

# **A Systematic Literature Review about the Influence of Good Project Management Practices Applying to Lean Manufacturing**

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## **Abstract**

Nowadays, a significant percentage of companies have maintained their success due to the constant effort and strategic application of optimization philosophies such as lean manufacturing. However, an uncontrolled implementation can significantly affect the resources of the companies without achieving the desired result, in fact, some studies reveal that more than 43 percent of unmanaged implementations of projects tend to fail. Therefore, it is important to know the execution of good practices and guides on project management applied to successful lean manufacturing developments to take them as a reference in future implementations. This article presents a systematic literature review that analyzes a collection of 54 articles in English language during the period 2011 to 2021, in order to explore about good practices, models or project management tools that allow identifying areas of opportunity for future approaches to industrial sectors in Mexico. This work extracts scientific articles of four prestigious databases (Elsevier, SpringerLink, Emerald, Scopus) to classify and analyze according to: article type, participation by country, participation by journal, research methodology, knowledge area, implementation level and the main techniques, tools or models for the solution used.

## **Keywords**

Lean manufacturing, Management, Lean Tools, Project

## **1. Introduction**

According to (Deif and ElMaraghy, 2014) the global competition in recent decades has created a high uncertain demand at the business environment and the customer expectations to adopt lean manufacturing principles and tools. One of the systems with higher impact in the world was the Toyota Production System implemented at the beginning of 1970 which is practically obsolete, nevertheless, the competitive world in these days has turned lean manufacturing into an important model to follow which organizations around the world have tried to implement, but the lack of clear comprehension about the principles, the performance and its measuring, contributes to the failure of these practices (Karlene M. et al., 2007) and her book "The machine that changed the world", these practices are based on the improvement of the continuous flow, impulse production by the customer, flexibility, waste elimination, zero defects, safe and tidy work environment and the customer's quality perception. At the same time (Alireza et al., 2012) and the literature review proposal by (Hofer et al., 2011) mention that the use of guidelines of the 5<sup>th</sup> edition of the body of knowledge of the Project Management (PMBOK, 2017) can achieve an interest correlation to work along with tools applied in the manufacturing.

On the other hand, (Gupta and Kundra, 2012) mention that the guidelines at the cycle stages of the services and /or product life, exists very few literatures review which give opportunity he lean manufacturing application to manage and develop new creation projects that recognize the relevance to adopt a structured method for manage continue improvement projects. In the same context, (Tiso et al., 2021) mentions in a literature review the relevance in sectors with a major impact and application of lean tools, highlighting that the value of identify and standardized the knowledge degrees of lean manufacture has been present in at least 34 researches, so it draws common future trails at the application stages for project development.

In the same way, it is said that in a global level, the industrial sector contributes with more of the gross domestic product of the main economies (Anon, 2019). The organizations generally search for a request which differs during the day, like the manufacturing companies, customers services, medical attention (F. Bar et al., 2003). For example, the changing challenges provoked by the fast growing of the high technologies, the consumers requirement alterations, and the increasing liberalization of the market, all the industry must improve their business strategy and the new project management to reach the production and the cost effectiveness to survive in a competitive market (Borenstein et al., 2004).

The article is structure by six sections, the first one is about the mean motives to develop this article including the importance of it. The second one present a group of articles which research projects management articles applying to lean manufacturing in a literature review manner. The third section talk about the specific systematic process to develop this article where are describe the criteria of searching, classified, and analyze. In the four sections, the discriminated articles and the final scientific articles collection was presented, to carry out the five sections with the qualitative analyze by graphs of article. The las section shows the discussion and conclusions about the information reviewed to highlight the opportunities areas about the topic.

### **1.1 Objectives**

The purpose is to explore about the use of project management tools in the successful application of lean manufacturing, through a qualitative analysis of systematic literature review of just scientific articles from 2011 to 2021. The foregoing will also make possible to raise awareness about the benefits and importance of using project management tools, glimpse areas of opportunity and reference future proposals for implementation in the industry in Mexico.

## **2. Literature Review**

After the invention of the mass production system (Ford and Crowther, 1926) lean manufactures are the next great evaluation major evolution in the efficient business creation process and one of its main objectives es the elimination of waste at the production line. Unlike (Panizzolo, 1998) mentions that the inventories reduction and waste it is to suppose that the client is willing to pay only for the activities which increase the value to product or service, and for that the enterprise must search for a manufacture system which does not waste and that be quick attending the customer requirements. Something similar to what (Shah and Ward, 2007) mention that the lean manufacturing must be focus mainly to reduce the inventories level, improve the productive processes, customer satisfaction, work quality and cost reduction. By consequence, focused inon the implementation of lean strategies without compares the organizations levels of the before and after its implementation, for which is hard to recognize the improvements at the productive performance. This has taken to the failure of a lot of enterprises to implement with success the lean production systems adjusted and to get potential benefits. In fact, (Soriano and Forrester, 2002) said that the effect of this it' is due mainly to the lack of Knowlagent and tools to measure, evaluate and compare the lean strategies

Also, it is important highlight that companies of all sizes should work in collaboration with their suppliers, sharing developments, dividing responsibilities to improve costs, and demanding precise delivery and high-quality standards through just in time it is interesting to note that project management applied to lean manufacturing tools are an extremely important strategies for developing new projects, as such as (Myerson, 2012) that , defines a project as a temporary endeavor designed to create a unique product or service (PMI, 2013). According to (Liang and Guodong, 2007) and (Mir and Pinningtonb, 2014) projects differ in size, uncertainty, and complexity, and it is essential to study these characteristics to determine the critical factors that lead to their success.

The Project Management Institute (PMI) show the guidelines of the correct project management that can be understood as the application of knowledge, skills, tools, and techniques to plan activities and achieve the requirements of the

project (PMI, 2013). Taking into account that good project management practices can be properly applied to lean manufacturing tools to develop newly created projects, they are avenues of opportunity that over the years the topic among the scientific community has not been explored by researchers in the world.

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### **3. Methods**

The methodological processes of this systematic literature review analyze articles of prestigious database thus obtaining accurate information for future works. In consequence, papers were selected and categorized according to relevant criteria, therefore, the process is divided into three main phases: A) Data collection B) Data analysis and C) Synthesis and classification framework.

#### **(A) Data collection**

1. In order to achieve the methodology proposed in this article, it is necessary to deploy the following points: Research question. This refers to the point of view, strategy, and direction, which is on the process of know the academic progress at the application of project management tools in the successful application of lean manufacturing.

2. Participation and search. In this point were selected Scopus®, SpringerLink®, Emerald®, and Elsevier®, the databases mentioned above are the ones with the highest contribution of cited articles, availability of recent contributions and research related to the topic of interest. For keywords search selected for this article were: "Lean manufacturing", "Management", "Lean tools", "Project" and "Management". The analysis was limited to just scientific articles published in English language from 2011 to 2021.

3 Evaluation of results. The articles were reviewed to find duplicates or points outside the selection criteria, section 4 shows the results of the final article collection for this analysis.

#### **(B) Data analysis**

The collection of articles from databases were performed with a structured form of reference with the help of a spreadsheet which facilitates the manipulation of the selection such as (Pérez-Salazar et al., 2017) in which specific points were evaluated according to Mayring (2014) such as type of article, area of knowledge, journal that has more percentage of publication and percentage of participation (countries) were considered, also other perspectives were taken into account adding as the solution methodology, technique and/or validation tools, business turn or application areas, and level of implementation, in order to cover the research needs.

#### **(C) Synthesis and classification framework**

The frame of classification of this article it is segmented on two important parts, with the objective of differentiate the relevant classification for its influence at the projects management good practices with the application of the lean manufacture tools. In the first part of the items of descriptive general analysis are detailed, conformed by year of acceptance, source or journal and institutional country of origin, article type and knowledge area. At the second part the next level categories are detailed of the descriptive analysis where can be found: investigation method, solution methodology and implementation level.

The classification frame is described next:

#### **Journal, country, year**

The present text shows the classification of a collection articles which accomplish with the final criteria selection, so that, all the articles are referred to the influence of the good practices for the project management apply to the lean manufacture tools. The first classification shows the ordination of articles according it's publication date, which was took in base with the acceptance year to warranty a major clarity of the obtained documents since 2011 to 2021. In the same way, other of the criteria's which was made for this classification it was to take into account the institutional, origin country from the authors group and to observe its tendencies in the world.

- Article Type

- According to the descriptive analysis in the systematic literature review proposed by (Crossan and Apaydin, 2010) scientific articles can be able to classify according to their methodological perspective, obtaining theoretical articles, literature review, articles with an empirical approach that build a theory and empirical approach that evaluates a theory.
- Theoretical articles are those that only present a discussion of specific topics without the conception of any frame of reference or model to follow and consequently have no validation of any kind. A literature review is any article that specifies a number of articles reviewed to show a trend, a scientific contribution, or highlights to address new research. In the case of articles that contain a frame of reference of experimentation, surveys or previous models and if it was validated or not with a case study or scientific technique, the articles are considered as an empirical contribution to the construction of theory. If only an application of an existing method or implementation of a technique in real problems are exposed, the contribution is considered as an empirical application of theory, because they are only applied to existing proposals, techniques or tools and are limited to only evaluating the application.
- Knowledge area  
The next classification has been made to understand which specific research groups of knowledge are applied project management tools related to lean manufacturing. The contributions are classified according to knowledge areas to create a trend of relevance, the next classification was done in the next way: computing, engineering, decision sciences, administration and business, mathematics, multidisciplinary, chemical engineering, economy and finances, material sciences, agriculture, biological sciences and environmental sciences.
- Research method  
For each article, we sought to detect the most common research methods that help validate the proposals. The most common in the academic area are simulation, case study, statistical validation, and experimentation in laboratory. It is important to mention that they are not only the only existing methods, leaving the classification open for proposals.
- Solution Methodology  
For each article it is analyzed the influence structure of the project management good practices, apply to the lean manufacturing, to identify its functionality under the used type of the lean tools. With the objective to determine the solutions which are used at the corporate sectors to solve the problems raised in the most efficient way.
- Implementation level  
At this last point, the main objective is to explore the scope of the implementation levels of the collection articles under analysis. For this category were taken into account the next levels: implementation under analysis about some study case, as it was only purposed the methodology without any empirical test. In process: the one which was implemented under articles with an empirical test and finally the proposal: which only is remitted to propose theories before proposed and/or construction models already existing.

#### **4. Data collection**

The final scientific articles collection is conformed of forty-four (45) from SpringerLink<sup>®</sup>, one (1) article from Elsevier<sup>®</sup> and Scopus<sup>®</sup>, and eight (8) articles from Emerald<sup>®</sup> database. Thus, generating a total of fifty-four (54) articles that make up the final collection of data analysis.

It is important to highlight that there was no exclusion of any article by reviewing in detail to avoid duplicity. It is worth to mention that no article was discriminated for language type or another selection criteria, the total contributions are evaluated and classify.

## **5. Results and discussion**

For this section, the result of the classification taxonomy described before are presented to show relevant descriptive information about the importance of the use of lean manufacturing tools with applications and use under a project management. The obtained results are showed as follow:

### **5.1 Public per year**

According to the linear graph in Figure 1, it can observe that in 2015, 2018, 2019 and 2020 the number of publications remains above the average, which corresponds to four articles per year. With respect to 2011, 2012, and 2013 are the years in which a downward trend, alike it is observed that the years that more publications attributions per year was between 2014, 2016, 2017, with an average of six attributions. Therefore, with a greater contribution, the year 2021 presents an increase that exceeds the previous years, surpassing the managed average in previous periods, corresponding to a total of nine articles.

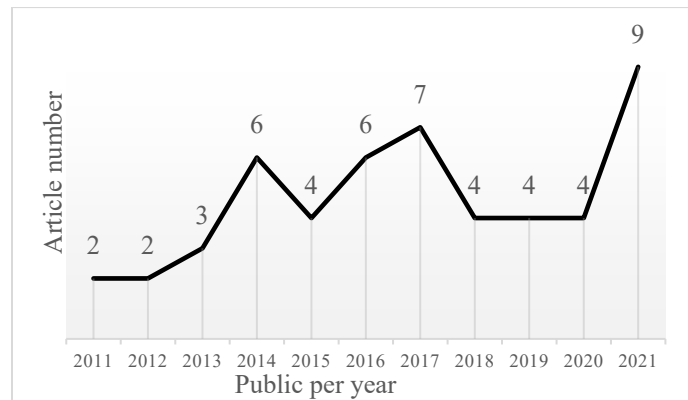


Figure 1. Lean manufacturing application trend under a management scheme of projects from 2011 to 2021.

In 2021 was the year with the highest number of contributions that shows notoriously the support to the research on the use of lean manufacturing tools under the scheme of the use of good practices for a correct project management. However, it should be noted that the trends in previous years have not caused a significant impact, although for 2021 the greatest contribution is observed, which is undoubtedly a significant challenge for companies even though in 2020 there was a change that stalked humanity with strong economic impacts and border closures which constantly kept the population uncertain.

### **5.2 Journal or resource**

The Figure 2 presents the distribution of the selected journal by the authors to publish their investigation. The behavior of journal publications is as follow: the International Journal of Advanced Manufacture Technology with 12% (24 articles) of the total number of lean manufacturing-project management publications, it has the largest share of published papers. In second place is BMC Health Services Research with a contribution of 1.5% (3 Articles).

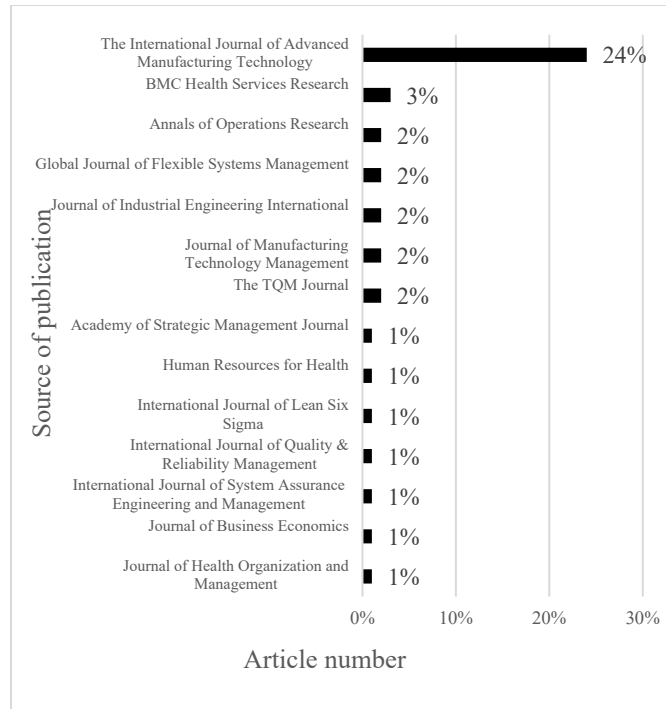


Figure 2. Classification of articles by source of publication

In third place, Annals of Operations Research, Global Journal of Flexible Systems Management, Journal of Industrial Engineering International, Journal of Manufacture Technology Management and The TQM Journal contributing with a 1.6% (2 published articles each one) thus 7 journals of great relevance in the industrial sectors and engineering, published research topics related to the influence of the good practices for management projects apply to the lean manufacturing tools, which contributes with one publish each one. So, for this literature review only represents 54 articles under study, which shows only one part of the great variety of themes and approaches which can be found about the investigation influences.

### 5.3 Proposed Improvements

Figure 3 shows the knowledge areas present at the literature review with the perspective counting of articles fit for each item. As can be perceive, the knowledge area which more accost at the analyzed articles are service companies which have 15 contributions in the 54 articles under analysis, meaning with this that the assistance of the project management good practices applied to the to lean manufacturing tools has been extensive used for the solution of problems and/ or improvements in this area. In addition, the automotive industry if the second knowledge area with one contribution of 10 articles of the literature collection, in which the use of management projects practices is apply to the lean manufacture tools which has played with success to solve problematics referents to improve and coordinate an effective production and to eliminate waste. The health sector is located in the third position with a total of six articles refer to this area.

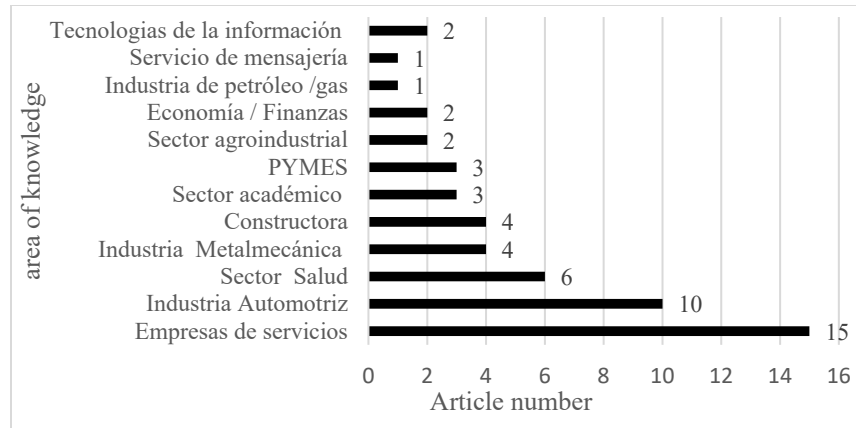


Figure 3. Number of articles by knowledge area

The other knowledge areas registered a lower index of contribution which goes between 1 or 2 articles, which reflects a very few applications of the tools in the knowledge area, which means that not enough studies have been realized due to the use of these practices. It is worth to mention that according to (Higgins et al., 2007) aspects of manufacture and other knowledge areas, results are easier to model and solve than in other knowledge areas.

#### 5.4 Ranking by country

It is important to highlight the country of institutional origin of the 54 articles under study to detect which country has the greatest influence on the use of good practices for proper project management applied to lean manufacturing tools. Fig. 4 shows the percentage of participation by country.

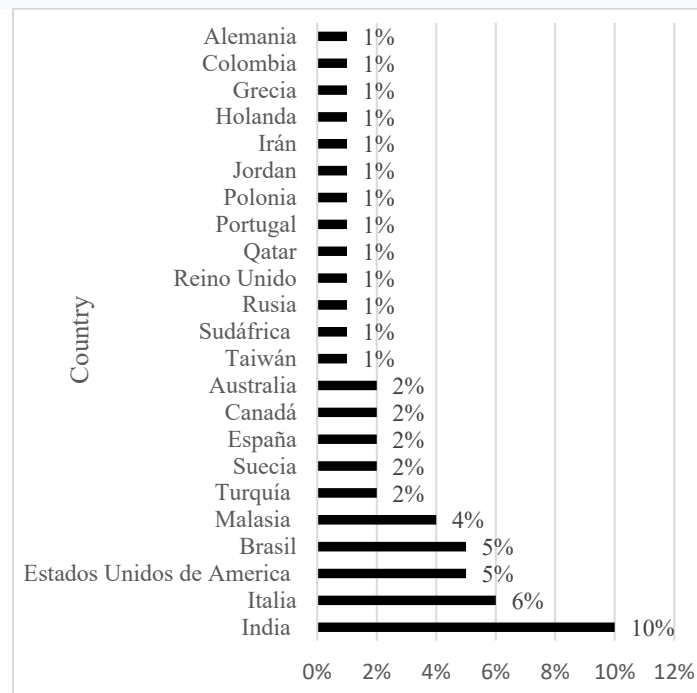


Figure 4. Percentage of participation by country

A highlight is that India has the largest contribution of published articles, which represents a total of 18.5%, represented by 10 contributions of the 54 documents reviewed (Figure 4).

On the other hand, in second place is Italy with a total contribution of six articles, representing 3.1% of the total number of articles reviewed. In third place is the United States and Brazil with 5 contribution of articles each country, representing 2.6%, we can also detect that several countries have the same number of contributions Turkey, Sweden, Spain, Canada and Australia with a total of 2 articles each country, representing 1.06%. The countries with less attributions and with the same number of articles are Taiwan, South Africa, Russia, United Kingdom, Qatar, Portugal, Poland, Jordan, Iran, Holland, Greece, Colombia, and Germany representing 1% in attributions per country.

### 5.5 Article type

For Fig. 5, the classification by type of document of the 54 articles under analysis can be observed. The most frequent when analyzing is of the Empirical type (theory construction) with 21%, equivalent to 54 articles, due to the fact that in this type of contributions methodological proposals or reference models for specific problems are influenced by the influence of good practices. In the management of projects applied to lean manufacturing tools, most of the time these proposals are checked to demonstrate the optimal performance of lean manufacturing tools. So, the second contribution was the theoretical articles with 16% that focus on the application of existing knowledge, and are only limited to evaluating the proposed applications. On the other hand, the Empirical type classification (application of theory), is presented with a contribution of 6% since only the experimentation or implementation of some technique or reference framework in real problems is presented and no referential models are presented.

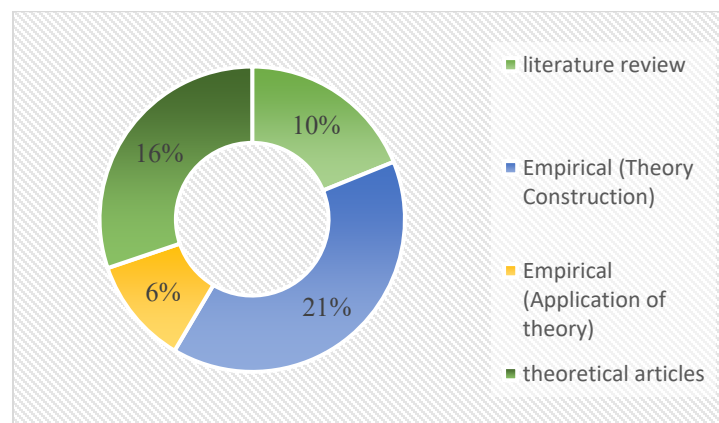


Figure 5. Percentage of use by item type

The articles related to the literature review (Figure 5), I only contribute to 10%, which focus on particular problems in financial sectors that have presented improvements under the use of lean manufacturing tools; 4 of the remaining articles mention the improvements by making use of lean manufacturing tools and management of new projects in the educational sectors, which contributes to opening new research gaps in these sectors.

### 5.6 Research method

The research method can be considered by authors and researchers as such as the way to show their procedures that they perform to evaluate theories or next lines of research. The Figure 6 shows five aspects proposals that the author saw most present in the literature review in which the case study predominates with a participation of 12.1% with a total of 23 articles that are performed and tested with this research methodology. In second place, a proposal approach is observed in which it is based according to methodologies already proposed in other case studies but nevertheless these methodologies continue to cause significant changes in the productive processes. This attribution has an impact of 9.01% with a total of 17 articles proposed.



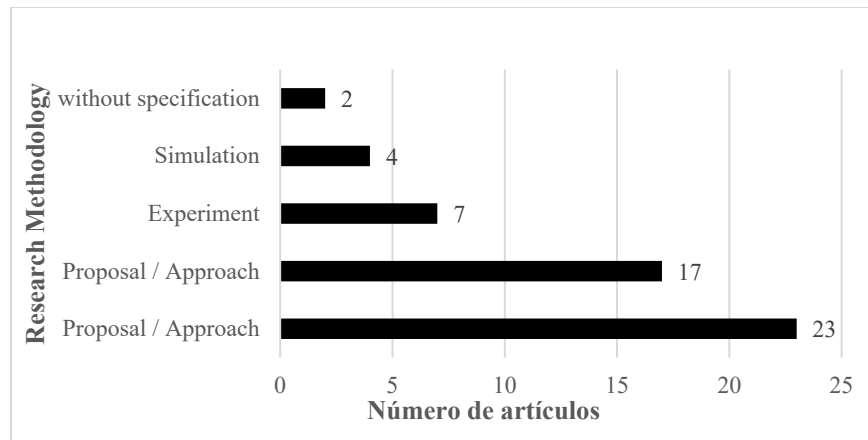


Figure 6. Number of articles by research methodology.

For experiment method, it has a contribution of 3.7% with a total of seven articles, which have an attribution that usually seeks to create real scenarios in which the researcher shows a panorama of the investigation or a solution of a specific problem. Finally, for the methodology used for the articles that were based on simulation were represented by 4 articles and a methodology that does not specify its contribution were represented by 2 articles. It is important to highlight since it opens new gaps and proposals for researchers to make use of simulation software, which can be simple to understand, show scenarios that best fit future challenges and raise case studies.

### 5.7 Solution methodology

The influence of good practices for correct project management represents an efficient performance in problems to evaluate the performance of lean manufacturing tools, despite the inference of each tool, the authors have considered proposing techniques that help make a better decision. In Figure 7, it is shown that the statistical tools attribute 13.7% to measure the current performance of the projects. The second incidence is the use of VSM (Value Stream Mapping) that contribute 10.6% which is a highly effective tool since it helps to graphically represent and establish improvements in production flows.

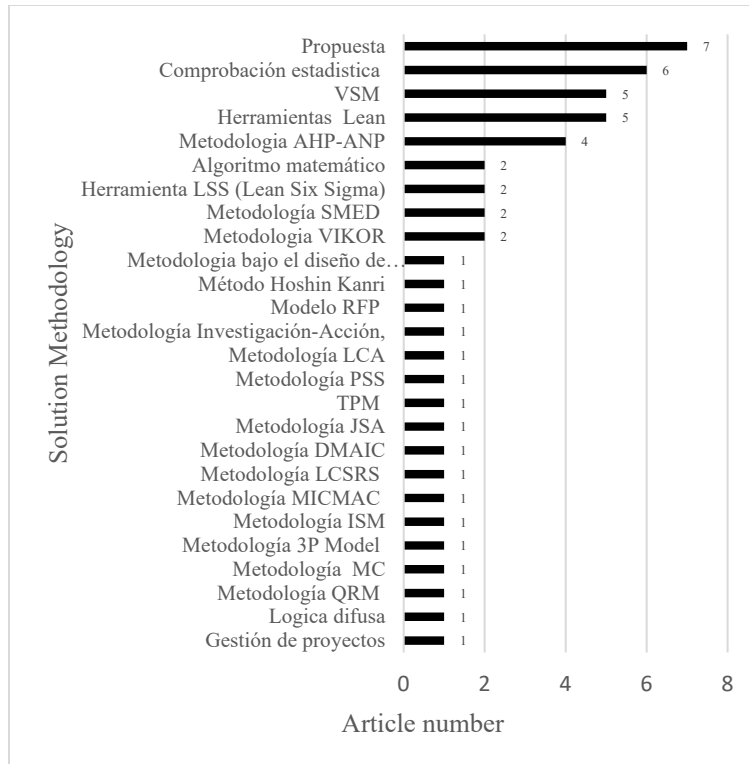


Figure 7. Number of articles by solution methodology.

Another important attribution was the use of lean tools, in which it was detected that the most used by the authors were: 5s, Poka Yoke, TPM (Total Production Maintenance) most of these tools were based on validating and influencing the use of good practices for proper project management, which represent a 16.9% share.

### 5.8 Implementation Level

Figure 8 shows the graphic representation of the articles that indicate the levels of implementation and scope of the contribution. In the first place, there is the level of implementation with a participation of 19.8% of the articles with significant attributions, opening new gaps for future researchers. The second place is headed by the articles with a level proposal with a participation of 6.8%, indicating that the authors do not show any type of practical result in the article.

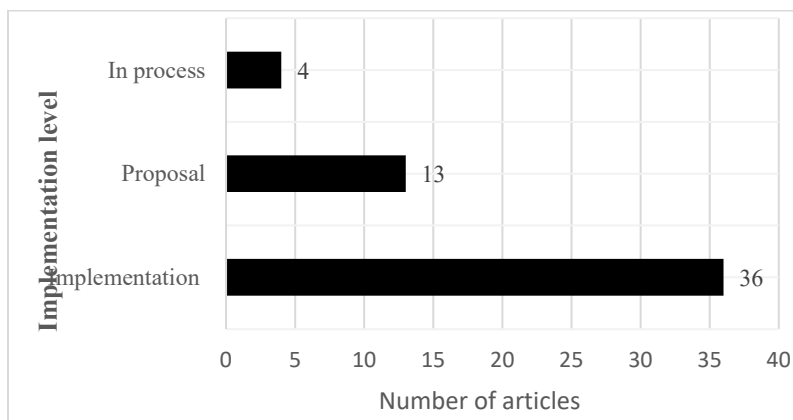


Figure 8. Implementation level

Finally, the level with the least attributions was in process with a participation of 2.1%, which means that the authors who used this implementation are still creating or opening new lines of research, without yet having a satisfactory result or the use of the tools or methodologies employed are still under discussion.

## **6. Conclusion**

The development of the following literature review is directly related under the influence of project management applied to lean manufacturing tools. In which 54 articles under study were analyzed through a qualitative analysis between 2011 and 2021, which show an optimal panorama of the usefulness and scope of project management as a tool for the development process of lean manufacturing and not only in that area but also in decision making within dynamic environments.

Project management and its good practices play a very important role in the automotive area and companies that provide services especially, to offer a solution to problems to make use of lean manufacturing tools. It is evident that statistical analysis and Value Stream Mapping are the most used tools for project management problems.

However, for the attributions by countries, it is shown that Mexico does not have significant advances in project management and administration that can be applied in schemes under the needs and characteristics for projects of the Mexican industry. This is not bad, on the contrary, the wide margins to expand new research and contributions of scientific articles that day by day allows us to offer a more standardized approach. Not to mention that (India) has a greater means of validation in its proposals, which it attributes to more successful and relevant publications for researchers seeking to open new paths with the use of lean manufacturing tools under a scheme of use of good practices for a proper project management as (Forno et al., 2014) and (Jadhav et al., 2014) pointed out that, despite the good results observed in the implementation of the lean manufacturing philosophy in the last decade, there are still many opportunities for improvement, that justifies further research in this area in order to identify critical points for the implementation of projects in the lean factory.

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## **Biographies**

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**Hernández-González** is a reviewer of articles from different conferences in Mexico and teaches about logistics and simulation. In the same context, he has published in journals and participates in seminars and international conferences such as the International Congress on Logistics and Supply Chain. His research interests include decision analysis, logistics and supply chain, simulation paradigms, and artificial intelligence.