The originality of the lean manufacturing studies
A systematic literature review

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Abstract

Purpose – The purpose of this paper is to identify the originality value of the lean manufacturing (LM) studies carried out worldwide so far.

Design/methodology/approach – Four major publishers, namely, Emerald Online, Science Direct, Springer Link and Taylor and Francis provided the databases for a systematic literature review (SLR) of peer-reviewed journal articles in LM. In total, 211 articles published in 52 journals during 2005-2016 were collected. The affinity diagram was applied to group the originality value statements identified into logical themes.

Findings – The plethora of originality value statements identified in the literature are analytically presented. Furthermore, meaningful themes of the originality value of the LM studies are formulated.

Research limitations/implications – Some publishers might have been missed out in this SLR, given that it is based on only four academic publishers.

Practical implications – Identifying the originality value of the existing LM studies and presenting respective meaningful themes can help researchers and practitioners design their future research and implementation plans, respectively.

Originality value – The originality value of the LM studies is a subject which has not been reviewed in the literature previously.

Keywords Lean manufacturing, Systematic literature review, Originality-value

Paper type Literature review

Introduction

Lean manufacturing (LM) is widely used by organizations not only in the developed economies of the USA and Europe but also in the developing economies of Asia and India (Chaplin et al., 2016). Organizations implement LM in an attempt to improve their cost, quality and performance (Sharma et al., 2016a) and withstand the current circumstances which are characterized by strong global competition (Jasti and Kodali, 2014a) and an economic downturn (Gelei et al., 2015).

The widespread adoption of LM by organizations has made academics and researchers focus more on this field (Samuel et al., 2015). However, confusion still exists on a theoretical and practical level (Narayanamurthy and Gurumurthy, 2016a) because of the various LM definitions and interpretations provided by several authors (Stone, 2012). Thus, there is a limited understanding of lean across industry, a fact that is also supported by Abolhassani et al. (2016) studying US manufacturing, Jasti and Kodali (2016) examining Indian manufacturing and Filho et al. (2016) focusing on Brazilian small and medium-sized enterprises (SMEs). It is worth noting that few literature review studies on LM have been published so far (Marodin and Saurin, 2013; Jasti and Kodali, 2014a; Jasti and Kodali, 2015), which could have shed more light on LM research and implementation. Furthermore,
authors such as Taylor et al. (2013), Wiengarten et al. (2015), Piercy and Rich (2015), Pakdil and Leonard (2016), Secchi and Camuffo (2016) identify a literature gap with regard to LM and make respective future research suggestions. For the LM research gap to be more clearly highlighted, for the benefit of academics and researchers, and furthermore, for the LM implementation plans to be more strongly supported by the knowledge obtained until now, for the benefit of practitioners, the area of the originality value of the existing LM studies should be clearly defined. Based on the above, the following question arises concerning the LM studies carried out so far:

RQ. what is the originality value of the LM studies?

The present study contributes to the literature by systematically reviewing LM articles published over a long period (2005-2016) and highlighting the originality value of the respective studies. Literature review studies on LM conducted so far, such as those of Stone (2012), Hasle et al. (2012), Moyano-Fuentes and Sacristan-Diaz (2012), Powell (2013), Jasti and Kodali (2014a), Bhamu and Sangwan (2014), Jasti and Kodali (2015), Samuel et al. (2015), Hu et al. (2015) and Narayananurthy and Gurumurthy (2016a), do not focus on this subject. This reflects the differentiation of the present study compared to the previous ones and strongly supports the originality of the present systematic literature review (SLR).

The structure of the paper is as follows: in the next section, the SLR and the respective phases are presented. In the following section, the results of the SLR are analytically presented describing the profile of the articles reviewed and the originality value of the existing LM studies. The results are then discussed and the conclusions are presented. Finally, the limitations of the study and the proposals of the author for further literature review studies are presented.

Methodology
To elicit the originality value of the LM studies carried out worldwide so far, a literature review was conducted. Given that the traditional narrative review lacks thoroughness and rigor (Tranfield et al., 2003), the SLR was selected as the methodological approach of the present study. The SLR adopts a scientific and transparent process (Tranfield et al., 2003), and thus, many literature review articles published in high-quality scientific journals are based on the SLR (Hu et al., 2015). The lean literature review studies of Alblwi et al. (2014), Hu et al. (2015) and Alblwi et al. (2015) are based on the SLR methodology presented by Tranfield et al. (2003). This methodology, which consists of the planning stage, conducting stage and reporting/dissemination stage, was also adopted in the present study.

Stage I – planning the review
Preparing and developing the review protocol is the main purpose of this stage. Thus, decisions should be made with regard to the population (or sample) of the present study, search strategy for the identification of relevant studies, criteria for inclusion and exclusion of studies in the review, as well as their quality assessment method (Tranfield et al., 2003).

Following the approach adopted by Jasti and Kodali (2014a) and Jasti and Kodali (2015), the present SLR was based on the whole database of four well-known management science publishers of academic articles, namely, Emerald Online, Science Direct, Springer Link and Taylor and Francis. The restriction of the search to articles relevant to the objectives of the present study was achieved through specific inclusion and exclusion criteria (Table I). From 2005 onward, the number of LM articles has substantially increased, and moreover, LM transformations are more successful
because of the strategic align of LM throughout the enterprise (Stone, 2012; Bhamu and Sangwan, 2014). Thus, the year 2005 was taken as the beginning of the present SLR. Following the suggestion of Shah and Ward (2007), according to which LM should be considered from a multidimensional perspective covering a variety of highly inter-related individual management practices in an integrated system, the search of the literature was based on terms such as lean, lean manufacturing, lean production, lean principles, lean practices/tools/techniques. In other words, articles focusing on a specific lean principle or practice/tool/technique (e.g. value stream mapping, kanban/pull, 5S, kaizen, etc.) (Bhamu and Sangwan, 2014) or bundle of lean practices (e.g. just-in-time, total quality management, total preventative maintenance and human resource management) (Yang et al., 2011; Taylor et al., 2013; Longoni et al., 2013) were not taken into consideration.

**Stage II – conducting the review**

The inclusion and exclusion criteria, as well as the respective search terms revealed from Table I, set the basis for constructing the search strings which were entered in exactly the same way in the bibliographic databases. The result of this search was hundreds of articles, which were screened appropriately for their fit with the objectives of the study by carefully reading the title, abstract and keywords of each article, and if these were not clear enough, by reading the full paper. So, the disciplined screening process resulted in a final sample of 211 articles published in 52 journals (Table II).

The information of the sample articles such as the title, year of publication, journal, authors, paper type, geographic research area, industry sub-sectors, together with the statements describing the originality value of the studies, were extracted in an excel spreadsheet (Tranfield et al., 2003; Hu et al., 2015). The large number of the statements describing the originality value of the studies were grouped according to some form of natural affinity, based on a simple affinity diagram (McQuater et al., 1995). Thus, meaningful themes of the originality value statements were formulated.
## Table II.

The list of journals considered in the present study

<table>
<thead>
<tr>
<th>Publisher – journals</th>
<th>No. of articles</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerald</td>
<td>86</td>
<td>0.407</td>
</tr>
<tr>
<td><em>Journal of Manufacturing Technology Management</em></td>
<td>21</td>
<td>0.100</td>
</tr>
<tr>
<td>International Journal of Operations and Production Management</td>
<td>16</td>
<td>0.076</td>
</tr>
<tr>
<td>International Journal of Lean Six Sigma</td>
<td>11</td>
<td>0.051</td>
</tr>
<tr>
<td>International Journal of Productivity and Performance Management</td>
<td>8</td>
<td>0.037</td>
</tr>
<tr>
<td>Benchmark: An International Journal</td>
<td>5</td>
<td>0.024</td>
</tr>
<tr>
<td>British Food Journal</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Measuring Business Excellence</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Supply Chain Management: An International Journal</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Management Decision</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>The TQM Journal</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Business Process Management Journal</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>European Business Review</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Grey Systems: Theory and Application</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>International Journal of Quality and Reliability Management</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Management Research News</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>The International Journal of Logistics Management</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Quality in Maintenance Engineering</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Competitiveness Review: An International Business Journal</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>International Journal of Organizational Analysis</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Engineering, Design and Technology</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Modeling in Management</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Research Journal of Textile and Apparel</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>VINE Journal of Information and Knowledge Management Systems</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Industrial Management and Data Systems</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Taylor and Francis</td>
<td>66</td>
<td>0.312</td>
</tr>
<tr>
<td>International Journal of Production Research</td>
<td>33</td>
<td>0.156</td>
</tr>
<tr>
<td>Production Planning and Control</td>
<td>21</td>
<td>0.100</td>
</tr>
<tr>
<td>Total Quality Management and Business Excellence</td>
<td>6</td>
<td>0.027</td>
</tr>
<tr>
<td>International Journal of Computer Integrated Manufacturing</td>
<td>4</td>
<td>0.019</td>
</tr>
<tr>
<td>Construction Management and Economics</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Asia-Pacific Business</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Elsevier/Science Direct</td>
<td>43</td>
<td>0.205</td>
</tr>
<tr>
<td>International Journal of Production Economics</td>
<td>13</td>
<td>0.062</td>
</tr>
<tr>
<td>Journal of Operations Management</td>
<td>10</td>
<td>0.047</td>
</tr>
<tr>
<td>Procedia Manufacturing</td>
<td>3</td>
<td>0.014</td>
</tr>
<tr>
<td>Expert Systems with Applications</td>
<td>3</td>
<td>0.014</td>
</tr>
<tr>
<td>Management Accounting Research</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Computers in Industry</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Journal of Business Research</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Elsevier/Science Direct</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Business Research Quarterly</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Review of Applied Management Studies</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>International Journal of Information Management</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Business Horizons</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Accounting, Organizations and Society</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Engineering and Technology Management</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Computers and Industrial Engineering</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Cleaner Production</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>European Management Journal</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Springer Link</td>
<td>16</td>
<td>0.076</td>
</tr>
<tr>
<td>The International Journal of Advanced Manufacturing Technology</td>
<td>10</td>
<td>0.047</td>
</tr>
<tr>
<td>Operations Management Research</td>
<td>2</td>
<td>0.009</td>
</tr>
<tr>
<td>Journal of Intelligent Manufacturing</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Systemic Practice and Action Research</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Production Engineering Research and Development</td>
<td>1</td>
<td>0.005</td>
</tr>
<tr>
<td>Journal of Business Ethics</td>
<td>1</td>
<td>0.005</td>
</tr>
</tbody>
</table>
**Stage III – reporting and dissemination**

Based on the excel spreadsheet developed in the previous stage, the profile of the LM studies reviewed is clearly presented. Furthermore, the themes of the originality value statements are presented and critically discussed.

**Results**

*The profile of the articles reviewed*

Table II presents the number and percentage of the sample articles published in each journal and the respective publisher. A limited number of journals have published the majority of the sample articles at each publisher. More specifically, 70.9 per cent of the LM articles of Emerald have been published by five out of 24 journals of this publisher, 81.8 per cent of the LM articles of Taylor and Francis have been published by two out of six journals of this publisher, 67.4 per cent of the LM articles of Elsevier/Science Direct have been published by four out of 16 journals of this publisher and 62.5 per cent of the LM articles of Springer Link have been published by one out of six journals of this publisher. The distribution of the journals among the four publishers is presented in Figure 1, while the distribution of the sample articles among the four publishers is presented in Figure 2.

**Figure 1.** Journals per publisher

**Figure 2.** Articles per publisher
Figure 3 presents how LM publication has evolved over the last decade. The increase of LM publication from 2011 onward is much higher than the increase of LM publication from 2005 to 2011. The majority of the sample articles present surveys and case studies (44.5 per cent and 36.5 per cent, respectively), while the minority of the sample articles present literature reviews and conceptual studies (9.5 per cent and 9.5 per cent, respectively) (Figure 4). It is worth noting that the majority of the surveys (76 out of 94) are based on a research sample which is smaller than 300, the majority of the case studies (47 out of 77) are based on only one case organization, while the majority of the literature review studies (17 out of 20) have reviewed fewer than 200 articles. The manufacturing sub-sectors that mostly participated in the surveys and case studies presented in the sample articles are the following: automotive, electrical/electronics, machinery, food, textiles and apparel, plastics and rubber and chemicals. Finally, the countries with the highest number of LM surveys and case studies are the following: the USA (34), the UK (33), India (26), Brazil (18), Italy (14), Sweden (10), Spain (10) and Germany (10).

The originality value of the LM articles
Table III presents the statements describing the originality value of the LM studies reviewed. These statements were classified, through the affinity diagram, into
<table>
<thead>
<tr>
<th>Themes</th>
<th>Statements presenting the originality of the studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean literature review</td>
<td>Presenting a historical account of the research that led to the formulation and dissemination of one of the most influential manufacturing paradigms of recent times, namely, lean (Holweg, 2007); presenting a topical review and historical overview of the development in the use of IT and its relation to lean production (LP) (Riezebos et al., 2009); addressing the challenge many scholars and practitioners encounter when communicating the ideology of lean by offering a literature review of the four decades of scholarly lean literature (Stone, 2012); conducting a comprehensive literature review with regard to lean, the definitions of and assumptions about lean (Arfbljorn and Freytag, 2013); providing a unique review of the lean product development research area (Khan et al., 2013); revising 209 research papers for various characteristics of LM (Bhamu and Sangwan, 2014); systematically reviewing the literature and critically evaluating key themes of lean implementation within an SME environment (Hu et al., 2015); exploring and evaluating previous work focusing on the relationship and links between lean and sustainable manufacturing and their impact on business performance (Hartini and Ciptomulyono, 2015); providing a complete review of lean articles in terms of various aspects of LP classifications and verifying the depth of the research carried out in the field of LP (Jasti and Kodali, 2015); providing a comprehensive review of the process industry’s assimilation of lean principles (Fanwar et al., 2015b); reviewing the topic of leanness assessment (Narayanamurthy and Gurumurthy, 2016a)</td>
</tr>
<tr>
<td>Lean theory</td>
<td>Proposing lean schools of thought (Hoss and Caten, 2013); extending the theories of resource-based view (RBV) and its extension, i.e. dynamic capability (DC) theory, to the area of lean operations (Wong et al., 2014)</td>
</tr>
<tr>
<td>Lean future research agenda</td>
<td>Focusing on the main areas of research, the needs of and opportunities for research on the LP (Marodin and Saurin, 2013)</td>
</tr>
<tr>
<td>Lean barriers – difficulties</td>
<td>Correlating the lean barriers encountered to the size of an organization (Bhasin, 2012a); explaining many of the failures that occur in exporting the LP outside Japan (Dominici and Palumbo, 2013); identifying potential barriers of LM in food SMEs (Dora et al., 2013); providing a concise description of 24 barriers of LM (Jadhav et al., 2014); concentrating on the value stream, revealing weaknesses, detecting their causes and evaluating the impact on the process according to LM (Magenheimer et al., 2014); re-interpreting the factors, barriers and difficulties for the LP from the perspective of risk management and presenting a classification of the risks (Marodin and Saurin, 2015a); taking a holistic view of the barriers to the LP and systematically analyzing the context (the nature of the LM barriers, their origins, interrelations and relative importance) (Marodin and Saurin, 2015b); addressing the problems in lean during the product development process (Forno et al., 2016); assessing the incidence of lean product development problems (Tortorella et al., 2016); identifying the properties of RFID-based lean manufacturing which are helpful for the handling of detected barriers (Rafique et al., 2016)</td>
</tr>
</tbody>
</table>

Table III. The originality of the LM studies (continued)
### Themes

<table>
<thead>
<tr>
<th>Human factor involved in lean</th>
<th>Statements presenting the originality of the studies</th>
</tr>
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<tbody>
<tr>
<td>Carrying out a multi-industry empirical study of the relationship of job stress (job demand, support, control) to a range of lean practices and to the degree of lean implementation (Conti et al., 2006); examining whether the LP job design or increased management control causes intrinsic motivation of employees to implement lean and whether managers hoping for worker commitment should avoid the LP because of its standardization (Treville and Antonakis, 2006); studying the partial success of the LP due to the persistence of legacy attitudes on the part of unionized and high-seniority employees (Sim and Rogers, 2008); exploring soft building blocks (e.g. employee commitment, belief, communication and work method) of successful LM on the shop-floor level and how workers’ perceptions and influential success factors vary in particular contexts (Losonci et al., 2011); establishing a statistically valid relationship between LP and worker commitment and associated work practices (Angelis et al., 2011); highlighting the importance of the human dimension in the LP and determining employee beliefs and attitudes to various dimensions of new management initiatives such as LM (Wickramasinghe and Wickramasinghe, 2011); making use of the existing research evidence to examine the complex and ambiguous relations between lean and the working environment (Hasle et al., 2012); examining the debate on the role of worker involvement and innovation in a lean setting (Angelis and Fernandes, 2012); accessing shop-floor employees and providing insights into the inner workings of a lean system showing several examples of the delicate balances and tensions (Taylor et al., 2013); discussing how intrinsic motivation is affected by lean enablers such as clear project objectives and customer requirements, continuous improvement and cross-functional teams (Ringen and Holtskog, 2013); providing empirical evidence on the impact of lean on both operational and worker health and safety performance (Longoni et al., 2013); addressing the role that people play during the different phases of the transition process to the LP (Martinez-Jurado et al., 2014); investigating the effects of lean operations, high involvement work practices and management behaviors on occupational safety (Camuffo et al., 2015); exploring the how’s and why’s of human behavior as an organization undergoes the massive transformation from traditional manufacturing to LM (Keyser et al., 2016); understanding of management communication daily practices used in the LP context (Alpenberg and Scarbrough, 2016); focusing exclusively on the content of values and behaviors of effective lean managers (Dun et al., 2016); examining the impact of perceived causal ambiguity on employee motivation during a change initiative involving the implementation of the LP (Shamsudin et al., 2016); investigating continuous improvement and job performance of shop-floor employees within the LP (Wickramasinghe and Wickramasinghe, 2016a); examining human factors associated with effective lean teams, thereby importing organization behavioral insights into the operations management (Dun and Wilderom, 2016); investigating design features of variable pay plans adopted for shop-floor workers engaged in manufacturing firms that currently implement the LP (Wickramasinghe and Wickramasinghe, 2016b); considering linkages between specific...</td>
<td></td>
</tr>
<tr>
<td>Themes</td>
<td>Statements presenting the originality of the studies</td>
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<tr>
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<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Waste management</td>
<td>Providing a coherent and consistent definition of waste, improving the understanding of waste (Thurer et al., 2016)</td>
</tr>
<tr>
<td>Leanness</td>
<td>Developing a generic framework for leanness and clarifying the major elements of the lean concept that are commonly referenced by the researchers and practicing engineers (Papadopoulou and Ozbayrak, 2005); proposing a leanness measure which delivers features such as an integrated index covering essential dimensions, variable scope of application, self-contained benchmark, up-to-date frontier and tradeoffs between competitive strategies (Wan and Chen, 2008); developing a relative, dynamic, long-term, integrative, holistic and objective measure of leanness (Bayou and Korvin, 2008); demonstrating the application of a model for measuring the degree of leanness and the extent of business improvement (Forrester et al., 2010); assessing the leanness of an organization using multi-grade fuzzy approach (Vinodh and Chinthu, 2011b); investigating the effect of inventory leanness on firm performance and presenting a size-adjusted inventory leanness measure controlling for the effect of firm size on inventory leanness (Eroglu and Hofer, 2011); assessing the leanness level of a manufacturing organization using a model based on fuzzy logic (Vinodh and Balaji, 2011); investigating the relationship between the LP and financial performance and the mediating role of inventory leanness (Hofer et al., 2012); developing a simplified leanness evaluation metric considering both efficiency and effectiveness attributes and integrating it with the lean implementation methodology (Karim and Arif-Uz-Zaman, 2013); the development and implementation of an efficient decision-making procedural hierarchy to support leanness extent evaluation using interval-valued fuzzy sets (Matawale et al., 2014b); demonstrating the large differences in the inventory leanness-financial performance link and the factors that govern it (Isaksson and Seifert, 2014); providing a measure for assessing the leanness level of an organization, adopting a holistic approach of performance measurement based on the socio-technical perspective which considers the inter-dynamics of human, system and technology (Wong et al., 2014); exploring how firm characteristics and environmental dynamism – measured in terms of innovative intensity, demand uncertainty and competitive intensity – moderate the link between inventory leanness and performance (Eroglu and Hofer, 2014); developing an efficient decision-making procedural hierarchy to support leanness extent evaluation (Azadeh et al., 2015); developing a conceptual model for leanness assessment for SMEs (Vidyadhar et al., 2016); measuring the leanness level using an integrated metric that combines efficiency, WIP performance, as well as service level and studying the impact of demand uncertainty on the leanness level dynamics (Ali and Deif, 2016); studying the importance of interactions between the lean elements and incorporating them to assess the systemic leanness (Narayananmurthy and Gurumurthy, 2016b)</td>
</tr>
<tr>
<td>Themes</td>
<td>Statements presenting the originality of the studies</td>
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<td>--------</td>
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<tr>
<td>Lean integration with other management approaches</td>
<td>Understanding the impact of lean thinking on ISO 9001 and proposing a guideline for their integration (Chiarini, 2011); mapping manufacturing execution system and lean activities onto the same framework and determining their dependency (Cottyn et al., 2011); proposing a concurrent engineering framework based on the application of IT and object-oriented methodology for LM (Pullan et al., 2013); designing a flexible lean model for integrated management systems in the real environment of an industrial SME (Rebele et al., 2014); showing that lean and international operations, knowledge management, dynamic capabilities and organizational configurations literature can be integrated to model lean roll-out processes (Secchi and Camuffo, 2016); embedding Taguchi’s quality philosophy and practice in an LM System (Gamage et al., 2016)</td>
</tr>
</tbody>
</table>

Countries |
<p>| Investigating actual LM practice and performance in Chinese plants (Tai, 2008); conducting a longitudinal study on the association between the LP and performance in British manufacturing (Menezes et al., 2010); providing insights into the adoption of lean practices in Thailand (Rahman et al., 2010); systematically comparing the adoption of lean practices in China and the USA (Hofer et al., 2011); addressing key relationships between LP, product quality performance and business performance within the Malaysian manufacturing industry (Agus and Hajinoor, 2012); measuring adherence to lean practices for Turkish automotive part suppliers (Sezen et al., 2012); investigating the degree of the LP implementation in the Indian manufacturing plants and its impact on operational metrics (Ghosh, 2012); developing a measurement framework to evaluate the lean readiness level and lean systems within Kuwaiti small and medium-sized manufacturing industries (Al-Najem et al., 2013); finding suitable LM frameworks for the Indian context (Jasti and Kodali, 2014b); reporting comprehensive insights on current awareness and implementation of LM in India and highlighting the initiatives taken by the Government of India (Thanki and Thakkar, 2014); exploring the status of lean adoption in the Indian process industries (Panwar et al., 2015a); exploring principles of lean product development in automotive companies in South Africa (Mund et al., 2015); examining the implementation of lean thinking and practices in Iran’s manufacturing industry (Zahraee, 2016); reporting the status of LM implementation in the Indian manufacturing industries (Jasti and Kodali, 2016); studying the application of LM in a company with limited resources operating in a developing economy (Pakistan) (Chaplin et al., 2016); examining a western organization implementing lean to a subsidiary in Southeast Asia (Indonesia) (Frahm, 2016); investigating the LM and its implications for business performance from a developing country standpoint (Indonesia) (Nawanir et al., 2016); investigating the degree to which LM practices are being implemented within Brazilian SMEs (Filho et al., 2016); examining the LM in companies operating in a context of economic instabilities and market changes (Italy) (Bevilacqua et al., 2016); studying individual practices used in the US industry (Abolhassani et al., 2016) |</p>
<table>
<thead>
<tr>
<th>Themes</th>
<th>Statements presenting the originality of the studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methodology of the study</td>
<td>Analyzing the causes for the limited adoption of LM based on the study of multiple cases (Lasa et al., 2009); studying the adoption of lean practices in an Asian context using survey data as opposed to case studies (Rahman et al., 2010); applying the QFD approach for linking the lean competitive bases, lean attributes and lean enablers (Vinodh and Chintha, 2011a); combining the balance scorecard and other group decision-making methods such as Delphi, Nominal Group Technique and DEMATEL, to introduce a lean strategy map for the auto part manufacturers (Seyedhosseini et al., 2011); establishing the validity and reliability of the model measuring adherence to lean practices, through rigorous statistical analysis (Sezen et al., 2012); utilizing a systematic approach to the analysis of LM system and considering the leaness practices or enablers in an integrated and not an isolated manner (Vinodh and Joy, 2012); using a fuzzy logic advisory system to assess the LM within SMEs (Achanga et al., 2012); developing a mathematical model and a systematic methodology to estimate the manufacturer perceived effectiveness of reduction of manufacturing wastes by implementing appropriate lean strategies within their limited time (Amin and Karim, 2013); measuring the value of the influence of lean attributes on manufacturing systems by using fuzzy membership functions and considering the decision makers' attitude toward risks (Anvari et al., 2013); taking into consideration the number of the articles reviewed (178 in 24 journals) and published over a time span of 20 years (Jasti and Kodali, 2014a); applying, through a large-scale empirical study, a multilevel and simultaneous dimensional test of the congruence between national culture and LM practices (Kull et al., 2014); integrating AHP and DEA with desirable and undesirable factors to evaluate the lean tools and techniques and to rank the aspect of efficacy (Anvari et al., 2014); considering as the unit of the literature review analysis, the lean phenomenon itself and not the organization (Samuel et al., 2015); obtaining objective information about the implementation of lean in companies other than the Japanese (Bamford et al., 2015); developing a more comprehensive understanding of lean by considering various dimensions of organizational culture, LM and performance, rather than focusing on a specific set of variables and by relying on a well-established OC model, the global leadership and organizational behavior effectiveness model (Bortolotti et al., 2015b); evaluating 29 GLOBE leadership attributes from the perspective of an ideal lean leadership profile (Gelei et al., 2015); applying the Bayesian network for business performance measures considering both the tangible and intangible results due to LM implementation under changing business conditions (Buyukozkan et al., 2015); examining the adoption of lean latent constructs and their effect on lean-based quality and productivity improvement model using SEM (Al-Tahat and Jalham, 2015); identifying the enablers for lean implementation in the manufacturing sector, to establish a relationship among them using interpretive structural modeling and to rank them using an interpretive ranking process (Sharma et al., 2016a)</td>
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### Themes

#### Lean knowledge and training

<table>
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<th>Statements presenting the originality of the studies</th>
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<td>Developing a model of the role of external information sources (training sessions, plant visits and conferences) in the success of lean (Boyle et al., 2011); managing the training needs of temporary workers to enhance the efficiency and effectiveness of lean (Tan et al., 2013); examining the relationships between dimensions of learning organization and contextual variables in companies that are implementing the LM (Tortorella et al., 2015); identifying which mechanisms for transferring lean knowledge are most important according to different contextual conditions (the maturity of lean in a subsidiary and headquarters–subsidiary relations) as lean evolves over time (Boscari et al., 2016); analyzing the effect of cross-training the lean tool in knowledge transfer processes in product development processes (Stanica and Peydro, 2016)</td>
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<td>Proposing a method of feature selection during incremental lean product development to maximize the customer perceived value for the changes (Gautam and Singh, 2008); monitoring the maintenance operation during the transition process from a non-lean to a lean production system (Moayed and Shell, 2009); developing a simple yet effective game on the LM (Ozelkan and Galambosi, 2009); providing a practical definition of core competence and application of theory within a lean implementation, trialed and validated in an industrial setting (Parry et al., 2010); focusing on a bespoke change strategy for lean (Bhasin, 2011b, 2012b); developing a decision framework for the selection of the best sequence of VSM tool application to maximize the performance of a lean manufacturer (Ramesh and Kodali, 2012); presenting the best practice case studies from selected manufacturing SMEs that have recently improved or deployed lean strategies (Panizzolo et al., 2012); determining the optimum route for lean implementation taking into consideration various factors (implementation cost, benefits, time of completion, technological capabilities, administrative constraints and the degree of risk involved) that govern the effective implementation of lean (Almomani et al., 2014); developing a new approach to evaluate the optimal quantity to be produced when a customer places an order, considering the impact of the risk of non-sale on the total cost of the LP (Lyonnet and Toscano, 2014); exploring the partial implementation of lean (Bamford et al., 2015); analyzing, for a single machine, which shop-floor variables should be prioritized by lean-based improvement programs that reduce the lead time (Filho and Barco, 2015); studying, in the case of the LP, the coming together of different concepts of management control (Tillema and Steen, 2015); analyzing what practitioners describe – in their own words – as critical for implementing lean in their factories (Netland, 2016); developing and testing a financially driven method for objectively targeting lean interventions (Darlington et al., 2016); presenting the ongoing work toward an interface for digitizing the LP methods using a cyber-physical system (Kolberg et al., 2016); analyzing an inventory model by considering a random defective rate in a cleaner multi-stage LM system (Tayyab and Sarkar, 2016)</td>
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<th>Themes</th>
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<td>Lean implementation assessment</td>
<td>Offering a practical and easy-to-use lean assessment tool (Taj, 2005); presenting an adaptive lean assessment approach that provides an effective way to guide the lean process, using computer-based decision support tool for lean (Wan and Chen, 2009); examining whether an organization has adopted lean as a philosophy, and deducing the phase of a lean journey the organization has reached (Bhasin, 2011a); gaining an understanding of how the LM can be measured (Chauhan and Singh, 2012); developing a comprehensive assessment tool for lean transformation (taking into account the objectives of the enterprise, the stakeholders’ expectations and a variety of system-change initiatives) and identifying the relative importance weights for every element (Gil and Turkan, 2013); developing an evaluation module of lean exploring the gray numbers theory (Matawale et al., 2014a); concentrating on lean assessment within a qualitative and quantitative perspective (Pakdil and Leonard, 2014); proposing a way to measure the degree of the LM (Lucato et al., 2014); proposing a method to assess the LP in a manufacturing cell (Marodin et al., 2015); assessing the adoption of lean product development enablers (Tortorella et al., 2016); measuring the current product development processes and comparing them to the lean best-case scenario (Al-Ashaab et al., 2016); evaluating warehouse performance on the basis of lean assessment (Sharma and Shah, 2016)</td>
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<td>Modeling lean – lean constructs</td>
<td>Providing a framework that identifies the most salient dimensions (internal and external) of the LP (Shah and Ward, 2007); creating a conceptual framework for a set of lean principles within the context of information management (Hicks, 2007); presenting the essentials of the LP and conveying its most salient philosophical elements (Pettersen, 2009); operationalizing and empirically validating the concept of complementarity of two of the main lean bundles, namely, JIT and TQM (Furlan et al., 2011); identifying the key aspects that should be included for the LP (apart from internal aspects at the shop-floor level and value chain elements, work organization and geographical context should also be considered) (Moyano-Fuentes and Sacristan-Diaz, 2012); developing a model for measuring adherence to lean practices, where a lean construct is uni-dimensional (Sezen et al., 2012); conceptualizing the LP as two bundles (internal and external) that collectively encompass all lean practices and testing the synergy between these lean bundles at the firm level, instead of at the plant level (Hofer et al., 2012); proposing a systematic lean methodology based on lean principles and continuous improvement techniques (Karim and Arif-Uz-Zaman, 2013); formulating a reference framework for the enablers that Toyota has used for lean product development (Khan et al., 2013); presenting the lean “Leadership People Process Outcome” model (Dibia et al., 2014); testing a model of lean (consisting of constructs such as deployment, engagement, training, processes, drivers and culture) on companies that have achieved successful and sustained lean (Sisson and Elshennawy, 2015); proposing an integrative structure of lean thinking (e.g. principles, practices, waste identification and value stream mapping) within the maintenance activities (Mostafa et al., 2015); studying three dimensions of lean, the technical, rhetorical and organizational (Langstrand and Drotz, 2016); focusing on segmenting the set of lean criteria into some meaningful portions (Sharma et al., 2016b)</td>
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<td>Themes</td>
<td>Statements presenting the originality of the studies</td>
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<td>Manufacturing sub-sectors and</td>
<td>Explaining how some lean techniques can improve productivity and quality in red meat-cutting plants (Simons and Zokaei, 2005); evaluating the current state of the LM in some selected plants in electronics, telecommunication/wireless and computer industries in the Republic of China (Taj, 2005); determining the degree of use of some of the most representative LP practices in the Spanish ceramic tile industry (Bonavia and Marín, 2006); studying lean visual communication from the tools being developed on the shop-floor throughout the aerospace companies (Parry and Turner, 2006); realization of critical factors determining a successful implementation of the LM within the environment of SMEs (Achanga et al., 2006); taking a case-based approach (in the steel industry) to address the view that the process sector is less amenable to many lean techniques (Abdulmalek and Rajgopal, 2007); exploring the relationships between the general application of lean principles primarily in the domain of engineering and product development (where much of the character of a product is determined) and success in markets for premium products (Oliver et al., 2007); examining the relationships of two aspects of lean strategy – lean design and lean manufacturing – to overall firm performance of the automotive supply industry (Jayaram et al., 2008); analyzing the decision to introduce a reverse-logistics system for remanufacturing used products in an LP environment (Rubio and Corominas, 2008); assessing the culture and understanding the influence of culture on the applicability of lean principles to industrialized housing (Hook and Stehn, 2008); tracing the challenges and accomplishments that a large, global organization (European manufacturer of food processing equipment) faced on its journey to achieving a vibrant and sustained lean program (Scherrer-Rathje et al., 2009); reconceptualizing the relationship between lean implementation and production costs, with evidence from the F-22 program, synthesizing the empirical data with other existing theories of complexity and learning (Browning and Heath, 2009); identifying the lean concepts (promoted by the use of VSM) which have limited use in discontinuous flow-line manufacturing system-type companies (Lasa et al., 2009); implementing the LM in a material handling system of a petroleum drill bit manufacturing company (Green et al., 2010); providing a detailed analysis of the implementation of lean operations in the agricultural sector in Brazil (Forrester et al., 2010); assessing the extent to which LP practices are used and their relationships, at the cell level, not in the plant as a whole (Saurin et al., 2011); applying lean principles (in a straightforward manner) downstream the point (of semi-process industries) where process production turns into discrete production (Pool et al., 2011); examining the use of LM in the textile industry (Hodge et al., 2011); comparing the validation of the lean practices constructs, as well as their impact on firm performance between manufacturing and service firms (Alsmadi et al., 2012); analyzing the current status of the use of LM practices among food-processing SMEs in Europe (Dora et al., 2013)</td>
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Themes

Manufacturing sub-sectors and units

Analyzing the extent to which the LP is compatible with the nature of complex systems such as construction sites, which have different characteristics of complexity in comparison with manufacturing plants (Saurin et al., 2013); linking specific process industry characteristics and the structure of process industry operations to specific lean principles (Lyons et al., 2013); providing some key enablers for the successful implementation of lean tools in Indian tyre manufacturing (Gupta et al., 2013); studying the applicability of LM to a different environment: a seasonal food industry (Tanco et al., 2013); applying a customized flowchart tailored for the aerospace manufacturing industry, supported by the lean principles and with focus on automation (Barbosa et al., 2014); investigating lean at Blue Star Limited, Dadra Plant, India, engaged in manufacturing air-conditioning coils, and in particular, condenser and evaporator coils for air-conditioning systems (Das et al., 2014); contrasting the common characteristics of SMEs with the realm of lean “genius” – Toyota (Rymaszewska, 2014); studying lean in the New Zealand apple and pear (pipfruit) industry (Doevendans et al., 2015); applying lean thinking to information management to improve the performance of an automotive company (Bevilacqua et al., 2015); demonstrating how the LM can help improve work efficiency of a company’s sheet-metal stamping process (Choomlucksana et al., 2015); providing information on the application of lean thinking in product engineering, not only in product design and development in automotive companies (Mund et al., 2015); examining the concurrent effect of lean fundamentals and relationship enterprise approach of collaboration on new product development in the automotive domain (Tuli and Shankar, 2015); developing a new lean action plan that can be adopted by SMEs, particularly by those operating in the food sector (Vlachos, 2015); developing a methodology that can help SMEs, in the manufacturing sector, to select an appropriate lean tool (Alaskari et al., 2016); identifying the most dominant factors influencing the implementation of lean remanufacturing principles in the context of advanced production and sustainable systems (Vasanthakumar et al., 2016); investigating the adaptability of the LM in a complex small and medium-sized food-processing enterprise environment (Dora et al., 2016); studying lean intervention projects in a UK low-volume manufacturer of large vehicles (Darlington et al., 2016); testing the lean principles in a service and administrative context of a textile SME (Manfredsson, 2016); combining lean principles with the boundary spanning theory to explore lean in the context of the operations management – applied service interface space within a large aerospace organization (McAdam et al., 2016); examining the mediating role of lean bundles on operational performance (Pont et al., 2008); proposing a dynamic multi-dimensional LM performance model that not only focuses on the intangible and intellectual assets but also embraces various time horizons and interests of multiple stakeholders (Bhasin, 2008); adopting an SEM framework for the examination of non-financial manufacturing performance measures as potential sources of variation in lean strategies’ financial performance effects (Fullerton and Wempe, 2009); studying how to survive in recession by means of lean principles and philosophies (Singh et al., 2009); studying the integration between operations management and Lean effects
Themes Statements presenting the originality of the studies

and HRM practices associated with lean production and the effects on firm performance (Menezes et al., 2010); seeking the complementarity effects of lean bundles, namely, JIT and TQM, on operational performance (Furlan et al., 2011); exploring the relationships between the LM, environmental management practices and environmental and business performance (Yang et al., 2011); examining the role of contingency variables such as environmental dynamism and industry clockspeed in the relationship between internal lean practices and operational performance (quality, delivery, flexibility and cost) (Chavez et al., 2013); investigating the impact of the LM on financial performance, and more specifically, how this impact has been measured, based on more than 20 years of experience in LM implementation (Camacho-Minano et al., 2013); explaining how lean operations and lean purchasing have distinct characteristics that influence the plant’s gross margin and assessing the influence of two different environmental contexts (complexity and dynamism) on the effects of lean practices (Azadegana et al., 2013); studying how the LM can affect organizational performance, not only at the operations level but also at the business level (Nawanir et al., 2013); highlighting the key areas of the LP that contribute to superior business performance (Losonci and Demeter, 2013); understanding the LP and its dynamics for the viability of the firms (Dominici and Palumbo, 2013); providing empirical evidence of the relationships among lean management accounting practices, operations performance and financial performance (Fullerton et al., 2014); analysis of the effects of all the most essential lean methods (JIT, automation, kaizen, TPM, VSM) on the most currently important measures of operational performance (cost, speed, dependability, quality and flexibility) (Belekoukias et al., 2014); developing an integrative stage-based model of lean and sustainable outcomes (which considers lean as more than a toolkit, but a philosophy and strategic direction also) (Piercy and Rich, 2015); studying the contingency effect of technological turbulence on the lean-performance link (Chavez et al., 2015); providing support for the sand cone of cumulative performance due to lean implementation (Bortolotti et al., 2015a); studying the effect of JIT/lean on performance of SMEs (Filho et al., 2016).

Impact on lean

Studying the relationship between LM practices, inventory turnover (different types of inventories) and contingency factors (Demeter and Matyusz, 2011); demonstrating how different manufacturing process choices (craft and mass production) influence the lean transformation process (Deflorin and Scherrer-Rathje, 2012); investigating the dynamics (uncertainty caused by demand variation and system’s availability) associated with applying some of the lean principles to a manufacturing cell (Deif, 2012); gaining insight regarding how management accounting and control practices work together to support an LM strategy (Fullerton et al., 2013); demonstrating the synergistic relationship between manufacturing technologies and lean practices (Khanchanapong et al., 2014); quantitatively testing the impact and complementarities between various control forms in a lean organization (Kristensen and Israelsen, 2014); exploring the causal relationships among the drivers which can be used for decision-making to implement lean easily and effectively (Sangwan et al., 2014); exploring whether or
meaningful themes. Thus, the following themes of originality value were revealed, which refer to the manufacturing context: lean literature review, theory, future research agenda, barriers-difficulties, knowledge and training, integration with other management approaches, effects, implementation issues, implementation assessment, modeling and constructs, motivation; waste management; human factor involved in lean; leanness; the countries which companies operate in; the manufacturing sub-sectors and units where lean is implemented; the methodology of the study of lean; and the impact on lean.

**Discussion**

*Discussing the profile of the reviewed articles*

The majority of the journals publishing LM articles belong to the publishers of Emerald and Elsevier/Science Direct, while the majority of the LM articles are published by Emerald and Taylor and Francis. A small number of journals have published the majority of LM articles at each publisher, which reflects the Pareto principle 80/20. This means that, at each publisher, a “vital few” journals have published the majority of the

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**Table III.**

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<th>Themes</th>
<th>Statements presenting the originality of the studies</th>
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<tr>
<td>Lean motivation</td>
<td>Analyzing an integrated framework of the factors that might explain the reasons why companies adopt the LP and interrelationships among these factors in the adoption process (Martinez-Jurado and Moyano-Fuentes, 2014)</td>
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LM articles, while the “useful many” journals have published the minority of the LM articles. However, the Pareto principle (in terms of the journals and the published LM articles) is clearly reflected not only in the present SLR but also in the literature review studies of Jasti and Kodali (2014a) and Jasti and Kodali (2015). The International Journal of Production Research, Journal of Manufacturing Technology Management and Production Planning and Control Journal are the journals with the highest number of the LM articles reviewed in the present SLR. These journals also rank among the journals with the highest number of LM articles of the literature review studies of Bhamu and Sangwan (2014) and Jasti and Kodali (2015). The increase of the LM articles with the passing of time is not only observed in the present SLR but also in the literature review studies of Jasti and Kodali (2015), Samuel et al. (2015) and Narayanamurthy and Gurumurthy (2016a). Surveys and case studies are presented in the majority of the LM articles of the present SLR, as well as in the literature review studies of Jasti and Kodali (2014a), Samuel et al. (2015) and Narayanamurthy and Gurumurthy (2016a). It is worth noting that the manufacturing sub-sectors mostly examined in the surveys and case studies of the present SLR are similar to the respective sub-sectors examined in the articles reviewed by Jasti and Kodali (2015) and Narayanamurthy and Gurumurthy (2016a). Finally, the present SLR reveals that the USA and UK are the countries where the highest number of LM studies has been conducted, which is in line with the findings of the literature review studies of Jasti and Kodali (2014a) and Bhamu and Sangwan (2014).

Discussing the originality value of the LM studies
The majority of the themes of the originality value statements refer to the three phases of the lean context, meaning its pre-implementation phase, implementation phase and post-implementation phase (Bhamu and Sangwan, 2014). More specifically, themes with regard to the lean literature review, theory, future research agenda, barriers-difficulties, knowledge and training, modeling and constructs, motivation and the human factor involved in lean concern the LM pre-implementation phase. Themes describing lean implementation issues and assessment and waste management concern the LM implementation phase itself, while themes describing lean effects and leanness concern the LM post-implementation phase (Bhamu and Sangwan, 2014). On the other hand, there are also themes of originality value which do not concern the lean context itself, such as the integration of lean with other management approaches, the countries which companies operate in, the manufacturing sub-sectors and units where lean is implemented, the methodology of the study of lean and factors which have an impact on lean. From the above, it is apparent that the originality value of the LM studies do not concern only the lean methodology itself but also the broader environment where it is developed.

Conclusions
The literature review articles of LM published so far focus on various subjects excluding the originality value of the LM studies carried out worldwide. This has strongly motivated the author of the present study to systematically review the literature focusing exclusively on the originality value of the existing LM studies. The contribution of the present SLR is attributed, firstly, to the fact that the subject that is analyzed has not been previously reviewed; secondly, to the analytical way that the originality value statements are presented; and finally, to the summarized picture of the originality value statements that is revealed though formulating the respective themes.
Portraying the originality value of the existing LM studies would help researchers better highlight the literature and research gap, as well as practitioners formulate their LM implementation plans.

A vital few journals contribute mostly to the evolution of the LM publication, which is increasing with the passing of time. The themes of originality value of the published LM studies concern mostly the pre-implementation, implementation and post-implementation phases of LM. However, they also concern factors outside the LM context, meaning other management systems, environment of a country, manufacturing sub-sectors and units, methodological research approach of LM and factors influencing LM implementation.

**Limitations and future studies**

The present SLR suffers from some limitations as every study does, even a literature review study. More specifically, the main limitations of the present SLR include the limited number of the publishers used for the literature review; the exclusion of studies examining an individual lean practice/tool/technique, lean – six sigma, lean – agile manufacturing, lean – green management, lean in the supply chain network, as well as lean in services, and finally, the subjectivity of grouping the large number of the originality value statements into themes. The above limitations can set the foundations for further literature review studies on LM. For example, focusing on all the available publishers and journals, studying not only the lean phenomenon individually but simultaneously with other managerial approaches which have many common elements with lean and incorporating into the review study the supply chain network of a company, as well as the services sector, could be among the main dimensions of the future research agenda.

**References**


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