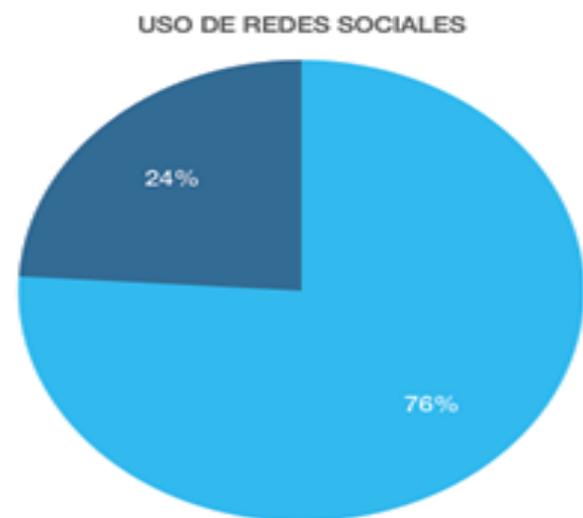
Graphic 2 Type of company
Source: own elaboration

In relation to the question about “Possession of a WEB page to promote your company, your products or services”, (68%) of the SMEs responded not to have it, some expressed that it represents an expense that they cannot do and not They have experience in the use of these technologies. (See graphic 3).



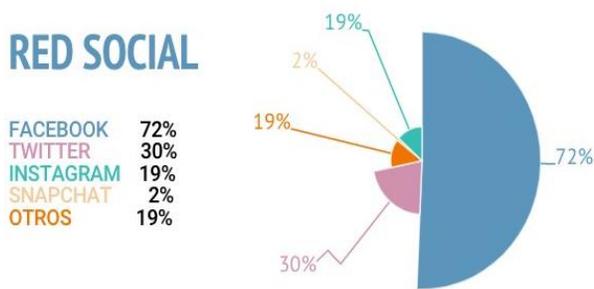
Graphic 3 WEB page
Source: own elaboration

On the questioning of the use of social networks (Graphic 4), an unexpected response was obtained, given that 7 out of 10 companies of this type already have a social network. This indicates that companies have found mobile telephony as a means of communication and use it to be in contact with their customers or to publicize their products or services. In this way it can be explained that many of these companies have formed a social network to keep their possible markets informed.



Graphic 4 Social networks
Source: own elaboration

Graphic 5 shows that the social network most used by SMEs is Facebook, since it is the most visited platform by netizens, more versatile and easy to use, but above all they do not have to make any expense or payment to promote The company, products or services and allows them to be in constant communication with their customers. Although there is reference that few of these companies do not spend much time to follow up and even less, they have a network administrator.



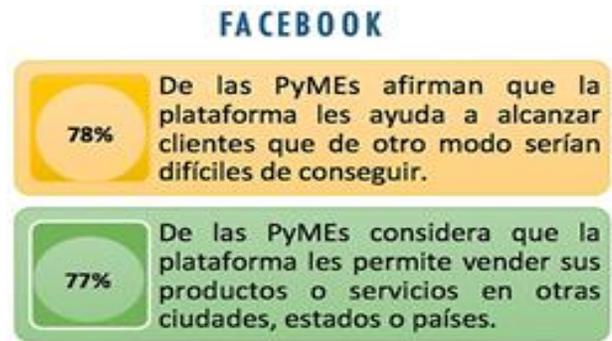
Graphic 5 Social networks used
Source: own elaboration

To understand the importance of social networks, it is convenient to comment that the Morning Consult Company conducted an investigation on the use of Facebook in companies. The data reveals that the platform is helping SMEs in Mexico, as the following graph shows, more than 65% of companies have benefited from the use of Facebook in increasing their business and sales, and it has also allowed them to generate sources of employment. In the same way in the graph it can be seen that the SMEs believe that the platform has helped them reach more customers and even in other states or countries.



Graphic 6 The Facebook Platform, own elaboration
Source: SMEs in Mexico accelerate their growth with Facebook

Graphic 7 analyzes the impact that the social network Facebook has generated in the surveyed SMEs. 78% affirm that the platform helps them reach customers that are outside their local market and that they could not access, without the help of social networks. 77% consider that the platform allows them to sell their products or services in other cities, states or countries.



Graphic 7 Facebook, own elaboration
Source: SMEs in Mexico accelerate their growth with Facebook

Proposal

After the analysis carried out, it is suggested that the SMEs should take different strategies that allow them to remain present in the markets (physical and digital), for which Michel Porter's proposal is taken up, which is broken down and shown below:

First, the SMEs must know or establish in detail their value chain, which according to Michel Porter, is an internal analysis of the company, through its disaggregation into the main value generating activities, as shown in the following figure.



Figure 1
Source Value Chain: Michael Porter

In Michel Porter's scheme within the Value Chain, three fundamental elements for the growth and permanence of SMEs are proposed:

1. In the primary activities are Marketing and Sales and Services.
2. Among the support activities, is the Development of Technology.
3. Another important aspect mentioned by the same Author, is to establish a Competitive Strategy, the company must initially define its competitive advantage, understanding this, how the value that a company manages to create for its customers (Porter, 2008). The advantage will allow the company to differentiate itself from its competition and be more attractive to its customers.

Taking into account the Technology Development of the value chain, Porter (2008) also points out that this is a great equalizer, since it can deteriorate the competitive advantage even of consolidated firms and push others to the forefront. He also points out that technology is in every valuable activity and technological change affects competition.

To permeate this philosophy in SMEs, it is necessary to note the importance of the incorporation of technology to potentiate its value chain. For example; for marketing and sales issues, they must have a website developed (initially) on a free platform, which allows them to publicize their products and / or services; This will allow them to enter the digital markets and be accessible to potential customers of the network. You can start with a website and then grow, as far as possible to your own application. Within the free platforms existing in the market, 4 of the most used are recommended with respect to a universe of 50 options:

1. Wix: "With Wix, you have the freedom to create a free web page that looks exactly like you dreamed it, no matter how much experience you have."
2. Weebly: "Professional e-commerce tools for entrepreneurs, all in one place"
3. Jimdo: "With Jimdo, take advantage of the power of artificial intelligence to offer you a fully customized web page adapted to your needs."

4. Word Press: "Word Press is a content management system or CMS (Content Management System, software tool to create, manage and manage a website), focused on the creation of any type of web page."

A website would allow SMEs to offer their products and services in the digital market, where digital sellers and buyers now converge. It is the necessary and mandatory tool today. Another important aspect mentioned in the Value Chain is marketing and sales. Therefore, to potentiate their advertising, generate possible sales and subsequently specify them, SMEs must enter the world of social networks; for which they must establish precisely the objectives they wish to achieve with them. There is a large number of social networks that can be used in an organic (free) way to increase customers, sales, image, etc. The following figure shows the possible social networks that should be used according to the objective to be achieved.

As you can see one of the most repetitive and far-reaching tools is Facebook, so it is the social network with the largest number of users. According to "El Economista" (2017) in June of that year, it reached 2,000 million active users. There are also more than 1,000 million people who use "groups" and more than 800 million who like something on Facebook every day.

It is worth mentioning that social networks must be used discreetly and according to the objective you wish to achieve, for this the main ones are mentioned. SMEs should consider their target (market profile) and use the social network that suits them.

Also in the same value chain parameter, if you want to grow your market through sales; Another proposal is to venture into the use of Marketplaces, which are platforms called "Digital Supermarkets" that offer products and / or services over the Internet. It is a website that allows sellers and buyers to interact to make a commercial transaction. According to Forrester Research data, they indicate that the marketplace trend is rising globally. In 2016, 50% of total e-Commerce sales in the globe were through this model, which in 2017 increased to 56%.

"In Mexico, electronic commerce is a trend that nobody should ignore." (Andrés Piedragil 2014, p.28), in fact, for entrepreneurs, micro, small and medium enterprises (MISMES). This modality, even with the barriers that still stop its full development, is an alternative that predicts pleasant surprises.

Amazon, eBay and Alibaba (TMall) are the three names that monopolize the marketplace globally, while in Mexico, Mercado Libre occupies an important place in this sector. These companies have grown exponentially in recent years, due to the success that e-Commerce is having in our country.

SMEs in our country have a great advantage in these types of markets. One of the main reasons why the Marketplace can help them is that only 100% of these types of companies have an online presence, according to Kubo Digital data.

One of the most recent competitors, which has also taken advantage of its impact as a social network, is Facebook, who at the end of 2016 saw its own marketplace born, offering its users one more option to not take off from its application, finding a way to offer articles of use; being an important niche for those who want to use this platform, in order to position items or services of their brand or company.

SMEs have in the different Marketplaces platforms, an important opportunity to offer and position their products. By joining these markets, which physically it would be very difficult to reach, they have the opportunity to grow and stay in the market.

Maybe the word could scare SMEs, but Facebook, one of the most popular social networks currently, has the Marketplace option as already mentioned and can be used by individuals and corporations that sell any type of product or service. Facebook allows SMEs to participate in their Marketplace and thus increase their sales possibility, which is the ultimate goal of any company. The last aspect that we will deal with regarding the Value Chain is the Service. As mentioned earlier, the current user or customer has become more demanding. That is why companies have incorporated into their processes some type of Customer Relationship Manager, CRM (Customer Relationship Management).

A CRM is a solution to customer relationships. They are normally oriented to three basic areas: commercial management, marketing and after-sales or customer service. There are many CRM options, there are even some that are free for a limited number of users. This type of software would allow SMEs to use the tool to streamline the customer service process and maintain a constant relationship with it, to make it a loyal customer. The following figures show some tools that can support SMEs in improving customer service.

Conclusions

As a result of the investigation it can be concluded that 99% of companies are SMEs, that 9 out of 10 tend to disappear from the market in the first 5 years of life. So it is considered that they have a very short life in it, and it is necessary that they develop marketing strategies that allow them to stay and grow in the market where they compete. It is also important that they develop a competitive advantage, which they can obtain if they incorporate new technologies and new digital marketing practices into their processes with the use of the WEB. The results of the investigation showed that 32% of these companies already have a WEB page and 76% use social networks and it is Facebook that they use most, which has helped them grow the business, increase their sales and reach to more customers, not only in Mexico, but also in other countries. The use of the WEB and social networks in SMEs represents an advantage for incorporating the aforementioned digital marketing strategies. This project presents the proposal of Michel Porter that emphasizes the obtaining of the value chain with the application of marketing, sales and service strategies, in addition to the use of new technologies. It is suggested that companies create their website through free applications, use the networks according to their profiles and sales and marketing objectives, but in addition the use of the Marketplace is recommended and in a matter of customer service it is also suggested to incorporate Customer Management Systems (Consumer Relationship Management) that will allow them to collect information about customer interactions, which will help them get to know it better and in turn improve the offer and sale, customer loyalty and perform better segmentation.

In the case of social networks, you must establish continuous communication with the client, for this you must incorporate applications that allow you to be in permanent contact with the client, as well as give accurate and timely responses, this proposal will benefit you because in addition to having your market physical, they can get customers in the digital market, which opens the possibility of expanding their field of action.

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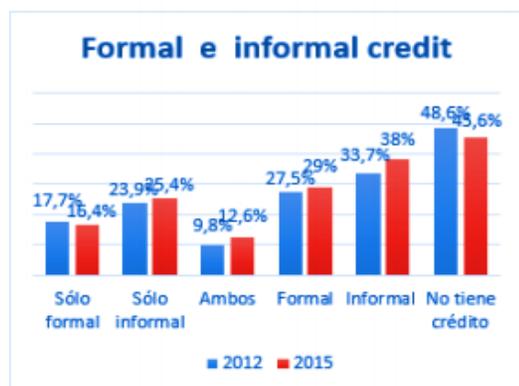
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Products	Industry	Chocolate Business
Food and beverage provision services	Processed food	
	Cultural tourism	Commercial chocolate (national and international brands)
Cultural Services	Agroindustry	Museums of chocolate

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