Key themes of practical implications of Lean, Six Sigma and Lean Six Sigma in the public administration sector. A Systematic Literature Review

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Abstract

Purpose: The purpose of this paper is to identify the key themes of practical implications of Lean, Six Sigma (SS) and Lean Six Sigma (LSS) in the public administration sector.

Design/methodology/approach: A Systematic Literature Review (SLR) was conducted based on the following academic publishers: Emerald, Elsevier/Science Direct, Sage, Springer Link, Taylor & Francis, and Willey online. Fifty-six articles published between 2004 and 2020 were found. Based on the “affinity diagram”, the practical implications of Lean, SS and LSS were classified into key themes.

Findings: The plethora of the practical implications identified were classified into fourteen meaningful key themes which can be further classified into two broad categories, namely “themes concerning the Lean, SS and LSS approaches themselves”, and “themes concerning factors outside the Lean, SS and LSS approaches”.

Research limitations/implications: The fact that some publishers might have been missed out and the subjectivity in applying the “affinity diagram” constitute the main limitations of this study.

Practical implications: The key themes of practical implications can guide practitioners to further develop Lean/SS/LSS in public administration and academics to focus on specific research subjects.

Originality value: This is the first SLR presenting the key themes of practical implications of Lean, SS and LSS in the public administration sector.

Keywords: Lean, Six Sigma, Public administration, Systematic literature review, Practical implications.

Paper type: Literature review

1. Introduction

The public sector, which has a limited budget, should do more with fewer taxpayer revenues. No public organization can afford to be wasteful (Pedersen and Huniche, 2011b; Antony *et al.*, 2016). In the last two decades, several efforts have been made in public sector organizations to eliminate waste, and crack down on bureaucracy and the culture of “silos” (Fletcher, 2018).

Lean, Six Sigma (SS) and Lean Six Sigma (LSS) are continuous improvement methodologies that can be applied in the public sector to ensure reliable and on-time delivery of quality services and reduce cost (Antony *et al.*, 2017b; Fletcher, 2018). LSS helps public organizations assess what people/citizens value and eliminate waste accordingly, thus saving money, increasing citizen satisfaction, and achieving better utilization of employee skills and better collaboration amongst departments (Antony *et al.*, 2017a; Fletcher, 2018; Alblooshi *et al.*, 2020).

The application of Lean, SS and LSS in the public sector has not been widely explored (Antony *et al.*, 2017b; Elias and Davis, 2017). The research studies on these methodologies in the public sector, focus on issues such as their critical success factors, benefits, and difficulties (Radnor and Walley, 2008; Pedersen and Huniche, 2011a,b; Rodgers *et al.*, 2019; Antony *et al.*, 2019). Few studies have been conducted in the past that critically review the literature on services (Gupta *et al.*, 2016) and even less on the public sector. More specifically, Rodgers and Antony (2019) reviewed articles related to Lean, SS and LSS in the public sector, and identified the literature gaps and the future research agenda. Lukrafka *et al.* (2020) reviewed Lean literature in the public sector, identified gaps and suggested avenues for future research. From the above it is obvious that studying the Lean, SS and LSS practical implications lay outside the scope and aims of the literature review studies of Rodgers and Antony (2019) and Lukrafka *et al.* (2020). Based on the existing literature gap, Psomas and Antony (2019) suggest more Systematic Literature Review (SLR) studies regarding Lean in the public sector, while Antony *et al.* (2020) suggest literature review studies focusing on the practical implications of Lean and LSS. Bearing in mind the above identified literature gap as well as the suggestions of authors, this study focuses on the practical implications of Lean, SS and LSS in the public administration sector. The SLR is conducted to determine the plethora of practical implications of these methodologies, which in turn are classified into meaningful key themes through applying the “affinity diagram” quality tool. Researchers, academics and practitioners can more easily focus on the key themes of practical implications rather than on a chaotic collection of information (Antony *et al.*, 2020). In addition, the key themes that are supported in the academic literature by most references are identified. Thus, professionals in the public administration can benefit from giving priority to the practical implications of those themes mostly supported in the literature. Moreover, researchers can identify specific subjects for future research studies in the field of Lean, SS and LSS.

The present SLR aims at answering the following research question:

RQ: What are the key themes of the practical implications of Lean, SS and LSS in the public administration sector?

The structure of the paper is as follows: in the next sections, the SLR methodology is described and the results of the SLR are presented. The results are then discussed, and the

conclusions are presented. Finally, the limitations of the study and the proposals of the authors for further literature review studies are presented.

2. Methodology

In order to determine the practical implications of Lean, SS and LSS, the SLR methodology was adopted, given that it is a scientific, systematic and transparent process for conducting a literature review (Tranfield *et al.*, 2003). This methodology has also been adopted by Rodgers and Antony (2019), Alblooshi *et al.* (2020), Antony *et al.* (2020) and Lukrafka *et al.* (2020) to review the Lean, SS and LSS literature. According to Tranfield *et al.* (2003), the SLR includes three stages: planning the review, conducting the review and reporting and dissemination.

2.1 Stage I – Planning the review

At this stage, the review protocol was developed (Tranfield *et al.*, 2003). The review team consisting of the authors of the present study, identified the sample that was the focus of the study, the search strategy for identifying the relevant studies, the review criteria, the process of inclusion and exclusion of the articles and their quality assessment method (Tranfield *et al.*, 2003).

Only academic journals publishing peer-reviewed articles were considered, while books, online sites and grey literature were excluded (Rodgers and Antony, 2019). For this purpose, the databases of the following academic publishers were searched: Emerald, Elsevier/Science Direct, Sage, Springer Link, Taylor & Francis, and Wiley online (Alblooshi *et al.*, 2020; Lukrafka *et al.*, 2020). Articles presenting literature reviews, conceptual and descriptive studies, case studies and surveys were included in the sample (Antony *et al.*, 2020).

The time frame selected for the review was 2004-2020. The year 2004 was considered as the beginning of the present SLR, since the earliest paper identified in this review was published in 2004 (Rodgers and Antony, 2019).

2.2 Stage II – Conducting the review

The second stage of the review process includes identification of research, selection of studies, study quality assessment, data extraction and monitoring progress and data synthesis (Tranfield *et al.*, 2003).

According to Rodgers and Antony (2019) and Lukrafka *et al.* (2020), the public administration sector includes the following areas: local government (organizations such as local authorities, municipalities, policing, etc.); general government including all national operations (such as defense, etc.); and the public sector without reference to an individual branch, department or operation. It is worth noting that public healthcare and education organizations were excluded from the present study. The search resulted in a plethora of related articles. However, based on the inclusion and exclusion criteria, a reduced number of articles emerged. All the articles were screened and examined for their fit with the objective of the study by taking into consideration the title, abstract and keywords of each article or by reading the full text. This process resulted in a final sample of 56 articles published in a total of 25 journals.

An excel spreadsheet was created including the title of the article, year of publication, journal, authors, type of paper, geographical area of study and the practical implications of Lean/SS/LSS (Tranfield *et al.*, 2003). The quality tool "affinity diagram" was applied to classify the practical implications of Lean, SS and LSS into key themes, based on their affinity or inherent/natural similarity (Antony *et al.*, 2020). In the same vein, Gupta *et al.* (2016), Rodgers and Antony (2019), Lukrafka (2020), and Alblooshi *et al.* (2020), classified the findings of the Lean, SS and LSS literature review in the public sector into main categories-themes.

2.3 Stage III–Reporting and dissemination

Based on the excel spreadsheet developed, the sample articles are critically presented. Moreover, based on the themes revealed, an in-depth examination of the practical implications of Lean, SS and LSS in the public administration sector is provided.

3. Results

3.1 Profile of reviewed articles

More than half of the sample articles (31 articles, 55.4 %) have been published by Emerald, while a percentage of 41.4% by Taylor & Francis (23 articles) and only 3.6% by Elsevier (2 articles). Few journals from each publisher have published the sample articles. Emerald is the publisher including the majority of the journals (15 out of 25, 60.0%) publishing the sample articles. It is worth noting that 5 out of the 25 journals (20%) published 31 relevant articles (55.4% of the sample articles). The diachronic evolution of the sample articles shows that there is an upward trend, with more than half of them (57.14%) being published between 2015 and 2020 (Figure 1). This reveals a recent interest in studying Lean, SS and LSS in the public sector.

Figure 1: Articles per year of publication

The case study is the most popular article type (57.1% of the sample articles), followed by the literature review studies (21.4 % of the sample articles). Only a small number of the sample articles are based on a survey (14.2 % of the sample articles). The remaining articles (7.14 %) are conceptual studies. The majority of the sample articles (64%) examined exclusively the implementation of Lean in the public administration sector, while a percentage of 25% focused on LSS.

The studies presented in the sample articles were conducted in 15 countries on 5 continents. Europe is ranked top, based on both the number of countries where the studies were conducted (9 countries) and the sample articles (34). It is followed by North America (2 countries, 5 articles) and Australia-New Zealand (2 countries, 2 articles). Only one study was found in Asia and one in South America. The country with the largest number of the sample articles is the UK (15 articles), followed by Norway (5 articles), Sweden (5 articles), the USA (4 articles) and Denmark (4 articles).

3.2 Practical implications of the Lean, SS and LSS

A plethora of practical applications of Lean, SS and LSS methodologies were revealed. These implications were classified through the affinity diagram into key 14 themes (Table I), which are presented in descending order based on the number of the supporting literature references (Figure 2).

Catergories of themes	Themes of practical implications
Themes concerning the Lean, SS and LSS approaches themselves	Waste management Lean, SS or LSS barriers – difficulties Human factor involved in Lean, SS or LSS Lean, SS or LSS training/knowledge Lean/SS/LSS assessment framework and guidelines Lean/SS/LSS benefits Lean/SS/LSS implementation issues Lean/SS/LSS definition
Themes concerning factors outside the Lean, SS and LSS approaches	Countries where Lean/SS/LSS is implemented Citizens –Customers Supply chain Management Government Factors affecting Lean/SS/LSS implementation Lean/SS/LSS integration with other management approaches

Table I: The practical implication of Lean, SS or LSS studies

Figure 2: The number of the literature references per theme of practical implications

4. Discussion

4.1 The Profile of the reviewed articles

Only 56 articles were found during the 17-year period of the literature review, which means that there is a limited availability of Lean, SS or LSS studies in public administration. Thus, a fertile ground is provided for further studying Lean, SS, and LSS in the public administration sector.

The Emerald publisher as well as the Total Quality Management and Business Excellence journal and the International Journal of Lean Six Sigma can be the primary literature sources for academics and practitioners who are interested in reading Lean, SS or LSS articles. The case study is the most widely used research method, similar to the findings of Rodgers and Antony (2019), while there is a lack of a significant amount of survey research, which is in line with the findings of Gupta *et al.* (2016).

Europe is ranked top in terms of both the number of countries where the Lean, SS or LSS studies were conducted and the number of the sample articles, similar to the studies of Rodgers and Antony (2019) and Lukrafka *et al.* (2020). The absence of articles from South America and Africa may be due to the fact that the application of Lean, SS and LSS in the public sector is still in its infancy and its suitability is still being investigated (Rodgers and Antony, 2019). The UK is the country with by far the most studies on Lean, SS and LSS, which is also confirmed by Rodgers

and Antony (2019) and Lukrafka *et al.* (2020). Thus, specific geographical regions are more highly suggested for further studying Lean, SS and LSS issues in the public administration sector.

Similar to Rodgers and Antony (2019), the present SLR reveals a diachronic increase in the Lean, SS and LSS articles related to the public administration sector. This is optimistic because it shows an obvious increase in the interest of both academics and practitioners in these improvement methodologies.

4.2 The practical implications of Lean/SS/LSS

A significant number of key themes were revealed which indicate the broad practical implications of Lean, SS and LSS. Taking into consideration the content of the themes revealed and following the approach of Antony *et al.* (2020), two broad categories of themes can be formulated, namely “themes concerning the Lean, SS and LSS approaches themselves”, and “themes concerning factors outside the Lean, SS and LSS approaches” (Table II).

Taking a more in-depth look at the first category and the respective themes, the following three sub-categories can be formulated (Antony *et al.*, 2020): the pre-implementation phase of Lean/SS/LSS (including the majority of the themes, namely the human factor needed in Lean/SS/LSS, Lean/SS/LSS barriers/difficulties, Lean/SS/LSS guidelines, Lean/SS/LSS training/knowledge, and Lean/SS/LSS definition), the implementation phase itself (including two themes, namely waste management and Lean/SS/LSS implementation issues), and finally the post-implementation phase (including only one theme, namely the Lean/SS/LSS benefits). From the above implementation phases and the respective themes, it is apparent that managers in the public administration sector should focus primarily on the practical implications of the pre-implementation phase of Lean/SS/LSS.

The themes that are supported by most references (Figure 2) include human factors involved in Lean/SS/LSS, Lean/SS/LSS benefits and Lean/SS/LSS implementation issues. The fact that these themes correspond to the three sub-categories mentioned above, highlights the practical significance of all the implementation phases of Lean/SS/LSS, and thus of the broad category “themes concerning the Lean, SS and LSS approaches themselves”.

5. Conclusions and suggestions for further studies

The practical implications of Lean, SS and LSS in the public administration sector were determined and classified into fourteen key themes using the "affinity diagram". These themes can be further categorized in two broad categories namely “themes concerning the Lean, SS and LSS approaches themselves”, and “themes concerning factors outside the Lean, SS and LSS approaches”. The themes of the first category can be further classified into three sub-categories, namely the pre-implementation phase, the implementation phase itself, and finally the post-implementation phase of Lean/SS/LSS. The Lean/SS/LSS practical implications and the key themes revealed can motivate academics to conduct further research by looking in depth at significant issues in this area. Moreover, this SLR provides an overview of the practical implications of Lean, SS and LSS that will guide practitioners to further develop such improvement methodologies in various public administration services.

The limited number of the academic databases used to collect articles, the exclusion of books, websites and gray literature, the exclusion of public healthcare and education organizations and the subjectivity of grouping the practical implications are the main limitations of the present SLR, based on which future literature review studies can be conducted.

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