



VIGILADA MINEDUCACIÓN

SMEs hardware store opportunities and challenges facing the industry 4.0

Kelly Stephanie Castaño Botero

University institution Esumer

Faculty of Internationals Studies

Medellin Colombia

2019.

SMEs hardware store opportunities and challenges facing the industry 4.0

Kelly Stephanie Castaño Botero

Degree work presented to qualify for the title of:

International Business

Tutor:

Saida Luz Quintero Núñez (Master, General Planning)

Line of research:

Logistics

University institution Esumer

Faculty of Internationals Studies

Medellin Colombia

2019.

Thanks and dedication.

Initially, I thankful and dedicate this project and my mother and grandmother for all support provided during all career and for the advice share for grow, both level professionally as personally, as well thanks to them today I have reach the dreams an goals that i have set out reach.

Thus, I thanks to all those professors that gave me their knowledge of the best way, for me to have great bases for face the professional life. Too I'm thankful to university that allowing me to enter in the business and enjoy to nice that is studding.

Likewise, to all those people who accompanied me in this process giving me ideas and contributions not only for my profession but also for life, I thank them infinitely for traveling this path by my side.

Finally, I thank life for all the good things that have placed me on the road, allowing me to experience every second of this career feeling proud of being an International dealer.

Abstract

In the present investigation, a complete analysis will be carried out on how an SME in the Medellin hardware store sector faces industry 4.0 from the logistics side, showing the pros and cons of this new global trend. Moreover, to know how the construction sector, to which the hardware store belongs, can be directly affected at the logistic level, because it does not have to face changes correctly, to a possible loss of competitiveness in the market.

In this order of ideas, strategies will be presented based on internal and external studies of hardware companies to be able to penetrate this trend with the least risk and better use in the logistics chain.

Keywords: SME, industry 4.0 or fourth industrial revolution, trends, hardware store, technology and logistics.

Table of contents.

INTRODUCTION.....	10
1. Formulation of the projet.....	11
1.1 State of the art.....	11
1.2 Problem statement.....	13
1.3 Objectives.....	16
1.4 Justification.....	19
1.5 Reference framework.....	22
1.6 Methodological framework.....	22
1.7 Scope.....	22
2. Research developmen.....	23
2.1 Evidence why the hardware sector needs to adapt to industry 4.0.....	22
2.2 Establish attainable strategies to improve the logistics chain through industry 4.0.....	32
3. Conclusions.....	40
4. BIBLIOGRAPHY.....	42

List of picture.

Picture 1. Since of the indrustry 1.0 to industry 4.0.....19

Picture 2. Evolution of the industry 4.0.....20

List of tables

Table 1. Investigation problem statement.....	14
Table 2. Positive and negative aspects of industry 4.0.....	26
Table 3. Trends in the construction sector.....	27
Table 4. FODA analysis.....	32
Table 5. Analysis of internal factors (MEFI).....	35
Table6. Analysis of external factors (MEFI).....	36
Table7. Matrix MEFA with of strategies creation.....	37

Graphic list

Graphic 1. Economic indicators.....	23
Graphic 2. National Sector achievement.....	24
Graphic 3. Sector achivement Antioquia.....	24

Preamble

Nowadays, the fourth industrial revolution went from being an assumption to being a reality, where robotization and the so-called internet of things have changed the landscape for companies around the world. It is worth mentioning that Medellin as the epicenter of Industry 4.0 in Latin America with its new RUTA N technology building is not far behind, since it is named before the world as one of the most innovative cities.

That is why, it has led small businesses in Medellin to wonder if they are living up to this exponential growth of the city, which shows a constant increase about this trend, leading entrepreneurs to ask themselves, how are they going to face These changes ? This is where this research performs an analysis about a subsector that belongs to one of the most recognized industrial sectors in the region and the country, such as building.

That said, the hardware sector is mostly composed of SMEs, which are companies that are afloat seeking stability in the market, this means that they mostly do not have the economic or structural capacity to enter the technological world since it is not a secret for any market that this industrial revolution carries a high cost for companies.

Therefore, the position facing hardware SMEs is between being competitive with high investment cost, creating strategies to accept industry 4.0 step by step and according to their capacity or end up falling behind in the market and with a tendency to bankruptcy.

To give a possible solution to this panorama, the present work establishes the tools that these companies have, in order to change the perception of the fourth industry revolution and see it as another scale in the growth of small hardware companies.

Project formulation.

1.1 Status of art.

Technological development presents new economic and cultural challenges for society, directly affecting companies, as well as Arteaga (2018) mentions in his study of the industrial revolution as a technological and cultural challenge.

“Cyber-physical systems, hyperconnectivity, sensing, the Internet of things and metadata favor technological mutations that are transforming the way of organizing production processes, products and business models of traditional industries”, (Arteaga, 2018),

That is why the prospect that we know of business is already falling behind and the new digital era is entering where the processes of production, distribution and commercialization are changing, for this reason the Colombian industry must begin to take this issue seriously as an emerging economy in search of growth and expansion of markets.

It should be noted that, not only globalization is another challenge for companies, the fourth revolution is also, because the market has changed its buying paradigms, where people are not only stand out by their physical capabilities but also digital.

Likewise, human participation must go hand in hand with new technologies to solve the new market challenges, since each one separately would not give the same results, as evidenced in the analysis carried out by Mónica Casalet in her study called the digitalization of the industry a path to collaborative governance (2018) (Casalet, 2018), where it is stated that the union between these two agents (people and technology) is not fortuitous but is due, to the constant development of the economy and society, where the interrelation of industries is generating the need to train personnel in the use of this new revolution, for this reason a positive view is established about the paradigm facing the industry against skilled labor.

Ana Lehmann, former secretary of state of Portugal for the industry at the conference held at EAFIT on industry 4.0, states that the digitalization of the industry is not only in production, it is a concept of 360 ° to logistics as the last link in the value chain, therefore the main challenge

facing Colombian companies is the adaptation to the change in the way of working, since this fourth industrial revolution is going at an exponential and vertiginous speed that became a current reality, it should be noted that This brings greater efficiency and effectiveness, with higher quality and lower risks, also to eliminate the fear that brings innovation must understand the machine as an extension of the human not as the replacement of it, on the other hand Ana highlights that Millennials have greater adaptation on this issue, and in the case of Medellinians we have resources to face this industrial change thanks to the Technological culture that is taking over the city, likewise, SMEs Paisas through these resources can reduce investments through digital platforms, reaching not only the Colombian market but also the whole world with just one click. (Lehmann, 2019)

Continuing with the notion that Medellín has great advances against industry 4.0, it should be noted that its 4.0 RUTAN technology center presents several training and growth projects for the businessman and the Colombian industry, and also establishes that Medellín wants to position itself as an innovative city focused on new technologies through projects such as Sumanti, which trains young entrepreneurs on how to use this revolution in their favor. (Bernal M. C., 2019)

It should be noted that in the hands of industry 4.0 goes logistics 4.0 terms coined in parallel, where technologies have taken a relevant role in the value chain, in this case the efficiency and optimization of logistics is present in the analyzes and foundations of the new market and industry trends that are being generated, to give an optimistic view to small industries, especially those located in Medellín. (Cortés, 2017) (Logistics, 2019).

1.2 Problem statement

Nowadays, Industry 4.0, also known as “Intelligent industry and the fourth industrial revolution, focuses on the search for smart organizations to obtain better results”(CIC, 2019).

Clarifying this concept, it is affirmed that the 21st century has been the epicenter of technological growth, where intercommunication and automation of production processes have led to a change not only industrial but also economic and cultural (UPB, 2018), where the market has revolutionized to the point that it seeks greater speed and effectiveness through artificial intelligence.

It's there, where Colombia as one of the emerging economies of Latin America, seeks to strengthen economic growth through this industry, containing the first center of Technology 4.0 RUTAN, located in the city of Medellín (Rengifo, 2019) as mentioned above , which predicts according to many economists a growth opportunity for entrepreneurs in the country.

However, the Construction Industry, to which the hardware store sector belongs, has shown a decrease in recent years in Antioquia (ANTIOQUIA, 2018), also one of the biggest challenges facing these companies is the entry to the new Digital era, since not only the cost but also the transformation of the processes can lead to large growths or large bankruptcies, as Marco Del Olmo, Intelligent Location Manager of Servinformación mentions in the following sentence:

"In this new revolution, it will be increasingly expensive to make the wrong decisions"
(Olmo, 2019)

Likewise, the context of this phrase directly tackle the main objective of this topic, since implementing industry 4.0 is expensive and doing it wrong can lead to a waste of resources that an SME cannot risk.

In this order of idea, the technological increase has led companies to adapt to a new trend in production and development, which has been termed as industrial revolution 4.0.

Although this industrial revolution 4.0 is accepted as an opportunity for Colombian companies, it can also generate negative effects for companies that do not adapt to it, however to

shorten our field of research we will focus on the hardware store Industries with offices in Medellín .

For this reason it is inevitable to ask the following question: A small company of the hardware store Industry located in Medellín if it has the capacity to adapt Industry 4.0 to its logistics functions? since this sector is mostly composed of SMEs that do not have with the economic capacity and in many cases physical to face this revolution, not to mention that this sector has been characterized by empirical growth; that is to say, they are mostly stores where their production chain may lack technological advances and in their eagerness to grow without logistic bases.

That said, it is there that Industry 4.0 enters as a determining factor in the advance or decline of hardware store SMEs, which face a decrease in their share of GDP (Mincomercio, 2018), (ANTIOQUIA, 2018) and a market which demands the adaptation of technologies to their production, placing them at a crossroads between continuing or leaving the competition.

Table 1. Research problem statement

Symptom	Causes	Prognostic	Prognostic control
Industrial Revolution 4.0 Growth of technologies in logistics processes. SMEs hardware store in search of growth. SMEs without economic capacity. Market trend when e-eating and technological	Search for greater productivity and performance in logistics processes. Requirement of the hardware market for better results and innovation. Concern that the industrial revolution 4.0 can take from the market	The industry revolution is a fact and the non-implementation of it in companies can lead to possible bankruptcies to potentiate all hardware SMEs, enter industry 4.0 and take advantage of government resources for this issue. Medellín hardware store	The hardware stores must implement E-eat and rely on logistics to comply with this new process. The logistics bases in these companies should be improved to start implementing technological processes in these areas.

innovation.	all those who do not innovate or improve their processes. Little economic capacity of the hardware industries for the adaptation of new technologies in their logistics.	companies face a more demanding market where delivery time and merchandise availability are key factors in their decision to buy and to reach them, industry 4.0 is needed.	Improve training in industry 4.0 through courses and conferences provided by the mayor's office. Start to create strategic alliances where more technological logistics processes can be unified and thus reduce costs through zebras business.
-------------	---	---	--

Source: (Duarte & González, 2017, p. 62)

When analyzing the previous table, it can be deduced that the market needs are those that control the focus and direction of the companies, and it is there that each company must adapt to these changes to meet these needs, therefore the small hardware store industries located in Medellín must be up to all the growth that the city makes and how its population evolves according to all the external factors that affect it.

Therefore, being one of the pioneers in Latin America in industry 4.0, the hardware store sector must take into account that technology and all that it entails must be a fundamental basis in its internal processes.

1.3 Objectives.

1.3.1 Overall objective.

The objective of this research is to look for the pros and cons of industry 4.0 against hardware store SMEs located in Medellín and show the strategies they must take to adapt the industrial revolution 4.0 to their logistics process.

1.3.2 Specific objectives.

- Evidence why the hardware store sector needs to adapt to industry 4.0
- Establish attainable strategies to improve the logistics chain through industry 4.0

1.4 Justification.

1.4.1 Theoretical justification.

We are in the century of technological growth where unicorn businesses, zebras and everything related to e-eating, are changing the market paradigm where social networks and different technologies are changing the way they market, leading people to a lower interaction but a greater demand, the current population no longer has time, everything wants it fast, good and at the door of the house.

It's at this point, where companies must be flexible and innovative if they want to continue growing in the market, however entering this world of technologies is not easy as shown on paper, since incurring these new facilities and systems they generate expenses that many small industries cannot assume, as is the case of the Medellín hardware stores, which are mostly small distributors that use manual and less advanced processes.

Therefore, by incurring this research, we can show how flexible logistics and technological solutions can be sought for SMEs and show how industry 4.0 is not a difficulty but, on the contrary, an opportunity for growth and stability for Medellín hardware stores.

1.4.2 Social justification and/or business.

As an evolutionary economy, it's clear that technological advances are part of the paisa industry, it's there that the 4.0 industrial revolution enters as a way to advance not only economically but also socially and culturally, directly tackling the corporate culture, where processes manuals go to a third plane and are replaced by more technological and efficient processes, therefore the hardware store industry, being a culturally manual sector, must face the abrupt change demanded by the market compared to technological commerce.

In this order of ideas, the first aspect that the hardware store industry must adapt is its logistics, since they are mostly distributors that depend heavily on this area for their good execution, therefore the investment in technological mechanisms of inventory, supply and distribution can be a great growth opportunity for these companies, however the cost of this can lead to them being unattainable or not becoming so drastic unfeasible for these SMEs.

Therefore, looking for feasible means and strategies for adapting industry 4.0 in hardware store logistics could benefit a potential sector of the economy and promote entrepreneurship in Medellin.

1.4.3 Personal justification.

As a professional in international business who is currently working in the logistics area of the International Ferretera company, I have detected that this industry has great inconveniences in logistics, due to its few technological investments in inventory systems, supply and distribution leading to serious problems and non-compliance with the end customer, therefore knowing about industry 4.0, denotes a possibility of growth for these companies.

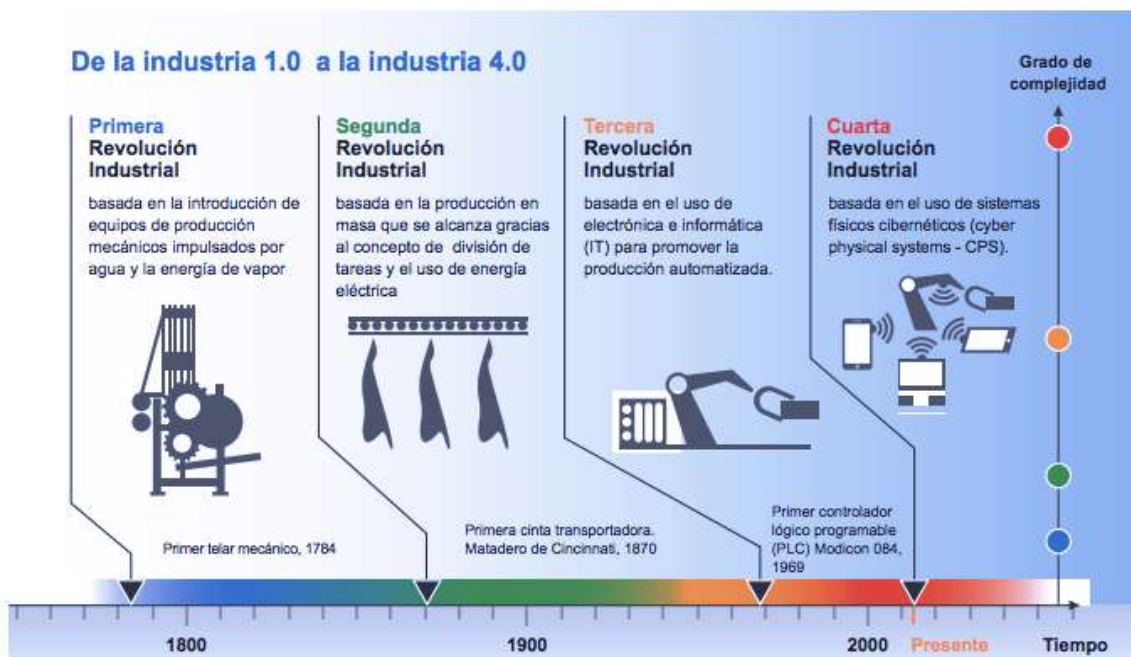
Likewise, when proposing a new way of executing the processes and improving the company's productivity, it can incur greater professional growth, since I am not only improving personal aspects but also providing great growth to the companies, incurring a new project that It can lead the company to remain competitive in the market.

1.5 Reference framework.

1.5.1 Theoretical framework.

The world has gone through different industrial transformations, starting with the steam engine that facilitated the mechanization of the processes, the second was the mass production of Henry Ford, the third was the exponential growth of the internet and electronics to automate all processes of production and finally the fourth industrial revolution arrived, which eliminates the gap between the physical and cyberspace, leading them to a coexistence together and dependence on each other (RUTAN, 2019).

Picture 1. Since of industry 1.0 to industry 4.0



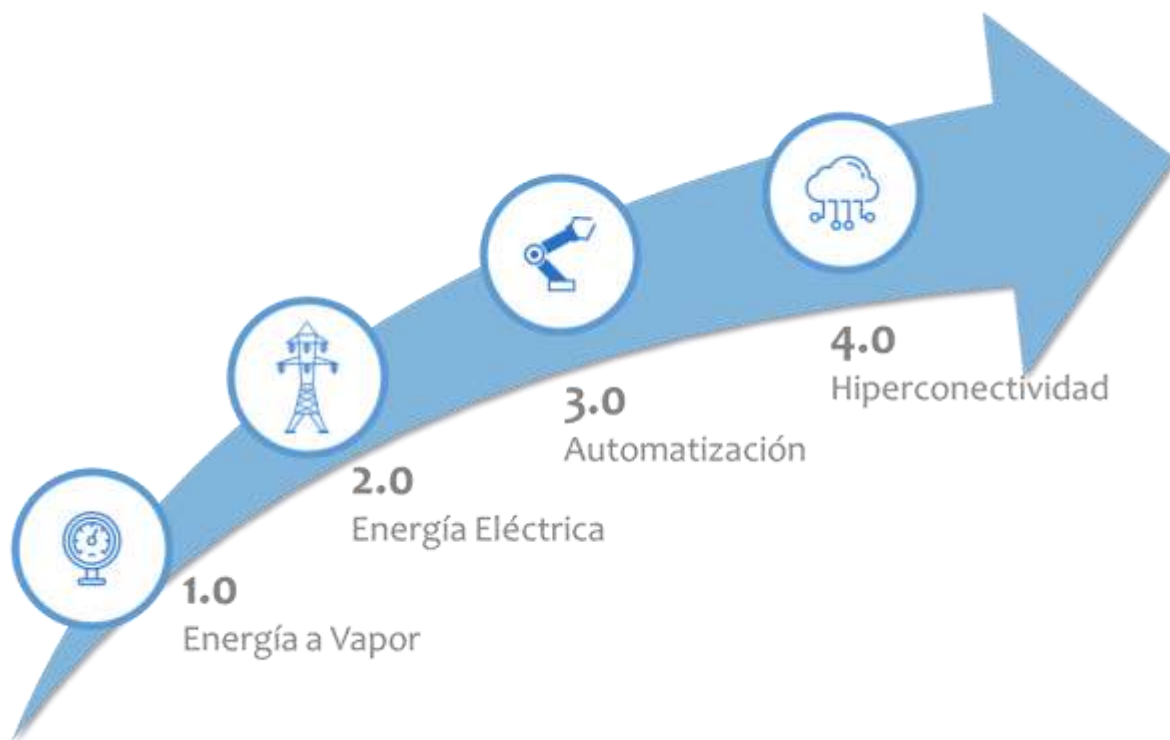
Source: (Incibe, 2017)

However, in all these scales of evolution there has always been the hand of man as a fundamental and influential part of these changes, since by him the need to grow is created and

by the same man technology is used as an extension, as the tool that leads him to evolve not only in the physical but also in the intangible.

In this order of ideas, man's need to expand has led him to growth across physical and technological boundaries by eliminating territorial barriers. A few centuries ago we were barely knowing the first computer, but today we have the world within reach of one click in our pockets, we can now control and manage our companies from anywhere, we can also share, manipulate and modify information from a cell phone (big data) the mass traceability of information to improve processes. (Josefina, 2018).

Picture 2 Evolution of industry 4.0



Source: (Rioja, 2017)

It's difficult to cover the countless possibilities that we are living in industry 4.0, but it can be deduced that industries are facing rapid and rapid change, where competitiveness is being measured by the innovation and adaptation of companies. (Rioja 2, 2017)

In this order of ideas the value chain has undergone several changes and the logistics 4.0 paradigm has led to the way of producing and working change, and the production and transport

processes are more efficient and less manual, it can already be monitored In real time the transport, in addition to the implementation of the robotization, the loss and the production error has been reduced, currently the biggest challenge is to have trained personnel that is why in the following sentence the change of the profile that can be evidenced must have the logistics staff to meet the demands of the market.

“The work of the logistics managers is no longer limited, as before, to transport itself, but also to the task of multifunctional and supra business coordination of logistics throughout the supply chain.” (Logistica 4.0, 2019)

To give an end to this point, it should be noted that the Medellín hardware store industry has great challenges but it has many tools in favor, where the good use of them can lead to the exponential success of small hardware store companies.

1.5.2 Conceptual framework.

To give definition to industry 4.0, it must be initially understood that this is the result of a series of transformations that the market has experienced both economically and culturally, since we have gone from selling “face to face” to selling without any contact physical, that is why the progress of technology has led to more specialized processes with greater security and more productive to achieve this market trend.

We are mentioning industry 4.0 as a future, but in reality this is the cyber connection of things, the communication between machine man and cyberspace has led to a world where the main strength is adaptation, since it runs wildly and evolves to such a high speed that the company that is not in this area will be taken out of the market.

That is why logistics 4.0, aims to provide greater traceability, unification and control to the value chain by eliminating high production and delivery times and magnifying control over processes giving better results to companies internally. (Logistica un futuro muy presente, 2019).

That is why the SME hardware of Medellín, composed of companies dedicated to the distribution of tools and machinery for the entire industrial sector, ranging from maintenance of machinery to construction and government projects, should focus on establishing logistics 4.0 processes to achieve encompass all the potential they have not only in the city but also nationally and internationally. (Fierros, 2019)

1.6 Methodological framework.

1.6.1 Reserch method.

The focus of this work is mixed since qualitative topics will be taken where opinions, concepts and studies are exposed, however qualitative data should be taken to justify the strategies and the possible advantages and disadvantages of Industry 4.0 in the SMEs hardware store of Medellín.

The study taken in this project is applied, since different activities will be developed that seek to provide strategies that can be applied in the hardware store SMEs of Medellín, and will also deepen the exploratory and explanatory, since the focus of this topic is to explore and explain a new trend; which is the industrial revolution 4.0 and can be developed in the hardware sector.

1.6.2 Research methodology.

In the first instance, research on industry 4.0 and the hardware store sector will be carried out, through google scholar, the main page of the RUTA N center of technologies and innovation of Medellín, conferences of industry 4.0 issued by universities such as EAFIT, among others, likewise An analysis of the Medellín hardware sector will be carried out, based on the own work experience in the International Ferretera SAS company, with these means the entire research and qualitative part will be carried out.

For the strategy part, FODA, MEFI, MEFE and MAFE matrices based on Fred David's methodology will be carried out, in order to have quantitative data that allow better results, likewise, comparative tables will be established under own analysis that allow the good strategic development of the project and Elimination of bias.

1.7 Scope.

The scope of this work is focused on SMEs in the Medellín hardware store sector with national projections, however it is applicable to all industries due to their universal themes.

2. Research development.

2.1 Evidence why the hardware sector needs to adapt to industry 4.0

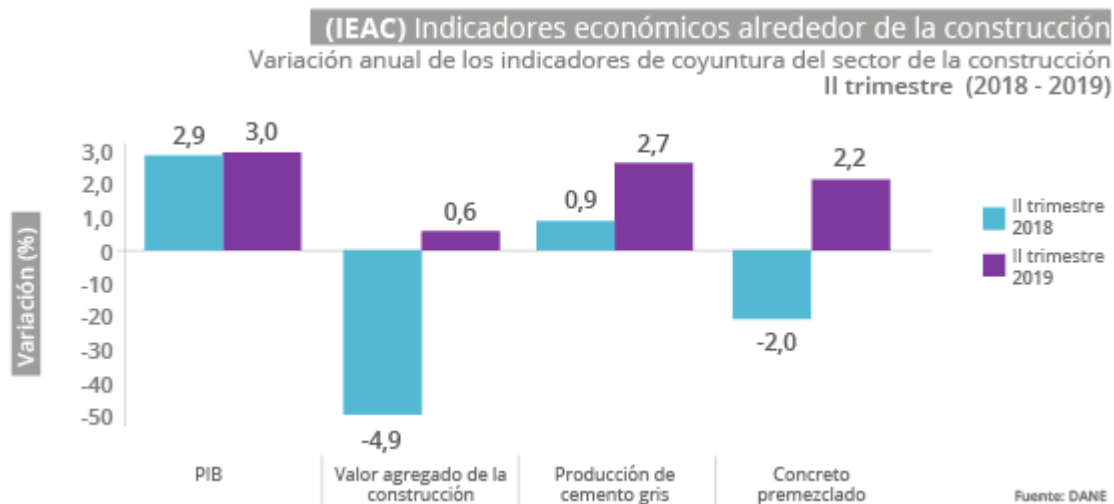
As a fundamental part of all economies, it is necessary to be able to adapt to the new market trends, where new technologies and cultures become the most relevant for any industry that wishes to remain competitive in the market.

To get a little deeper into the subject, it is necessary to know a little about the hardware sector and later of industry 4.0.

- Ironwork Industry

It should be noted that the hardware store industry belongs to the construction sector, therefore it's pertinent to observe its participation in the Colombian market, so the following graph is shown:

Graph 1. Economic indicators



Source: DANE, IEAC. Pr: cifras provisionales

This table shows a constant growth of this sector, however, this has had a recess in its usual growth, therefore its participation in the GDP has decreased, said that it is important to mention that the hardware industry depends totally on the growth of this sector, since this is

based mostly on building and civil works which are the potential customers of this industry. Likewise, in Antioquia the construction sector has had the same recess, but continues to maintain a good participation in the economy of this department as shown in the following graphs:

Graph 2. National sector performance.



Source: (COMERCIO, 2019)

Graph 3. Sector performance Antioquia.



Source: (COMERCIO, 2019)

According to these graphics, it should be considered that the construction industry despite its low growth so far in 2019 remains a potential market and its participation is considerable in

the Antioquia economy, for this reason it is worth mentioning the following sentence taken from the article of my finances to invest in Davivienda

“To continue with the growth of the economy of Medellín, it is desired that the construction sector improve. This sector of the economy, in addition to contributing to GDP growth, generates employment and contributes to the development of 32 other subsectors.”
(Invertir, 2019, p.)

It's for this reason that the industrial revolution 4.0, can be a great advantage for the Antioqueños in the construction sector and therefore in the hardware subsector.

In this order of ideas, to understand a little more about what links the hardware industry with the fourth industrial revolution we must know a little more about the latter.

To begin with this topic it is pertinent to add the following sentence:

"Industry 4.0, another name used for the transformations from the Fourth Industrial Revolution, builds from the ground traveled in terms of digitalization but, additionally, comes to combine technologies and blur the boundaries between the physical, biological and digital world."
(RUTAN, 2019)

Mentioned this phrase, it can be said that the story comes from a constant development of humanity starting with the steam engine, continuing with mass production, following the internet and ending in the current one that focuses on the internet of things , artificial intelligence, block chains and data science, where exponential growth and a market tendency to depend more and more on them are denoted, make this industry not only affect socially, but also economically proposing better forms of production and development, such as new supply and distribution systems, improvements in data intercommunication, new forms of entrepreneurship such as unicorn and zebra businesses, among others, generating better results reducing both internal and external times of industries usually.

Continuing with the idea, it is clear that for any industrial sector, it must begin to enter this industry 4.0 to be at the forefront and be competitive at the departmental, national and international levels, it is there that the hardware industry in Medellín must seek possible improvements through These new forms of production, it is pertinent to mention that in Medellín

is the first center in Latin America for the development of these new technologies and business forms for entrepreneurs.

To start focusing this research, the following comparative chart is presented where the pros and cons of the fourth industrial revolution are mentioned.

Table 2. Positive and negative aspects of industry 4.0

Positive aspects	Negatives aspects
<ul style="list-style-type: none"> • Reduction of production time. Processes are more refined, repetitive and without errors or alterations. Thus we achieve an uninterrupted production and available 24 hours a day. 	<ul style="list-style-type: none"> • Lack of adaptation of new methods. Not all organizations are adapting properly to Industry 4.0. In fact, with the constant changes that it implies, many industries run the risk of being outdated in a short time.
<ul style="list-style-type: none"> • Optimization of quality levels. Process automation allows greater precision in weights, measurements and mixtures. In this way, downtimes and interruptions are avoided. 	<ul style="list-style-type: none"> • Social inequality. Rapid industrial advances may allow inequalities and some social fragmentation to grow.
<ul style="list-style-type: none"> • Greater cost savings. Automated processes require less staff, fewer errors and greater energy efficiency and / or raw materials. 	<ul style="list-style-type: none"> • Complex and higher cost staff. The necessary personnel in the new processes is more specialized, and it is not always easy to access these profiles. In addition, due to their knowledge they require higher remuneration.
<ul style="list-style-type: none"> • Greater process security. This point is especially important for work at high temperatures, with heavy weights or in hazardous environments. 	<ul style="list-style-type: none"> • Higher investment cost. The cost of the investment is high in its beginnings. However, the ROI must be taken into account, and in the medium and long

	term, it is well recovered. But initially, not everyone can face the costs.
<ul style="list-style-type: none"> • More flexible production. The product is adaptable to the requirements of each specific company. 	<ul style="list-style-type: none"> • Technological dependence. Industry 4.0 lives under a huge technological dependence for its machinery. That is why, new specific needs are developed that must be identified and solved as soon as possible.
<ul style="list-style-type: none"> • More efficient data flow. All this thanks to the communication networks. Reaction times and decision making are reduced. 	<ul style="list-style-type: none"> • Obsolescence of technology. The risk is very high and must be taken into account in any initial project to calculate the ROI and the amortization of the investment, among other factors.
<ul style="list-style-type: none"> • Greater business competitiveness. The needs of the markets are better answered, high quality products are offered and the changes are reacted more quickly and flexibly. 	

Source: (ALCALA, 2019) (ALDAKIN, 2019)

In this order of ideas it can be deduced that, like all industrial revolutions, the cultural, social and economic shock is always present, however it is necessary to carry out an analysis of the current market and new trends in the construction sector.

To identify why industry 4.0 is a reality for the hardware sector, the following table will identify 30 trends in the construction sector focused on industry 4.0.

Table 3. Trends in the construction sector.

#	Title	Abstract
1	Use of drones	in the construction sector drones are being used to reduce costs and times
2	3d printers	This technology aims to speed up times by changing building materials being a new perspective for the way of building
3	green and sustainable buildings	bioclimatic buildings, focused on the optimization of energy use through the adaptation of buildings to conditions climáticas de su entorno
4	Design	vegetation, green and wide spaces and contact with the outside is the new trend of new homes
5	security and technology	security control through new technologies such as cell phones including the App for this services
6	energy efficiency	adaptation of homes to reduce electricity consumption and implementation of solar panels
7	dry construction	It refers to a faster and cleaner construction than the traditional one among which is Steel framing
8	Lonelier Colombians and New Family Centers	According to DANE studies, Colombians are choosing to live alone, which generates new building designs
9	common areas or shared spaces	Colombians are demanding better common areas and are even willing to pay higher prices for accessing these facilities
10	another of the trends in construction, tall buildings and areas between 51 to 70 m2	another of the most marked trends is the displacement of the population from rural areas to large cities, it is constantly growing

11	construction trends that start to sound like Coliving and coworking	collaborative constructions
12	modular / prefabricated structures:	manufacturing of economic and not very sophisticated designs is the new trend of architects
13	software for the administration and management of the work	new programs and applications that help meet the needs of construction managers to improve their operation and optimize their resources
14	eco-friendly	work with renewable and environmentally friendly materials
15	industry 4.0	adaptation of processes to technology in a nutshell robotization and internet of things
16	'millennials'	the market is increasingly different and the need for it changes therefore the new technological tools help you discover what these needs are
17	the bank, an ally	"There are lines of credit, lease of even 85% of a home, that allow people to buy with what was previously paid a part"
18	the sector must think about young people	more experiences, less ties
		more time control, less commitments
		more human relationships, less individualism
		more freedom, less accumulation of things
		more energy, less stress
19	Geopolitical instability and changes in the regulatory framework.	Managers identify it as the trend with the greatest impact at present and the greatest potential for future impact.
20	Workforce management and talent optimization.	The competitiveness of the sector depends directly on its workforce

21	business model and strategy challenges	The globalization of the market imposes a series of strategic challenges in the sector.
22	risks resulting from digitization and new technologies	Innovation presents great opportunities, but, for managers, it also involves significant risks.
23	complex business models in a global scenario	Different work cultures and adjudication systems between countries and regions add complexity to the market.
24	regulations and legality	from a normative point of view, the most relevant in recent years has been the evolution experienced thanks to the approval of the technical building code and the qualitative leap that the market itself has taken towards sustainable buildings
25	rehabilitation: key sector for consolidation	rehabilitation will be a fundamental part of the stability of the sector
26	material manufacturing	This trend towards sustainability is directly affecting material manufacturers.
27	Professional qualification	All this evolution in the development of new materials and the need to use new technologies will affect all workers in the sector
28	the shortage of human capital will force the industry to adopt new technologies and business models	The scarcity of a crucial resource threatens the growth rate of this sector worldwide. Energy? water maybe? capital? actually, it's about the workforce
29	With integrated manufacturing in construction, 10% of traditional contractors could disappear in the next 5 years	Undoubtedly, modular construction and integrated construction play an increasingly important role worldwide. this trend is expected to increase 6% worldwide by 2022

30	globalization will increase the foreign content of construction projects by 20% in five years	logistics-centric construction will also be a catalyst for further globalization
----	--	---

Source: Análisis propio de diferentes paginas

With this table it can be verified that as in many industries, new technologies are very present and evident in market trends, being one of the fundamental bases to remain competitive and constantly growing.

That is why industry 4.0 leads companies to implement it throughout its value chain in order to continue existing in the market.

2.2 Establish attainable strategies to improve the logistics chain through industry 4.0

In the first instance, a FODA analysis will be carried out in order to continue deploying the other matrices that lead us to establish strategies with strong and verifiable bases for better results.

• Table 4. FODA Analysis

Strengths	Opportunities
1. Effectiveness and efficiency in logistics processes such as: Inventories, Rotation of merchandise, Supply, Receipt of merchandise, Reverse logistics, picking, dispatch, among others. 2. Decrease with a tendency to eliminate logistic errors 3. Improvement of production	1. Growth and expansion of logistics 2. Increased national coverage 3. Better resources to meet customer needs 4. Support from national and regional governments 5. Tendency to online marketing (E-eat) 6. Facilitation of import and export processes 7. Increased competitiveness of SMEs

<p>indicators in times</p> <ol style="list-style-type: none"> 4. Greater control over the logistics chain 5. Improvement in the documentation and information of the areas 6. Structural improvement of the process 7. Supply improvements and purchases based on more real and verifiable data 8. Staff with more training and potential 9. Implementation of new software with greater resources 10. Decrease in lead time 	
<p>Debility</p> <ol style="list-style-type: none"> 1. Greater structural investment 2. High investment in labor 3. Ignorance in the use of new technologies 4. System dependence 5. Resistance to change 6. Little personnel specialized in the required profiles 	<p>Threats</p> <ol style="list-style-type: none"> 1. Risk of industries to remain outdated in a short time 2. Delay in governments and their legislation in relation to the growth of the industry and its technological advances 3. Innovation and access to resources can produce excessive and dangerous changes 4. Growth of inequality and social fragmentation due to excessive speed in industrial advances 5. High technological dependence for the specialization of machinery required 6. Increase of hackers 7. High investment cost

Source: own analysis

With these results, Fred David's method will be carried out, to arrive at strategies with well-founded and viable bases for the hardware industry.

Fred David in his book of strategic administration ninth edition (David, 2003) presents a general study both internally and externally, which constitutes the basis or starting point for the formulation or development of strategies, from the FODA Matrix new Matrices, in this way of the SWOT Matrix (Strengths, Opportunities, Weaknesses and Threats), will develop the analytical framework and strategies through the following stages:

- Internal Factors Evaluation Matrix (MEFI).
- Matrix for the Evaluation of External Factors (MEFE).
- Analysis Matrix Threats, Opportunities, Weaknesses, Strengths (MAFE). Strategy Creation

The MEFI and MEFE matrices will be given a weight which must add 1, a rating of 1 to 4, each with an ascending importance value the larger the number, the more important is the factor for the strategy, in this In order of ideas, a weighted total will be generated with these data, which in both matrices must be greater than 2.5 so that the strategies established in the MEFA matrix are viable and based on the project. (Cooperación, 2019).

• **Table 5. Analysis of internal factors (MEFI)**

MATRIZ MEFI			
FACTOR	PESO	CALIFICACION	TOTAL PONDERADO
F1	0,10	4	0,4
F2	0,04	3	0,12
F3	0,10	4	0,4
F4	0,10	4	0,4
F5	0,04	3	0,12
F6	0,04	3	0,12
F7	0,07	4	0,28
F8	0,05	3	0,15
F9	0,06	4	0,24
F10	0,06	4	0,24
D1	0,04	1	0,04
D2	0,04	1	0,04
D3	0,09	2	0,18
D4	0,05	1	0,05
D5	0,05	1	0,05
D6	0,07	2	0,14
TOTAL	1		2,97

Source: own analyses

As evidenced in the table, the sum of the weighted totals gives a result of 2.97% which indicates the viability of the strengths and weaknesses for the creation of strategies more focused on priorities and with better results for hardware store SMEs compared to industry 4.0

In this order of ideas, it is pertinent to highlight that weight indicators and qualifications can show us which aspects should be attacked or given greater relevance, such as force number 4 that corresponds to the control of the logistics chain, which for all The company in particular in this sector is the basis of its processes and in large part of its growth, not to mention that it is one of the factors that most affects industry 4.0 in companies.

• **Table 6. Analysis of external factors (MEFE)**

MATRIZ MEFE			
FACTOR	PESO	CALIFICACION	PESO PONDERADO
O1	0,09	3	0,27
O2	0,05	2	0,1
O3	0,08	3	0,24
O4	0,09	3	0,27
O5	0,10	4	0,4
O6	0,07	2	0,14
O7	0,10	4	0,4
A1	0,07	2	0,14
A2	0,05	2	0,1
A3	0,05	2	0,1
A4	0,05	2	0,1
A5	0,06	2	0,12
A6	0,04	1	0,04
A7	0,10	4	0,4
TOTAL	1		2,82

Source: own analysis

In order to analyze this matrix, it must be taken into account that they are external factors, therefore this not controllable factors but if adaptable, that is, if they are forecast or considered in advance, actions can be taken and possibilities become no problems, likewise This table highlights the threat 7 corresponding to high investment is one of the great difficulties that arises in the implementation of industry 4.0 in the hardware SMEs of Medellín.

In this order of ideas as well as the previous matrix, being above 2.5%, showing that it is feasible to propose strategies on these indicators, for greater adaptability and reaction to external factors that can affect the hardware store SMEs of Medellin with respect to industry 4.0

• **Table 7. MEFA matrix with strategy creation**

<p style="text-align: center;">internal</p> <p style="text-align: center;">External</p>	<p>Strengths</p> <ol style="list-style-type: none"> 1. Effectiveness and efficiency in logistics processes such as: Inventories, Rotation of merchandise, Supply, Receipt of merchandise, Reverse logistics, picking, dispatch, among others. 2. Decrease with a tendency to eliminate logistic errors 3. Improvement of production indicators in times 4. Greater control over the logistics chain 5. Improvement in the documentation and information of the areas 6. Structural improvement of the process 7. Supply improvements and purchases based on more real and verifiable data 8. Staff with more training 	<p>Weaknesses</p> <ol style="list-style-type: none"> 1. Greater structural investment 2. High investment in labor 3. Ignorance in the use of new technologies 4. System dependence 5. Resistance to change 6. Little personnel specialized in the required profiles
---	---	---

	<p>and potential</p> <p>9. Implementation of new software with greater resources</p> <p>10. Decrease in lead time</p>	
<p>Opportunities</p> <ol style="list-style-type: none"> 1. Growth and expansion of logistics 2. Increased national coverage 3. Better resources to meet customer needs 4. Support from national and regional governments 5. Tendency to online marketing (E-eat) 6. Facilitation of import and export processes 7. Increased competitiveness of SMEs 	<p style="text-align: center;">FO</p> <ul style="list-style-type: none"> - Implement GPS system for real-time control of company vehicles - Create shared folders where information is unified and available to all participants in each process (inventories, purchases, among others) - Use outsourcing for national deliveries - Create unions or agreements with similar companies in the sector to expand the portfolio and implement e-commerce - Create a customer service line through the page of immediate response to customer needs and concerns - Have authorized distributors 	<p style="text-align: center;">DO</p> <ul style="list-style-type: none"> - Implement group training by area about the new systems to use - Make a benchmark of the success strategy where it establishes with certain operators the use of the same software to speed up the information and that they pay a percentage of the monthly total of the software - Create security systems and plan b of the processes in case damage is generated in the system can continue to operate. - Improve the page more customer-friendly and use

	<p>in difficult-to-transit or reach sectors to improve lead time and control their information and movement through established systems and software</p>	<p>social networks for company advertising</p>
<p>Threats</p> <ol style="list-style-type: none"> 1. Risk of industries to remain outdated in a short time 2. Delay in governments and their legislation in relation to the growth of the industry and its technological advances 3. Innovation and access to resources can produce excessive and dangerous changes 4. Growth of inequality and social fragmentation due to excessive speed in industrial advances 5. High technological dependence for the specialization of machinery required 6. Increase of hackers 7. High investment cost 	<p style="text-align: center;">FA</p> <ul style="list-style-type: none"> - Start with basic logistics systems such as a WMS, 5S, barcode among others, that are not as high cost - Seek government aid for hardware entrepreneurs - Establish adaptation processes according to the needs of the company seeking to accept the changes little by little - Hardware companies should start looking for training and soak up the changes in the market and industry 4.0 - Structure the processes properly to face the changes - Create security alternatives in the system so that it is very difficult to invade - Create green campaigns where the reduction of the environmental footprint is 	<p style="text-align: center;">DA</p> <ul style="list-style-type: none"> - Reduce the cost of labor through internal training of the company - The personnel of each area must know and have bases of all the processes so as not to depend on the worker or stop the production - Mark all the shelves and the picking area according to the information written in the bar code - The shelves must be of different colors depending on the date of arrival at the company - Delimit the dispatch area by route and organize macros to eliminate paper handling and help with the environment - Use the boxes as a storage medium for small

	<p>encouraged</p> <p>-Reduce structural investment through electronic platforms</p>	<p>merchandise and thus save space and improve inventories</p> <p>- Keep the purchasing area communicated with the logistics area and supply large brands through inventories</p>
--	---	---

Source: own analysis

These strategies are intended to show that Medellín hardware store SMEs can reach a 4.0 industrialization of their processes in a safe way and controlling investments so that this goal is more attainable and viable.

Likewise, more positive perspectives are established about this new trend to eliminate the fear of businessmen and the general population towards the fourth industrial revolution.

3. Recommendations and Conclusions.

3.1 Conclusions.

In the first instance, it is defined that industry 4.0 is not an assumption nor a possibility is a reality and we are currently living it, therefore it is a priority for small and large entrepreneurs to contextualize and start taking measures so that this trend do not plunge negatively with our industries.

On the other hand, hardware store SMEs have great possibilities for growth and if you focus logistics 4.0 on your value chain, you would fully empower companies and cover market needs with greater certainty.

In this order of ideas, industry 4.0, encourages growth and evolution not only of the industry but also of the workforce, since some jobs will end but many more will be generated with greater demands but with better possibilities

On the other hand, logistics 4.0 will reduce costs, eliminate loss, time and generate better results, it's an investment with high profit rates

Likewise, implementing these technologies does not necessarily mean high costs, since as it's spent in some areas it saves in others.

To grow, you must innovate to captivate the market and remain competent in it.

Each company must have previous strategies to face this revolution, and be very clear that internal aspects must improve and which must change completely to achieve better results and with greater adaptation.

3.2 Recommendations.

Eliminate bias or fear of industry 4.0 as an entrepreneur and learn to see it as a growth opportunity
Perform employee training to prevent the lack or increase of the cost of labor

Search platforms and enter the new markets presented by these technologies

Use of 100% of the technological resources already established in the companies to improve logistics and other areas.

Approach the training and growth centers provided by the Free State, to prepare for this new change.

It should be noted that the use of the strategies established in the MEFA matrix is recommended, since it is a determining factor in the processes of adaptation of industry 4.0, since these are based on an internal and external vision that can generate better results.

Likewise, the strategies established in this project will be very useful for the hardware store SMEs of Medellín, because they have a comprehensive analysis of the factors that are influencing this cultural, economic and social sector, covering the entire value chain.

Finally, it is recommended to focus on the following sentence to face the industry 4.0.

“The challenge is not in the cost but in the capacity of human adaptation”

Kelly Castaño 2019

4. Bibliography.

- ALCALA, U. D. (2019). *VENTAJAS Y DESVENTAJAS DE LA INDUSTRIA 4.0*. Obtenido de <https://www.masterindustria40.com/ventajas-desventajas-industria-4-0/>
- ALDAKIN. (2019). *Industria 4.0. Qué es, ventajas e inconvenientes*. Obtenido de <http://www.aldakin.com/industria-4-0-que-es-ventajas-e-inconvenientes/>
- AMAZON. (08 de 2019). *AMAZON CENTROS LOGISTICOS*. Obtenido de <https://www.aboutamazon.es/centros-log%C3%ADsticos-de-amazon/nuestra-innovaci%C3%B3n/>
- ANTIOQUIA, C. D. (2018). *DESEMPEÑO ECONOMIA ANTIOQUIA*. Obtenido de https://www.camaramedellin.com.co/Portals/0/conozca_la_camara/informes-SIC/Informe-Economico-SIC2019.pdf
- Arteaga, F. (2018). *Revolucion Industrial como reto tecnologico y cultural*.
- Bejarano, J. M. (s.f.). *Economía colombiana crecería 3,3% según el Banco Mundial al cierre de este año*. Obtenido de <https://www.larepublica.co/globoeconomia/economia-colombiana-creceria-33-segun-el-banco-mundial-al-cierre-de-este-ano-2812453>
- Bernal, C. (2006). *Metodología de la Investigación: Administración, Economía, Humanidades y Ciencias Sociales*. México DF: Pearson.
- Bernal, M. C. (05 de 09 de 2019). *RUTAN*. Obtenido de <https://www.rutanmedellin.org/es/noticias-rutan/item/creditos-para-estudiar-para-la-cuarta-revolucion-industrial>
- Caballero, A. (04 de 2018). *Llega la cuarta revolucion Industrial*. Obtenido de <http://www.impulsodigital.elmundo.es/economia-digital/llega-la-cuarta-revolucion-industrial>
- Casalet, M. (2018). *La digitalizacion industrial un camino hacia la gobernanza colaborativa*.

- CIC, C. I. (14 de 01 de 2019). *Industria 4.0, la cuarta revolución industrial y la inteligencia operacional*. Obtenido de <https://www.cic.es/industria-40-revolucion-industrial/>
- COMERCIO, C. D. (2019). *CAMARA DE COMERCIO MEDELLIN*. Obtenido de <https://www.camaramedellin.com.co/Portals/0/Noticias/Documentos/Como%20avanza%20la%20economia%20de%20antioquia%202019.pdf>
- Cooperación, U. p. (2019). *Conceptos de Administración Estratégica de Fred*. Obtenido de <https://maliaoceano.files.wordpress.com/2017/03/libro-fred-david-9a-edicion-con-estrategica-fred-david.pdf>
- Cortés, C. B. (2017). *El Entorno de la Industria 4.0: Implicaciones y Perspectivas Futuras*. Obtenido de <https://www.redalyc.org/jatsRepo/944/94454631006/html/index.html>
- DANE. (2019). *DANE*. Obtenido de <https://www.dane.gov.co/index.php/estadisticas-por-tema/construccion/indicadores-economicos-alrededor-de-la-construccion>
- Daros, W. (2002). ¿Qué es un marco teórico? *Revista Enfoques*, 73-112.
- David, F. (2003). *Conceptos de administracion estrategica novena edicion*. Obtenido de <https://maliaoceano.files.wordpress.com/2017/03/libro-fred-david-9a-edicion-con-estrategica-fred-david.pdf>
- digital, E. e. (2019). *Logística, la clave del éxito de Amazon*. Obtenido de <https://www.expansion.com/economia-digital/companias/2016/05/30/574c66eeca4741d63d8b464b.html>
- Duarte, L., & González, C. (2017). *Metodología y Trabajo de Grado: Guía práctica para las ciencias empresariales*. Medellín: Centro Editorial Esumer.
- Fierros, E. (20 de 02 de 2019). *FERRETERÍAS 4.0, LA ACTUALIZACIÓN*. Obtenido de <https://fierros.com.co/ediciones/ed-75-proyecciones-fierros-2019/ferreterias-4-0-la-actualizacion/>
- Incibe. (13 de 03 de 2017). *La pyme industrial ante el reto 4.0 de la ciberseguridad*. Obtenido de <https://www.incibe.es/protege-tu-empresa/blog/pyme-industrial-el-reto-40-ciberseguridad>

Invertir, M. f. (30 de Julio de 2019). *LA ECONOMÍA EN MEDELLÍN CUENTA CON LOS INGREDIENTES DESEADOS*. Obtenido de <https://www.misfinanzasparainvertir.com/como-la-bandeja-paisa-sectores-de-la-economia-en-medellin-cuentan-con-los-ingredientes-deseados/>

JIMÉNEZ, F. A. (16 de 02 de 2017). *Sector ferretero busca duplicar ventas y facturar \$36,5 billones*. Obtenido de <https://www.elcolombiano.com/negocios/economia/ferreterias-buscan-expandir-sus-negocios-en-colombia-NA5938197>

Josefina, M. C. (15 de 10 de 2018). *Historia de la industria 4.0*. Obtenido de <https://www.logicbus.com.mx/historia-industria-4.0.php>

Lehmann, A. (2019). *La cuarta revolución industrial tiene grandes posibilidades para empresas de países emergentes: Lehman*. Obtenido de <http://www.eafit.edu.co/altadireccion/Paginas/La-cuarta-revoluci%C3%B3n-industrial-tiene-grandes-posibilidades-para-empresas-de-pa%C3%ADses-emergentes-Lehman.aspx>

lideres. (06 de 05 de 2019). *Medellín apuesta por la innovación y la industria 4.0*. Obtenido de <https://www.revistalideres.ec/lideres/medellin-apuesta-innovacion-industria-colombia.html>

Logística 4.0. (2019). Obtenido de <https://www.timocom.es/lexicon/El-Diccionario-de-Transporte/Log%C3%ADstica%204.0>

Logística un futuro muy presente. (11 de 02 de 2019). Obtenido de <https://www.mecalux.es/blog/logistica-4-0-futuro-presente>

Logística, I. (10 de 06 de 2019). *La revolución de la logística 4.0*. Obtenido de <https://www.redalyc.org/jatsRepo/944/94454631006/html/index.html>

Martínez, J. P. (30 de 08 de 2019). *Tendencias Inmobiliarias Colombia: el sector debe pensar en los jóvenes*. Obtenido de <https://www.grupobancolombia.com/wps/portal/empresas/capital-inteligente/especiales/activos-productivos-colombia/tendencias-inmobiliarias-jovenes>

- Medellín, E. B. (18 de 06 de 2016). *Colombia, en la cuarta revolución industrial*. Obtenido de <https://www.elespectador.com/noticias/economia/colombia-cuarta-revolucion-industrial-articulo-638602>
- Melendez, C. (2019). *Conozca las 7 tendencias aplicadas al mundo de la construcción*. Obtenido de <https://www.constructoramelendez.com/novedades/noticias-del-sector/item/229-7-tendencias-de-la-industria-de-la-construccion.html>
- Mincomercio. (2018). *Ministerio de industria y comercio*. Obtenido de <http://www.mincit.gov.co/CMSPages/GetFile.aspx?guid=ff7f4c9b-1a3c-43b2-bf1d-2f2dd43eb02f>
- Mintic. (23 de 10 de 2018). *Inicia Colombia 4.0, un escenario para las industrias creativas*. Obtenido de <https://www.mintic.gov.co/portal/inicio/Sala-de-Prensa/MinTIC-en-los-Medios/80387:Inicia-Colombia-4-0-un-escenario-para-las-industrias-creativas>
- Mintic. (08 de 05 de 2019). *“El Gobierno le apuesta a la transformación digital para lograr más equidad”, dice Viceministro de Economía Digital del MinTIC en foro sobre Industria 4.0*. Obtenido de <https://www.mintic.gov.co/portal/inicio/Sala-de-Prensa/Noticias/100558:El-Gobierno-le-apuesta-a-la-transformacion-digital-para-lograr-mas-equidad-dice-Viceministro-de-Economia-Digital-del-MinTIC-en-foro-sobre-Industria-4-0>
- Mintic. (30 de 04 de 2019). *Colombia en la Cuarta Revolución Industrial*. Obtenido de <https://www.mintic.gov.co/portal/inicio/Sala-de-Prensa/Columnas-Ministra-TIC/100434:Colombia-en-la-Cuarta-Revolucion-Industrial>
- Montaña, C. (25 de 04 de 2019). *Tendencias del sector constructor: transformación digital y ‘millennials’*. Obtenido de <https://www.bbva.com/es/co/tendencias-del-sector-constructor-transformacion-digital-y-millennials/amp/>
- Olmo, M. d. (20 de 02 de 2019). *FIERROS, FERRETERIAS 4.0, LA ACTUALIZACION*. Obtenido de <https://fierros.com.co/ediciones/ed-75-proyecciones-fierros-2019/ferreterias-4-0-la-actualizacion/>

Rengifo, S. C. (30 de Abril de 2019). *MinTic*. Obtenido de <https://www.mintic.gov.co/portal/604/w3-article-100434.html>

Rioja 2. (11 de 12 de 2017). Obtenido de <https://www.rioja2.com/n-115584-2-industria-40-indagando-en-la-historia-moderna/>

Rioja. (11 de 12 de 2017). *Industria 4.0: Indagando en la historia moderna*. Obtenido de <https://www.rioja2.com/n-115584-2-industria-40-indagando-en-la-historia-moderna/>

RUTAN. (2019). *EL MUNDO, CUATRO REVOLUCIONES INDUSTRIALES DESPUES*. Obtenido de <https://www.rutanmedellin.org/es/cuarta-revolucion-industrial>

Torres, A. G. (23 de 01 de 2019). *Medellín ya se mueve al ritmo de la Industria 4.0*. Obtenido de <https://www.medellincuenta.com/?NavigationTarget=navurl://b1ffe7a122c93277659be886c8d33289>

UPB, M. A.-A. (01 de 08 de 2018). *¿Qué es la Cuarta Revolución Industrial?* Obtenido de <https://www.upb.edu.co/es/noticias/que-es-la-cuarta-revolucion>

