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SYSTEMATIC REVIEW OF LEAN THINKING IN EDUCATION INSTITUTIONS

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ABSTRACT

The economy, culture, and social development of countries in the 21st century are directly related to the quality of education. For education to have expected quality and deliver the desired values to their client, many educational institutions are applying Lean management. Therefore, the paper aimed to explore the Lean implementation in education through a systematic review of papers from the past five years, in English and the Scopus and Web of Science databases. The methodology was developed using the PRISMA protocol and has been according to the type of approach, place of analysis, tools, facilitators, barriers, positive results, negative results, and the tendency of future work. The main results found were that 69.57% of the papers are analytical, LSS is the most discussed tool, the reduction is the main facilitator, the lack of Lean knowledge is the main barrier, and the attendance to the student obtained the best positive result.

Keyword: Education; Lean; Systematic review; PRISMA

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1. INTRODUCTION

The economic, cultural, and social development of countries in the 21st century is directly related to the quality of education offered by their educational institutions (Brinia et al., 2017). Because of this, educational institutions are researching who their most important customer is, what improvements need to be made and how these improvements will be implemented to enable assertive changes in their administrative and educational areas to add value to their product (Santos, 2001; Emilian, 2005; Lemahieu, Nordstrum & Greco, 2017). According to Suárez-Barraza et al. (2012), the Lean implementation in education started to be discussed in 1993 in a forum focused on educational quality in Europe. However, the first applied paper was published by the author Van Der (1995) two years after this forum, and addressed the use of Lean management in improving communication between the sectors of the Higher Education Institution (HEI).

Based on the practices of the Toyota Production System, Lean Management seeks to eliminate waste in the process and thus improve it (Persoon, Zaleski & Frerichs, 2006; Shokri, 2017), being adaptable to the needs of each environment and can be applied through different tools (Koskela et al., 2019). Lean management, also known as Lean thinking, needs well-defined goals to add value to the product. The main benefits found in the area of education were improvements in the evaluation system of grades (Nallusamya, 2018), reduction of paper waste in the photocopying and food sector in the cafeteria (Sunder & Antony, 2018), and identification of who is the most relevant customer and what are the values identified by them (Petrusch, Roehe & Luchese, 2019).

Balzer et al. (2016) carried out a literature review to map the main contributions of Lean implementation in HEIs and proposed a direction for future work. Vukadinovic, Djapan and Macuzic (2017) analyzed the Lean tools and principles adopted in the engineering education system. Cudney et al. (2018) addressed the difference between Lean, six sigma, and Lean six sigma (LSS) according to the implementation and the resulting impacts in an HEI. Despite the literature reviews carried out, no work was found covering all levels of education (from early childhood education to higher education), neither about the difficulties encountered in the implementation, nor about the negative results, nor about the trends of future work and whether the approach used was conceptual or analytical.

This paper aimed to explore the Lean implementation in education through a systematic review of papers from the last five years (January 2016 to September 2020),

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written in the English language and present in the Scopus and Web of Science (WoS) databases.

The next sections of the paper were organized in research methodology in section 2, followed by the results of the analysis in section 4 and in section 5, the final considerations, limitations and future work.

2. RESEARCH METHODOLOGY

The systematic review is a transparent and rigorous methodology that defines exclusion and inclusion criteria to answer research questions, which makes the process replicable and less prone to biased or selective reports such as traditional narrative reviews (Andrews, 2005; Dixon-Woods et al., 2006; Torgerson, 2006). The proposed review of the literature was carried out according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocol (PRISMA) and covered the stages of identification, selection, eligibility, and inclusion (Moher et al., 2009; Santos et al., 2020).

In the identification stage, a search for relevant papers that had been published in the last five years at least (January 2016 to September 2020) was carried out by us, taking into account the WoS and Scopus databases. WoS for allowing access to more than 12,000 journals (Costa et al., 2017) and being considered an authority in the scientific literature (Yan, Liao & Chen, 2018) and Scopus for being the largest bibliometric database (Filser. Silva & Oliveira, 2017; Silva & Oliveira, 2017), both considered as the most relevant standard citation bases (Cisneros et al., 2018; Mongeon & Paul-Hus, 2016; Tunger & Eulerich, 2018).

Only works found in academic journals (paper or review) and written in the English language were selected in our search. The first selection criterion adopted by us was to allow accessibility and scientific relevance in the research carried out (Leiras et al., 2014). In addition to this, English is the universal language and one of the most used criteria in the selection of documents in literature reviews (Costa & Godinho Filho, 2016; D'andreamatteo et al., 2015; Filser. Silva & Oliveira, 2017; Hallam & Contreras, 2018; Soliman & Sauron, 2017).

In adjusting the search filter of the WoS and Scopus databases, the combination of keywords and BooLean operators used was defined in such a way as to result in the most comprehensive possible number of relevant documents. The Boolean operator OR was used in our search to unite several keywords, which are used by different authors in their work to

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indicate the same thing. The Boolean AND operator made it possible for us to intersect complimentary terms.

And so it allowed excluding from our search results papers that were not adherent to the theme or the objects of study. The use of quotation marks made it possible to find the terms exactly as they were defined, and the symbol star (*) made it possible to count any term that prefixed with the keyword that precedes it. Table 1 shows the terms used in each search strategy and the number of papers identified in each database. In this stage, a total of 714 papers were identified in Scopus and 648 in WoS, with 580 duplicate papers.

Table 1: Search strategies in the Scopus and WoS databases

Strategies	Search Terms	Scopus	WoS
I	(lean and education*) OR (“lean education”)	564	536
II	("lean manufacturing") AND (education*)	24	21
III	("toyota production system") AND (education*)	6	5
IV	("lean thinking") AND (education*)	23	19
V	("lean management") AND (education*)	18	9
VI	("lean toll" OR "lean technique" OR "lean practice" OR "lean method" OR "lean approach") AND (education*)	-	6
VII	("lean services") AND (education*)	3	2
VIII	("lean production") AND (education*)	29	15
IX	("lean principles" OR "lean philosophy") AND (education*)	19	14
X	(“lean manufacturing”) AND (“educational activities” OR “education process” OR “smart education” OR “fild of education” OR “public education” OR “colleges” OR “academic” OR “higher education” OR “educations institutions”)	29	21
	Total	**714**	**648**

A total of 782 papers proceeded to the selection stage to verify whether the themes addressed Lean implementation in educational institutions. After reading the title, summary, and keywords of this total, it was concluded that 742 papers dealt with the implementation of Lean in areas outside our scope, with 40 papers remaining.

At the eligibility stage in PRISMA, all remaining papers were read in full. A total of 18 papers were eliminated for addressing Lean as part of the content of a management discipline in an HEI, with only 22 papers remaining. Finally, a paper was added that addressed the systematic review of Lean applications in HEIs between the years 2000 to 2015 (Balzer et al., 2016). This document did not appear in our search due to the time frame that started in January 2016. However, it was cited by some of the remaining papers. And due to its relevance, this paper was added in the inclusion phase. Therefore, 23 papers were selected after completing all stages of the PRISMA (Figure 1).

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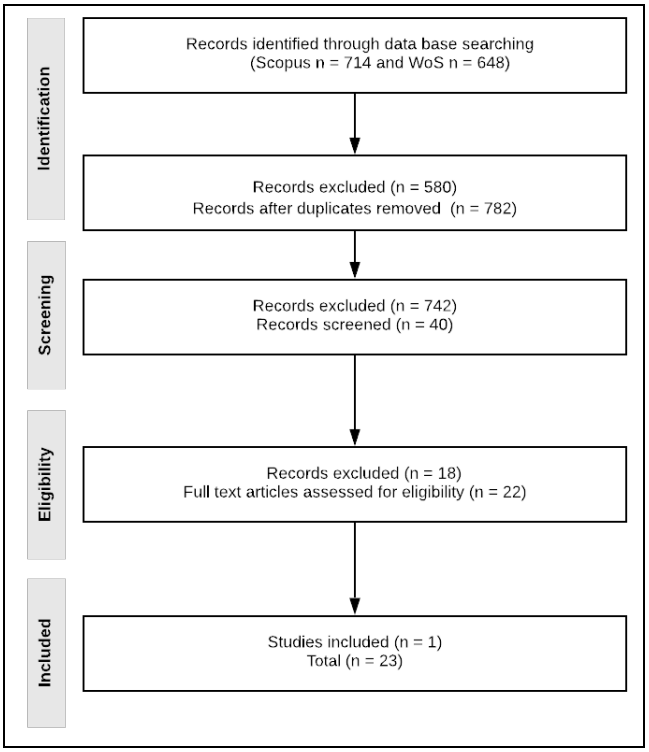

Figure 1: PRISMA Protocol

A qualitative analysis was made of all 23 remaining papers, taking into account the type of approach (conceptual or analytical), the location where the survey was conducted, the tools used, the facilitators found, the barriers found, the positive and negative results shown, and the trends of future research.

3. RESULTS AND DISCUSSION

This section has been divided into subsections that will be presented below.

3.1. The type of approach

The kind of approaches used in the preparation of papers can be classified as conceptual or analytical (Natarajarathinam, Capar & Narayanan, 2009; Leiras et al., 2014; Santos et al., 2020). Conceptual studies include literature reviews, narrative or systematic, elaboration of new techniques, approaches, and frameworks. Analytical studies comprise the analysis of data collected through interviews, questionnaires, or mathematical simulations.

It was observed that 69.57% of the papers between the years 2016 to 2020 are analytical. Sunder (2016) combined Kaizen and LSS to improve service in the library. Thomas et al. (2017) improved the educational curriculum through the Voice of the Customer (VOC) and LSS tools. Lemahieu, Nordstrum and Greco (2017) used the PDCA tool to teach 4-year-old children to read. Antony et al. (2018) addressed the LSS training day at a UK HEI.

http://www.ijmp.jor.br v. 12, n. 9, Special Edition, December 21, IFLOG 2020
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Sunder and Mahalingam (2018) used Belt certification to train employees at the educational institution where their research was conducted. Nallusamya (2018) applied LSS to make curricular changes to increase the approval rate in the disciplines.

Li, Laux and Antony (2019) applied LSS in the administrative sector of an HEI. Haerizadeh and Sunder (2019) used LSS at the University of Iran to increase enrollment, decrease waiting time for student counseling, and measure student satisfaction levels. Furterer et al. (2019) combined tutoring time and student waiting time using the LSS tool. Tetthe (2019) implemented Lean leadership in the administrative sector of an HEI to improve resource management. Kazancoglu and Ozkan-Ozen (2019) used Fuzzy and DEMATEL to predict future intervention actions on the administrative sector of an HEI.

Petrusch, Roehe and Luchese (2019) interviewed students in an HEI to understand what they consider as added value for the product. Magalhães et al. (2019) made use of 5S and Poka-Yoke tools to improve the visual organization of the screen and decrease the number of files stored on computers used in graduate school. Tilfarlioglu and Karaguguk (2019) needed to improve the students' performance in the English test, and for that, they applied the PDCA, 5S, and Kaizen tools.

Petrusch and Vaccaro (2019) mapped the entire value stream of an HEI so that it was possible to reevaluate the curriculum previously used. And authors Zihad and El-Qasem (2020) interviewed students to increase the number of graduates in the job market in Jordan.

Conceptual studies represent 30.43% of publications between the years 2016 to 2020. Balzer (2016) compiled several studies on the application of LSS in HEIs and identified research gaps on the topic. Vukadinovic, Djapan and Macuzic (2017) presented positive results on the relationship between Kaizen and Lean. Lu., Laux and Antony (2017) addressed Lean leadership and its application in the HEI administrative sector, and Cudney et al. (2018) showed how this implementation occurs. Sunder and Antony (2017) and Kucheryavenko et al. (2019) compared HEI and industry from the perspective of LSS and Sanahuja (2020) from the perspective of types of waste.

3.2. Analysis Locations

Of the 23 papers, 23.33% analyzed the HEI holistically from the educational to the administrative and financial environment, 26.09% addressed only the administrative sector, 26.09% the classroom, and 13.04% the libraries, as can be seen in Figure 2.

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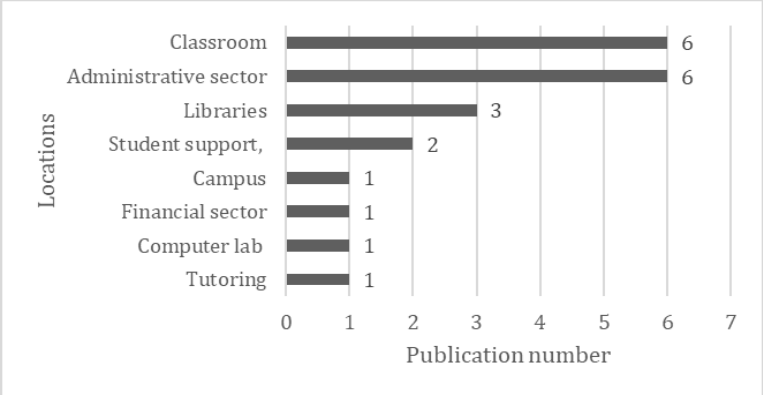

Figure 2: Application locations

Some authors have implemented it in more than one location, such as the authors Antony et al. (2019), who applied in the administrative sector, human resources, finances, and on IES campuses to identify the types of waste and train employees in these locations. Blazer et al. (2016) analyzed the classroom, the library, student support, and the administrative sector to understand the positive aspects of the implementation and what still needs to be done to improve studies in these places. Blazer et al. (2016) analyzed the classroom, the library, student support, and the administrative sector to understand the positive aspects of the implementation and what still needs to be done to improve the conditions of study in these places. Sunder and Magahalingam (2018) implemented Lean in the library and computer lab to increase the number of users in these ambients by improving its services.

Regarding the Lean application areas, a study showed improvements in educational institutions provided by the implementation of Lean tools in the areas of education and administration, from early childhood education to higher education (Tilfarlioglu & Karaguguk, 2019). An experience with the application of Lean tools in eighth grade English classes was reported in Lemahieu, Nordstrum and Greco (2017), and Sunder and Mahalingam (2018) showed research gaps in the areas of early childhood education through high school.

3.3. Tools

The most discussed tool in the papers was LSS, with 38.89% of the publications. This tool made it possible to map the processes of educational institutions through the DMAIC methodology (Define, Measure, Analyze, Improve and Control) (Sunder et al., 2018; Nallusamya et al., 2018; Li, Laux & Antony, 2019; Haerizadeh & Sunder, 2019; Futrerer et al., 2019; Lemahie et al., 2017; Cudney et al., 2018; Balzer et al., 2016).

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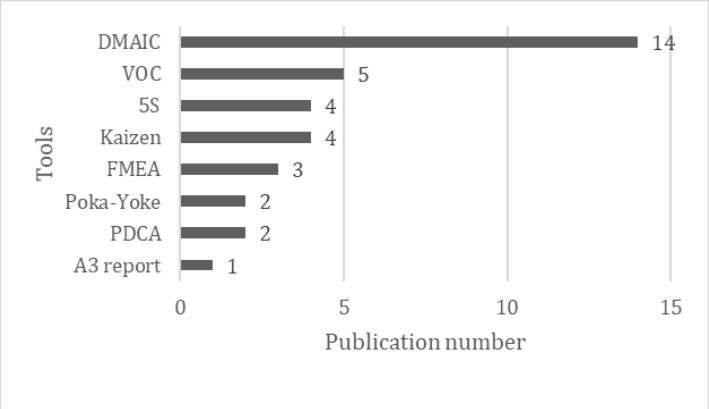

Figure 3: Tools

The VOC tool was in second place in the ranking with 13.89% and was used to identify who clients of the institutions were and what values needed to be delivered (Li, Laux & Antony, 2019; Sunder & Mahalingam, 2018; Cudney et al., 2018). In third place in the ranking, with 11.11%, the Kaizen tool was used to reduce the time to search for books in a library (Sunder, 2016). There were also reports that the Kaizen tool was also used to improve the proposed activities during an English class (Tilfarlioglu & Karaguguk, 2019), the performance of employees in the administrative, financial and educational sectors (Vukadinovic, Djapan & Macuzic, 2016). In third place, also with 11.11%, is the Belt certificate, which according to Sunder et al. (2017) and Cudney et al. (2018), the training has a great focus on solving problems, assisting in the construction of the LSS culture, and in the use of the tools necessary for its application.

Lean tools were also associated with other management tools, such as the Project Charter and the Scope Statement. The set of management tools was used to define what waste would be eliminated, where the application would take place, who would be responsible, and which tools would be used for the LSS implementation (Li, Laux & Antony, 2019; Sunder & Mahalingam, 2018). The SWOT tool (Strengths, Weaknesses, Opportunities, and Threats) was approached together with 5S and Poka-Yoke to organize the desktop and folders of computers in the post-graduate administrative sector (Magalhães et al., 2019). Pareto Diagram and Fishbone Analysis were used to identify what was the waste and where the intervention would take place, being handled with the Belt, LSS, and VOC certificate (Balzer et al., 2016; Li, Laux & Antony, 2019; Nallusamya et al., 2018; Sunder & Mahakingam, 2018; Sunder & Antony, 2018).

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3.4. Facilitators

According to Figure 4, the three principal facilitators are the management system with 23.67%, the stakeholders (teachers, students, and other IES employees) with 23.33%, and the leadership team with 20%.

Having good management was a relevant factor to have good results (Sunder & Antony, 2019). This allowed to have adequate responses to the requested demands (Tetteh, 2019; Antony et al., 2018), to have an efficient feedback mechanism (Kazancoglo & Ozkan-Ozen, 2019), having employees committed to the established goals (Petrusch, Roehe & Luchese, 2019), and is committed to the implementation of the tools used (Haerizadeh & Sunder, 2019; Li, Laux & Antony., 2019).

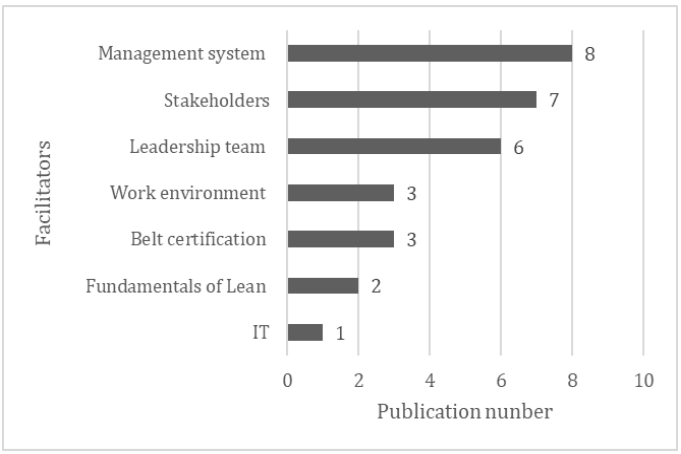

Figure 4: Facilitators

Several authors appointed the institution's collaborators and students as facilitators in the process of implementing management tools (Kucheryavenko et al., 2019; Sunder & Mahalingam, 2018; Zigham & El-Qasem, 2018; Petrusch, Roehe & Luchese, 2019; Petrusch & Vaccaro, 2019). Sunder (2016) argued that students were responsible for managing the Lean application project. Furterer et al. (2019) highlighted that implementation of Lean tools in the tutoring sector of an HEI was only possible because of the initiative taken by the graduate students of that institution.

Leadership was seen as a facilitator due to the commitment and support offered during the implementation of management tools (Li, Laux & Antony, 2019; Lu, Laux & Antony, 2017; Kazancoglo & Ozkan-Ozen, 2019; Vukadinovic, Djapan & Macuzic, 2017). Antony et al. (2018) and Cudney et al. (2018) emphasize the help in creating strategies for the better functioning of the Lean methodology and the monitoring of implementation as determinant characteristics of leadership.

http://www.ijmp.jor.br v. 12, n. 9, Special Edition, December 21, IFLOG 2020
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Other facilitators were good communication in the work environment (Antony et al., 2018; Petrusch, Roehe & Luchese, 2019) and cooperation between sectors in educational institutions (Kazancoglo & Ozkan-Ozen, 2019). The organizational culture provided by the Belt certification can also be considered as a facilitator (Kuvadinovic et al., 2017; Antony et al., 2018; Kazancoglo & Ozkan-Ozen, 2019). The dissemination of the fundamentals of Lean theory allowed everyone involved to understand the concepts, tools, and terminologies (Haerizadeh & Sunder, 2019; Balzer et al., 2016) and with the understanding that the implementation would be long-term (Haerizadeh & Sunder, 2019; Balzer et al., 2016). And, availability of the institution's use of IT (information technology) resources, which contributed to the development and implementation of managerial and organizational software (Vukadinovic, Djapan & Macuzic, 2017).

3.5. Barriers

The most cited barriers were Lean knowledge and poor management with 16.13% each, followed by the financial sector, work environment, and stakeholders (teachers, students, and other IES employees) with 12.90% each and in third place leadership and the process with 9.68% each, according to the ranking presented in Figure 5.

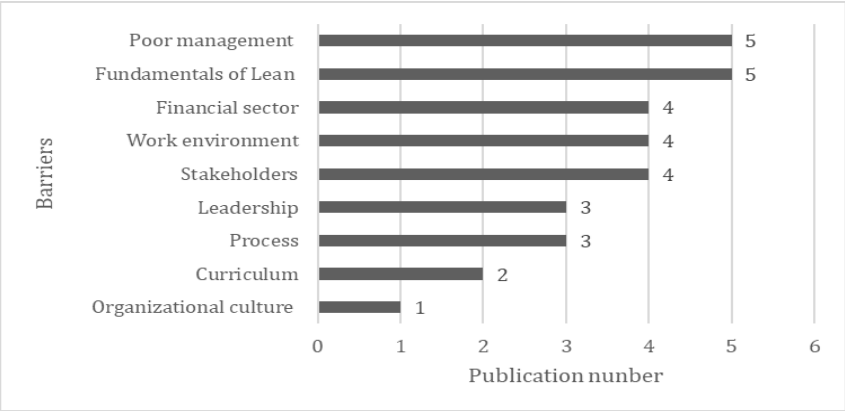

Figure 5: Barriers

The Lean knowledge barrier occurred because employees do not understand its methodology and use it only as a tool and not as an institutional culture (Vukadinovic, Djapan & Macuzic, 2017; Cudney et al., 2018; Balzer et al., 2016; Petrusch, Roehe & Luchese, 2019; Thomas et al., 2017).

For Antony et al. (2018) and Cudney et al. (2018), the management sector was a barrier because it was unable to identify who was the principal customer or which processes

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added value to the institution. The creation of unattainable performance goals based on the activities of employees, the lack of standardization of terms used in Lean implementation, poor management of people and resources, and the lack of monitoring changes in the process were other points that transformed the management sector into a barrier (Li, Laux & Antony., 2019; Haerizadeh & Sunder, 2019; Tetteh, 2019; Cudney et al., 2018).

Financial constraints, produced by budget cuts, made it impossible to acquire equipment, software, and training to assist in Lean application (Magalhães et al., 2019; Haerizadeh & Sunder, 2019; Vukadinovic, Djapan & Macuzic, 2017). According to Nallusamy (2018), budget cuts are directly related to unsuccessful implementations of Lean tools.

Poor office infrastructure, lack of organization in educational spaces, and poor communication between sectors contributed to the work environment becoming a barrier to implementing Lean tools (Nallusamy, 2018; Li, Laux & Antony, 2019; Kucheryavenko et al., 2019; Antony et al., 2018). The barriers found in the stakeholders were the conflict between employees and students (Vukadinovic, Djapan & Macuzic, 2017; Sunder; Mahalingam, 2018). The lack of understanding about the need for implementation and the lack of support made leadership an obstacle (Balzer et al., 2016; Lu, Laux & Antony, 2017). The difficulties encountered in the process were implementations of Lean tools carried out quickly or made in many sectors at the same time (Petrusch, Roehe & Luchese, 2019; Sanahuja, 2020; Kucheryavenko et al., 2019). The poorly planned curriculum harmed students after subjects (Nallusamya, 2018; Haerizadeh & Sunder, 2019). And finally, the lack of organizational culture made it hard to implement Lean tools (Antony et al., 2018).

3.6. Positive and Negative Results

The main positive results pointed out by papers were student service with 31.37%, educational activities with 17.64%, and financial activities with 15.69%, as shown in Figure 6.

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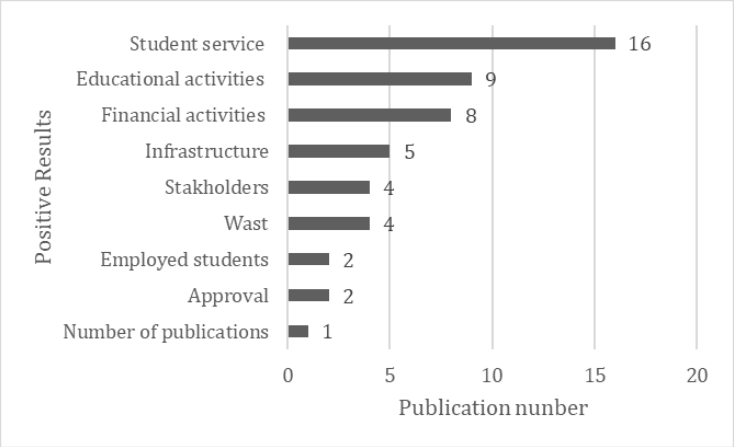

Figure 6: positive results

Identifying students as the institution's principal customers and mapping their needs has enabled responsible managers to improve services offered for them (Balzer et al., 2016). The values identified by students in the process were quick feedbacks, visible processes, personalized service, search for the solution of the problem, use of technology giving greater autonomy to the teacher, and improved communication between institution and student (Sunder & Mahalingam, 2018; Petrusch, Roehe & Luchese, 2019; Li, Laux & Antony, 2019; Sunder, 2016; Balzer et al., 2016; Sunder & Antony, 2018). LeMehieu et al. (2017) pointed out that if customers were not identified, the institution would have more expenses instead of reducing waste.

Improvements in educational activities have been observed in children Beginning to read at the age of four in early childhood education in the United States (Lemahieu, Nordstrum & Greco, 2017), in improving the knowledge of grammar and reading in English for Indian students in the fundamental education (Tifarlioglu & Karaguguk, 2019) and in the elaboration of an integrated curriculum with the other IES courses and adaptable according to the demand of the job market in Jordan (Zighan & El-Qasem, 2020; Balzer et al., 2016; Antony et al., 2018).

The financial sector was responsible for changes that resulted in the reduction of food waste in the cafeteria, in the standardization of gym maintenance (Sunder & Antony, 2018), in the reduction of paper consumption in the administrative sector (Vukadinovic, Djapan & Macuzic, 2017; Lu, Laux & Antony, 2017), in the elimination of 31 processes that did not add value in the administration of the Hei (Tetthe, 2019), and in the reduction of $ 5,000.00 that was spent on sending checks to pay invoices (Antony et al., 2018).

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Negative results were identified in only three papers. Sunder et al. (2018) pointed out excessive financial expenses with Belt certification and a lack of students' perception of process improvements after the Lean implementation. Le Mahieu et al. (2017) cite a case where it has been hard to identify who the principal customers of the educational institution were. Finally, Balzer et al. (2016) highlighted the increased workload for employees in the administrative sector due to the Lean implementation.

3.7. Future Work

In 52.17% of papers, authors cited what would be the next steps to be taken to continue their research. Table 2 contains the author's names and the papers' titles with the respective future works.

Table 2**:** Future works

Authors	Titles	Future works
Sunder and Antony (2018)	A conceptual Lean Six Sigma framework for quality excellence in higher education institutions	Make a comparative analysis between the Lean implementation in HEIs and other areas of education and compare HEIs from different parts of the world.
Sunder and Mahalingam (2018)	An empirical investigation of implementing Lean Six Sigma in Higher Education Institutions	Research the lean application in early childhood education, elementary and high school.
Li, Laux and Antony (2019)	How to use lean Six Sigma methodology to improve service process in higher education A case study	Build theoretical support to support the application.
Haerizadeh and Sunder (2019)	Impacts of Lean Six Sigma on improving a higher education system: a case study	Implementation in other HEIs.
Magalhães et al. (2019)	Improving processes in a postgraduate office of a university through lean office tools	Implement in other areas of the institution besides the computer.
Thomas et al. (2017)	Implementing Lean Six Sigma into curriculum design and delivery – a case study in higher education	Implementation in other HEIs.
Kazancoglu and Ozkan-Ozen (2019)	Lean in higher education A proposed model for lean transformation in a business school with MCDM application	Broaden the search for waste disposal methods, investigate HEI waste in several countries, and include students and administrative staff to investigate waste.
Sunder (2016)	Lean Six Sigma in higher education institutions	Research in more HEIs.
Antony et al. (2018)	Lean Six Sigma journey in a UK higher education institute: a case study	Implement green belt and black belt certification
Lu, Laux and Antony (2017)	Lean Six Sigma leadership in higher education institutions	Develop a systematic interview protocol based on a series of themes emerging from the systemic review
Petrusch et al. (2019)	They teach, but do they apply?: An exploratory survey about the use of Lean thinking in Brazilian higher education institutions	Research on the lean implementation in Brazilian public HEIs and the distance learning modality.

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Balzer et al. (2016)	A review and perspective on Lean in higher education	Assess the lean impact on employees and do experimental research.

In 58.33% of papers, which presented future work, authors will reply to the studies in other educational institutions (Sunder & Antony, 2018; Haerizadeh & Sunder, 2019; Magalhães et al., 2019; Thomas et al., 2017; Antony et al., 2018; Kazancoglu & Ozkan-Ozen, 2019). In 25.00% of papers, authors will compare HEIs from different countries or different areas of the same institution (Sunder & Antony, 2018; Sunder, 2016; Petrusch, Roehe & Luchese, 2019). In some papers, authors will investigate lean implementations in early childhood education, elementary, and high school to have a wider scope and knowledge on all levels (Sunder & Mahalingam, 2018). Li, Laux and Antony (2019) will create a theoretical basis to assist the practice, Lu, Laux and Antony (2017) will develop an interview protocol, and Balzer et al. (2016) will evaluate the impacts of lean implementation on employees.

4. FINAL CONSIDERATIONS

This article aimed to explore the lean implementation in education through a systematic review of the articles from the last 5 years (January 2016 to September 2020), in English and the Scopus and WoS databases. For this purpose, the type of approach, place of analysis, tools, facilitators, barriers, positive results, negative results and trend of future work were analyzed.

From the analysis it was possible to observe that 69.57% of the articles are analytical and 30.43% are conceptual. Considering the place of analysis, there was a higher frequency of citations for applications of Lean tools, in an integrated manner, on various sectors in the HEI. LSS was the most used tool, used to map processes and identify customer values. An important point highlighted was the use of different tools of production engineering, such as the TAP of the project management sphere and the Pareto diagram of the quality scope, showing the integration of several fields of knowledge.

Most of the articles approached the stakeholders as facilitators, highlighting the students' involvement and initiatives. The management sector has been cited as the principal facilitator for providing services when requested, having effective feedback mechanisms, and assisting in the implementation process. However, it was pointed as a barrier when not allowed to identify who potential clients are, created unattainable goals, and in the standardization of the lean terms used in the implementation.

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The improvement in the attendance to students was the most cited positive result in papers for allowing to meet the needs of these clients of the institutions. The negative results were financial expenses with training, the employees' failure to recognize the success of the implementation of the lean tools, and the increase in the workload.

Most authors argue that they will implement their studies in other HEIs, or compare HEIs from different countries or compare different areas of the same institution in future works. The search for articles published in journals, in the English language, in the time interval of the last five years, and only in the Scopus, and WoS databases, restricted the analysis of more documents that could assist in the study.

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