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MONOGRAPH

“The changing face in the Automotive Industry”

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Summary

The topic of this monograph is "The changing face in the automotive industry", which is a study of innovation that, for years, and currently, is being applied in the automotive industry, to be specific, in the assembly of cars. The history and evolution of the automotive industry is reviewed, in which the old world demand for vehicles, the new forms of work, which have undergone changes due to the new demands of the client population of this type of companies, are reviewed. the automotive industry a model for other types of industries in the world market, quality control applied to the new systems of automatic machines to achieve reduce production costs, give priority to work to modernize, efficiency of finished products.

The automotive industry has been qualified by a high-tech field, and as it grows day by day due to its focus on research and development, new challenges arise such as globalization and new competitors seeking space and success in this area of the market. It explains in detail the advantages and disadvantages that have occurred in companies that have added robots to their work staff, which should be given great importance before modernizing manufacturing systems. We will analyze the demand for industrial robots, and how over the years it is expanding significantly.

The impact that these intelligent systems have allowed has been very great, both in the workforce, in society, and in the manufacturing companies. And since these automated processes have affected humans in their jobs, a comparison is made between humans and robots in these tasks, so that, when reading it, each company makes its decision, humans, or robots?

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Introduction

Throughout the history of mankind, man has been creating tools and artifacts to help him perform tasks that may have been complicated and / or dangerous for him; and thus we come to create great inventions to help us reach our objectives. Thanks to our vision and creativity, along with our individual and social needs, we have come to create gadgets and machines, both great and small to serve our needs. As we developed our skills, so did we develop the machines with which we assisted ourselves. Thanks to the implementation of these great machines, man has been able to have instilled several advantages by their applications in different areas. In modern times, easily exemplified in its application in the automotive area, there are many advantages to be had by the simple implementation of the mass production line among these advantages: to maximize costs, reduce risks for workers, decrease operating times, mass production, etc. stand tall amongst the rest.

This monographic work is a study of Robotics in the automotive industry, which aims to analyze the implementation of new technologies in the automobile manufacturing process. Since its inception, auto assembly was conducted by people, used human manpower, yet, however, now seeks to make a few changes in the functions originally set in the past.

This specific study of the subject is of the utmost importance since the implementation of automation in industrial processes is already a reality that is expanding globally, from the more developed to the third world countries. This change will not only maintain the security of the human workers but that it will also ensure new products, higher quality, less waste and in less time.

Several authors and institutions that have tried this topic as for example Yolanda Montiel in her book "Automation and automotive industry: the case of VW of Mexico", Boston Consulting Group, Fernando Reyes, among others. The real intention of implementing automation for the automotive industry was born about a decade ago in major truck producing countries such as Japan, the United States, France, Germany, and China, with the latter being the great engine of Robotics in the world.

This monograph will consist of three chapters: the first will be the history of the automotive industry, from its inception to date, analyzing its evolution, the forms of labour applied that have existed over time and the type of product quality control used and applied in the manufacturing of these vehicles, and to question which turns out to be very effective; Second, the implementation of Robotics in the different processes carried out in the Assembly and manufacture of automobiles; and the third, the consequences of the automation on the productivity and the competitiveness of enterprises and on employment and the benefits it will provide society.

Also, it will include a brief comparison and contrast between humans and robots, the theme that already is being talked about all over the world, some think that human-

robot is a great combination, however, others fear that robots will be responsible for the removal of the human element from the industries.

Chapter I

History of the automotive industry

1.1. Evolution

In the Decade of 1890, the automotive industry was born, becoming a model, and influence for other industrial sectors for its efficiency in production. The largest assembler nation of automobiles of the era, was the United States that, prior to the great depression in 1929, produced 90% of the approximately 32 million cars that existed around the world at the time, and, after the capitalization, manufactured around 75% of the world's production of cars. In the year 1980, Japan beat the United States becoming the leader of the world's production up to 1994, when it lost that lead. Approaching the year 2006, the Japanese industry regained its strength and caught back up to the United States in production maintaining this position until 2009 when China claimed the title, manufacturing 13.8 million cars a year.

The automotive industry is a field that will continue to grow with the passing of the years, new technologies which are now available must be implemented to satisfy the needs of today's society. In this day and age, there strategic global consultants as Boston Consulting Group which seek to predict the future of tomorrows automotive industry.

According to Dauner (2018), a global leader of the auto industry's practice of BCG, "Original equipment manufacturers will find their competitive positions under attack from new players in the market, including suppliers, platforms on demand and technological giants, as well as cities that play a role increasingly more active in mobility" (para. 4).

It appears that the automotive industry is in for a dynamic and potentially disruptive decade. Advances in technologies as well as new possibilities offer today's society the opportunity to select from a wider range of choices in our methods of transportation and even in the way we handle vehicles. New participants from the fields of technologies and connectivity have also entered in the business race. Bringing new threats to the competition.

The leaders of this business will be the companies that optimize their actions, develop innovative ideas, form strategic alliances to take advantage of the market opportunities and entering new businesses to merge their operations and improve their processes.

Says Andersen (2018), partner of BCG, "original equipment manufacturers are facing the dual challenge of having to invest in these areas of growth at the same time that is declining margins in its core business" (para. 8).

1.2. New ways of working

In modern times, the automotive industry faces new challenges by changes in society, in the economy, technology and in the Organization, which are impacting on the Assembly, auto parts production and the maquiladoras that confirm it's the value chain.

There are authors who believe that:

The industry is experiencing profound changes. Since the rise of emerging economies and the development of new forms of travel by car (such as the sharing of private vehicles) to growing "digitalization" of production and the need to manufacture more eco-friendly cars, these changes will have an impact on the quality and quantity of jobs in the future no doubt. (Delautre, 2017, para. 3)

The changes that are affecting the design of parts and cars in general are: convergence in the use of new technologies based on the electricity, electronics, telematics and computer science, among others.

There are more changes that are occurring in this industry: the processes of regional integration, the emergence of new countries manufacturers of cars and parts around the world (e.g. China and India), the birth of new consumer sections, and the recent energy ideas.

Since the twentieth century, the automotive industry has adopted a new model, and under this, companies decreased their suppliers, they abolished the routine work scheme, has been given greater importance to the effectiveness of the processes, inventories have slowed creating new organizational structures of more horizontal type.

The plan to continue successfully and continue to evolve in the production of autos and auto parts is to design automotive companies "tight" which involves cooperating with workers in the decision-making process with the aim of being a company of liability. A key organization to achieve this goal is the creation of work teams.

Work equipment generates knowledge in the professional experience from training, but also, share this knowledge acquired within the company, helps all those who constitute it can progress, without having delays. The work teams are dominated by cooperation and sharing.

1.3. Quality control

The cars that are being manufactured are adapting to their systems, more advanced and complex technologies so automotive original equipment manufacturers and auto parts suppliers have to get a:

- Permanent pressure to achieve accessible prices
- Growing need for new contributions with little time to reach the market

- Global and increasingly complex supply chains

As a result of these conditions, the quality control of the automotive industry need plants and worldwide real-time monitoring for dynamically:

- Reduce production costs
- Prosper continuously to increase the quality
- Ratify the implementation of certifications
- Priority given to labor to modernize
- Compare the capacity of the production lines
- Effectiveness of the finished products

1.3.1. Metrology.

Metrology is a tool of quality in the automotive industry that plays a vital role in the process of production of cars and auto parts in all phases of design, development, and manufacturing. Allows you to establish a controlled production, testing appropriate time with a proper mention (traceability) mentions unknown (physical measurement patterns), thus achieving the reliability of these tests.

There are authors who explained it thus:

Is the prerequisite without which could not guarantee you quality, reliability, and accuracy of the parts manufactured by thousands of metal-mechanical and manufacturing plants workshops. In these industries, the Metrology becomes the key process to provide objective proof of the quality of a process or a product, which depend on reliable measurements using measuring equipment. (Tovar, 2016, para. 2)

In the automotive industry the use of Metrology is critical because, in the majority of occasions, parts of cars are manufactured by several different distributors, so it is important that each piece meets the quality parameters International in regards to tests of strength, geometric dimensions, and accuracy of parts produced in the manufacture of automobiles and auto parts, mass production prototypes were innovated by the interchangeability of the Parties and the simplicity of Assembly. All this requires that manufacturing and monitoring of the parties comply with the instructions of its original design.

Chapter II

Implementation of Robotics

2.1. Automation in Assembly of vehicles

Considered as a half hi-tech industry, and valued by its important focus on research and development level, the automotive industry is still a sector facing worldwide challenges such as regionalization, saturation of some markets, globalization, as well as technological advances, new competitors and its continuous restructuring.

According to Michalos, Makris, Papakostas, Mourtzis, & Chryssolouris (2010), "market trends generate a transformation of the production industry in mass customization, which generates a need to manufacture vehicles with large amount of variants, using the least amount of resources and materials in the shortest time"(p. 2).

Additionally, in the same production process, it is necessary to face challenges such as ergonomic conditions, facilitating human interaction with manufacturing processes and material management, ensuring the safety and health of the plant workers, and also, decreasing costs for unnecessary activities or that can be performed automatically by machines with limited intervention human. In automation processes, is required to take into account variables such as the dimension and size of parts to manage, the level of accuracy of processes and production rates. Some of the points which may need automation in vehicles Assembly companies are described below.

There are also authors who highlight that:

“The designs of production processes and the redesigns of a plant conditioned on various factors. For example, shown that systems fully automated or fully manual processes do not become the optimal system in the Assembly of automobiles, in terms of the combined effects of cost, quality, and flexibility. Therefore, to implement any type of automatic system in a production process will require vision in the long term, logical procedures and efficient design of production lines to ensure efficiency in the processes of manufacturing” (Görlach & Wessel, 2008, p.3).

2.1.1 Advantages

Automation is a process that provides advantages to the technological, economic and social level of each organization. Automate now is something very important in order to be a company competitive and capable of reaching the public.

Then, the main advantages of "modernizing" industrial processes:

- Companies who implement process automation are placed in a position of advantage over its competitors, because they generate more confidence in the population, besides that they combine its activities and are more effective in production.
- It influences the reduction of operating costs.
- It eliminates the execution of manual scripts that may be subject to human error, increasing the efficiency and productivity of the organization.
- Allows the transparency and control of all workflows and activities, offering state of completed, ongoing and future processes report.

- Permanent repetition. Already implemented the automation process, operations are repeated identically continuously.
- It offers "zero defect" quality. When the process of repetition is set, the optimum levels of quality are achieved.
- Availability 24 hours a day. Appropriate programming is performed so that the machines work day and night without rest.
- Production time. If not you need a production without interruption, due to the efficiency and accuracy of the automated process, significantly reduces production time.
- Safe staff. It takes care of the well-being of staff, especially in processes that include heavyweights, temperatures or hazardous environments (with harmful, radioactive chemicals...).

Cordoba expressed one of the advantages of automation in the following idea, "the procedures logical human instruct special automated machines, computers, which process information much faster than men, with the help of mathematical models describing both the technology and the analytical and regulatory human activity"(para. 3, 2006).

2.1.2 Disadvantages

As any development process, automation in automobile manufacturing has disadvantages that must be thoroughly analyzed by the company that is going to adapt this process to your daily activities so that you can get the most benefit from it.

The disadvantages can affect in a very serious way the production process if not it is taken into account in the operation of machines, these are:

- Fear of being excluded from their jobs. Employees can face this fear. However, companies that automate their processes have the ability to generate more jobs. This, because they are more prosperous and efficient, and can deal with a larger number of projects and cater to more satisfied customers.
- Cost of investment. Implement a solution for process automation involves a substantial initial investment. However, this factor should be analyzed in comparison with the benefits that will be generated in terms of productivity and compliance.
- Inflexibility. Adaptation of an automated process is extremely expensive and slow to produce new models of products made by different parties together.

2.2 Expansion of the marketing of industrial robots

The marketing of industrial robots is expanding. The global automotive industry performs the more intensive use of that technology, as it uses around 1,200 robots for every 10,000 workers, said a report by the Economic Commission for Latin America and the Caribbean (ECLAC).

Between 2010 and 2015, the use of robots in the automotive industry grew 20%, to account for 38% of the total number of robots sold worldwide at the end of the period.

In this context, Mexico has become an important emerging market, and by 2015 doubled its claim to 5,500 units, record that exceeds 1,400 units acquired by Brasil in the same year.

The ECLAC said that, from the point of view of the labor market, this movement towards the robotization revives tensions between technological progress and the creation of jobs, notably about whether the automation will eliminate jobs in the automotive industry.

2.2.1 Industrial robots demand.

In the next three years, the sale of industrial robots will increase by 13% in the world, a trend that Latin America will not be foreign, mainly due to the growth of the automotive sector.

Also grow human collaboration with controllers in the activities of the factories, which will improve the efficiency and quality of production.

As Segura (2017) describes it:

"The unstoppable robotization of the industry has made alarm bells ringing. In Spain, the last year 3.371 units, a record growth of 12% settled. The total since 2003 amounts to 33.338, as the accumulated historical located in 53.410 machines. The pace will accelerate in the coming years. This situation, which is repeated in all the world, a number of questions arise: what impact does the automation job? Will the loss of jobs lead to a lower fundraising? If so, how pensions will be paid?" (para. 1).

Chapter III

Consequences of automation

1.1. Impact of automation with robots

We are witnessing progress of significant proportions in the field of industrial technology, which is clearly aimed towards automation and Robotics in production

plants, and have generated different positions as to what people believe will happen in the future of the industry.

Revealing way, Automation, and robotics have attracted a special PUBLIC interest due to the impact these can have on a person's daily life and\ or job. Some experts focus on the advantages that this type of technology can bring to the industry such as competitiveness, productivity, and training. Other , on the other hands focus only on the negative aspects such as the loss of jobs.

Promoting the increase of public interest in robotics and automation is both a fascination with the potential of these technologies to change our lives and a fear of the impact of automation, including robotics, in jobs. These, interests and fears are linked to broader geopolitical and social changes, driven by issues such as trade policy and immigration that, in general, help to create a sense of insecurity about employment prospects of generations current and future.

In less than a decade, spending on Robotics will double worldwide. Currently, China is the major global consumer and aspires to be one of the largest manufacturers.

The automotive industry is one of the great engines of global automation existing in today's modern day race for precision, efficiency and low cost productivity .

For 2019 it is expected that has almost 2.5 million robots be installed in factories and industries of all the world, although most will be in a handful of countries of the Union European and in China. The Chinese Automation appetite is the great engine of

Robotics in the world. The Chinese industries account for almost a third of global demand for new robots, with the installation of new 90,000 units last year alone.

The International Federation of Robotics (2017), said that "in 2019 is expected, only in that country, 160,000 new devices of this type are installed" (para. 3).

By way of context, in 2015 the IFR estimated that sales of robots would come to little more than 250,000 units, the highest number recorded in 12 years.

In this segment, automotive, industries electrical and electronic are the three sectors where there is more Robotics labor in the world and that being mostly mainly within China.

In accordance with the signature of consultancy IDC, the related expenditure on robotics and services will come in 2020 to more than US\$ 188,000 million in all the world. Last year, that figure was \$91.500 million. Asia-Pacific will be the fastest-growing spending market on Robotics for 2020, followed by the Americas.

It is evident that the big winners in this scenario are the manufacturer of robots. Among them, Chinese companies are also positioning themselves in a highly competitive market.

One-third of the demand in China is supplemented with domestic companies, which lowers the cost of production and installation and stimulates the growth of an ecosystem that includes manufacturers, but also the related service providers and the skilled labor to operate these machines. By 2020, the Chinese Government wants 50%

of sales of Robotics to be local; growth in Chinese production will grow three times its current numbers and will reach 100,000 units manufactured in this country alone..

Follow by countries such as Japan, United States and Germany, the largest consumer of Robotics in the European Union. It is estimated that only in the German automotive industry, there are presently more than 1,200 robots for every 10,000 workers, according to data from the IFR.

1.1.1. On productivity and competitiveness

The robots enable companies to become or remain competitive. This is particularly important for small and medium-sized enterprises (SMEs) are the spine of the economies of the developed countries and developing.

Currently, "the robot is a tool helping us human beings with the productivity of a company, but in the end with his creative ability and its technology developments always must be present in the industry" (Niembro, 2017, para. 1).

A recent study found that investment in robots contributed 10% of the growth of per capita GDP in the countries of the OECD between 1993 and 2016. He also determined that a unit increase in robotic density (number of robots per million hours worked) is associated with a 0.04% in labor productivity. Another study shows that the use of robots contributed to 10% of the total growth of GDP in 17 European countries between 1993 and 2002.

Robots have increased productivity for 14 years in 17 European countries in the same amount as the technology in the United Kingdom - but in a quarter of the time.

The McKinsey Global Institute expects that up to half of the total growth of the productivity necessary to ensure a GDP growth of 2.8% over the next 50 years will be driven by automation.

In general, the greatest threat to employment is not Automation, but an inability to remain competitive. Companies that employ effective technological innovations are between 2 and 10 times more productive than those who do not. Increased productivity through Automation enables large companies to "restructure" or bring back to their supply chains that formerly had been subcontracted to sources of cheap labor.

Caterpillar and Ford Motor in the United States are examples of this trend. 250,000 jobs have been returned to the United States by restructuring and foreign direct investment.

1.1.2. On employment.

With the development of new technologies, the fear of being replaced by robots is a global concern. But, are there reasons to feel fear?

The fear of being replaced by a machine started with the consolidation of industries, at the beginning of the 19th century, when workers were organized to end

machines, considered responsible for the dismissals and poor wages. This fear of technology increases with its progress and development of artificial intelligence. It is estimated that by 2025 many existing jobs will be filled by robots, but there is a basis to believe that we move at all?

Robots improve the quality of the work and created new types of work with higher incomes. On the BMW in the United States, ground robots fit doors with insulation, a task that used to cause wrist stress for workers.

The human factor is one of the points that most concern in the panorama of the automation, then, ultimately, use a robot may involve the hiring of one person less. The fear is felt in a variety of sectors, from industrial manufacturing to the front of the customer service and online sales.

But, at least so far, the encouraging figures of Robotics go hand in hand with positive numbers in employment human: in the United States, for example, to June of this year, we had added 159,000 new jobs, while this country focus 14% g World Auto robots during 2017, according to IDC.

German automotive industry created 93,000 new jobs between 2010 and 2015. Gemma, President of the IFR (2017), notes that "as a result of the growing trend of automation, employment in this sector came to 813,000 places by 2015" (para. 4).

Workers are especially required for specialized tasks, for accurate results. This does not mean that the human hand is relegated to the craftwork. Taking for example the BMW plant in South Carolina (USA), there are tasks referring to the complexity and

personalization, two issues in which the robots cannot replace a trained person with experience and judgment.

In China, the effect of automation has not started to hit the wages of workers. Employees of manufacturing with secondary education recorded an increase in their wages by more than 50% between 2010 and 2014.

1.2. Comparison: humans and robots

Whenever we hear the word "robot" we imagine artificial beings who were created through technologies developed by human beings, in order to facilitate certain activities or processes in the life of the same.

We must never be under the impression that that fiction became a reality, since nowadays the robots take an important role, at least in the world of industry.

Sectors as manufacturing, food, household appliance, automotive, among others, are some of the areas that benefited thanks to the support of the robots, are still the latter the most representative.

However, there are still those who believe that robots will replace human within factories capital, presenting different kinds of features that benefit businesses, but in reality, the opposite is true since they act as complements in the processes industrial.

The main objective of using this kind of mechanisms is to replace those activities that come to present some risk to the health of the worker, as well as eliminate the simple and monotonous work.

While the use of Robotics in the industry is on the rise, human capital will remain the key factor for the success of a company, as those who continue to innovate and programming to these tools.

Capacity analysis and creativity of a person are fundamental in the industry, by more robots that are within them, it is necessary that human being continue with these virtues, improving operation methods.

Mentioned that "humans and robots in industries will always go hand in hand because ultimately someone has to program and continue with creative ideas to keep the company growing" (flowers, 2015, para. 3).

It is no doubt the benefit generated by the use of Robotics in the companies, since it reduces the physical effort of people, reduces stress to the individual who is directly handling the process, reduces operating costs as it allows that the industry to be more competitive and increase their production.

Increasing the productivity of industrial processes through the use of Robotics presents three important factors: the consistency of production; increased speed in the procedures of a company and energy saving that the robot gives you t, since they have

different types of systems that give a lower consumption of the above, considerably reducing production costs.

Thanks to these factors, the use of robots in a plant can increase productivity above 20%, a number which reflects the importance that provides these mechanisms today in the industrial sector.

Conclusions

- The industrial mechanisms as we can see are very useful in a person's daily life either to facilitate work and mass production.
- Also, when carrying out the study it can be taken into account that each robot must be designed for a proper action, it is meant by this, that having different types of movement will use a type of robot according to the research carried out.

- Throughout the present work it was possible to know how the automotive industry is experiencing these changes that will completely revolutionize the idea of manufacturing that we had before, changes that will improve the products, save costs, and other benefits; However, it is a difficult time, because although the changes will be of great benefit, companies must make a decision that may leave thousands of people unemployed, and that is why you cannot have a specific conclusion on this issue. However, it was possible to present all the relevant ideas, aspects that will make the reader to form their own criteria, that having finished reading this work, be able to discern and choose which is the best way of working in the industry automotive, the way in which humans are benefited by this change, and that is the reason why, at present, another proposal is being listened strongly, and that is that humans and robots can work together in different spaces, which complement, that the robot performs the most difficult tasks for the human, and that the human reaches where the robot cannot reach.
- In conclusion, we can deduce that robotics is one of the most complete branches of technology. A single robot requires knowledge of micro technology, of computer science to program it, of physics to be able to calculate what will be its limitations and capacities when lifting weights, transporting objects ..., of telecommunications if they require remote

control, or to communicate among them, of electronics to establish all your electrical installation, etc.

- Today, although we do not realize, robotics is something, perhaps not essential, but very usual in ours.
- On behalf of myself, I hope that this work has been understood by all its readers and helps to form a more conscious society that knows how to make decisions for the benefit not only of a group of people, but also of an entire population that seeks its constant developing.

Recommendations

- It is recommended to extend this topic in a personal way, and make it reach people who are still unaware of it.
- Car manufacturing companies must now begin the changes, because we live in a demanding society.

- It is necessary for people to be aware of this issue since the future will be based on this.
- Every country in the world should implement advances in this technology since in the short or long term it will benefit us all.
- Humans must get used to the idea that our world is evolving and we must prepare ourselves for the changes of the future.

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