ISSN 1980-5411 (On-line version)
Production, 30, e20200030, 2020
DOI: 10.1590/0103-6513.20200030

Thematic Section - Present and Future of Production Engineering

Critical success factors-based taxonomy for Lean Public Management: a systematic review

Rodrigo Goyannes Gusmão Caiado[a]*, Daniel Michilini Carocha[b], Adriana Karla Goulart[b], Guilherme Luz Tortorella[c]

[a]Universidade Federal Fluminense, Niterói, RJ, Brasil

[b]Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brasil

[c]Universidade Federal de Santa Catarina, Florianópolis, SC, Brasil

*rodrigoggcaiado@gmail.com

Abstract

Paper aims: This paper aims to critically review the Lean-based methodologies (e.g. Lean production, Lean Six Sigma, and lean government) in Public Administration to locate the critical success factors (CSFs) for lean public management implementation.

Originality: It is one of the first systematic literature reviews to explore the CSFs of Lean-based methodologies in the public sector with a strategic focus on the l-government.

Research method: This research is based on a systematic review of 83 articles that were published on Lean-based methodologies in public sector organizations in well-known academic databases.

Main findings: There were identified 28 CSFs, grouped by a taxonomy of five significant lean public management categories that deal with the spread of Lean-based methodologies in different public sector environments and can be used to guide continuous improvement (CI) in the public sector.

Implications for theory and practice: This paper can provide a better panorama to understand the present status of Lean-based methodologies towards public practices, as well as, to bridge the gap of a systematic approach (taxonomy) that could direct CI implementation in the public sector, considering a proper understanding of distinct public management characteristics, which can effectively guide practitioners, facilitating their decision-making.

Keywords

Lean thinking. L-government. Critical factors. Literature review. Public sector.

How to cite this article: Caiado, R. G. G., Carocha, D. M., Goulart, A. K., & Tortorella, G. L. (2020). Critical successes factors-based taxonomy for Lean Public Management: a systematic review. *Production*, *30*, e20200030. https://doi.org/10.1590/0103-6513.20200030.

Received: Mar. 18, 2020; Accepted: Sept. 14, 2020.

1. Introduction

Over recent years, the public sector all over the world is facing pressures to reduce costs and budgets without deteriorating service levels. To combine efficiency and economy in public organizations, it is necessary to reduce the administrative burden for businesses and governments. At the same time, it helps to increase customer-centricity and to stimulate economic growth and innovation (Janssen & Estevez, 2013). The so-called New Public Management (NPM) (Christensen & Laegreid, 2001), has been encouraging the public sector to embrace private sector practices through more market-oriented elements. One example is the concept of 'lean' (Radnor & Johnston, 2013; Ferlie, 2002; Pollitt & Bouckaert, 2004; Bhatia & Drew, 2006), which originates from the manufacturing industry (Bharosa et al., 2012), to achieve more control, efficiency and performance than the traditional Weberian view (Maarse & Janssen, 2012). In essence, the public sector specifically considers the

fulfillment of the values that guide the management of the public service while continuous improvement (CI) methodologies (e.g. lean and Six Sigma) are industry-oriented methodologies (Juliani & Oliveira, 2019), which would make it necessary to customize or personalize their implementation in public service organizations.

Regardless of the specific function or service, or country of operation, the public sector plays an important role in the world economy and has many operational challenges and restrictions common to any country in the world (Rodgers & Antony, 2019). Besides, the public sector represents the economic part of a country that is controlled or supported financially by the Government (Rodgers & Antony, 2019), with the public service being the goods and services provided by the public organizations and governments to guarantee rights to society (Lukrafka et al., 2020). The public sector remains quite distinct in some key aspects, due to the following factors (Fryer et al., 2007):

- The primary goal is not maximising profit;
- The public services have distinct domains (policy, managerial and professional) (Talbot, 2003) that makes people within the organisations have to switch between the different and multiple reporting structures, presenting conflicts and uncertainties;
- The lack of clarity about who their customers are;
- The diversity of stakeholders to serve and meet their different needs; and
- Generally, a change of government or new public administration results in reorganization with new limits and partnerships in the public sector, which creates uncertainties.

In the last decade, academics and practitioners have increased their interest in the application of CI initiatives like Lean production (LP) in the public context (Hines et al., 2008; Radnor & Walley, 2008; Radnor et al., 2006; Scalera et al., 2012; Pedersen & Huniche, 2011; Suárez-Barraza et al., 2009). As Radnor (2010, p. 14) defined, "[...] *lean is potentially a good framework for public services as the principles give managers something to 'hang onto' with simple tools and techniques to use*". The relevance of this theme is due to the growing demand for value creation with budget constraints and few resources from both politicians, citizens, and employees (Kjærgaard, 2008). Besides, has spread to meet the wide variety of societal expectations, productivity, quality, and job satisfaction (Pedersen & Huniche, 2011). Also, LP can increase productivity and address some efficiencies of the public sector.

Although the growing popularity of LP in public services, the literature has revealed few studies about its implementation by public organizations (Maarse & Janssen, 2012; Almeida et al., 2017) or governments (Lukrafka et al., 2020). Specifically, little has been researched about the term Lean Government (l-government), which is a philosophy and a system that changes the role and shape of governments, making them smaller by using existing capabilities, intelligence and resources of society. The benefits of the implementation include reaching public values and to orchestrate and manage a network, bringing the right parties together and managing problem-solving (Janssen & Estevez, 2013). Furthermore, despite the growing number of studies focused on both manufacturing and service organisations, few public sector studies integrate LP and Six Sigma, addressing these methodologies in a complementary way (Salah et al., 2010). Thus, LSS applications in the public sector have not been widely explored (Albliwi et al., 2015; Antony et al., 2019).

Therefore, there is a lack of studies about how Lean-based methodologies (e.g. LP, LSS or l-government) could be aligned with the values, beliefs and strategic direction of public sector organisations or governments (Rodgers & Antony, 2019). In this sense, the implementation of these approaches in the public sector needs an essential group of elements known as critical success factors (CSFs) that are instrumental to any CI initiative stands little chance of success (Laureani & Antony, 2012; Juliani & Oliveira, 2019), by helping the organization in achieving its goals, ensuring better business performance in the eyes of its customers and investors (Sreedharan et al., 2017). Finally, there is also an apparent lack of a systematic approach that could direct a "customized" CI implementation in the public sector (Rodgers & Antony, 2019), considering a proper understanding of distinct public management characteristics (Fryer et al., 2007; Lukrafka et al., 2020).

To fill these gaps, the purpose of this paper is to critically review and synthesizes relevant studies about Lean-based public management approaches to identify the CSFs for Lean-based methodologies implementation in the public sector, considering the adequacy of these CI approaches to the public sector environment. To do this, a systematic literature review (SLR) of the subjects under investigation was conducted to locate the relevant existing studies and to evaluate and synthesize their respective contributions. The use of a SLR contributes to synthesize the central themes and critical information (Thomé et al., 2016) and proposes a taxonomy, with appropriate breadth and depth, rigor and consistency (Nakano & Muniz Junior, 2018). Thus, the SLR method

was carried out to offer a CSFs-based taxonomy to implement Lean-based public management approaches. This review explores the following research question (RQ):

RQ: What are the CSFs of the implementation of the lean-based methodologies by the public sector?

Thus, RQ aims to (i) identify what has been covered by previous scholars regarding LP, LSS and l-government methodologies in the public organizations or governments; (ii) survey instrumental elements (CSFs) to understand the scale, breadth and effectiveness of the use of Lean-based methodologies in the public sector (Rodgers & Antony, 2019), and (iii) provide new ways to synthesise the body of work and sheds a light on the gaps in research.

The critical analysis and synthesis provided by this paper contributes to the academic knowledge (Whetten, 2003) about CSFs of Lean in public sector and instigates new researches to validate, complement or contrast the taxonomy proposed. Furthermore, it supports and expands current literature, providing a better panorama to understand the present status of Lean-based methodologies towards public practices, services and organisations, which represents a meaningful contribution to Operations Management (OM) theory (Boer et al., 2015). In particular, it also aims to bridge the knowledge gap in the integration of LSS into public practices. Finally, the paper focuses on translating the concept and capturing the nature of government, which according to Pedersen & Huniche (2011) often remains generic by most studies that address Lean in the public sector.

As practical implications, the present research also may generate insights for practitioners on how to implement Lean-based methodologies into the public administration. The proposed taxonomy can be used to guide a CI strategy to achieve and sustain competitive advantage (Antony et al., 2017) in the public sector. This paper also seeks to contribute to and broaden the limited body of evidence of the applicability of lean-based approaches to Public Sector and identifies areas for further research and review.

This paper is structured as follows. After this introduction, section 2 presents the theoretical background related to Lean-based methodologies in the public sector. Section 3 describes the research methodology adopted in the SLR. The results are presented and discussed in section 4. Finally, section 5 presents the conclusions and further research directions.

2. Lean-based methodologies applied to the public sector

Nowadays, LP seems to be an increasingly valid practice to address the growing demand for value (Kjærgaard, 2008) as well as dealing with issues such as poor documentation and excessive bureaucracy, which can lead to a fragmented understanding of the complete process (Dawes et al., 2009). As regards the crucial elements of Lean - waste, variability and inflexibility, according to Bhatia & Drew (2006), the following ones that have particular relevance for the public sector are:

- Waste; scrap and rework, waiting, inventory, unnecessary motion, unnecessary transport, overproduction and over-processing;
- Variability; examples of which in public services include the variation is gathering evidence for a trial;
- Inflexibility especially concerning to staffing levels being inflexible and the same every day on the assumption that a standard service necessarily offers economies of scale, whereas customer segments require different levels and types of service (Radnor, 2010).

Radnor (2010, p. 14) presents "*The House Lean for public services*", which integrates the technical and cultural aspects of lean throughout with them feeding into each other in order by ongoing training and development. The goal is to achieve "[...] *a whole process, value chain or system view, embedded improvement behaviours and stable robust processes*" and highlights the following needs: an organizational readiness; to find ways for public sector managers to view their organisations as a system and not a series of functional processes or activities; to develop ways to a successful implementation of effective communication within the organisation and mechanisms for external support and expertise; clearer performance measurement and monitoring systems along with supportive auditing tools to support continual effective progress. Lean principles are also considered useful when citizens (clients) perceive internal efficiency as service level agreements (SLAs) (Delias, 2017). Therefore, Lean service refers to the application of LP tools and principles in a service context, but with certain limitations, higher emphasis in human resources, and following characteristics such as reduction of performance conflict, pull production flow, value-chain oriented, customer focus and training and employ empowerment (Lins et al., 2019).

Besides that, as Tapping (2005), in the public sector, the use of Lean thinking in administrative processes through Lean office and Lean government (l-government) is also observed, and the complexity of these processes can be determined through this last terminology, based on metrics (U.S. Environmental Protection Agency, 2009). Lean Office represents the use of lean principles in the administrative environment, intending to improve workflow, by creating value for the citizen and eliminate wastes in administrative areas and its implementation need to be adapted considering particularities of public administration such as political influences (Almeida et al., 2017).

On the other hand, l-government is a contemporary approach, a concept under development in response to electronic government (e-government) - the use of Information and communication technologies (ICTs) to improve the activities of public sector organizations, which do not make any structural changes and with just an operational focus - and transformational government (t-government), a way to reform and transform bureaucracy (Janssen & Estevez, 2013). Like these authors, l-government aims at reducing the complexity, to make government transparent, to introduce flexibility to a higher degree, to empower employees and shift power downward toward the citizens. The concept is focused on taking advantage of technological developments and is better positioned at the strategic level. According to Bharosa et al. (2011), l-government makes it possible to do more tasks (previously performed by regulators), either by cutting nonessential ones or by transferring them to private companies. The initiative should allow efficient use of resources, such as shortening processing time. Janssen & Estevez (2013) also state that the main principles of l-government are: (1) smaller public sector, which means to do more or better with less spending (money); (2) involvement of the public (citizens and business), due to the opening of data and increased transparency, which motivates the voters to put pressure on the public sector to improve and stimulate innovations; (3) orchestration role, which involves the arrangement, monitoring, coordination, and management of complex networks, to facilitate interactions and collaboration between many public and private stakeholders; (4) use of platforms as an infrastructure or a source of technology to develop all kinds of applications, value-added functions and services and to make their information available.

3. Methodology

In this paper was conducted a systematic review to locate relevant existing studies based on prior formulated research questions, to evaluate and synthesize their respective contributions. This SLR adapted the review processes proposed by Thomé et al. (2016) to systematic reviews in OM and consists of the following steps: (1) formulation of the research questions; (2) location of studies; (3) evaluation and selection of studies; (4) analysis and synthesis; and (5) reporting and use of the results. The formulation of the RQ (step 1) and the aims of this review are delineated in Section 1. The location of studies (step 2) comprises the selection of databases and identification of keywords, which is extremely critical to a comprehensive and unbiased review (Azevedo et al., 2019). According to Thomé et al. (2016), at least two databases should be searched. In this study, we selected the following databases: Scopus, Web of Science (WoS), Emerald, Science Direct and Taylor and Francis. The search is limited to a set of keywords, which were divided into two axes (Lean-based methodologies and Public Administration) and by the Boolean expressions "AND"; and "OR", as shown in Table 1.

Table 1. Search string.

(("Lean approach" OR "Lean process" OR "Lean methodology" OR "Lean method" OR "Lean transformation" OR "Lean philosophy" OR "Lean principles" OR "Lean practices" OR "Lean process improvement" OR "Lean theory" OR "Lean management" OR "Lean thinking" OR "Lean production" OR "Lean manufacturing" OR "Lean service" OR "Lean Six Sigma" OR "lean sigma" OR "Six Sigma") AND ("Government" OR "Public sector" OR "Public industry" OR "Public organization" OR "Public administration" OR "Public service" OR "Public Management" OR "Public policy")) OR ("Lean government" OR "l-Government" OR "lean public")

The conducted research had combined the search terms into title, abstract or keywords, limited to papers in English published in peer-reviewed journals up to May 2020, when they were available. Thus, the exclusion criteria used for determining evaluation and selection of studies (step 3) were: a) documents that are not published in peer-reviewed journals; b) documents are written in a language other than English; c) documents that are not available online; and d) non-adequacy to the scope of Lean-based public management, which in this study covered research on lean within the five categories defined by Rodgers & Antony (2019) that include: Heath, Education, Local government (include state, municipal or county functions), Central government (national or federal functions) and public sector in general (without referencing any individual public area), and other public areas such as policy, military and financial. This evaluation had the participation and analysis of three researchers, thus avoiding subjectivity of interpretation.

Furthermore, the final stage of the article inclusion/exclusion process was the backward and forward search. The backward consists of evaluating the literature cited by the articles found in the research from the

keywords and the forward consists of reviewing the articles that cited those that were filtered by the keywords (Thomé et al., 2016). Figure 1 describes the process of including and excluding articles during the evaluation and selection of studies, following the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyzes) (Moher et al., 2009).

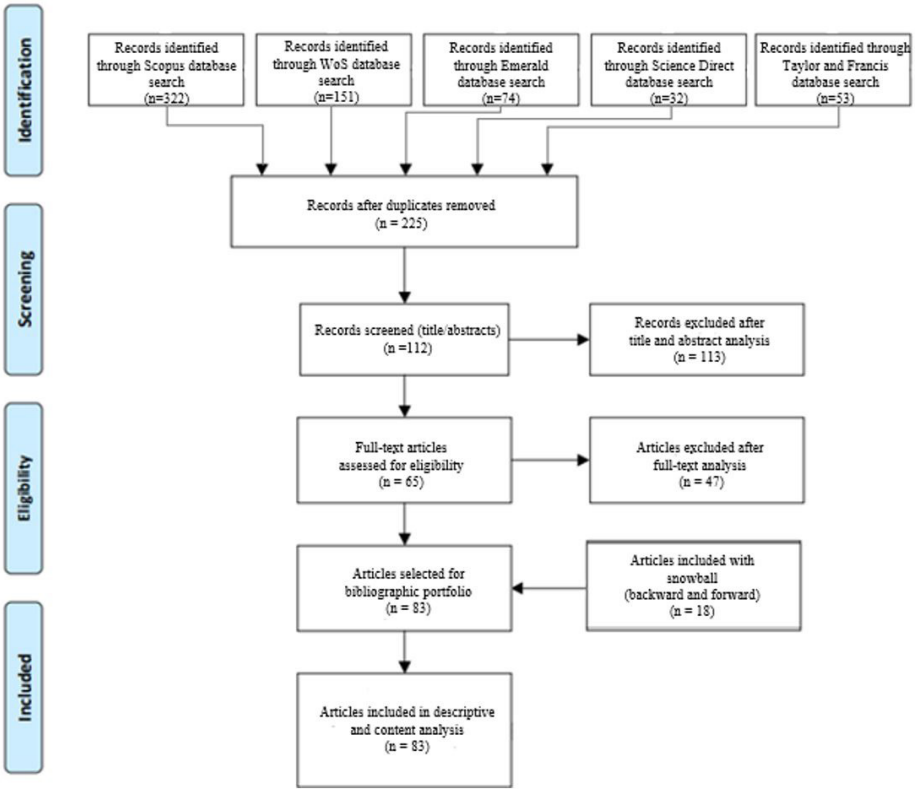

Figure 1. Flowchart of the research methodology. Source: Adapted from Moher et al. (2009).

A total of 83 articles complied with the selection criteria and represent the bibliographic portfolio of this research. Hence, these were all the articles that, to a certain extent, referred to Lean-based methodologies in the public sector. After identifying the relevant articles, data gathering considered a concept matrix, using Microsoft Excel worksheet, which listed the unit of analysis in lines (articles) and categories (bibliographic characteristics) in columns. Articles were coded according to these categories and this matrix used for qualitative assessment was later used for data analysis (step 4). The results were first analyzed using the descriptive analysis. Then, there was a content analysis guided by Julianelli et al. (2020), in which the authors critically evaluated each document from the selected literature to build the CSFs taxonomies. The categories proposed for the taxonomies were defined based on the content analysis that represents an effective tool for analyzing a sample of research documents in a systematic way (Seuring & Gold, 2012). The definition of these categories followed an inductive approach (Eisenhardt, 1989), had an iterative process of category building, testing, revising, and constantly comparing categories and data, and involved the four authors of this paper to define the categories and validate the analysis. Finally, data synthesis and the reporting of the results (step 5) through the taxonomies and the framework are covered in section 4.

4. Results and discussion

4.1. Descriptive analysis

Figure 2 illustrates the distribution of the selected articles, which referred to Lean-based methodologies in public sectors, by year of publication (a)concerning public categories, and (b) concerning to CI methodologies.

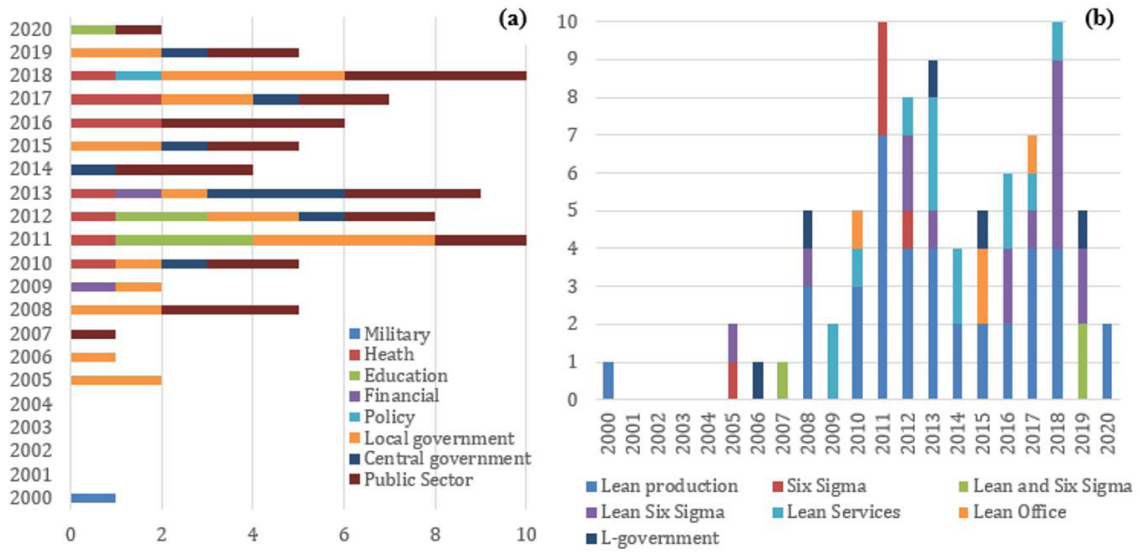

Figure 2. Evolution of the selected papers by public categories (a) and by CI methodology (b).

In general, the results indicate that lean-public topic has gained special interest and popularity within the research community since 2005. After 2010, the topic gained more relevance and more papers were published. The distribution of papers by publication year across the last decade depicts an increasing interest of researchers in the topic. More than half of the papers (79.5%) were published recently, from 2011 to 2020.

Figure 2a indicates that although the majority of publications are related to the public sector (37%) in general, without mentioning a specific area of this broad domain, there has also been attention to local government (29%), central government (11%) and Heath (11%) areas. Besides, 2011 and 2018 were the years that presented the most publications and in both years, there was an emphasis on local government. Figure 2b shows that among the CI methodologies used in the last twenty years in the public sector, there has been an increasing number of publications on lean production (46%) and LSS (18%). Therefore, there is still a predominance of applications of these methods concerning to Lean services and l-government in municipalities, which shows an adaptation of common manufacturing tools and principles for public services such as Kaizen and VSM. About the national level, there is a preponderance of methodologies such as l-government, more focused on a strategic and technological vision, and lean office, more focused on a tactical and project vision. It is also clear that in public health services the use of lean services tools has been increasingly explored because of innovations and improved customer service.

Figure 3 depicts the frequency of articles per method. Sixty-five percent of the articles adopt a case study methodology. Case studies from public services such as Higher education, Healthcare and municipal services were

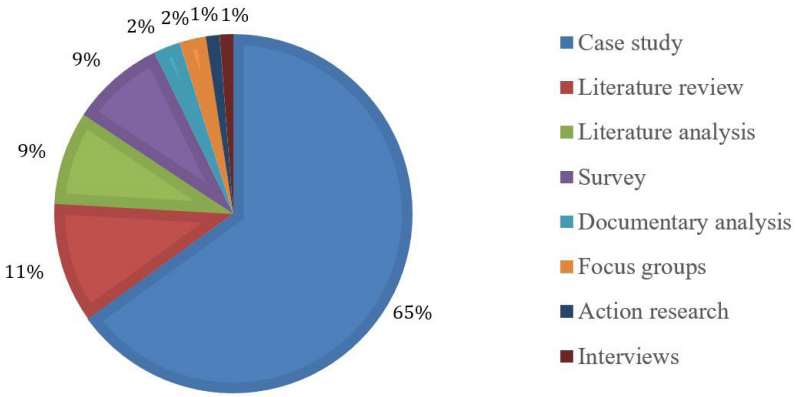

Figure 3. Frequency of articles per method.

the most frequent among all studies. There was also the presence of multiple case studies involving financial and public consultancy services.

Furthermore, there is almost twenty percent of theoretical articles, including literature reviews and literature analysis, which do not have a structured method. Among these theoretical articles, it is worth mentioning the research by Fryer et al. (2007) focused on LSS, Janssen & Estevez (2013) focused on l-governance, and Radnor & Osborne (2013) focused on lean production, in the public sector.

Figure 4a presents the most frequent journals in the sample of selected documents and the number of papers published in each one. The "International Journal of Lean Six Sigma" and the "Total Quality Management and Business Excellence" were the journals with the most publications and were followed by the "International Journal of Productivity and Performance Management" and the "Public Money and Management" both with

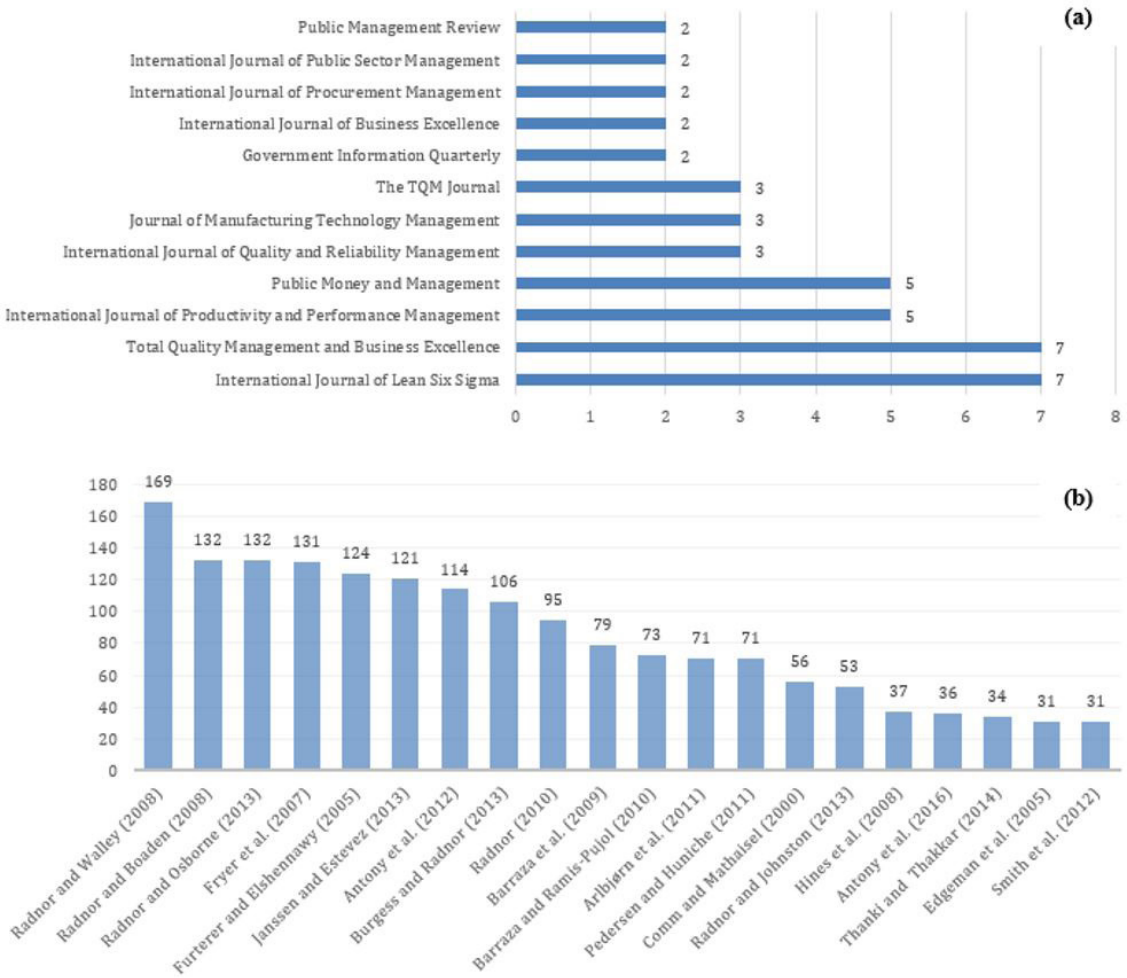

Figure 4. Journals with the higher frequency of publications (a) and the most cited articles (b).

five publications. "Public Money and Management", "Journal of Manufacturing Technology Management" and "The TQM Journal" had three publications each. Figure 4b depicts the number of citations of the article who received more than thirty citations, verified in May 2020, which is used to measure the impact of the papers in other peer-reviewed articles that were indexed in the Scopus and WoS databases. Radnor & Walley (2008) are the most cited, followed by Radnor & Boaden (2008), Radnor & Osborne (2013), Fryer et al. (2007), Furterer & Elshennawy (2005) and Janssen & Estevez (2013). In more recent papers, after 2015, Antony et al. (2016), Tortorella et al. (2017) and Antony et al. (2019) appear as the most cited articles.

4.2. Content analysis

This section presents the findings of the content analysis, synthesizing knowledge about relevant case studies about Lean-based methodologies in the public sector, and then offer a taxonomy referring to the CSFs for Lean-based public management.

4.2.1. Case studies discussion and CSFs for lean-based public management

Walker (1996) shows the restructuring of New Zealand's public sector for leaner government and improved performance. The country became an open and deregulated economy with an efficient and leaned public sector, with output-based accountability; focus on the incentives for performance and new forms of employment and systems of reward. Thus, the main elements of this reform were building organizations with clear objectives; separating funder, purchaser and provider; specifying outputs; focusing on quality; letting the managers be free to manage; serving the customer; accounting for the interests of the Government; managing staff for high performance.

As Kissler (2000) identified, the most common modernization strategies used between 1990 and 2000 to reform the German public administration were privatization, lean administration and internal modernization (new management model, public service bodies). The benefits of Six Sigma of Information Technology Service Level Management (ITSLM) for the Office of the Chief Technology Officer of the Government of the District of Columbia allowed ITSLM to become the key IT provider for various public sector agencies in Washington, DC (Edgeman et al., 2005). The team that applies the Six Sigma methodology identified an abundance of "hanging"- that is, easily made improvements and armed with this information they derived strategies aimed at making the necessary improvements (Nascimento et al., 2019).

In review, several case studies in the public sector predominantly based in Scotland, Radnor & Walley (2008) argue that Lean's contribution may have much more to do with employee involvement in the change process and the immediacy of these changes. In addition, they described the process-based improvement opportunity in the public sector as 'low-hanging fruit but apples on the floor', suggesting that the gains to which they are being made will be an easy target and that the challenge will become more difficult as the low-hanging fruit has been 'picked'. Thus, public sector organizations that incorporate 'enabling' conditions and link the Lean activity to their strategy will not only meet the challenges set by the government to improve productivity but will also provide a high-quality service that meets customer requirements.

Hines et al. (2008) explore how LP can provide big rapid gains into the legal sector, through the discussion of two public sector cases from Portugal and Wales. They demonstrated that there are major opportunities for the application of LP in court services, as well as a need for a Lean-friendly culture and climate that is suitable for its translation and there are several modifications that reflect how important people are in the information-based environment.

Almeida et al. (2017) analysed how lean office planning and implementation take place in a Brazilian regulatory agency ANAC (National Civil Aviation Agency), which is responsible for civil aviation regulation and safety oversight in Brazil, and deepened understanding of the necessary adjustment following the particularities of the public institution. It was demonstrated that LP may be applied to the public administration but observe two decisive aspects in the public environment: human (people who manage public interests) and legal - (slow and bureaucratic processes). The assess and benchmark lean practices applied by Comm & Mathaisel (2000) in the production and operation of U.S. military aerospace products permitted to detect key generic and contingent factors for a strategy to improving supply upstream chain integration.

Radnor & Johnston (2013) present two case studies of large government departments in the UK to show that while public service organizations recognize that methodologies such as LP improve their internal processes, they do not link this to value or with customer service. Thus, although the demands of the efficiency agenda have brought great improvements (e.g. budget cuts, reduced resources and led to the rewriting of key processes), increasing productivity, quality and staff satisfaction, these changes have not yet been conducted by the understanding of customer needs and values.

In addition, Suárez-Barraza & Ramis-Pujol (2010) present a successful example of how Lean-Kaizen is implemented in the human resource management (HRM) process of a Mexican public service organization. It has been helping the organization's Human Resources Office to reduce the cycle time of its selection and hiring of human resources, maintaining its performance and adopting a defined pattern when listening to the client. It was noted, from this study, the importance of some facilitators for this transfer and implementation to be achieved with potential benefits, such as: commitment to and wish for improvement, clear resolve to improve,

focus on the simple and practical, active leadership, the service is outcome/customer/stakeholder-oriented, holistic and transversal thinking, establishing a system for measuring service process performance and effective implementation of best HRM practices.

Local councils in Spain have also followed similar improvement initiatives under the umbrella of "*global quality programs*", through three techniques related to Lean-Kaizen: 5S, gemba kaizen workshops and mapping processes. They have a direct effect on processes and management systems through the integration of LP to eliminate wastes (muda). They have generated some significant improvements in their work processes and public services such as: organization and order in their work areas, saving space and resources, reducing the response time to citizens' requests for service and an overall improvement in public services offered to the community (Suárez-Barraza et al., 2009). It was observed the importance of the involvement of managers and directors in public positions for the implementation of specific initiatives of Lean-Kaizen.

Lean's public management through cross-network information integration becomes the only way for the successful implementation of municipal governance reform in China. To satisfy public demand, the municipal government of Jiangmen city proposed the plan of building interconnected and citizen-centric municipal service network. Meanwhile, the municipal government began to change the scattered and closed administration style to improve comprehensive management level. The reorganization of public service provision and delivery by Information and Communication Technology (ICT) has enabled the adoption of new processes, procedures, and organizational structures. In turn, it has led to sustainable gains in productivity, quality, and responsiveness. Lean public management is enhancing access of information resources and public service, accelerating innovation in public sectors, and enriching learning and knowledge sharing at all levels of the extended organizations (Miao et al., 2011).

As Bharosa et al. (2011) indicated, the information technology (IT) architectures for l-government can be differentiated and specified migration challenges for two emerging types of compliance architectures: Standard Business Reporting (SBR) for low frequency (periodic) reporting and Continuous Control Monitoring (CCM) for high-frequency (real-time) reporting. From two case studies in the Netherlands - the meat supply chain and the financial reporting using XBRL - the authors have shown that both compliance architectures have the potential to create leaner governments by reducing the administrative burden of companies and regulators as well as the need for resources (such as physical inspections and manual auditing).

Historically, as Bharosa et al. (2012) pointed, the Dutch government developed the National Taxonomy Project (NTP) in 2004. It resulted in the first version of the Dutch Taxonomy, a structured list of information rules and relationships according to relevant laws and regulations. They are according to eXtensible Business Reporting Language (XBRL), a recent language which increases corporate responsibility, reduces the time for data collection of businesses, decreases the requirement of resources and increases the quality of information in monitoring compliance of governments. XBRL is a "*network innovation*" that relies on the collaborative and voluntary efforts of many key stakeholders such as local government and regulatory agencies (Willis, 2005). Standardizing business information from all types of production or trade sectors could also help regulatory agencies and companies to proactively analyze, compare, filter and categorize organizations.

Technology architectures can help in the implementation of l-government, since they facilitate close cooperation between the parties, process-based analysis and the process redesign (Bharosa et al., 2011). A XBRL-based business-to-government, (B2G) reported by Janssen & Estevez (2013), is an example of l-government and some of the developments contributing to increase customer-centricity and innovation are: process standardization, providing services (only) online, open data, social media, participative innovation and reducing the size and complexity of the public sector. In addition, for the Dutch parliament, the development of a more transparent, effective and efficient compliance monitoring structure for government agencies requires the creation of B2G lean processes, data standardization and process economics, along with development of a secure electronic information infrastructure (Bharosa et al., 2012).

Furthermore, Agbodzakey & McCue (2015) explores possible dimensions and variables associated with LP by public procurement departments in North America. Including, identifying key enablers for the adoption of the lean approach in the public sector. The authors emphasize that the decision to adopt Lean is subject to multiple variables such as: strategic choices, management commitment and involvement of individual employees, in order to experience beneficial results for all relevant parties, especially customers.

Analysis through ethnographic fieldwork in the social and cultural context and (unintended) consequences of introducing Lean management among family counsellors in a Danish municipality shows that: the persuasiveness of Lean depends on building a metaphorical connection between organizational aims and individual experiences and bodily ideals; and Lean purports to be a win-win game and road to eliminating "waste" through worker participation, empowerment and enthusiasm (Krause-Jensen, 2017).

Besides that, Antony et al. (2017) evaluated the role of LSS in various public sector contexts of the UK and noted that the LSS methodology can be adopted by all public sector organizations to create efficient and effective processes to provide greater experience and value to the customer with reduced operational costs, but this depends heavily on the leadership and success of its execution and the LSS is deployed in its true sense on a global level, thus generating reduced cash savings of up to several billion.

Therefore, as seen in the synthesis of the studied cases, a wide range of individual, organizational, and environmental factors affect the fate of lean in an organization. To develop lean public management, one should pay attention to the CSFs pointed in Table 2. They are divided into a taxonomy of five dimensions that have all proved to influence the lean implementation in the public sector: I. Goals and values; II. Complexity and importance; III. Balance of power, IV. Resources and capabilities, and V. Technology and systems.

The proposed CSFs taxonomy represents a process facilitator and management philosophy to Lean-based methodologies implementation in the public sector. It could also be considered a genuine route a with holistic perspective to increase public service effectiveness and increase end-user value. However, the current implementation of Lean-based methodologies in the public sector should not focus only on the technical tools without an understanding of the principles and premises, or disregarding the context in which the methodology is being implemented. The Lean-based methodologies will only reach its potential when it is based on a logic dominant

Table 2. Critical success factors taxonomy for Lean-based public management.

	CSFs	Description	References
I. Goals and values	Continuous monitoring	Understand lean is an ongoing evaluation, monitoring and assessment. It is continuous improvement approach as compared to process re-engineering which can be viewed as a one-time change.	Comm & Mathaisel (2000); Edgeman et al. (2005); Furterer & Elshennawy (2005); Fryer et al. (2007); Radnor & Boaden (2008); Suárez-Barraza & Ramis-Pujol (2010); Radnor (2010); Papadopoulos (2011); Silva et al. (2015); Antony et al. (2016); Antony et al. (2017); Almeida et al. (2017); Fletcher (2018); Lukrafka et al. (2020)
	Communication	Communication and role of Quality department. Having aims and objectives that are communicated to the workforce and used to prioritise individual's actions – a corporate quality culture.	Edgeman et al., (2005); Hines et al. (2008); Radnor & Boaden (2008); Suárez-Barraza & Ramis-Pujol (2010); Pedersen & Huniche (2011); Miao et al. (2011); Radnor & Osborne (2013); Silva et al. (2015); Juliani & Oliveira (2019); Rodgers & Antony (2019)
	Process-based view	Rationalize and map the process. Study the entire working, not just one part, and avoid cannibalizing the process.	Radnor & Walley (2008); Radnor & Boaden (2008); Suárez-Barraza & Ramis-Pujol (2010); Silva et al. (2015); Agbodzakey & McCue (2015); Antony et al. (2017); Lukrafka et al. (2020)
	Incentive/Reward system	Recognition and reward systems. Recognize the viability of outsourcing as a driver of needed changes.	Fryer et al. (2007); Pedersen & Huniche (2011); Rodgers & Antony (2019)
	Workflow integration	Integrate the workflow and make it visible. Breaks in the flow, both internal and external and blind spots can be pockets of waste.	Miao et al. (2011); Almeida et al. (2017); Lukrafka et al. (2020)
	Strategic alignment	Link between improvement programs and strategy.	Hines et al. (2008); Radnor & Walley (2008); Almeida et al. (2017); Juliani & Oliveira (2019); Rodgers & Antony (2019)
II. Complexity and importance	Quick wins prioritisation	Project selection and prioritisation – look for quick wins or "low hanging fruit". Assess for gaps or redundancies that create time waste.	Fryer et al. (2007); Elias (2016)
	TQM tools	Understanding Total Quality Management (TQM) guidelines and philosophy and identification of critical quality characteristics.	Furterer & Elshennawy (2005); Edgeman et al. (2005); Suárez-Barraza & Ramis-Pujol (2010); Di Pietro et al. (2013); Arfmann & Barbe (2014); Agbodzakey & McCue (2015)
	Root cause focus	Drive for root causes, not symptoms, and be objective (cost cutting/lay-offs or improvement of process).	Edgeman et al. (2005); Rappel et al. (2017)
	Cause-effect actions	Perform cause-effect impacts and product design. Grasp the impact of the organization and culture on lean process design and operation.	Miao et al. (2011); Arlbjørn et al. (2011); Almeida et al. (2017)
	Advanced control tools	The complexity of public affairs increases the need for event and exception management technology, capability and control.	Comm & Mathaisel (2000); Adler et al. (2012); Sreedharan et al. (2017)

Table 2. Continued...

	CSFs	Description	References
III. Balance of power	Top management commitment	Gain top management's commitment and stability. Continuous improvement requires ongoing support.	Comm & Mathaisel (2000); Radnor & Boaden (2008); Juliani & Oliveira (2019)
	Employee involvement	Structured organisational culture and ownership management system, as well as readiness and employee support. Bottom up as well as top down approach.	Radnor & Boaden (2008); Radnor & Walley (2008); Rodgers & Antony (2019)
	Multi-disciplinary team work	Project, process, customer and supplier management skills. Build a multi-disciplinary team for the project-one that understands lean management..	Hasenjager (2006); Barton & Barton (2011); Fletcher (2018)
	Training and education	Training, knowledge transfer, learning and teamwork, collaborate with various departments. It is a requirement, not an option; and it is a two-way exchange.	Comm & Mathaisel (2000); Hasenjager (2006); Fryer et al. (2007); Juliani & Oliveira (2019); Lukrafka et al. (2020)
	Employee empowerment	Employee empowerment. Honesty of the organisation, i.e. trust of and by all employees. Avoid general belief that staff are overworked and underpaid.	Hasenjager (2006); Fryer et al. (2007); Fletcher (2018); Rodgers & Antony (2019)
IV. Resources and capabilities	Reliable performance measures	Use of pilot study, quality data, measurement and reporting to elaborate a strategic planning. 'Identifiability' of impact and realistic time plan/natural pace of change.	Comm & Mathaisel (2000); Fryer et al. (2007); Pedersen & Huniche (2011); Procter & Radnor (2014)
	Skilled professionals	Adequate amount and skills of human resources. Involve relevant people to provide input on present effectiveness and for improvements.	Comm & Mathaisel (2000); Radnor & Boaden (2008); Radnor & Walley (2008); Juliani & Oliveira (2019)
	Customer focus	Clear customer focus. Ask citizens about how well the public bodies operate.	Hasenjager (2006); Radnor & Johnston (2013); Di Pietro et al. (2013); Antony et al. (2017); Juliani & Oliveira (2019); Rodgers & Antony (2019)
	Social responsibility	Management commitment and social responsibility. Demand public department performance. It is vital to lean implementation. Awareness of strategic direction procedures and targets.	Fryer et al. (2007); Suárez-Barraza & Ramis-Pujol (2010); Sreedharan et al. (2017)
	Proactive culture	Cultural change. Improve the process to drive fast response to change, e.g. environmental or technological. Include change management in lean program requirements.	Hines et al. (2008); Radnor & Osborne (2013); Silva et al. (2015); Antony et al. (2017); Lukrafka et al. (2020)
V. Technology and systems	Technological integration	Effective incorporate new technology and medium as part of the process improvement. Know that technology cannot overcome process flaws.	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)
	Data reuse	Business data reuse;	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)
	Shared infrastructure	Use of generic (shared) infrastructure services;	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)
	Architectural considerations	Emergence of architecture as a critical stabilising force;	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)
	Built-in application controls	Shift of control tasks for simple data checks and functions to the businesses;	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)
	Network innovation	Restrictive yet flexible project management, positioning SBR as a cross-government policy initiative;	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)
	Information security	Emphasis on end-to-end security and development of a national taxonomy allowing extensions.	Edgeman et al. (2005); Bharosa et al. (2013); Fryer et al. (2007)

public service market. Besides, it cannot be problematic to integrate the strategic level and management-related factors at the public sector operational and individual levels (Radnor & Osborne, 2013; Agbodzakey & McCue, 2015). Furthermore, the development of a more transparent, effective and efficient compliance monitoring structure in the public sector and government agencies, requires the creation of B2G lean processes, data standardization and process economics, along with the development of a secure electronic information infrastructure.

5. Conclusions

Lean-based methodologies are private-sector practices applied to new public management to reduce costs, wastes and budgets, to increase efficiency and economy performance in public sector levels, political and legislative, to improve customer-centricity and to stimulate economic growth and innovation. Their application in public sector domain has indicated that these methodologies have been increasing corporate responsibility, reducing the time of data collection in businesses, opening and deregulating the economy, decreasing the requirement of resources and increasing the quality of the information in monitoring compliance of governments, improving supply upstream chain integration, providing new forms of employment and systems of reward and it leads to administration and internal modernization. Besides that, their implementation can promote the organization and sequencing of work processes, saving space and resources, reducing the response time to citizens' requests for service and an overall improvement in public services offered to the community. In addition, from the case studies analysis, it was noted that these methodologies have also helped public organization's Human Resources Office to reduce the cycle time of its selection and hiring of human resources, maintaining its performance and adopting a defined pattern when listening to the client.

Public sector leaders and managers must commit to these methodologies to overcome overproduction, waiting, extra processing, transport and motion, inventory, defects, underutilization of people, lack of customer focus, unclear communication, and other service sectors wastes. Moreover, the link of Lean-based methodologies with ICTs can improve operational activities, aiming to reduce the complexity and bureaucracy and to reform public sector organizations at strategic global leadership level. In addition, they can also contribute to build interconnected and citizen-centric municipal service network, and the reorganizing the public service provision and delivery by ICT could enable sustainable gains in productivity (Caiado et al., 2019), quality, responsiveness, access to information resources and public service, accelerating innovation in public sectors, and enriching learning and knowledge sharing (Tortorella et al., 2019) at all levels of the extended organizations.

Furthermore, this paper endorses the Lean-based public management discussion since it introduces a CSFs taxonomy and, in particular, has responded to the growing need of studies about LSS in public management (Antony et al., 2017), about l-government (Janssen & Estevez, 2013) and the lack of systematic reviews about LSS (Albliwi et al., 2015). As a theoretical contribution, this study presents a SLR, which has the ability to be replicated in the future and allows to avoid biases through more rigorous and objective criteria. In addition, from the practical perspective these proposed CSFs can guide Lean public management implementation, reducing costs and budgets without deteriorating service levels.

As in all studies, this research also faced some limitations. One of them is related to the time, since the data was collected on a certain date, we consider just the articles which were published or were in press until that date. Additionally, the decision regarding whether or not an article aligns with the theme or not was sometimes made by the researchers, being inherently limited to their opinions. Lastly, due to the keyword-based identification of publications, it is possible that some searches were not considered because they did not contain the selected keywords.

For future research, it is suggested that lean-based methodologies such as l-government be integrated with Industry 4.0 technologies (Caiado et al., 2021) through an innovative lean management model to build a long-range plan using LSS and Industry 4.0 technologies to prioritize and track all success projects opportunities for government programs. It is hoped that the alignment of l-government with Industry 4.0 technologies and Six Sigma indicators can: anticipate emerging technologies, develop opportunities, spot potential threats, identify trends and priorities for the success of the innovation process and has a positive impact in the modernization of the nation's institutional framework.

References

Adler, N., Hakkert, A. S., Kornbluth, J., & Sher, M. (2012). Lean management for traffic-police enforcement planning. *Policing*, *35*(4), 662-686. http://dx.doi.org/10.1108/13639511211275382.

Agbodzakey, J. K., & McCue, C. P. (2015). The key enablers for the adoption of lean thinking by public purchasing departments. *International Journal of Procurement Management*, *8*(6), 666. http://dx.doi.org/10.1504/IJPM.2015.072386.

Albliwi, S. A., Antony, J., & Lim, S. A. (2015). A systematic review of Lean Six Sigma for the manufacturing industry. *Business Process Management Journal*, *21*(3), 665-691. http://dx.doi.org/10.1108/BPMJ-03-2014-0019.

Almeida, J. P. L., Galina, S. V. R., Grande, M. M., & Brum, D. G. (2017). Lean thinking: planning and implementation in the public sector. *International Journal of Lean Six Sigma*, *8*(4), 390-410. http://dx.doi.org/10.1108/IJLSS-06-2016-0027.

Antony, J., Rodgers, B., & Cudney, E. A. (2017). Lean Six Sigma for public sector organisations: is it a myth or reality? *International Journal of Quality & Reliability Management*, *34*(9), 1402-1411. http://dx.doi.org/10.1108/IJQRM-08-2016-0127.

Antony, J., Rodgers, B., & Cudney, E. A. (2019). Lean Six Sigma in policing services: case examples, lessons learnt and directions for future research. *Total Quality Management & Business Excellence*, *30*(5-6), 613-625. http://dx.doi.org/10.1080/14783363.2017.1327319.

Antony, J., Rodgers, B., & Gijo, E. V. (2016). Can Lean Six Sigma make UK public sector organisations more efficient and effective? *International Journal of Productivity and Performance Management*, *65*(7), 995-1002. http://dx.doi.org/10.1108/IJPPM-03-2016-0069.

Arfmann, D., & Barbe, G. T. (2014). The value of lean in the service sector: a critique of theory & practice. *International Journal of Business and Social Science*, *5*(2), 18-24.

Arlbjørn, J. S., Vagn Freytag, P., & de Haas, H. (2011). Service supply chain management: a survey of lean application in the municipal sector. *International Journal of Physical Distribution & Logistics Management*, *41*(3), 277-295. http://dx.doi.org/10.1108/09600031111123796.

Azevedo, B. D., Scavarda, L. F., & Caiado, R. G. G. (2019). Urban solid waste management in developing countries from the sustainable supply chain management perspective: a case study of Brazil's largest slum. *Journal of Cleaner Production*, *233*, 1377-1386. http://dx.doi.org/10.1016/j.jclepro.2019.06.162.

Barton, H., & Barton, L. C. (2011). Challenges, issues and change: what's the future for UK policing in the twenty-first century? *International Journal of Public Sector Management*, *24*(2), 146-156. http://dx.doi.org/10.1108/09513551111109044.

Bharosa, N., Janssen, M., Hulstijn, J., Van Wijk, R., de Winne, N., & Tan, Y. (2011). Towards a lean-government using new IT-architectures for compliance monitoring. In E. Estevez, & M. Janssen (Eds.), *Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance - ICEGOV '11* (pp. 147-156). New York: ACM Digital Library. http://dx.doi.org/10.1145/2072069.2072095.

Bharosa, N., Janssen, M., Van Wijk, R., de Winne, N., Van Der Voort, H., Hulstijn, J., & Tan, Y. H. (2013). Tapping into existing information flows: the transformation to compliance by design in business-to-government information exchange. *Government Information Quarterly*, *30*, S9-S18. http://dx.doi.org/10.1016/j.giq.2012.08.006.

Bharosa, N., Winne, N. D., Van Wijk, R. & Janssen, M. (2012). Lean government: critical success factors for XBRL-based business-to-government reporting. *European Journal of ePractice*, 24-37.

Bhatia, N., & Drew, J. (2006). Applying lean production to the public sector. *The McKinsey Quarterly*, *3*(1), 97-98. Retrieved in 2018, January 20, from https://www.mckinsey.com/industries/public-sector/our-insights/applying-lean-production-to-the-public-sector

Boer, H., Holweg, M., Kilduff, M., Pagell, M., Schmenner, R., & Voss, C. (2015). Making a meaningful contribution to theory. *International Journal of Operations & Production Management*, *35*(9), 1231-1252. http://dx.doi.org/10.1108/IJOPM-03-2015-0119.

Caiado, R. G. G., Quelhas, O. L. G., Nascimento, D. L. D. M., Anholon, R., & Leal Filho, W. (2019). Towards sustainability by aligning operational programmes and sustainable performance measures. *Production Planning and Control*, *30*(5-6), 413-425. http://dx.doi.org/10.1080/09537287.2018.1501817.

Caiado, R. G. G., Scavarda, L. F., Gavião, L. O., Ivson, P., Nascimento, D. L. M., & Garza-Reyes, J. A. (2021). A fuzzy rule-based industry 4.0 maturity model for operations and supply chain management. *International Journal of Production Economics*, *231*, 107883. http://dx.doi.org/10.1016/j.ijpe.2020.107883.

Christensen, T., & Laegreid, P. (2001). New public management: the effects of contractualism and devolution on political control. *Public Management Review*, *3*(1), 73-94. http://dx.doi.org/10.1080/14616670010009469.

Comm, C. L., & Mathaisel, D. F. X. (2000). A paradigm for benchmarking lean initiatives for quality improvement. *Benchmarking*, *7*(2), 118-128. http://dx.doi.org/10.1108/14635770010298584.

Dawes, S. S., Cresswell, A. M., & Pardo, T. A. (2009). From 'need to know' to 'need to share': tangled problems, information boundaries, and the building of public sector knowledge networks. *Public Administration Review*, *69*(3), 392-402. http://dx.doi.org/10.1111/j.1540-6210.2009.01987_2.x.

Delias, P. (2017). A positive deviance approach to eliminate wastes in business processes. *Industrial Management & Data Systems*, *117*(7), 1323-1339. http://dx.doi.org/10.1108/IMDS-09-2016-0393.

Di Pietro, L., Mugion, R. G., & Renzi, M. F. (2013). An integrated approach between Lean and customer feedback tools: an empirical study in the public sector. *Total Quality Management & Business Excellence*, *24*(7-8), 899-917. http://dx.doi.org/10.1080/14783363.2013.791106.

Edgeman, R. L., Bigio, D., & Ferleman, T. (2005). Six Sigma and business excellence: Strategic and tactical examination of IT service level management at the office of the chief technology officer of Washington, DC. *Quality and Reliability Engineering International*, *21*(3), 257-273. http://dx.doi.org/10.1002/qre.635.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532-550. http://dx.doi.org/10.5465/amr.1989.4308385.

Elias, A. A. (2016). Stakeholder analysis for Lean Six Sigma project management. *International Journal of Lean Six Sigma*, *7*(4), 394-405. http://dx.doi.org/10.1108/IJLSS-11-2015-0046.

Ferlie, E. (2002). Quasi strategy: strategic management in the contemporary public sector. In A. Pettigrew (Ed.), *Handbook of strategy and management* (pp. 279-298). London: Sage.

Fletcher, J. (2018). Opportunities for Lean Six Sigma in public sector municipalities. *International Journal of Lean Six Sigma*., *9*(2), 256-267. http://dx.doi.org/10.1108/IJLSS-07-2017-0086.

Fryer, K. J., Antony, J., & Douglas, A. (2007). Critical success factors of continuous improvement in the public sector. *The TQM Magazine*, *19*(5), 497-517. http://dx.doi.org/10.1108/09544780710817900.

Furterer, S., & Elshennawy, A. K. (2005). Implementation of TQM and lean Six Sigma tools in local government: a framework and a case study. *Total Quality Management & Business Excellence*, *16*(10), 1179-1191. http://dx.doi.org/10.1080/14783360500236379.

Hasenjager, J. (2006). Lean government (is not an oxymoron): a Connecticut agency in efficiency's court. *Industrial Engineering*, *38*(7), 43-48.

Hines, P., Martins, A. L., & Beale, J. (2008). Testing the boundaries of lean thinking: observations from the legal public sector. *Public Money & Management*, *28*(1), 35-40. http://dx.doi.org/10.1111/j.1467-9302.2008.00616.x.

Janssen, M., & Estevez, E. (2013). Lean government and platform-based governance: doing more with less. *Government Information Quarterly*, *30*, S1-S8. http://dx.doi.org/10.1016/j.giq.2012.11.003.

Julianelli, V., Caiado, R. G. G., Scavarda, L. F., & Cruz, S. P. D. M. F. (2020). Interplay between reverse logistics and circular economy: critical success factors-based taxonomy and framework. *Resources, Conservation and Recycling*, *158*, 104784. http://dx.doi.org/10.1016/j.resconrec.2020.104784.

Juliani, F., & Oliveira, O. J. D. (2019). Synergies between critical success factors of Lean Six Sigma and public values. *Total Quality Management & Business Excellence*, *30*(15-16), 1563-1577. http://dx.doi.org/10.1080/14783363.2017.1383153.

Kissler, L. (2000). Reforma administrativa caminhos e percalços no processo de modernização do serviço público Alemão. *Organization Science*, *7*(18), 13-24. http://dx.doi.org/10.1590/S1984-92302000000200001.

Kjærgaard, J. (2008). Involvering af Ledelsen. In S. Sønderby, F. Iversen & A. Holte (Eds.), *Lean i kommunerne: effektivisering i fællesskab* (pp. 63-65). København: Væksthus for Ledelse. Retrieved in 2018, January 1, from www.vaeksthusforledelse.dk

Krause-Jensen, J. (2017). Trimming the social body: an analysis of Lean management among family counsellors in a Danish municipality. *Journal of Organizational Ethnography*, *6*(2), 68-86. http://dx.doi.org/10.1108/JOE-01-2017-0005.

Laureani, A., & Antony, J. (2012). Critical success factors for the effective implementation of Lean Sigma: results from an empirical study and agenda for future research. *International Journal of Lean Six Sigma*, *3*(4), 274-283. http://dx.doi.org/10.1108/20401461211284743.

Lins, M. G., Zotes, L. P., & Caiado, R. (2019). Critical factors for lean and innovation in services: from a systematic review to an empirical investigation. *Total Quality Management & Business Excellence*, 1-26. In press. http://dx.doi.org/10.1080/14783363.2019.1624518.

Lukrafka, T. O., Silva, D. S., & Echeveste, M. (2020). A geographic picture of Lean adoption in the public sector: Cases, approaches, and a refreshed agenda. *European Management Journal*, *38*(3), 506-517. http://dx.doi.org/10.1016/j.emj.2020.02.004.

Maarse, N., & Janssen, M. (2012). The need to adjust lean to the public sector. In *Proceedings of the 11th IFIP WG 8.5 International Conference on Electronic Government (EGOV 2012)*. Berlin: Springer. http://dx.doi.org/10.1007/978-3-642-33489-4_5.

Miao, X., Tang, Y. H., Xi, B., & Liu, Z. Y. (2011). Lean public management: How lean principles facilitate municipal governance reform in China. *African Journal of Business Management*, *5*(5), 1564-1569. http://dx.doi.org/10.5897/AJBM09.436.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., Altman, D., Antes, G., & Clark, J. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Journal of Chinese Integrative Medicine*, *7*(9), 889-896. http://dx.doi.org/10.3736/jcim20090918.

Nakano, D., & Muniz Junior, J. (2018). Writing the literature review for empirical papers. *Production*, *28*, e20170086. http://dx.doi.org/10.1590/0103-6513.20170086.

Nascimento, D. L. M., Quelhas, O. L. G., Caiado, R. G. G., Tortorella, G. L., Garza-Reyes, J. A., & Rocha-Lona, L. (2019). A lean six sigma framework for continuous and incremental improvement in the oil and gas sector. *International Journal of Lean Six Sigma*, *11*(3), 577-595. http://dx.doi.org/10.1108/IJLSS-02-2019-0011.

Papadopoulos, T. (2011). Continuous improvement and dynamic actor associations: a study of lean thinking implementation in the UK National Health Service. *Leadership in Health Services*, *24*(3), 207-227. http://dx.doi.org/10.1108/17511871111151117.

Pedersen, E. R. G., & Huniche, M. (2011). Determinants of lean success and failure in the Danish public sector: a negotiated order perspective. *International Journal of Public Sector Management*, *24*(5), 403-420. http://dx.doi.org/10.1108/09513551111147141.

Pollitt, C., & Bouckaert, G. (2004). *Public management reform: a comparative analysis* (pp. 1-309). Oxford: Oxford University Press.

Procter, S., & Radnor, Z. (2014). Teamworking under Lean in UK public services: lean teams and team targets in Her Majesty's Revenue & Customs (HMRC). *International Journal of Human Resource Management*, *25*(21), 2978-2995. http://dx.doi.org/10.1080/09585192.2014.953976.

Radnor, Z. (2010). *Review of business improvement methodologies in public services* (pp. 1-77). London: Advanced Institute of Management Research. Retrieved in 2018, January 20, from http://www.gov.scot/resource/doc/129627/0030899.pdf

Radnor, Z., & Boaden, R. (2008). Editorial: lean in public services: panacea or paradox? *Public Money & Management*, *28*(1), 3-7.

Radnor, Z., & Johnston, R. (2013). Lean in UK government: Internal efficiency or customer service. *Production Planning and Control*, *24*(10-11), 903-915. http://dx.doi.org/10.1080/09537287.2012.666899.

Radnor, Z., & Osborne, S. P. (2013). Lean: a failed theory for public services? *Public Management Review*, *15*(2), 265-287. http://dx.doi.org/10.1080/14719037.2012.748820.

Radnor, Z., & Walley, P. (2008). Learning to walk before we try to run: adapting lean for the public sector. *Public Money & Management*, *28*(1), 13-20. http://dx.doi.org/10.1111/j.1467-9302.2008.00613.x.

Radnor, Z., Walley, P., Stephens, A., & Bucci, G. (2006). *Evaluation of the lean approach to business management and its use in the public sector (full report)* (pp. 1-77). Edinburgh: Office of Chief Researcher, Scottish Executive.

Rappel, M. J., Hunter, N. L., Alexandrow, A. I., Hair, K. O., Sherman, R. E., & Califf, R. M. (2017). Case study for lean management in the public sector: improving combination product review at the food & drug administration. *Clinical and Translational Science*, *10*(3), 124-127. http://dx.doi.org/10.1111/cts.12441. PMid:28079301.

Rodgers, B., & Antony, J. (2019). Lean and Six Sigma practices in the public sector: a review. *International Journal of Quality & Reliability Management*, *36*(3), 437-455. http://dx.doi.org/10.1108/IJQRM-02-2018-0057.

Salah, S., Rahim, A., & Carretero, J. A. (2010). The integration of Six Sigma and lean management. *International Journal of Lean Six Sigma*, *1*(3), 249-274. http://dx.doi.org/10.1108/20401461011075035.

Scalera, F., Dumitrescu, C., & Talpová, S. Z. (2012). International crisis and competitiveness of service companies and public administration in Italy and in Europe: the application of lean office. *Business and Management Review*, *2*(1), 63-75.

Seuring, S., & Gold, S. (2012). Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management*, *17*(5), 544-555. http://dx.doi.org/10.1108/13598541211258609.

Silva, I. B., Seraphim, E. C., Agostinho, O. L., Lima Junior, O. F., & Batalha, G. F. (2015). Lean office in health organization in the Brazilian Army. *International Journal of Lean Six Sigma*, *6*(1), 2-16. http://dx.doi.org/10.1108/IJLSS-09-2013-0053.

Sreedharan, V. R., Raju, R., & Srinivas, S. S. (2017). A review of the quality evolution in various organisations. *Total Quality Management & Business Excellence*, *28*(3-4), 351-365. http://dx.doi.org/10.1080/14783363.2015.1082421.

Suárez-Barraza, M. F., & Ramis-Pujol, J. (2010). Implementation of Lean-Kaizen in the human resource service process: a case study in a Mexican public service organization. *Journal of Manufacturing Technology Management*, *21*(3), 388-410. http://dx.doi.org/10.1108/17410381011024359.

Suárez-Barraza, M. F., Smith, T., & Dahlgaard-Park, S. M. (2009). Lean- kaizen public service: an empirical approach in Spanish local governments. *The TQM Journal*, *21*(2), 143-167. http://dx.doi.org/10.1108/17542730910938146.

Talbot, C. (2003). How the public sector got its contradictions: the tale of the paradoxical primate: integrating the idea of paradox in human social, political and organisational systems with evolutionary psychology. *Human Nature Review*, *3*, 183-195.

Tapping, D. (2005). *The lean office pocket guide XL* (pp. 1-178). Chelsea: MCS Media.

Thomé, A. M. T., Scavarda, L. F., & Scavarda, A. J. (2016). Conducting systematic literature review in operations management. *Production Planning and Control*, *27*(5), 408-420. http://dx.doi.org/10.1080/09537287.2015.1129464.

Tortorella, G. L., Fogliatto, F. S., Anzanello, M., Marodin, G. A., Garcia, M., & Reis Esteves, R. (2017). Making the value flow: application of value stream mapping in a Brazilian public healthcare organisation. *Total Quality Management & Business Excellence*, *28*(13-14), 1544-1558. http://dx.doi.org/10.1080/14783363.2016.1150778.

Tortorella, G., Nascimento, D., Caiado, R., Arrieta Posada, J. G., & Sawhney, R. (2019). How do different generations contribute to the development of a learning organization in companies undergoing a lean production implementation? *The Learning Organization*, *27*(2), 101-115. http://dx.doi.org/10.1108/TLO-02-2019-0035.

U.S. Environmental Protection Agency – US EPA. (2009). *Lean government metrics guide*. Washington. Retrieved in 2018, January 1, from http://www.epa.gov/lean/government/pdf/Metrics_guide.pdf

Walker, B. (1996). Reforming the public sector for leaner government and improved performance: the New Zealand experience. *Public Administration and Development*, *16*(4), 353-375. http://dx.doi.org/10.1002/(SICI)1099-162X(199610)16:4<353::AID-PAD883>3.0.CO;2-P.

Whetten, D. A. (2003). O que constitui uma contribuição teórica? *Revista de Administração de Empresas*, *43*(3), 69-73.

Willis, M. (2005, March 1). XBRL and data standardization: transforming the way CPAs work. *Journal of Accountancy*. Retrieved in 2018, January 20, from https://www.journalofaccountancy.com/issues/2005/mar/xbrlanddatastandardizationtransformingthewaycpaswork.html