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IMPACTS OF 3D PRINTING IN AUTOMOTIVE ACCESSORIES: CASE STUDY IN A BRAZILIAN DISTRIBUTOR

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ABSTRACT

The automotive parts and accessories market is an important source of revenue for global automotive manufacturers, in this paper, focusing in Brazilian case. With expressive billing, it has a large and complex distribution chain that can be profoundly altered by a disruptive innovation that may be the arrival of 3D printing. This technology is still focused on processes with low volume of distribution, but presents great potential for high capacity to modify the whole cycle of the supply chain. It is fundamental important that affect companies know the benefits interference of this technology, its capabilities, risks and, mainly, the potential impacts on its own business. This research demonstrated the importance of these markets for the automotive industry and then elucidated important concepts of innovation. Through the objectives point out the potential impacts that can be generated by 3D printing technology in the distribution objectives, a-) demonstrate the importance of supply chain strategies; b-) check from the perspective of customization; c-) aspects of the operation of a 3D printing; shown conditions for the companies to develop strategies for using this technology, so as not only survive, but also make the most of its use.
Keywords: 3D printing, Parts, Accessories, Automotive Distributors.

1 INTRODUCTION

Recent trends in automotive parts and accessories have led to the proliferation of studies that 3D printing and the impact to distributors. Large industries are automatic, due technological trends bringing innumerous benefits (Castells, 2007) for these ones, however may bring some damaging consequences on employability (Dantas, 2006; Van der Heijden et al., 2018) and in particular, in the case of this paper, on automotive parts and accessories distributors.

Clothes, shoes, automotive parts and other assemblies are manufactured in an automated way. In parallel, the processes involved, linked to quality services and development of new technologies, were key to increasing efficiency and production gains (Drumond & Neves, 2002; Porter, 1999).

In engineering, whatever, several resources like labor, materials and equipment are used all incur costs (Dallasega, Rauch, & Linder, 2018). In order to achieve this, it is important to note that, in the case of a market economy, there is a need to increase market share and profitability (Scurati et al., 2018).

Thus, the emergence of disruptive technologies such as 3D printing has the ability to revolutionize various aspects of the market. 3D printing is referred to as the 3rd industrial revolution (Hu et al., 2018; Vukicevic et al., 2018), given its ability to transform the manufacturing industry. Undoubtedly there are many gains with this innovation, but there are also several potential impacts not clearly identified (Sveiby, 1998; Terra, 1999).

3D printing is the process through which it is possible to create a solid object, in three dimensions – 3D by over levels, using as a basis a digital model (Vukicevic et al., 2018). It permits reconcile production and customizing, which previously could not be done by other means and still drastically reduces the production of resistance (Scurati et al., 2018).

By these advantages this technology has gained notoriety and a significant increase of utilization em some areas, in this paper, automotive manufacturers are particularly interested in this one, as they can be impacted in different areas of activity, among them the distribution of parts and accessories (Hu et al., 2018; Li & Tanaka, 2018).

3D printing has emerged as a discipline that integrates the objectives of the distributors with the needs of the automotive industries, considering the structure, culture, people, systems, and so on. In this sense, 3D printing process management needs to be aligned with the company's strategy goals (Davenport & Prusak, 1998), and any proposed process improvement must be in accordance with the company's strategic objectives, considering its costs and business.

Consequence hence, the main objective point out the potential impacts that can be generated by 3D printing technology in the distribution of parts and accessories of a Brazilian automobile manufacturer. And as specific objectives, a-) demonstrate the importance of strategies based on the adoption of disruptive innovation; b-) check from the perspective of customization meet the market's custom demand; c-) to superficially review aspects of the operation of a 3D printing (Li & Tanaka, 2018; Vukicevic et al., 2018); d-) evaluate the possibility of manufacturing automotive parts on demand.

Provocative, current and challenging are justifications for the proposition of the addressed topic in this paper. The theme is current because it proposes the relation between established 3D printing and the transformation of innovative knowledge into products and services that can be incorporated into automotive industries. Addressing 3D printing is challenging because to deal with interdisciplinary issues means to treat with borderline issues, in this case technologies and innovation in new business models in line with company’s competition interesting.

Different methods have been proposed to investigate it, using descriptive (Byrne, 2005) research to cover the impacts to distributors, the approach can be considered qualitative

(Venkatesh, Brown, & Bala, 2013). Since this approach is adequate for a real world analysis like case study (Leclercq, 2007), making it possible to analyze and demonstrate national coverage, high volumes of production, products with different compositions in its production, great distribution chain, in an automobile assembly chose to identify a company with some requirements.

In the face of a scenario in which disruptive innovation is a challenging journey in which companies always seek to increase competitiveness and may be faced with a 3D printing, which could help in the increment of this competitiveness. As a result, the following question arises: What are the potential impacts of 3D printing on the distribution of parts and accessories of Brazilian automotive distributors?

To facilitate the understanding and monitoring of the text, in addition to this section1 Introduction, this paper was structured with the following sections. Section 2 Literature Review, pointing out the main scientific sources and theoretical framework, 3 Research Methods, justifying and characterizing the methods used, 4 3D Printing like Innovation Model, describing the steps for the proposition, 5 Conclusions, with the final considerations and the References.

2 LITERATURE REVIEW

Most of the work carried out on 3D printing does not consider the complex nature of integrated Brazilian distributors market. Showed that the main results achieved by the companies that implemented 3D printing were increased process efficiency, reducing costs, increased quality of products and services for customers.

However, some fundamental issues remain about impacts to supply chain company objectives, as discussed below.

Impacts

The Brazil's automotive market, according to Anfavea (2018), it is the fifth largest in the world with a great perspective of growth, because the car relative / inhabitants in Brazil is still low compared to developed countries considered.

Thus, the growth of the Brazilian automotive sector has been gaining strength and prominence in the national economy. Actions by the government, such as tax incentives and reduction of tax rates, positively affect the entry of new companies and innovations in the sector in Brazil (Anfavea, 2018).

Research & Development (R&D) could be a starting point for analyzing innovation activities, as it can present itself in many ways in terms of functioning and participation in problem solving. One of the arguments states that companies must do R&D to identify, test and, as a consequence, adopt technologies regardless of where they have been developed (Ben Letaifa & Rabeau, 2013; Blind, Petersen, & Riillo, 2017).

Schumpeter is among the first economists to highlight the development of new products as key to economic growth. For him the development of new products is much more important than strategies based only on price reduction (Schumpeter, 1982).

The OSLO Manual has two approaches to innovation, this paper adopts 3D printing like technologically improved products whose performance receives significant improvement, the other one is technologically new products with technological characteristics or proposed use different from the previous ones (OECD & Eurostat, 2005).

An important point to highlight is the creation of a list of potential impacts, based not only on bibliographic references or field research, but also on a combination of the results of these two sources of information, show in Figure 1.

Impacts	Authors	Concepts Analizing

Supply Chain and the Impact of the 3D Printer	(Hu et al., 2018)	Good similarity to the research being developed, but with some crucial differences. It is based more on bibliographic study and is more generalist in relation to the distribution chain, while the research developed together academic material, technical publications and also field study directed to the case in question
	(Strange & Zucchella, 2017)	
	(Ezair, Fuhrmann, & Elber, 2018)	
	(Vukicevic et al., 2018)	
Insufficiency of the Intellectual Property Protection Paradigms in relation to new technologies	(Edvinsson & Malone, 1998; Stewart, 1998)	It focuses on identifying impacts only on the property right, showing how 3D printing will create a new scenario where it will be necessary to reposition itself to preserve material and intellectual rights, focusing on the consequence that will be generated by specific equipment
	(Terra, 1999)	
3D Printer: Does Intellectual Property Rights Need to Reach New Dimensions?	(McGhee, Sinclair, Southee, & Wijayantha, 2018)	It resembles the previous one and also focused on identifying impacts only on the property right, showing how 3D printing will create a new scenario where it will be necessary to reposition itself to preserve material and intellectual rights, but less focused on specific equipment

Fig. 1 - Concepts Analysis

3D Printing - Concepts

In order to have a correct understanding of the importance of 3D printing, it is necessary to approach the existing manufacturing processes to allow the relationship with the impacts to be postulated (Li & Tanaka, 2018; Vukicevic et al., 2018). The production of material goods is done through three production processes:

Subtractive: In this process, the creation of the object is made from an initial block of raw material. From this initial block of raw material, the excess of material is removed until the desired object is obtained. The removal takes place through several tools, depending on several factors, mainly of the type of raw material used; and one of the main characteristics of this means of production is the generation of waste in considerable volumes (Hu et al., 2018);

Formative: Already in the formative production process, the creation of the final product is performed by modeling. The raw material is added in a state that allows it to be molded, usually liquid or pasty, giving shape and contour, and sometimes adding or removing material to achieve the desired volume and shape. Although it can include or remove raw material, no waste is generated in the same volume of production by subtraction, being a much more assertive method as regards the amount of raw material used(Chung & Chen, 2018);

Additive: And, finally, we have the production process by adding material. In this technology, the production is based on gradual addition of material, layer by layer, until the desired product is formed. The material used in each layer can be in solid, liquid or powder form. Among the layers some kind of binder product is used to make them solidify, and the generation of residues presents the lowest indices among the technologies discussed(Hu et al., 2018).

The first indications of the development of equipment with 3D object production capability by manufacturing additive are from the 1980s. Hideo Kodama of Nagoya, of the Industrial Research Institute, published in 1981 the report on a rapid prototyping system based in photopolymers and resulting in the construction of a solid three-dimensional layered object that corresponded to transverse slices of the model (Dallasega et al., 2018).

Basic operation of 3D printers

There are some different technologies on which 3D printing is based, but they have in common the fact that production takes place by adding the necessary material and not by removing it, as in conventional production models (Strange & Zucchella, 2017).

It could help the specific objective, to review superficially aspects of the operation of a 3D printing.

In addition, the production using a 3D printer is based on a model created through Computer Aided Design - CAD program. The creation of these models for 3D printing has gained such a facility that can be produced by experts, but even by people with little or no knowledge of computer graphics.

Although there are different 3D printing technologies, the most usual, they resemble general characteristics. The main technologies found in different bibliographic references were:

Fusion and Deposit Modeling - FDM
Selective laser sintering - SLS
Stereolithography - STL
Laminated Goods Manufacturing - LOM
Three-dimensional printing - 3D print

3D printing can use various materials (plastic, metal, ceramics, and living cells) in layers to produce a 3D object. There are many technologies, their features (speed, resolution) and materials, but general rule is the same: object is built vertically layer-by-layer allowing creation of the complex structures.

3 RESEARCH METHODS

In order for the research to reach the objective of identifying the possible impacts on the distribution of parts and accessories of the Brazilian automotive industry, a multidisciplinary scope is necessary, in this way the main areas of the company that were supposed to participate in the research were identified:

Products, Supply Chain, Production, Business Intelligence, Parts & Accessories, IT Governance, Digital Innovation, IT Architecture, Security & Technical Support, Administrative Area. The number of respondents per area was also defined, totaling nineteen potential respondents.

Specifically, and as an exception, the IT area participated with a greater number of respondents, as it had specialists dedicated entirely to attending to the other areas included in the survey. Also, in addition to IT, will be interviewed another three experts from specific areas considered transversal, which support all other areas of IT itself, these being 3 areas: Architecture, Security and Governance.

Descriptive, qualitative, quantitative, semi structure interview in case study were the used methods. It is a descriptive research, to cover the 3D specific area so that the readers and interested in this study can understand all work, from the origin of the technology, demonstrating the practical applicability and the results obtained (Caregnato & Mutti, 2006).

The approach can be considered qualitative, since this approach is adequate for a real world analysis, making it possible to analyze and demonstrate the impacts in real case with due importance, but without the dependence of quantification of situations. This approach is able to address naturally the beliefs, principles and values related to the work problem (Hevner, 2007).

A case study, with some requirements are validated, national coverage, high volumes of production, products with different compositions, great distribution chain, thus, obtaining the necessary data and information (Isnard & Viegas, 2014) in a semi-structured interview makes it possible to reach very specific objects like unknown effects of a new technology (Byrne, 2005).

This research was limited to the language papers (Venkatesh et al., 2013) Portuguese and English and encompassed the period from 2016 to 2018. Various keywords were used in the searches and frequency of specified keywords combinations, including "3D printer", "3D scanner", “3D parts” and “3D accessories”.

Number of papers with aforementioned keywords seems to be huge for such novel technologies, and there is observed significant increase in the articles' number since 2017.

The research was chosen directly in the CAPES Portal due to the relevance of the databases available in this vehicle, especially with regard to timeliness and comprehensiveness, so we searched all available databases to identify relevant publications from the search criteria: "Applications of printing 3D "," 3D Scanning "and" Reverse Engineering in the automotive parts distribution and accessories engineering ".

The areas participating in the research were selected considering a cross-section by the main areas of the company, seeking to have the perception from different points of view, again the interdisciplinary vision and the qualitative embroidery, through the development, production, distribution and marketing of products (Strauss & Corbin, 2008).

Questions are based on the Likert scale; collect the participants' perception of their own knowledge in the main pillars of the research, namely:

- Introduction to the Brazilian market for automobiles, auto parts and accessories;
- Technological strategy used in production;
- Innovation and disruptive innovation;
- 3D printing and its basic concepts.

Then, open questions, return to the main pillars of the research mentioned above.

Thus, create conditions for comparing the answers given, using the Likert scale , with the detail that each participant was able to provide on the respective subject in the answers of the open equivalent questions (Günther, 2013).

The result of this comparison provides with a better evaluation of the participating public of the research, and enables the identification of points of attention and divergences, which may lead to distortions in the evaluation of interviews and research findings (Caregnato & Mutti, 2006).

4 3D PRINTING LIKE INNOVATION MODEL

Innovation is highlighted in the literature as a competitive differential for companies, capable of providing a path to the growth and leadership of a product or service (Terra, 1999).

Defining its position to innovate is the first step, because without this alignment a crucial part of the company's innovation efforts can be wasted, which may not achieve the expected objectives. The main approaches relation with automotive industries, are show in Figure 2.

Authors	Innovation Approach
(Sveiby, 1998)	Innovation is an economic and social process in which new products or processes are developed, or existing products and processes are improved through the insertion of knowledge.
(Stewart, 1998)	Science and technology are allied in the process of generating innovations, so that scientific knowledge goes beyond the limits of method and relies on development through significant leaps of social and economic change.
(Canongia, Santos, Santos, & Zackiewicz, 2004)	Innovation refers to a set of processes in which some imaginative minds interconnect science, technology and the market in order to develop new technologies and products.
(Schumpeter, 1982)	Innovation is a process of creative destruction, in which old elements give way to others.
(Terra, 2012)	Innovation, rather than the creation of something new, is a process by which a creative idea is diffused in society.

(OECD & Eurostat, 2005)	Innovation is the implementation of a new or significantly improved product (service or service), process or method, or a new organizational method in business practices, workplace or external relations.
(Zeitschrift, Jg, Schmidt, Brinks, & Brinkhoff, 2014)	Innovation involves creating routines that allow companies to absorb and develop internal and external capabilities together to generate learning.
(Gevorgyan & Ivanovskii, 2009)	Innovation can be considered an ability to establish relationships, observe opportunities and create processes based on knowledge, in order to extract learning and competitive advantage.

Fig. 2 – Innovation Approach

The 3D printing technology, motivating factor of this work, falls into the category of additive production technology, certainly a disruptive innovation and with capacity to produce objects in 3 dimensions by the addition of successive layers, having the whole process controlled by a computer (Rifkin, 2014).

3D printing can signal the beginning of a new industrial revolution, for some the 3rd industrial revolution (Dallasega et al., 2018), profoundly modifying or even replacing traditional production lines.

Jeremy Rifkin's thinking is easily supported, which states that the industrial revolution would be essentially a drastic productive increase brought about by the insertion of new technologies, which impacts on changes in the population's lifestyle (Fongwa, 2018).

Many advances in automotive parts have been achieved as a result of advances in other fields, including robotics (Zobel, 2017), employability, open innovation, forming an interdisciplinary action.

3D technologies have emerged as powerful platforms for competitiveness. The companies who are looking for reduce costs are currently being compelled to develop technologies that surpass their main areas, thus becoming the company in good global position, which corroborates with a worldwide trend of growth of the topics related to interdisciplinary (Bernstein, Machlup, Polanyi, & Shera, 2014; Choi & Pak, 2006).

This makes parts novel approaches and technologies, which can increase effectiveness of the industries interventions, 3D printing, 3D scanning and associated technologies can constitute another step towards better application of the automotive engineering principles in current parts distribution (Dantas, 2006; Marcuello, 1996; Zobel, 2017).

5 CONCLUSIONS

This section analyses the results of interviews discussions undertaken during the research. In order to meet the specific objectives: a-) demonstrate the importance of strategies based on the adoption of disruptive innovation; b-) check from the perspective of customization meet the market's custom demand; c-) to review superficially aspects of the operation of a 3D printing; d-) evaluate the possibility of manufacturing automotive parts on demand; it will be matched with the results detailed.

Keeping the correlation attention as a general objective: Point out the potential impacts that can be generated by 3D printing technology in the distribution of parts and accessories of a Brazilian automobile manufacturer, aiming to answer the research question: What are the potential impacts of 3D printing on the distribution of parts and accessories of Brazilian automotive distributors?

To achieve objectives, main pillars were defined, bringing to the fore several important concepts and information for the discussion and creation of an environment conducive to the exploration of possible scenarios of use of 3D printing and, consequently, for the identification of possible impacts on the distribution of parts and accessories.

The results were grouped into categories aiming at their best association with the proposed objectives, the categories were:

Analysis of the participating public
Participant analysis x Knowledge
Innovation
3D printing
Identification of potential impacts
Individual analysis of potential impacts

Analysis of the participating public

The result of this comparison provides with a better evaluation of the participating public of the research, and allows the identification of points of attention and divergences, which may lead to distortions in the evaluation of interviews and research findings.

More than 50% of the audience participating in the interview consider knowing the numbers and values of the automotive market and auto parts and accessories

Although most claim to know the numbers and values of the Brazilian automotive market and auto parts and accessories, contradictorily, in the qualitative answers it was evident that the vast majority of respondents have a superficial knowledge about these numbers and values. Even if this superficial knowledge is evidenced, the perception of the importance of the auto parts and accessories market for the company is unanimous, as can be seen in the quantitative responses and in the analysis of the qualitative discussion.

This phenomenon of contradiction can be explained by the knowledge that everyone has about strategies and results of the company. Although they do not have details of numbers and financial figures of the Brazilian auto parts and accessories market, they all follow the company's results through corporate communications, being affected by these results in several ways: bonuses, promotions, increase or reduction of employees, etc. In addition to monitoring the company's results, all are informed about strategies for maintaining, expanding and conquering new markets; such as the creation of a specific division for auto parts and spare parts.

Participant analysis x Knowledge

To speculate the level of understanding of the participants about the technological strategy used in production, the absolute majority positions themselves with a good level of information.

The tacit knowledge, like cited Polanyi’s interest in the interior mental spaces of knowing led him to identify and write at length about something that became the greatest source of his afterlife: the notion of tacit knowledge, referring to knowledge that cannot (easily) be articulated (Bernstein et al., 2014).

However, evaluating the qualitative discussions shows that most of the interviewees really have knowledge about the productive process, but a superficial knowledge related to the stages of production, not a detailed knowledge of the process at each stage and about the technologies involved in the productive processes and steps.

Innovation

Among the pillars that support the research, knowledge about the concept of innovation was arguably one of the points where the interviewees proved more secure to claim knowledge

These findings co-operate with the ideas that innovations always bring some kind of serendipity embedded in quantitative responses (Günther, 2013) that can be better explored in qualitative analyzes (Schultze & Avital, 2011). In addition to claiming knowledge, during the

interviews, they discussed the subject in a broad and satisfactory manner, which confirms the quantity responses.

Confirming investments in innovation, several cases of incentives, projects and works were cited in the search for innovation, including specific cases of 3D printing for the production of spare parts for machinery, molds for the production of parts and printing of prototypes, among others.

It attempt to demonstrate the importance of strategies based on the adoption of disruptive innovation, specific objective.

3D printing

Not surprisingly, because of the precocity of the subject, the lowest level of confidence in the subject was presented, and no "strongly agree" answer was obtained, and almost half of those interviewed indicated that they did not know about the subject.

Confirming the lack of knowledge on the subject, and even though in the quantitative issues there has been a high degree of recognition of the company's high investments in innovation, the majority clearly shows here that they do not have more detailed information about innovative 3D printing jobs.

This should be a point of concern, perhaps to be evaluated in greater depth in future work (Brown, 2017), as it is explicit that few people have knowledge about the technology, and that the study initiatives or tests about it are localized and restricted, thus limiting the capacity identify problems, solutions, and usage opportunities (Hu et al., 2018).

Identification of potential impacts

This section summarizes, according to the main objective, the central findings of potential impacts. The qualitative issues lead to the discussion on various themes related to 3D printing and the distribution chain of parts and accessories, thus creating an environment conducive to speculation about the use of this new technology.

The gathering of scenarios, the emergence of hypotheses and the use of all tacit knowledge of each participant to identify the potential impacts. Each interview was analyzed in detail and a list of 28 potential impacts was created, shown in Figure 3:

Item	Description
01	Reduction of inventories
02	Reduced shipping time
03	Disposal of stocks with low turnover
04	Print on demand
05	Geographically distributed production
06	Rapid Prototyping
07	Production of complex parts as a whole
08	Production with high degree of personalization
09	Elimination of the need for batch production
10	Just-in-time simplification
11	Simplification of production lines
12	Reduction of losses due to changes in production lines
13	Off-line parts production
14	Reduction of import and export of parts
15	Elimination of load composition
16	Creation of new competitors
17	Facilitation of copy and production of parts

18	Need for regulation
19	Complementing traditional production lines
20	Creation of temporary solutions
21	Reuse of raw material
22	Production of parts with additional technology on board
23	Answering niche markets
24	Identification and tracking of parts
25	Opening and monetization of parts designs
26	Elimination of some traditional production lines
27	Elimination of high investment to produce new parts
28	Production of small parts before supplied only with large sets

Fig. 3 - Identification of potential impacts

The following Figure 4, list shows how often each potential impact was identified in the research, thus generating a clear vision about the most perceived by the participating public.

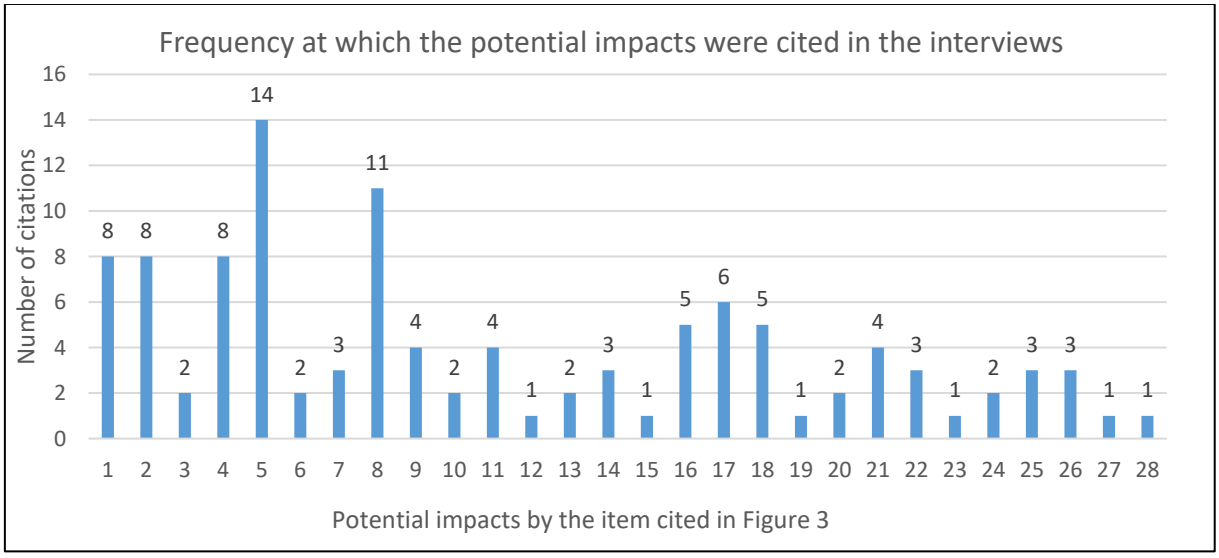

Fig. 4 – Frequency of potential impacts

Individual analysis of potential impacts

Participants have made valuable contributions on the conditions that can make these potential impacts come true. A detailed analysis of each potential impact generated contributions to identify the extent of these potential impacts, and other specific details about them.

The most relevant according to results frequency analysis are:

1- Reduction of inventories, 2 - Reduced shipping time, 4 - Print on demand, 5 - Geographically distributed production and 8 - Production with high degree of personalization.

Reduction of inventories - presented a frequency of 8 citations

The maintenance of stockpiles of high-volume parts has equally high costs, by either the financial capital of the stock material itself, the need for adequate storage facilities for security, access control, fire prevention, insurance and management labor of these stocks and their locations.

3D printing can help reduce or eliminate these inventories and all costs associated with them. Even though it is necessary to store raw material for the production of the parts, this

storage is simpler and cheaper, and can count on the division of costs, since the raw material stored may not be exclusive for the production of automotive parts.

The reduction of inventories can still contribute to reducing losses caused by the production of parts that can never be used.

Reduced shipping time - presented a frequency of 8 citations

The transportation of parts and accessories in a country like Brazil, with continental extension and transport based on a precarious road network, besides consuming large amounts of time in all its stages, generates high costs, with great variation, and difficult predictability.

3D printing can dramatically change this scenario, causing many parts to be produced close to your consumer market, reducing shipping costs and time. Reduced delivery can allow the industry to comply with legal regulations, reduce the number of cars waiting for parts, and even get higher customer satisfaction ratings.

Print on demand - presented a frequency of 8 citations

When the specific objective, check from the perspective of customization meet the market's custom demand, customizations were make trends of USA market.

The production of parts and accessories is essentially done in advance. The definition of what will be produced, as well as the quantity of what will be produced, are defined by consumption forecast. Even with the use of systems, historical data, mathematical models and statistical models for more assertive forecasts, all production is done in advance, and there is no work on demand.

3D printing technology creates the possibility of eliminating this entire problem for a large set of parts and accessories through on-demand production; bringing a new concept where we produce what we want, where we want and when we want.

Geographically distributed production- presented a frequency of 14 citations

In the current model, the production is made in large centralizing poles, with productive capacity for high volumes. This characteristic can be changed to decentralized production, geographically distributed, with lower risk of shortages, and close to the consumer market.

The distribution of production can take place at various levels, with regional centers connected to the manufacturer and approved by it, independent production centers, production in the network of concessionaires or even production by the consumer itself, drastically reducing the time to meet demand.

Customer-made production, known in the US market as "Do it yourself," is likely to gain momentum as 3D printers become popular and equipment and supplies costs become more affordable. So the specific objective, evaluate the possibility of manufacturing automotive parts on demand, was got.

Production with high degree of personalization - presented a frequency of 11 citations

The personalization market in Brazil, unlike many countries like the United States for example, is still incipient. For a long time it was neglected by the automakers, due to the difficulty of meeting the expectations of the customers, being thus attended by companies specialized in personalization.

3D printing enables customization of cars without changing or penalizing production lines, thus creating conditions for automakers and their network assistance to meet this growing demand and with considerable profit margins, since customers interested in customizing greater availability of investment.

The personalization can cover several aspects, such as appearance and design, attendance to special physical needs and the provision of vehicles to attend special functions

such as ambulances, police and firefighters among others. 3D printing brings the possibility of adding large-scale personalization to production lines, generating a great competitive differential without mischaracterizing the mass production model.

Final Considerations

3 D printing technology is evolving and it is impossible to define how far it will evolve and how far it will go, but its potential for transformation as disruptive innovation is very clear. If today the state of technological advancement still does not allow adoption and use as imagined, it is necessary to keep up with evolution so that, at the appropriate time, to make the most of potentialities.

As an additional result of this work it is indicated that the potential impacts are studied and detailed by a multidisciplinary team, which can go through specific training, visit suppliers, since it is fundamental to choose and homologate suppliers and modifications of parts and components (Marcos & Bernardes, 2009), and other companies, promote tests and proofs of concept, and keep the company aligned and attentive to evolution technology and its possibilities of real use.

This research does not have the objective of measuring the probability of each impact occurring or not and neither its comprehensiveness

3D printing technology is still very new and will continue to evolve. Various studies, researches and experiments can be developed to entire understand current and future potentialities.

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