Lean management in hotels: Where we are and where we might go

Vladimir Perdomo-Verdecia, Macarena Sacristán-Díaz, Pedro Garrido-Vega [*]

Universidad de Sevilla, GIDEAO Research Group, Facultad de Ciencias Económicas y Empresariales, Avenida Ramón y Cajal, 1, 41018 Sevilla, Spain

ARTICLE INFO

ABSTRACT

Given the successful implementation of Lean Management (LM) in other service industries and its potential benefits for hospitality, this study aims to pursue two specific goals: 1) to offer an overview of LM research in the hospitality industry; 2) to detect and propose LM research lines in this sector. The research methodology chosen for these goals is a systematic literature review based on a structured, transparent, replicable multistage process. Thirty-six references have been found, which indicates the paucity of research studies in this field. The use of LM tools in hotels seems to be very limited, with VSM and the 5S applications standing out. Reference analysis clearly shows that much more research is required on specific applications in many hotel activities and some under-reported practices.

1. Introduction

The use of methods and tools for the continuous improvement (CI) of production and organisational processes is a perpetual requirement for almost every firm. One of the best-known CI methods is Lean Management (LM) (Farrington et al., 2018) and many companies have moved forward by implementing LM as an efficiency-oriented management system and eliminating any source of waste through the reduction or minimisation of the sources of variability (Womack and Jones, 1996; Hines et al., 2004; Shah and Ward, 2007).

LM first emerged as a production system or philosophy in the mid-twentieth century in the Japanese Toyota company, which needed to make production more flexible to serve smaller markets with a greater variety of vehicles. Toyota's efforts led to the creation of an integrated manufacturing system designed to minimise inventory levels and reduce system variability (Moyano-Fuentes and Sacristán-Díaz, 2012).

Despite the differences between manufacturing and services, the service industry can also benefit from the application of the LM philosophy to increase organisational competitiveness and customer satisfaction and reduce process variability and waste. Bowen and Youngdahl (1998) argued that manufacturing logic should transfer to service operations and highlighted five lean manufacturing characteristics developed for service operations: 1) reduction of performance trade-off goals focused on internal efficiency and external flexibility; 2) making value-adding processes flow and implementing JIT customer-pull; 3) elimination of waste from the activity's entire value chain from product development to product delivery; 4) increased customer focus and involvement in the product development and delivery processes, and 5) empowerment of workers and teams.

However, it was not before the system had become widespread and widely accepted in the industrial sector that LM practices started to be adopted in services. Additionally, these practices do not reach as deep or as wide in services, due, among other reasons, to the difficulties encountered in standardising operations and times, a lower degree of innovation and the need for an appropriate approach to managing demand (Cuatrecasas, 2002). Indeed, the introduction of LM principles in any service activity must begin with a deep understanding of certain inherent aspects of services and a strong knowledge of customer value: the thinking or philosophy behind LM principles may not change from manufacturing to services, but LM tools and practices must be adapted (Gupta et al., 2016).

Nonetheless, LM continues to expand and is now being applied in many service sectors, including healthcare, banking, financial services and insurance, public sector services, education, food-beverage services, distribution, retail and logistics services, IT-enabled services, airlines, etc. (Gupta et al., 2016; Narayanamurthy and Gurumurthy, 2016; Leite and Vierira, 2015; Hadid and Mansouri, 2014), sometimes in combination with Six Sigma (Vijaya Sunder et al., 2018).

However, evidence of LM implementation in hospitality has been very limited, despite Berger et al. (1989) long ago identifying several LM-linked aspects as organisational characteristics of innovative hospitality firms, including a climate that encourages teamwork, sensitivity to employees' needs, a focus on guests' needs, and the non-stop exploration of ideas for change and growth (Barlow, 2002; Vlachos and

---

* Corresponding author.
E-mail addresses: vlaperver@alum.us.es (V. Perdomo-Verdecia), macarena-sd@us.es (M. Sacristán-Díaz), pgarrido@us.es (P. Garrido-Vega).

Bogdanovic, 2013; Farrington et al., 2018). Indeed, many years later Vlachos and Bogdanovic (2013) still identified LM implementation in hotels as an emerging field of study and observed that evidence continued to be scant.

With the recent COVID-19 pandemic having caused an unprecedented worldwide crisis in the tourism industry, hospitality is one of the most affected industries, with demand, occupancy rates and revenues plummeting globally (Bonfanti et al., 2021). This warrants a review of the sector's services and their innovative transformation with competitive costs and profitable operations that generate value to adapt to the 'new normal'. Managers have to design safe experiences for their customers by identifying safety measures, undertaking internal work reorganisation, redistributing the service space, investing in technology and digital innovations, acting on guest waiting time, providing their staff with new skills and updating their communication (Bonfanti et al., 2021). In the current context, a focus such as LM with its goal of being highly responsive to customer demand by reducing waste (Bhamu and Sangwan, 2014) can be one of the most attractive and valuable responses that hotels can engage to tackle the need to reduce costs and improve customer service. But to what extent is it already being used? What techniques could be the most suitable and effective for the sector? What hotel activities would it be most feasible to apply LM to? What results are being obtained or can be obtained with LM? What adaptations are needed for LM to be applied to organisations of this type? What are the main factors that are obstacles to, or facilitators of, LM implementation in hotels? The present research intends to find answers to these questions by undertaking a literature review that establishes what research has been done and what the current state of knowledge on LM in hotels is. A study of this type is useful in two ways since, as Antony et al. (2021) state, identifying and analysing the body of knowledge in a field is time-consuming for academicians and this knowledge is not easily accessible for policymakers and practitioners. At the academic/scientific level, such a study would enable research efforts to focus on and be oriented towards the most interesting and useful issues for developing knowledge in the field. From a practical point of view, it would enable hotels to approach LM implementation with a greater guarantee of success while giving priority to the tools and applications that could be the most effective and efficient, given the limited resources (financial, human, etc.) that all organisations are having to deal with.

Therefore, this paper identifies some gaps in the knowledge in terms of the use of theoretical perspectives, research contexts, countries investigated and content of studies on lean in hotels. We present a systematic review of the literature that reports research into lean management adoption in the hospitality industry with two specific goals: 1) to identify, organise and summarise current LM research in the hospitality industry, and 2) to detect and propose lines of research on LM in hotels.

The following section establishes the theoretical framework of the research. Next, the way that LM literature reviews cover hospitality is analysed and confirms the timeliness of this SLR. Then, the structured, transparent, replicable and multistage process followed is explained in the methodology section. Lastly, the results of the bibliometric and content analysis are presented and discussed, and some conclusions are drawn about where the topic stands at the moment and where it might go to from here.

2. Theoretical framework: lean management scope

The scientific community has increasingly focused on the Lean model as a suitable management method to improve company competitiveness. The term Lean Production (LP) was first coined by Krafcik (1988) and popularised by MIT Toyota researchers in the book The Machine that Changed the World (Womack et al., 1990). Initially, the term lean was mainly used to contrast the Toyota System's lean production with mass production. However, by the time that the Womack et al. book (1990) came out, the LP concept had already been extended to product

development, the supply chain and distribution (Moyano-Fuentes and Sacristán-Díaz, 2012).

Hines et al. (2004) analysed the evolution of research on LP in conjunction with the evolution of the lean concept itself with differentiation between Lean at the strategic level, with a focus on its goals and principles, and at the operational level, focusing on tools and techniques. This distinction between Lean's strategic and operational levels is now commonly accepted.

At the strategic level, LM's main objective is to execute operations at a minimum cost and with no wastage. It is, therefore, designed to act upon the causes of variability or losses (i.e., anything that the customer does not perceive as added value) and inflexibility (anything that does not adapt to customer demand) to achieve improvements to quality, costs and delivery, inter alia. In their book 'Lean Thinking', Womack and Jones (1996) identified the five fundamental principles of Lean that can not only be extended to the value chain, but also from automobile production to any company, sector or country: 1) specify value, 2) identify the value stream, 3) avoid interruptions in the value flow, 4) let customers pull value and 5) start pursuing perfection again. Several major papers have subsequently examined these principles in greater depth, while others have proposed new principles supporting lean thinking, including committed management, respect for people and involving supply chain management (Moyano-Fuentes and Sacristán-Díaz, 2012).

These LM principles are operationalised as tools and practices that work synergistically to achieve the objectives of the system as a whole. However, although there seems to be a certain consensus around the identification of two main sets of practices, internal and external, with the latter related to the degree of integration with suppliers and customers, an agreement is not so clear on the tools or techniques in either case. Thus, the number and grouping of tools or techniques associated with lean practices can vary considerably depending on the author/s consulted. The most cited in reviews of LM, in general (Caldera et al., 2017; Jasti and Kodali, 2015; Hu et al., 2015; Bhamu and Sangwan, 2014; Sing and Ahuja, 2012), and services, in particular (Leite and Vierira, 2015; Hadid and Mansouri, 2014), include: Continuous flow production and levelling (Heijunka), Just-in-Time (JIT) production, Inventory reduction, Set-up time reduction (SMED), Cellular layout, Takt time, Value stream mapping (VSM) and other mapping tools such as Spaghetti diagrams, Multifunctional employees and other employee practices (teamwork, engagement, empowerment, training), Pull system and Kanban, Work standardisation, Poka-Yoke, Visual management, Continuous improvement and Kaizen, Total Quality Management (TQM, including Quality circles, Jidoka, the PDCA system and quality tools such as Fishbone diagrams, the 5 Whys, Pareto analysis, Control charts), Total Productive Maintenance (TPM), Supplier management (including supplier involvement, long-term relationship, JIT purchasing, Milkrun), Top management commitment and Leadership, and Customer orientation. Although many of these are already well-known, a clear and full explanation of these and other Lean tools can be found in handbooks such as, e.g., Bicheno & Holweg (2016).

From a theoretical perspective, many authors have highlighted the opportuneness of implementing lean thinking in services in general, and hospitality in particular, and the potential benefits that it can bring (e.g., Bowen and Youngdahl, 1998; Barlow, 2002; Vijaya Sunder, 2013; Rauch et al., 2020). However, research on specific LM tools and how they are applied seems to be limited (Hadid and Mansouri, 2014), despite the great variety of hotel activities, many of which can be found in other organisations that frequently implement LM. Espino-Rodríguez and Ramírez-Fierro (2017) identify many such hotel activities: reception, training, housekeeping, personnel selection and recruitment, common area cleaning, marketing and sales, laundry, information systems, food and beverage (F&B), leisure activities, maintenance (exterior, interior, gardening) and security and surveillance, to which could be added procurement, warehouses and general administration, to name but a few. All are likely to benefit from the improvements provided by LM.

However, the question as to which specific LM techniques and tools can be applied profitably in hotel management is still unanswered (Rauch et al., 2020).

3. Hospitality in lean management literature reviews

Secondary sources can be used to obtain an initial impression of the state of research on LM in hotels. Lean Management is a broad and long-standing field of knowledge that is well-consolidated and has generated an enormous number of publications and, consequently, literature reviews. The sample of literature reviews in Table 1, which includes many that either focus on or cover services, was obtained with searches of the WoS, Scopus and Google Scholar databases and an examination of the references in the retrieved articles (snowballing). As the table shows, most have been published during the past decade and pursue different objectives. Some are summaries of lean and its evolution (Hines et al., 2004; Bhasin and Burcher, 2006; Holweg, 2007; Moyano-Fuentes and Sacristán-Díaz, 2012; Arlbjørn and Freytag, 2013; Bhamu and Sangwan, 2014; Jasti and Kodali, 2015; Samuel et al., 2015; Danese et al., 2018),

Table 1
Literature reviews of Lean Management.

Reference (chronological order)	Main focus	Services covered?	Hotels mentioned?
Duclos et al. (1995)	Lean in services	Yes	Yes
Hines et al. (2004)	Lean concept and evolution	Implicitly	No
Bhasin and Burcher (2006)	Lean concept and evolution	Implicitly	No
Holweg (2007)	Lean concept and evolution	Yes	No
Hasle et al. (2012)	Lean and the working environment	Yes	No
Moyano-Fuentes and Sacristán-Díaz (2012)	Lean concept and evolution	Yes	No
Singh and Ahuja (2012)	Practice implementation	Implicitly	No
Suárez-Barraza et al. (2012)	Lean in services	Yes	Yes
Arlbjørn and Freytag (2013)	Lean concept and evolution	Yes	No
Bhamu and Sangwan (2014)	Lean concept and evolution	Yes	No
Hadid and Mansouri (2014)	Lean in services	Yes	Yes
Martínez-Jurado and Moyano-Fuentes (2014)	Lean and Sustainability	Yes	No
Hartini and Ciptomulyono (2015)	Lean and Sustainability	No	No
Hu et al. (2015)	Lean in SMEs	Yes	No
Jasti and Kodali (2015)	Lean concept and evolution	Yes	No
Leite and Vierira (2015)	Lean in services	Yes	Yes
Samuel et al. (2015)	Lean concept and evolution	Yes	No
Gupta et al. (2016)	Lean in services	Yes	No
Narayanamurthy and Gurumurthy (2016)	Leanness assessment	Yes	Indirectly
Caldera et al. (2017)	Lean and Sustainability	Yes	No
Bellisario and Pavlov (2018)	Lean practices and performance	No	No
Danese et al. (2018)	State-of-the-art and future directions	Yes	No
Farrington et al. (2018)	CI in hospitality and tourism	Yes	Yes
Takeda-Berger et al. (2018)	Lean Supply Chain Management	Yes	No
Vijaya Sunder et al. (2018)	Lean Six Sigma for services	Yes	No
Antony et al. (2021)	Practical implications and research agenda	No	No

whereas others focus on a range of specific issues (see Table 1).

Table 1 is not comprehensive, but it is sufficiently representative of the literature reviews of LM conducted to date. As can be seen, only 3 of the 26 identified references (Hartini and Ciptomulyono, 2015; Bellisario and Paulov, 2018; Antony et al., 2021) do not implicitly cover Lean in services as they specifically focus on manufacturing companies. However, of the 23 reviews that cover services either explicitly or implicitly, hotels are only mentioned in six, and in one of those, only indirectly.

It is, perhaps, striking that the first reference in Table 1 covers lean in services—or more exactly, JIT, as it used to be referred to. Duclos et al. (1995) highlighted JIT applications in both service sector firms and service operations and used these examples to build a case for further research into JIT in service industries. Hotels are occasionally mentioned as examples of services, but no hotel cases are covered.

Suárez-Barraza et al. (2012) conduct a literature analysis to classify references to lean services and find four specific applications in hotels and restaurants (2.3%) out of 172 references. Two are research articles: Heskett (1987)—which barely mentions hotels—and Berger et al. (1989); one is a two-page opinion article with only a passing reference to LM, and another is a book in Spanish about 'improvement capsules' for SME competitiveness. Elsewhere, Leite and Vierira (2015) present a bibliographic study of the creation, principles, evolution, and practices of lean thinking in services which includes only three references to hotels: Cuatrecasas (2004) and two in Portuguese (a conference paper and a master's thesis). Finally, a review by Narayanamurthy and Gurumurthy (2016) only mentions hotels indirectly when referring to the Suárez-Barraza et al. (2012) analysis.

According to Hadid and Mansouri (2014), future research should focus on providing more empirical evidence of the impact of the lean system on performance in services and should consider the obvious lack of attention given to the hotel industry. These authors also state that interesting results can be obtained by examining whether specific sets of lean practices are more applicable to some particular service industries than others.

The research by Farrington et al. (2018) is also worth highlighting as it presents a systematic literature review, not specifically of Lean, but of continuous improvement research in the hospitality and tourism management literature that also includes LM. Studies of CI methodologies and practices in hospitality are found to be published infrequently, tend to focus on total quality management in European contexts, and, despite the customer-centric guiding principles of CI methodologies, focus on improving internal processes rather than the service encounter. The only article devoted to Lean in hospitality found in this analysis is the previously mentioned paper by Vlachos and Bogdanovic (2013).

The most recent paper in the table (Antony et al., 2021) states that excluding the services sector (and consequently hotels) is a limitation and SLR studies on the practical implications of LM should consider articles examining the service business environment.

In light of the above, we consider that the present systematic literature review of LM in hotels is, to our knowledge, the first to establish the state-of-the-art and identify further lines of research, and can act as a guide for further research in this field and help fill in the gaps detected in the research done thus far.

4. Methodology

The research method used is the systematic literature review (SLR) (Tranfield et al., 2003; Petticrew and Roberts, 2006). This was chosen as the best method to achieve our research goals: to establish the state-of-the-art of research on Lean in hotels and propose guidelines and recommendations for developing future research in the field. As Snyder (2019) states, literature reviews play an important role as the basis for all types of research and they can serve as the groundwork for knowledge development, create guidelines for policy and practice, and can trigger new ideas and directions for a particular field. Briner and Denyer (2012) argue that systematic reviews are an efficient and effective

method for developing an understanding of what we know and what we do not know about a given topic. In addition, this method has been increasingly used in recent years for many research topics, including LM (see Table 1). This research methodology adopts a structured, transparent, replicable, multistage process (see Fig. 1).

As previously stated, the field of study in which the SLR is to be conducted is 'Lean Management in hotels'. The aim is to establish the state-of-the-art of research on the implementation of this management philosophy in said sector as this could be useful for detecting and proposing lines of research. An excessively broad definition has been avoided and the question of customer service omitted, i.e., the search did not include references to customer service in hotels if it did not come under the umbrella of the Lean approach.

4.1. Setting search criteria and pilot tests

The search was conducted in Web of Science (WoS) and Scopus, both well-established bibliographic databases containing a wide, fully reliable catalogue of academic sources including the most prestigious scientific journals (Paul and Criado, 2020).

Realising from the outset that restricting output to LM in hotels would drastically reduce the number of returned items (as was confirmed by the pilot tests) and despite the initial idea to search exclusively for articles published in scientific journals, we decided to extend the search to conference proceedings and other sources including books and book chapters.

Regarding the appropriate temporal depth, our expectations of limited output also determined our decision not to limit the time period for the search. The search covers up to February 2021 inclusive.

Regarding search keywords, it was decided to include the terms just-in-time and JIT in addition to lean, hospitality and hotels, since Lean has frequently been referred to as such, with one part (the JIT tool) used to refer to the whole (Lean Production). Searches were limited to keywords, abstract and title.

Finally, a pilot test was done to deduce adequate search syntax. A variety of syntaxes were tested in the pilot test in WoS. With the definitive search syntax determined, the search was conducted in both of the selected databases, yielding 166 references: 72 in WoS and 94 in Scopus.

4.2. Results filtering and validation

As mentioned, the searches yielded a total of 166 results, from which overlaps between databases, false positives and false negatives had to be eliminated. Taking WoS as the starting point, duplicate references were eliminated in the other database using the Zotero bibliographic manager. This left a total of 139: the original 72 in WoS plus a further 57 in Scopus.

A prior reading was done of the title, keywords and abstract to eliminate any false positives (works found using the established search strategy that do not correspond to the aim of the research). Full texts were read in-depth when any doubts arose. Numerous works were found on health issues and rejected, as were others that, although directly linked to LM, were not related to hotels or, conversely, although focused on hotels, only mentioned LM indirectly. Thus, the criteria for considering a paper as a false positive explicitly included several studies on how LM or JIT affects the accounting system, some exclusively referring to Six Sigma but not Lean Six Sigma, and others on LM in restaurants not located in hotels. In addition, SLRs on services that only mentioned hotels (Suárez-Barraza et al., 2012; Farrington et al., 2018) were not considered to conform to the research goals and were excluded from the sample. This second filter reduced the references to 33. Two conference proceedings references in WoS were also eliminated as the whole papers could not be accessed. Thus, at this point, the sample stood at 31, with 18 remaining in WoS and a further 13 in Scopus.

After eliminating the false positives, a snowball review was conducted of the content and bibliography of available references to detect any false negatives (no additional references corresponding to the object of the research were detected with the search strategy). This identified two new references: Gürel (2013) and Ivasciuc and Epuran (2015). Finally, a separate search in Google Scholar added three further references: Vijaya Sunder (2013), Kamar (2018) and Zhang and Chen (2018). Two of the added works corresponded to journals not indexed in the reference databases and the third was in a non-indexed conference
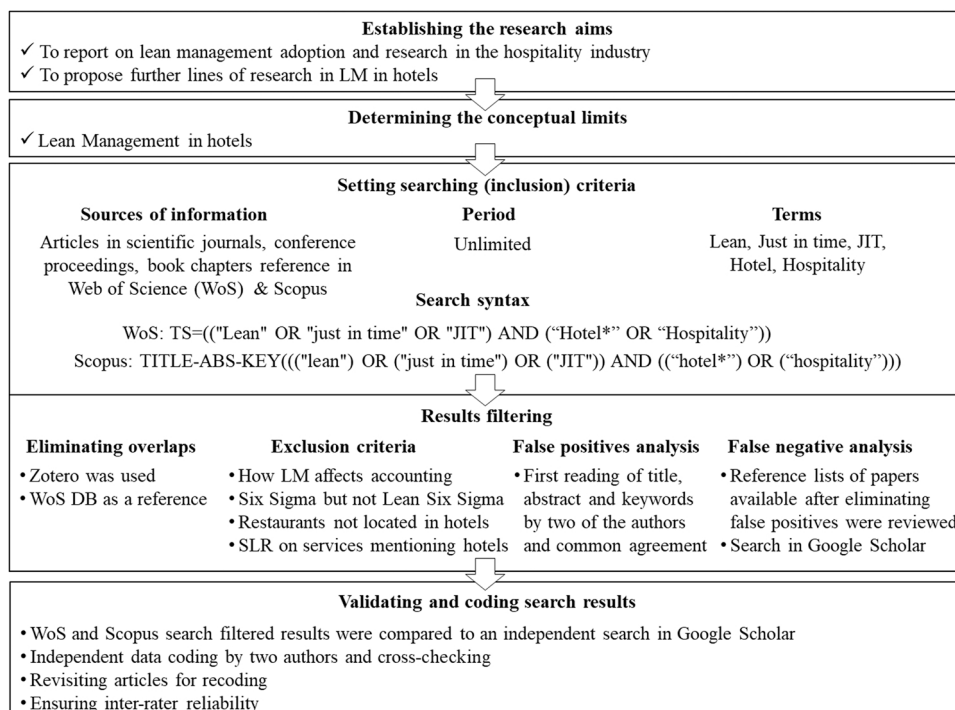

| **Establishing the research aims** |
| ✓ To report on lean management adoption and research in the hospitality industry |
| ✓ To propose further lines of research in LM in hotels |

| **Determining the conceptual limits** |
| ✓ Lean Management in hotels |

Setting searching (inclusion) criteria		
Sources of information	**Period**	**Terms**
Articles in scientific journals, conference proceedings, book chapters reference in Web of Science (WoS) & Scopus	Unlimited	Lean, Just in time, JIT, Hotel, Hospitality
	Search syntax	
WoS: TS=(("Lean" OR "just in time" OR "JIT") AND ("Hotel*" OR "Hospitality"))		
Scopus: TITLE-ABS-KEY((("lean") OR ("just in time") OR ("JIT")) AND (("hotel*") OR ("hospitality")))		

Results filtering			
Eliminating overlaps	**Exclusion criteria**	**False positives analysis**	**False negative analysis**
• Zotero was used • WoS DB as a reference	• How LM affects accounting • Six Sigma but not Lean Six Sigma • Restaurants not located in hotels • SLR on services mentioning hotels	• First reading of title, abstract and keywords by two of the authors and common agreement	• Reference lists of papers available after eliminating false positives were reviewed • Search in Google Scholar

| **Validating and coding search results** |
| • WoS and Scopus search filtered results were compared to an independent search in Google Scholar
• Independent data coding by two authors and cross-checking
• Revisiting articles for recoding
• Ensuring inter-rater reliability |

Fig. 1. Systematic Literature Review process followed.

proceeding. The Google Scholar search also ensured that no important work had gone undetected in the WoS and Scopus searches. The first 100 results obtained were analysed using the same terms as in the other searches.

As indicated in Fig. 1, the entire filtering process was conducted by two authors independently and the few discrepancies found were resolved in pooling meetings. The references were also analysed in detail and coded by two of the authors for inclusion in a previously designed spreadsheet containing the features of interest discussed in the results section. The 36 references in the final sample have been synthesised and ordered chronologically in Appendix I and are indicated with an asterisk (*) in the reference list.

5. Results

The bibliometric analysis of the 36 references in Appendix I will cover the following aspects: temporal distribution, type of publication, research methodology, authors and geographical area.

5.1. Timeline

Fig. 2 shows the temporal distribution followed by the references on LM in hotels found from 1995, the year when the first is found. Only 2 references can be found before 2000. This is clear evidence of the scant research done on the subject during the 20th century and the late implementation of Lean in the services sector, especially in the hotel industry.

Production during the first decade of the 21st century is similarly limited, with only 5 further references between 2001 and 2010. The number of publications on the topic seems to stabilise from 2013 onwards, although it is not until 2018 that references start to increase rapidly. Indeed, a total of 19 references have been published in the last four years of the timeline, with only two months in 2021 included in the search, i.e., 52.8% of the sample. It is also interesting to observe that 8 of the references published since 2016—33.3% of the total in the five-year period in question—correspond to works in conference proceedings, so they will likely be published as journal articles in the future.

Although the results are inconclusive, we believe that they may indicate that research on LM in hotels has finally flourished in recent years. Following Price's Law, this is very likely the period of exponential growth that precedes consolidation, which is a typical step in the evolution of scientific fields and reaffirms the timeliness of our literature review.

5.2. Type of publication

Reference distribution by type of publication identified—articles in journals, conference proceedings and book chapters—shows that 66.7% (24/36) of the references correspond to articles published in journals, 30.6% to 11 works published in 11 different conference proceedings and only one reference, 2.8%, to a book chapter.

Articles are found in 21 journals. These are presented in Fig. 3 grouped into the JCR/Scopus and other scientific journals (OSJ) categories. No publication can be said to specialise in LM in hotels, but the *African Journal of Hospitality, Tourism and Leisure* has published three articles on the topic and *Tourism Management*, two.

Fig. 4 shows the importance of the different journals measured by the number of citations received: Tourism Management stands out with a joint total of almost 60 citations for two articles.

5.3. Research methodology

Initial categorisation of the references by research methodology (qualitative or quantitative) shows that qualitative methodology predominates and is used in 27 of the works, i.e., 75%.

Statistical analyses based on surveys (7) or other data (1) and modelling (1) have been considered quantitative research. The case study is the most frequently used qualitative methodology (16; 44.4% of the sample references) followed by theoretical presentations (7) and some other surveys and interviews (4). Also note that although empirical research with surveys and data analysis is still limited, at 22.2% it is not negligible. Quantitative research is also considerably more frequent in the most recent years of the analysed period (6 of the 9 references are concentrated between 2018 and 2020), which points to the fact that LM use in hotels is already growing despite still being a new field of research.

5.4. Authors

Firstly, regarding the number of authors who sign each work: of the 36 analysed references, 13 have one author (36.1%), 11 have two (30.6%), 6 have three (16.7%) and, lastly, another 6 references (16.7%) have been found with four or more authors (2 with four, 3 with five and 1 with six). Thus, 63.9% of the works have been written by two or more
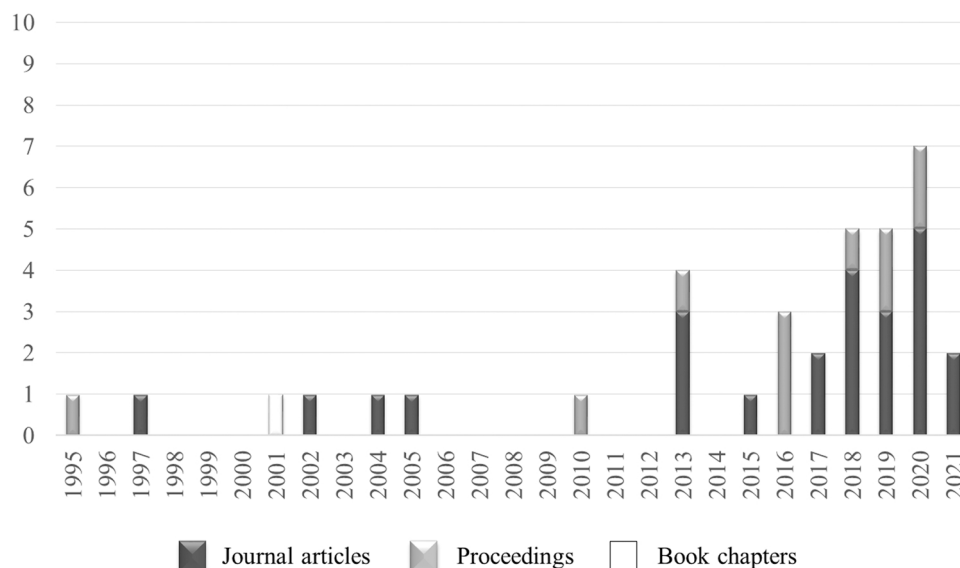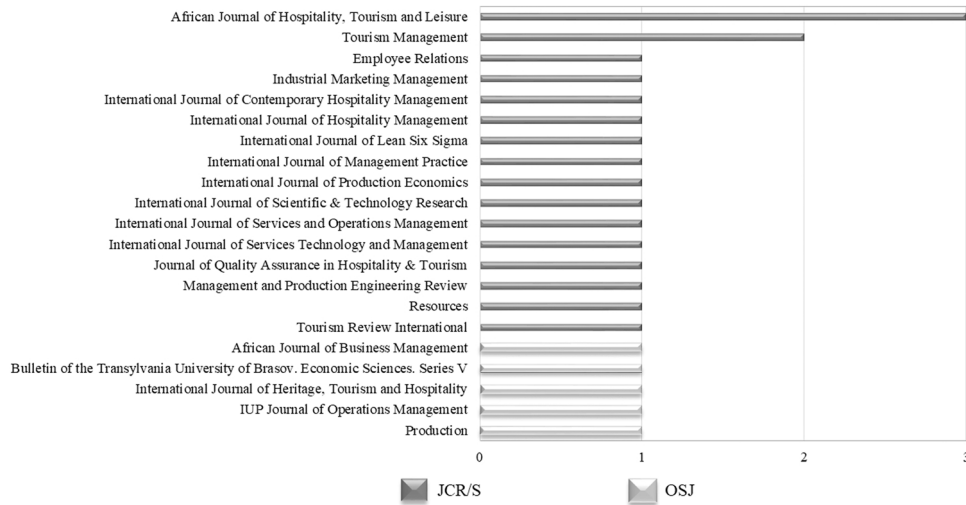

Fig. 2. Time distribution of references by type.

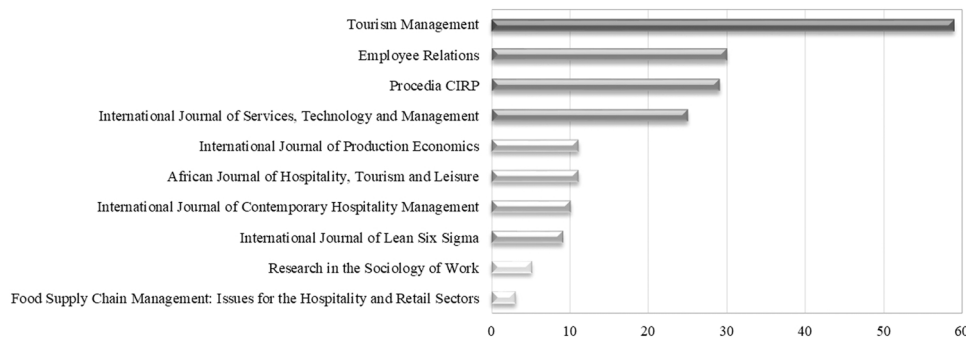**Fig. 3.** Articles by journal.

Fig. 4. Most cited journals.

authors.

Regarding the number of references per author, only 6 of the 73 identified authors have contributed to more than one publication (3 maximum). Despite no author being found whose production in LM in hotels can be considered prolific, some stand out. For example, Gerald Lee Barlow appears to have pioneered the topic with three of the first four references (Barlow, 1995, 1997, 2002) and Raid Al-Aomar and Matlou Hussain show considerable recent output, co-authoring 3 papers in the last three years.

The most influential (most-cited) documents are Vlachos and Bogdanovic (2013), followed by Lai and Baum (2005), Rauch (2016) and Cuatrecasas (2004). These are the only articles with over 20 citations. However, there are some others (e.g., Al-Aomar and Hussain, 2018) whose influence is probably still not consolidated as they have been published more recently.

5.5. Geographical area

Four references analyse hotels in the United Kingdom and India, and 3 in South Africa and the UAE, while China, Egypt, Italy, Poland and Thailand have generated 2 references each. All the other countries explicitly identified in the analysis (Australia, Brazil, Germany, Hungary, Romania, Russia, Saudi Arabia, Singapore, Spain, Turkey and the USA) only have one reference each.

As can be seen in Fig. 5, by continent, most of the references have been identified in Asia. It should be noted that European production has remained stable during the analysed period, while Asian production took off in 2010 and is, therefore, concentrated in the last decade. African production seems to have also emerged strongly more recently,
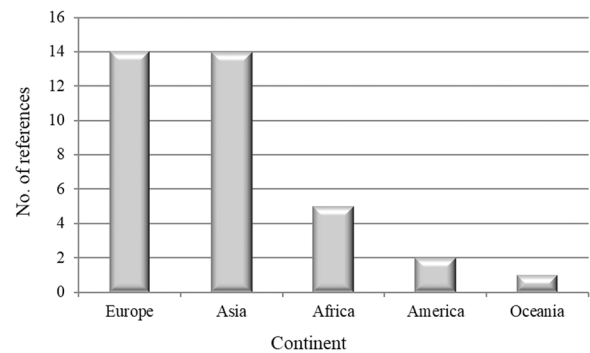

Fig. 5. Number of references by geographical area.

with its first reference from 2017, while the limited American production is also very recent, from 2019.

5.6. Content

Appendix II summarises the content of the references and highlights whether they focus specifically on LM or hotels, what their core topics are and whether they report or propose any specific application of LM tools. Regarding the latter, all the practices and tools considered in the original works have been specified as Lean, although many are OM tools and practices not generated in the scope of LM.

The first works on LM in hotels, which date from the mid-1990 s and were authored by Barlow, focus on JIT purchases and inventories,

mainly of beverages. The three Barlow papers prompted a small stream of work focused on F&B service, with Ongkunaruk and Kessuyan (2013) analysing JIT purchases in three cases, one of which was a hotel chain. These works show that JIT purchasing, delivery and inventory have a great potential in this area. Later, Mohammad (2017) analysed the adoption of Lean Thinking for F&B operations in hotels in Egypt and found that the majority do not use or are not aware of this approach. More recently, Gładysz et al. (2020) proposed an LM model for the reduction of food waste in the HoReCa sector. Another work in this line was developed by Leverenz et al. (2021), who concluded that using smaller plates and preparing food just-in-time at the breakfast buffet reduces leftovers.

Lean human resource management is another research trend. It begins—with some criticism—with Timo (2001) seeking labour flexibility to have the right staff at the right time (just-in-time). Next, Lai and Baum (2005) propose the application of JIT to relationships with employment agencies for the supply of hotel cleaning staff. The third reference in this research line is by Zhang and Chen (2018), who show an exemplary case of a Chinese state-owned hotel coping with high staff turnover using a management approach called 'lean and people-oriented management'. Respect for people, decentralisation, multifunctional training, teamwork and the search for consensus are some of the elements of Lean that contribute to solving this problem.

Other papers focus on the use of one or more specific LM tools. The first of these is Cuatrecasas (2004), which advocates the use of the flexible manufacturing concept in services with its corresponding layout and multitask positions, and uses the hotel check-out process to illustrate the proposed method. Much later, Gürel (2013) highlights the role of for quality of services and proposes its comprehensive application in hotels instead of in isolated departments. Another paper focused on this specific tool is Pluchevskaya et al. (2016), which applies and spaghetti diagrams to reduce housekeeping time and staff in a hotel-type student residence. According to its impact measured by the number of citations, one prominent paper in this line is Vlachos and Bogdanovic (2013), which surveys a sample of small and medium-sized hotels in Europe on the usefulness of the seven Hines and Rich (1997) VSM types to eliminate the seven wastes in two hotel key processes, bookings and reception, and procurement. Finally, Kuaites et al. (2020) uses visual management tools (flow process charts and flow diagrams) to analyse room cleaning in order to eliminate and re-organise activities to reduce time and worker numbers. As can be seen, 5S and VSM and other mapping instruments are the tools most frequently researched individually.

The results show another clear line of research focused on the use of Lean Six Sigma in hotels. This was initiated by Vijaya Sunder (2013), which shows that LM predominates over Six Sigma in four sectors, one of which is the hospitality industry. Manaf (2016) describes an improvement project based on the DMAIC cycle (which he considers to be typical of LM, although it actually is more typical of Six Sigma). This study also uses other tools such as flow diagrams, cause-effect diagrams and time and motion studies. Ramphal (2017) proposes a framework for the adoption of Lean Six Sigma in four phases that combines the 5 Lean principles of Womack and Jones (1996) and the five phases of the DMAIC cycle. The most recent work in this research line is a conference paper by Shofia et al. (2020), which, based on a literature review, proposes a research model with 9 factors that influence the success of Lean Six Sigma and two types of performance (operational and organisational) to measure its impact.

Due to its contribution to the topic, we understand that one of the most relevant existing research lines is the identification, classification and analysis of the applicability of LM tools and methods to hotels. The two works by Rauch et al., (2016, 2020) stand out in this line. The first establishes four criteria to evaluate the suitability of Lean tools (47 in total) and identifies the 10 most useful. Later, in 2020, the authors further develop their previous work by ranking the 20 main tools. Other papers also include lists of potentially useful tools for hotels. For

example, Ramphal (2017) provides a table of 24 Lean tools and many associated methodologies in the framework of the Lean Six Sigma hybrid approach. Kumar (2018) lists ten Lean SCM tools. Al-Aomar and Hussein (2019) identifies 6 categories of Lean practices and 19 specific techniques in the hotel supply chain, which are prioritised with AHP. Sztorc and Savenkovs (2020) identifies 17 tools that can be used to redefine a hotel business model to create value.

Although the last column in Appendix II shows all the specific practices/tool applications tested or suggested in the 36 sample

Table 2
LM practices/tool applications per hotel activity.

LM practice/tool	Hotel activity/department	Reference
5 S	Housekeeping	Manaf (2016),Pluchevskaya et al. (2016),Alhisan et al. (2019),Rauch et al. (2020)
	Restaurants+F&B	Alhisan et al. (2019),Gładysz et al. (2020),Rauch et al. (2020)
	Laundry	Rauch et al. (2020)
	Bookings & reception	Rauch et al. (2020)
	Leisure activities	Rauch et al. (2020)
	Administration	Gürel (2013)
	Maintenance	Rauch et al., (2016, 2020)
VSM	Maintenance	Rauch et al., (2016, 2020)
	Restaurants+F&B	Mohammad (2017),Gładysz et al. (2020)
	Laundry	Rauch et al., (2016, 2020)
	Bookings & reception	Vlachos and Bogdanovic (2013),Rauch et al. (2020)
	Procurement	Vlachos and Bogdanovic (2013)
Spaghetti diagram	Housekeeping	Pluchevskaya et al. (2016), Rauch et al., (2016, 2020)
	Restaurants+F&B	Gładysz et al. (2020)
	Common area cleaning	Rauch et al. (2020)
Kaizen/CI circles & workshops	Housekeeping	Alhisan et al. (2019),Rauch et al. (2020)
	Bookings & reception	Rauch et al. (2020)
	Restaurants+F&B	Gładysz et al. (2020),Rauch et al. (2020)
	Administration	Rauch et al., (2016, 2020)
	Training	Rauch et al., (2016, 2020)
	Leisure activities	Rauch et al. (2020)
JIT	Housekeeping (labour supply)	Lai and Baum (2005),Alhisan et al. (2019)
	Restaurants+F&B (purchasing and inventory)	Barlow (1995, 1997, 2002)
	Restaurants+F&B (production and delivery)	Ongkunaruk and Kessuvan (2013),Leverenz et al. (2021)
Kanban	Housekeeping	Alhisan et al. (2019)
	Restaurants+F&B	Gładysz et al. (2020)
5 Whys	Housekeeping	Alhisan et al. (2019)
	Restaurants+F&B	Gładysz et al. (2020)
Process standardisation	Housekeeping	Alhisan et al. (2019)
	Restaurants+F&B	Gładysz et al. (2020)
DMAIC	Housekeeping	Manaf (2016)
Time value map	Housekeeping	Manaf (2016)
Cause-effect diagram	Housekeeping	Manaf (2016)
Time and motion study	Housekeeping	Manaf (2016)
Poka-yoke	Housekeeping	Alhisan et al. (2019)
Respect for people	Housekeeping	Alhisan et al. (2019)
ECRS	Housekeeping	Kuaites et al. (2020)
Flow Diagram & Flow Process Chart	Housekeeping	Manaf (2016),Kuaites et al. (2020)
SMED	Housekeeping	Rauch et al. (2020)
Gemba walk	Restaurants+F&B	Gładysz et al. (2020)
Suggestions system	Restaurants+F&B	Gładysz et al. (2020)
Flexible layout, takt-time, multi-skilled workers	Bookings & reception	Cuatrecasas (2004)
Layout improvement	Warehouse	Rauch et al. (2020)

references, Table 2 contains those actually applied to the hotel activity in which they are analysed and the corresponding references. In short, 18 references have been found to contain specific applications of LM practices and tools associated with 11 specific hotel activities. Two LM tools clearly stand out: and VSM, with examples found in most of the identified activities. However, the hotel activities with the most applications are unequivocally housekeeping and restaurants and F&B; these activities are addressed by 8 and 9 of the 18 references, respectively. These studies show that a wide range of LM methods can be successfully applied to many hotel activities.

There are very few empirical studies that measure the effect of LM's application on performance, although we can mention the work by Hussein et al. (2019), which analyses the impact of LM, measured through 3 practices, and of some other Green practices on the three performance areas of the 3BL model (economic, social and environmental) and finds that the greatest impact of Lean is on economic performance. Another example is Rauch et al. (2020), which present the results of applying various Lean tools in an Italian hotel and identifies some economic savings per year and some qualitative benefits. Some works mention advantages and potential benefits. One example is Govender and Jasson (2018), which proposes a set of Lean advantages (7) and challenges (6) for the South African hotel sector. In a study of small homestay establishments, Rai et al. (2021) states that implementing Lean produces better performance and profitability and that even those that unknowingly implement lean practices work better. The works that study cases in which some tools have been applied with concrete results could also be included in this line, including Barlow (1995, 1997, 2002), Pluchevskaya et al. (2016) and Kuaites et al. (2020).

As for how LM is defined and conceptualised, the Womack and Jones five principles (1996) are the most used vision or approach and appear in at least 10 papers, from Vijaya Sunder (2013) to Sztorc and Savenkovs (2020). It is also quite usual to refer to the seven wastes of Ohno. This is done by 7 works in our sample, from Vijaya Sunder (2013), which adds one more, 'unused Human Resources', to Rai et al. (2021). Some transfer or exemplify these in the case of hotels (Al-Aomar and Hussein, 2018; Kamar, 2018). Less common is the Liker (2004) approach with its four Ps and their 14 related principles, which is only found in Ivasciuc and Epuran (2015) and Criscione-Naylor (2020).

The barriers, obstacles or reasons for the failure of LM implementation in hotels and the critical success factors are also addressed. Vijaya Sunder (2013) states four main reasons for the failure of Lean Six Sigma, including senior management's lack of involvement and wrong project selection. Mohammad (2017) discusses some barriers to adopting Lean Thinking and finds that the main barriers in the case of Egyptian hotels are: 1) it is an unknown and non-established system; 2) the lack of incentives for its application; 3) resistance to change, and 4) it may entail an additional workload and extra expenses. Kamar (2018) states that barriers to implementing Lean in the hotel industry include a lack of both knowledge and customer and supplier involvement. Al-Aomar and Hussain (2018) highlight investment, associated costs and training, a long wait for returns and long implementation times as obstacles to the adoption of lean practices in hotel supply chains. For Ramphal and Nicolaides (2018), one major barrier to Lean in hospitality is the fragmented nature of hotel departments with employees in differentiated groups working without the required LM team approach. Finally, Shofia et al. (2020) focuses on the critical success factors of lean six sigma implementation and establishes 9 from a literature review.

6. Conclusions

Only five of the 26 literature reviews on different aspects of LM identified in this work mention hotels directly and do so principally to highlight the scant attention that researchers give to the application of LM in hotels. The limited number of LM bibliographical reviews that cover hotels and the way that they are covered are already clear

indicators that LM in hotels continues to be an underexplored research field. The identification and processing of references for this SLR have yielded a portfolio of 36 papers, which demonstrates that research on the subject is still scarce and enables the proposal of further research lines.

6.1. Discussion: where we are

The most relevant results produced by the analysis of these references are as follows:

- Research on LM in hotels was scarce during the 20th century, but results seem to indicate an increase in very recent years, especially given the rise in recent references corresponding to conference proceedings.
- Journals are the source of the greatest number of references; however, no particular publication can be said to specialise in LM in hotels.
- Qualitative research is the most widely used methodology, particularly case studies. Empirical research is neither predominant or negligible (which is normal in a new field of research) but it is growing, as is the application of LM in hotels.
- Most of the works have been co-written by two or more authors, but none of the 73 authors found can be said to be prolific in quantitative terms.
- All the continents generate references, but most are found in Asia (which started strongly in 2010) and Europe (stable during the entire period analysed). More recently, African production seems to have also emerged strongly. Perhaps most surprising is the low production in the USA, which tends to lead research in other fields and LM scopes.
- Although most of the references in the sample simultaneously cover hotels and LM, almost 20% are not actually focused on LM or its tools and one addresses LM but only covers hotels indirectly.
- The core topics identified in the content analysis are inventory management and JIT purchases and inventories, lean human resource management, the applicability of LM tools and methods, the use of specific LM tools, the use of Lean Six Sigma, LSCM, the effect of LM application on performance, and barriers, obstacles and critical success factors for LM implementation.
- Applications of specific LM tools have been found in 11 hotel activities or departments, mainly housekeeping and restaurants and F&B. The tools that stand out are 5 S and VSM.

Some other undocumented and/or unpublished lean applications in hotels may also exist, as well as others that have not been investigated as such. As indicated by Rauch et al. (2016), Lean methods are used only partially in single hotel departments. Consequently, the overall approach is missing, and these applications are not attributed to LM. Particularly worth mentioning is that when LM is applied in the hospitality area, it frequently occurs in combination with the Six Sigma management system, as found in Ramphal and Nicolaides (2018).

6.2. Further lines of research: where we might go

In line with the second research goal, some further research lines can be determined and some implications can be drawn for practitioners. Regarding the latter, Rauch et al. (2020) identifies 20 top lean hospitality methods and tools and establishes that some of the most promising are Kaizen workshops for CI, visual management, and Poka-Yoke. VSM and can also be highlighted among the most used tools and are most usually applied to housekeeping, Restaurants and F&B, and Booking & reception. Hotel managers who wish to implement LM should, perhaps, begin with these tools in the above-mentioned activities.

However, managers should also be aware of the opportunity for waste elimination presented by the adaptation to hotel processes of

other lean techniques such as SMED, TPM and Kaizen events. A good starting point would be an analysis of customer value and, based on this, the identification of wastage that can be eliminated or reduced. Also, in light of the results, training in LM philosophy would have to be extended to management as it does not seem to be very well-known in the sector. Broad knowledge of LM, its principles and tools is required for companies to be able to analyse its suitability and how to implement it based on their strategies and characteristics. In addition, as Hines et al. (2020) state, to achieve the performance improvements expected from LM, it should not be considered an 'easy' results-oriented and tools-only approach but a distinct evolutionary approach based on principles-led behaviour, systems, and cultural change, which appears to be more successful and sustainable.

At the academic level, our results clearly show that LM in hotels is a field in which there is only scant extant research and, therefore, much more remains to be done. Many of the questions posed in the introduction section remain unanswered or have been answered only partially or incompletely. Research is needed with surveys to show, among other things, the degree of knowledge of LM and the extent to which it is applied in hotels in different countries and geographical areas. More international studies are also required to throw some light on the contextual, cultural or social aspects that might affect LM implementation in hotels. Case studies of the implementation of some specific techniques in different hotels and activities will be useful for a better understanding of how they should be implemented and greater knowledge of the results that can be obtained with them. More empirical evidence is also needed on the impact of LM on performance in the hotel industry (Hadid and Mansouri, 2014). Much more research is required into specific applications in a wide range of hotel activities, practices such as Kaizen, Cellular layout, Poka-yoke, Set-up time reduction, Kanban control, etc, and activities such as booking and reception, administration and maintenance.

Finally, our results point to two research gaps. More research is needed in certain geographical areas, particularly in the United States, which is also a major tourist destination. In addition, although there are some works on smaller hotels and even one on private accommodation establishments, the most studied types of hotels are those with 4 or 5 stars, so more research is also needed on smaller and lower category hotels.

Despite the scant literature on LM applications in hotels, there is positive evidence of its results. However, no methodological development has been found with Lean applied to all hotel processes, starting with the identification of real value for customers. One major barrier to this seems to be the variety of activities that hotels develop, together with the fragmented nature of their departments. Notwithstanding, a hotel's business success could depend on good knowledge of customer value, which enables the generation of proposed services aimed at greater customer satisfaction. A focus such as Lean, which pursues processes in which the aggregated value flows towards the customer and wastage is eliminated throughout the value chain, and which offers so many tools and practices for this, seems a good solution for the sector. Managing hotel processes and activities under LM principles and identifying value for customers provide an opportunity to improve competitiveness and efficiency in which innovation and technology can play a fundamental role. In this sense, as IT and digitalisation have drastically changed travelling and tourism, the connection between LM and Industry 4.0 (I4.0), including emerging concepts such as the internet-of-things (IoT), cyber-physical systems (CPS) and big data, is a promising line of research. Integrating I4.0 with LM can lead to the adoption of new business models to obtain competitive advantages, thus enabling hotels to employ more effective sales tactics and provide a more personalised customer experience (Rauch et al., 2020; Paiva Santos et al., 2021).

To summarise, LM in hotels appears to be a field with great potential both for research and practice. The lack of useful academic research for industry, together with the lack of knowledge of LM in the business world, may be holding back its application and development. Although the problem of the gap between academia and practice is not exclusive to LM but affects the discipline of hospitality management in general (Khan, 2019), we believe that in the times we are living in, the hotel industry cannot ignore a focus such as LM, which has already demonstrated its potential in many other service sectors.

6.3. Limitations

Other LM applications in hotels may exist that have been published in other languages or professional or lower impact journals indexed in other, less relevant databases. This is only a relative limitation since the SLR has been designed to focus mainly on high-quality research. Nonetheless, being aware that other publications may exist can broaden the knowledge of the current situation of coverage of the topic and interest among researchers and practitioners. Informal searches in Google Scholar have retrieved papers in Korean, Turkish and Portuguese, for example, as well as some master's theses in English and Spanish.

Appendix I. Reference profile: summary

Authors	Year	Type*	Methods	Country
Barlow, G.L.	1995	CP	Case study	UK
Barlow, G.L.	1997	JCR/S	Case study	UK
Timo, N.	2001	BC	Case study	Australia
Barlow, G.L.	2002	JCR/S	Case study	UK
Cuatrecasas, L.	2004	JCR/S	Modelling	Spain
Lai, P.; Baum, T.	2005	JCR/S	Case study	UK
Hsieh, Y.; Chen, H.; Chang, W.	2010	CP	Theoretical	China
Gürel, D.A.	2013	OSJ	Theoretical	Turkey
Ongkunaruk, P.; Kessuvan, A.	2013	CP	Case study	Thailand
Vijaya Sunder, M.	2013	OSJ	Survey & descriptive analysis	India
Vlachos, I.; Bogdanovic, A.	2013	JCR/S	Survey & statistical analysis	19 European countries
Ivasciuc, I.; Epuran, G.	2015	OSJ	Theoretical	Romania
Manaf, M.H.	2016	CP	Case study	Singapore
Pluchevskaya, E.; Kuchkartaeva, A.; Kabanova, N.; Varlacheva, N.	2016	CP	Case study	Russia
Rauch, E.; Damian, A.; Holzner, P.; Matt, D.T.	2016	CP	Case study	Italy
Mohammad, A.A.A.	2017	JCR/S	Qualitative survey & analysis	Egypt
Ramphal, R.R.	2017	JCR/S	Theoretical	South Africa
Al-Aomar, R.; Hussain, M.	2018	JCR/S	Survey & descriptive analysis	UAE
Govender, C.M.; Jasson, C.C.	2018	JCR/S	Theoretical	South Africa
Kamar, A.M.	2018	OSJ	Survey & statistical analysis	Egypt

(*continued*)

Authors	Year	Type*	Methods	Country
Ramphal, R.R.; Nicolaides, A.	2018	JCR/S	Theoretical	South Africa
Zhang, T.; Chen, X.	2018	CP	Case study	China
Al-Aomar, R.; Hussain, M.	2019	JCR/S	Qualitative survey & AHP	UAE
Alhisan, Z.; Alrifaie, N.; Dhabban, A.K.; Samour, O.A.; Abdelhadi, A.	2019	CP	Case study	Saudi Arabia
Hussain, M.; Al-Aomar, R.; Melhem, H.	2019	JCR/S	Survey & SEM	UAE
Pankotay, F.M.; Koloszár, L.	2019	CP	Qualitative survey & analysis	Hungary
Tortorella, G.L.; Rosa, M.V.L.L.; Caiado, R.; Nascimento, D.; Sawhney, R.	2019	OSJ	Qualitative survey & analysis	Brazil
Chittipaka, V.	2020	JCR/S	Survey & statistical analysis	India
Criscione-Naylor, N.	2020	JCR/S	Case study	USA
Gładysz, B.; Buczacki, A.; Haskins, C.	2020	JCR/S	Case study	Poland
Kuaites, T.; Thueanphae, T.; Chanthranapasawat, N.	2020	CP	Case study	Thailand
Rauch, E.; Damian, A.; Linder, C.	2020	JCR/S	Case study	Italy
Shofia, A.; Bakhtiar, A.; Prastawa, H.	2020	CP	Theoretical	India
Sztorc, M.; Savenkovs, K.	2020	JCR/S	Survey & statistical analysis	Poland
Leverenz, D.; Hafner, G.; Moussawel, S.; Kranert, M.; Goossens, Y.; Schmidt, T.	2021	JCR/S	Data statistical analysis	Germany
Rai, S.S.; Ansari, I.A.; Ganguly, K.; Giri, S.; Rai, S.	2021	JCR/S	Case study	India

* JCR/S: Scientific article in JCR or Scopus journals; OSJ: Scientific articles in other journals; CP: Conference proceedings; BC: Book chapter

Appendix II. Reference content: summary

Reference	Focus on hotels?	Focus on LM?	Core topic	Summary	Specific practice/tool applications
Barlow (1995)	Yes	No	Inventory Management	Implementation of a JIT logistics system for drinks supply to a hotel restaurant. Results include reductions in stocks, savings in storage space, a reduction in paperwork and savings in staff time.	JIT purchasing and inventory
Barlow (1997)	Yes	No	Inventory Management	Reports on the current methods used in a range of 4 UK hotel groups and how they currently operate their inventory management systems, including JIT inventory/purchasing. The best examples found in these cases use the JIT system to reduce variability to work with small inventories.	JIT purchasing and inventory
Timo (2001)	Yes	No	Labour	Investigates labour flexibility in the Australian hotel industry and identifies the different types of labour used to provide a theoretical framework that accounts for changes in the pattern of hotel labour use to restructure the supply, effort, timing and intensity of work on a just-in-time basis. The conclusion is that hotel practices are more 'mean than lean'.	None
Barlow (2002)	Yes	Yes	Inventory Management & procurement	Studies three hotel establishments in London that are representative of a multinational operator, a small international hotel and a family group and concludes that the savings observed in costs show that the benefits derived from the adoption of JIT purchases compensate for any potential problems and justify implementation. Therefore, the conclusion is that all hotels should consider adopting JIT purchasing.	JIT purchasing and inventory
Cuatrecasas (2004)	Yes	Yes	Efficiency of check-out	Describes a methodology applied step-by-step to the check-out service of a hotel-type establishment with a system that calculates the main magnitudes related to operations efficiency and optimisation. The system achieved optimisation of speed of service, efficiency and competitiveness and elimination of queuing, idle times and other kinds of waste.	Shojinka (flexible layout, takt-time, multi-skilled workers)
Lai and Baum (2005)	Yes	Yes	Demand management	Aims to propose possible solutions to the characteristically erratic demand fluctuations in the hotel sector by applying just-in-time philosophy through the development of relationships with employment agencies. Future empirical study is required to more fully assess the applicability of JIT principles to HRM in the hotel sector.	JIT labour supply
Hsieh et al. (2010)	Yes	Yes	Demand management	The feasibility of the consumption cycle model of the demand chain (founded on the concept of lean) is established based on supplier demand and customer needs. According to the authors, this model can help hotels drive up sales growth and reduce unnecessary costs.	None
Gürel (2013)	Yes	No	Applicability of tools	Conceptual evaluation of the 5 S model in hotels. 5 S is proposed as a quality- and value-oriented	5 S

(*continued*)

Reference	Focus on hotels?	Focus on LM?	Core topic	Summary	Specific practice/tool applications
				business model appropriate for the service characteristics of hotels. 5 S can be used for employees to focus on value in an orderly, safe, clean, comfortable and positive work environment, which is crucial for service quality.	
Ongkunaruk and Kessuvan (2013)	Yes	No	Demand management	Studies large-scale food services best practices in Thailand with a focus on demand characteristics and management practices. JIT is implemented to have fast, tractable and high-quality deliveries.	JIT delivery
Vijaya Sunder (2013)	Yes	Yes	Applicability	Analyses corporate views of the practical applicability of Lean and Six Sigma to compare and contrast their usage in real-time scenarios. Lean is more evident than Six Sigma in the hospitality sector, but Lean Six Sigma is preferred over all other methodologies in the service industry as a whole.	None
Vlachos and Bogdanovic (2013)	Yes	Yes	Waste reduction	Survey on Lean thinking in the European hotel industry in which seven value mapping streams are assessed in two key processes: guest bookings and reception and procurement. A high percentage of operational time is spent on both 'value streams', indicating that waste largely depends on external factors.	VSM
Ivasciuc and Epuran (2015)	Yes	No	Organic Growth	Lean principles are considered to be the key to long-term organic growth as designing the service process to deliver what customers expect from the hotel offer is a crucial component of encounter marketing. Applies Liker (2004) Process principles from hotel marketing point of view (continuous flow, pull system, Heijunka, problem-solving culture, standardisation, visual controls and use of reliable technology only).	None
Manaf (2016)	Yes	Yes	Applicability of tools	LM is used to improve the productivity of hotel housekeeping operations, proving that Lean can be applied to hotel operations and have a significant impact on work outcomes: a 20% increase in daily work outputs was made possible by redesigning work processes and systems to be leaner.	5 S, DMAIC, swim lanes process, flow chart, time value map, cause-effect diagram, time and motion study
Pluchevskaya et al. (2016)	Yes	Yes	Applicability of tools	Describes an experiment with 5 S implementation in a hotel-type dormitory at the National Research Tomsk Polytechnic University. The optimum option for the maid's cleaning movements in the room is visualised in a spaghetti diagram. A reduction in time loss allows cost-effective value to be created.	5 S, Spaghetti diagram
Rauch et al. (2016)	Yes	Yes	Applicability of tools	Describes practical experiences of the application of LM methods in the hospitality sector and states their suitability and any possible potential for optimisation. Identifies and assesses 47 suitable methods for hospitality grouped into 5 categories: a) machinery and equipment, b) material flow and layout, c) organisation and staff, d) production planning and control and e) quality. The top ten Lean methods are FIFO, ABC-Analysis/Pareto diagram, XYZ-Analysis, Ideas management, Kaizen (CIP-Workshops), Milkrun, Economic (optimal) lot size, Visual Management, Poka-Yoke and 5 S The work also produces a case study in a hotel company where several LM methods have been successfully implemented.	Kaizen circles, ABC analysis, spaghetti diagram, 5 S
Mohammad (2017)	Yes	Yes	Adoption level & obstacles	Most hotels in Egypt do not adopt LM principles. Some obstacles exist that limit said adoption, such as a lack of motivation and the additional work effort and expenses associated with applying the new approach. The results also show that applying lean thinking principles in hotel food operations can result in many operational benefits, such as reducing operating costs by eliminating waste and achieving customer satisfaction by providing added value. 21 practices related to the five Lean thinking principles were identified: identification of value, value stream mapping, value flow, pull production and pursuing perfection.	None

(*continued*)

Reference	Focus on hotels?	Focus on LM?	Core topic	Summary	Specific practice/tool applications
Ramphal (2017)	Yes	Yes	Implementation of Lean Six Sigma	This paper proposes a framework for the integrated Lean Six Sigma methodology and a template for the hospitality industry. Many Lean tools from Leite and Vierira (2015) and the book by Stevenson (2012) are mentioned. Synergies between Six Sigma and Lean are presented and DMAIC and the five lean thinking principles are compared and integrated into a Lean Six Sigma framework with four phases: initiation, data management, improvement and freezing.	None
Al-Aomar and Hussain (2018)	Yes	Yes	Applicability in supply chain	Assesses the adoption of lean techniques across hotel supply chains. A theoretical framework of lean assessment for value creation is first developed and a SIPOC-based construct of a hotel supply chain is used to identify and categorise hotel waste. Lean practices (19) are classified into six main categories: JIT, Kaizen, Quality improvement, Inventory control, Productive maintenance and Standardisation. Study results can subsequently be used by practitioners and researchers to conceptualise and assess lean adoption across hotel supply chains in different contexts.	None
Govender & Jasson (2018)	Yes	Yes	Applicability of LM	Identifies and discusses 7 advantages and 6 challenges to Lean thinking and Lean practices in the hospitality sector in South Africa.	None
Kamar (2018)	Yes	Yes	Lean hotel supply chain	Assesses the current level of awareness of Lean, willingness to implement it and the perceived benefits and barriers to doing so. It also proposes a framework for implementing Lean in hotel supply chain management. Many LM and LSCM practices and tools are presented for potential implementation but no specific applications.	None
Ramphal and Nicolaides (2018)	Yes	Yes	Applicability of Six Sigma and Lean	A literature analysis to create greater awareness of the usage of Six Sigma and Lean in the hospitality industry and to disseminate key steps for an improvement in quality and ethical actions. The conclusion is that Lean Six Sigma has been proven to lead to improved service and quality, both of which create value for guests.	None
Zhang and Chen (2018)	Yes	Yes	Lean human management	Shows how a state-owned hotel has used lean human management (decentralisation, multifunctional and cross-training, teamwork, respect for people) to make breakthroughs in addressing serious staff turnover problems.	None
Al-Aomar and Hussain (2019)	Yes	Yes	Applicability in supply chain	A survey tool is used to develop a framework for the identification, categorisation and prioritisation of lean techniques adopted in a hotel supply chain. The study found that JIT and Kaizen take top priority among the identified categories of lean practices.	None
Alhisan et al. (2019)	Yes	Yes	Applicability of tools	Assesses lean thinking applications in housekeeping operations and quality management strategies at The Ritz-Carlton Hotel, including a comparison of the hotel's managerial approach to waste-reducing practices with lean thinking implementation. The authors conclude that the standardisation of operational processes and respect for both employees and guests led this hotel to achieve such a high-bar service advantage, which is an indication of how easy it is to apply lean thinking to this industry.	Respect for people, Poka-Yoke, just-in-time, continuous improvement, 5 Whys, 5 S, process standardisation, Kanban and pull system
Hussain et al. (2019)	Yes	Yes	Impact of lean and green practices on sustainable performance	A case study of a large sample of UAE hotels is used to assess the impact of integrated lean and green practices on the hotel supply chain's sustainable performance. The results show that three major lean techniques (Kaizen, quality and productive maintenance) and three green techniques (health and safety, waste disposal and green certifications) have substantial impacts on the sustainable performance of hotel supply chains. Lean techniques have the highest impact on economic performance and the smallest impact on environmental performance.	None
	Yes	Yes			None

(*continued*)

Reference	Focus on hotels?	Focus on LM?	Core topic	Summary	Specific practice/tool applications
Pankotay and Koloszár (2019)			Applicability: opportunities & threats	Based on in-depth interviews, the authors argue that an illusory lean exists that originates from a misinterpretation of its principles: that LM is used as a tool and not as a philosophy and that this is why it does not bring the expected results. The development possibilities and potential dangers of misinterpreting LM use are presented through hotel industry examples.	
Tortorella et al. (2019)	Yes	Yes	Applicability in supply chain	Six different supply chains of high-quality hotels are analysed through semi-structured interviews. The adoption level and degree of importance of 10 LSC practices in the hotel supply chains are analysed. Evidence is provided of how lean principles are being disseminated in this sector: some practices are intuitively adopted; an understanding of the necessary adaptation is required for successful implementation and the full potential is still unknown.	Few supply sources, Collaborative relation-ships based upon mutual trust and commitment and Low vertical integration
Chittipaka (2020)	Yes	Yes	Applicability of Six Sigma and Lean	Although Lean Six-sigma is addressed at the theoretical level, the empirical study focuses on Six Sigma. Results show that Six Sigma execution is mainly connected to operational performance and that Indian hotels using Six Sigma have gained more significant advantages than hotels executing other quality administration programs.	None
Criscione-Naylor (2020)	No	Yes	Kaizen team leadership	Identifies kaizen team leaders' values, assumptions and behaviours during the kaizen process and identifies the post-participation impact on professional practice.	Kaizen and continuous improvement
Gładysz et al. (2020)	Yes	Yes	Applicability of tools for waste reduction	The article analyses the applicability of lean management methods for achieving efficient operations and eliminating food waste in food services based on a literature review and three case studies in Poland. Results suggest a set of activities for food delivery service organisations to streamline their processes through the application of lean management practices.	Spaghetti diagrams, Gemba walk, 5 S, standardisation, VSM, 5 Whys, Kaizen, suggestion system, Kanban
Kuaites et al. (2020)	Yes	Yes	Applicability	The objective of the study is to use visual management techniques to reduce working process waste in hotel housekeeping activities. Two types of rooms are analysed. Several activities are eliminated or re-arranged and, as a result, the cleaning time and the service cost are reduced and work efficiency improved.	Flow Process Chart, Flow Diagram, ECRS (Eliminate, Combine, Rearrange and Simplify)
Rauch et al. (2020)	Yes	Yes	Applicability of tools	Outlines the potential of LM as a successful approach to increase efficiency and productivity in operational processes in the hospitality industry. Based on a real case study in a premium hotel in the north of Italy, the research shows a selection of LM methods that are particularly suitable for application in the hotel sector. Ten lean measures (Customer-oriented planning and synchronisation, continuous improvement, lean in purchasing and warehousing, spaghetti diagram and milkrun, SMED in housekeeping, 5 S, VSM in check-in/out, value analysis in food, reduction of energy waste and creation of a lean management leader) and several lean methods for each measure are analysed and the qualitative results are presented with the associated monetary savings. Results are similar to those in a previous work by Rauch et al. (2016).	Pull/Kanban, job rotation, visual management, dashboard, kaizen (CIP-workshops), idea-management, PDCA, FIFO, EOQ, ABC-analysis/Pareto diagram, XYZ-analysis, supplier development, optimisation of the SC, supermarket, Kanban, JIT, milkrun, workplace ergonomics, SMED, 5 S, Poka-Yoke, control charts, VSM, work station design/layout, lessons learned workshops.
Shofia et al. (2020)	Yes	Yes	Critical success factors of Lean Six Sigma in the hotel industry	The study aims to identify the critical success factors in Lean Six Sigma implementation in the low-cost hotel industry in the Semarang city area of India. The paper proposes a research framework that connects nine critical success factors with LSS implementation and a subsequent impact on operational and organisational performance.	None
Sztorc & Savenkovs (2020)	Yes	Yes	Use of tools	The purpose of this paper is to identify lean management instruments used to implement strategic objectives related to the creation and retention of value in the area of value networks while redefining the business model of service	VSM, Six-sigma, Hoshin Kanri, 5 S, JIT, pull system, Kanban, Kaizen, FIFO, Jidoka, teamwork, work standardisation, Poka-Yoke, PDCA, visualisation and spaghetti diagram.

(*continued*)

Reference	Focus on hotels?	Focus on LM?	Core topic	Summary	Specific practice/tool applications
				enterprises in the example of Polish hotels. 17 LM instruments for redefining business models are listed and surveyed.	
Leverenz et al. (2021)	Yes	No	Waste reduction in food services	This investigation focuses on quantifying and analysing breakfast buffet leftovers in hotel kitchens and shows how these can be reduced. The findings demonstrate that breakfast buffet leftovers can be significantly reduced by simple operational changes such as the use of smaller serving dishes and refilling the buffet with smaller quantities of food prepared just in time.	JIT food preparation
Rai et al. (2021)	Yes	Yes	Applicability	The paper examines the implementation of lean practices in the service operations of five different homestay establishments using the case study methodology. Lean implementation is measured through waste elimination, transparency, quality management and workforce empowerment and treatment. The study explores multiple scenarios of lean implementation with varying lean knowledge and identifies and observes three different practitioners of lean management as methodical, admirer and sustained believer.	None

References

Al-Aomar, R., Hussain, M., 2018. An assessment of adopting lean techniques in the construct of hotel supply chain. Tour. Manag. 69, 553–565. https://doi.org/10.1016/j.tourman.2018.06.030.

Al-Aomar, R., Hussain, M., 2019. Exploration and prioritization of lean techniques in a hotel supply chain. Int. J. Lean Six Sigma 10 (1), 375–396. https://doi.org/10.1108/IJLSS-10-2017-0119.

Alhisan, Z., Alrifaie, N., Dhabban, A.K., Samour, O.A., Abdelhadi, A., 2019. Application of Lean Manufacturing to Hospitality Sector; Case Study, Ritz-Carlton Hotel, Riyadh-Kingdom of Saudi Arabia. Proceedings of the International Conference on Industrial Engineering and Operations Management, Riyadh, Saudi Arabia. November 26–28, 869–875. (*).

Antony, J., Psomas, E., Garza-Reyes, J.A., Hines, P., 2021. Practical implications and future research agenda of lean manufacturing: a systematic literature review. Prod. Plan. Control. 2 (11), 889–925. https://doi.org/10.1080/09537287.2020.1776410.

Arlbjørn, J.S., Freytag, P.V., 2013. Evidence of lean: a review of international peer-reviewed journal articles. Eur. Bus. Rev. 25 (2), 174–205. https://doi.org/10.1108/09555341311302675.

Barlow, G.L., 1995. JIT implementation within a Service Industry: A case study. Proceedings of the 2nd International Symposium on Logistics, Nottingham. 197–207. (*).

Barlow, G.L., 1997. Inventory: asset or liability? Int. J. Hosp. Manag. 16 (1), 11–22. https://doi.org/10.1016/S0278-4319(96)00049-7.

Barlow, G.L., 2002. Just-in-time: Implementation within the hotel industry — a case study. Int. J. Prod. Econ. 80 (2), 155–167. https://doi.org/10.1016/S0925-5273(02)00315-8.

Bellisario, A., Pavlov, A., 2018. Performance management practices in lean manufacturing organizations: a systematic review of research evidence. Prod. Plan. Control 29 (5), 367–385. https://doi.org/10.1080/09537287.2018.1432909.

Berger, F., Ferguson, D.H., Woods, R.H., 1989. Profiles in innovation: companies and leaders. Cornell Hotel Restaur. Adm. Q. 30 (2), 98–105 https://doi.org/10.1177/001088048903000220.

Bhamu, J., Sangwan, K.S., 2014. Lean manufacturing: literature review and research issues. Int. J. Oper. Prod. Manag. 34 (7), 876–940. https://doi.org/10.1108/IJOPM-08-2012-0315.

Bhasin, S., Burcher, P., 2006. Lean viewed as a philosophy. J. Manuf. Technol. Manag. 17 (1), 56–72. https://doi.org/10.1108/17410380610639506.

Bicheno, J., Holweg, M., 2016. The Lean Toolbox: A Handbook for Lean Transformation. PICSIE Books, Buckingham.

Bonfanti, A., Vigolo, V., Yfantidou, G., 2021. The impact of the Covid-19 pandemic on customer experience design: The hotel managers' perspective. Int. J. Hosp. Manag. 94, 102871 https://doi.org/10.1016/j.ijhm.2021.102871.

Bowen, E.D., Youngdahl, W.E., 1998. "Lean" service: in defence of a production line approach. Int. J. Serv. Ind. Manag. 9 (3), 207–225. https://doi.org/10.1108/09564239810223510.

Briner, R.B., Denyer, D., 2012. Systematic review and evidence synthesis as a practice and scholarship tool. In: Rousseau, D.M. (Ed.), Handbook of Evidence-based Management: Companies, Classrooms and Research (chapter 7). Oxford University Press, New York.

Caldera, H.T.S., Desha, C., Dawes, L., 2017. Exploring the role of lean thinking in sustainable business practice: a systematic literature review. J. Clean. Prod. 167 (20), 1546–1565. https://doi.org/10.1016/j.jclepro.2017.05.126.

Chittipaka, V., 2020. Lean six sigma applications in service sector – a study. Int. J. Sci. Technol. Res. 9 (3), 1–6.

Criscione-Naylor, N., 2020. Kaizen (continuous improvement) and systems thinking: exploring how kaizen facilitators operationalise values and assumptions. Int. J. Manag. Pract. 13 (5), 547–564.

Cuatrecasas, L., 2002. Design of a rapid response and high efficiency service by lean production principles: methodology and evaluation of variability of performance. Int. J. Prod. Econ. 80 (2), 169–183. https://doi.org/10.1016/S0925-5273(02)00316-X.

Cuatrecasas, L., 2004. A lean management implementation method in service operations. Int. J. Serv. Technol. Manag. 5 (5/6), 532–544.

Danese, P., Manfè, V., Romano, P., 2018. A systematic literature review on recent lean research: state-of-the-art and future directions. Int. J. Manag. Rev. 20 (2), 579–605. https://doi.org/10.1111/ijmr.12156.

Duclos, L.K., Siha, S.M., Lummus, R.R., 1995. JIT in services: a review of current practices and future directions for research. Int. J. Serv. Ind. Manag. 6 (5), 36–52. https://doi.org/10.1108/09564239510101518.

Espino-Rodríguez, T.F., Ramírez-Fierro, J.C., 2017. Factors determining hotel activity outsourcing. An approach based on competitive advantage. Int. J. Contemp. Hosp. Manag. 29 (8), 2006–2026. https://doi.org/10.1108/IJCHM-05-2016-0291.

Farrington, T., Antony, J., O'Gorman, K.D., 2018. Continuous improvement methodologies and practices in hospitality and tourism. Int. J. Contemp. Hosp. Manag. 30 (1), 581–600. https://doi.org/10.1108/IJCHM-03-2017-0141.

Gładysz, B., Buczacki, A., Haskins, C., 2020. Lean management approach to reduce waste in HoReCa food services. Resources 9 (144), 1–20. https://doi.org/10.3390/resources9120144.

Govender, C.M., Jasson, C.C., 2018. Lean practices for efficiency in the South African hospitality sector. African J. Hosp. Tour. Leis. 7 (2), 1–14.

Gupta, S., Sharma, M., Vijaya Sunder, M., 2016. Lean services: a systematic review. Int. J. Product. Perform. Manag. 65 (8), 1025–1056. https://doi.org/10.1108/IJPPM-02-2015-0032.

Gürel, D.A., 2013. A conceptual evaluation of 5s model in hotels. African J. Bus. Manag. 7 (30), 3035–3042. https://doi.org/10.5897/AJBM2013.7098.

Hadid, W., Mansouri, S.A., 2014. The lean-performance relationship in services: a theoretical model. Int. J. Oper. Prod. Manag. 34 (6), 750–785. https://doi.org/10.1108/IJOPM-02-2013-0080.

Hartini, S., Ciptomulyono, U., 2015. The relationship between lean and sustainable manufacturing on performance: literature review. Procedia Manuf. 4, 38–45. https://doi.org/10.1016/j.promfg.2015.11.012.

Hasle, P., Bojesen, A., Jensen, P.L., Bramming, P., 2012. Lean and the working environment: a review of the literature. Int. J. Oper. Prod. Manag. 32 (7), 829–849. https://doi.org/10.1108/01443571211250103.

Heskett, J.L., 1987. Lessons in the service sector. Harv. Bus. Rev. 65, 118–126.

Hines, P., Holweg, M., Rich, N., 2004. Learning to evolve: a review of contemporary lean thinking. Int. J. Oper. Prod. Manag. 24 (10), 994–1011. https://doi.org/10.1108/01443570410558049.

Hines, P., Taylor, D., Walsh, A., 2020. The lean journey: have we got it wrong? Total Qual. Manag. Bus. Excell. 31 (3–4), 389–406. https://doi.org/10.1080/14783363.2018.1429258.

Holweg, M., 2007. The genealogy of lean production. J. Oper. Manag. 25, 420–437. https://doi.org/10.1016/j.jom.2006.04.001.

Hsieh, Y., Chen, H., Chang, W., 2010. The application of lean concept combines demand channel and supply channel in service industry. Proceedings of the IEEE

International Conference on Industrial Engineering and Engineering Management. Macau, China. 1309–1313. (*).

Hu, Q., Mason, R., Williams, S.J., Found, P., 2015. Lean implementation within SMEs: a literature review. J. Manuf. Technol. Manag. 26 (7), 980–1012. https://doi.org/10.1108/JMTM-02-2014-0013.

Hussain, M., Al-Aomar, R., Melhem, H., 2019. Assessment of lean-green practices on the sustainable performance of hotel supply chains. Int. J. Contemp. Hosp. Manag 31 (6), 2448–2467. https://doi.org/10.1108/IJCHM-05-2018-0380.

Ivasciuc, I., Epuran, G., 2015. A marketing approach on how continuous processes improvement can contribute to hotel business organic growth. Bull. Transilv. Univ. Braşov Ser. V Econ. Sci., 8, 57, pp. 185–200.

Jasti, N.V.K., Kodali, R., 2015. Lean production: literature review and trends. Int. J. Prod. Res. 53 (3), 867–885. https://doi.org/10.1080/00207543.2014.937508.

Kamar, A.M., 2018. Lean philosophy: a step towards improving the management of hotel supply chain. Int. J. Herit. Tour. Hosp. 12 (3), 59–93. https://doi.org/10.21608/IJHTH.2018.32059.

Krafcik, J.F., 1988. Triumph of the lean production system. Sloan Manag. Rev. 30 (1), 41–52.

Kuaites, T., Thueanphae, T., Chanthranapasawat, N., 2020. The Application of Lean Concept to Waste Reduction of Working Process in Hotel Service Industry. Proceedings of the 2020 IEEE 7th International Conference on Industrial Engineering and Applications. Bangkok, Thailand. 1070–1075. (*).

Lai, P., Baum, T., 2005. Just-in-time labour supply in the hotel sector: the role of agencies. Empl. Relat. 27 (1), 86–102. https://doi.org/10.1108/01425450510569328.

Leite, H.R., Vierira, G.E., 2015. Lean philosophy and its applications in the service industry: a review of the current knowledge. Prod. 25 (3), 529–541. https://doi.org/10.1590/0103-6513.079012.

Leverenz, D., Hafner, G., Moussawel, S., Kranert, M., Goossens, Y., Schmidt, T., 2021. Reducing food waste in hotel kitchens based on self-reported data. Ind. Mark. Manag. 93, 617–627. https://doi.org/10.1016/j.indmarman.2020.08.008.

Manaf, M.H., 2016. Application of lean to hotel's operations raising housekeeping productivity. Proceedings of the Asia Tourism Forum 2016 - the 12th Biennial Conference of Hospitality and Tourism Industry in Asia in Bandung. West Java, Indonesia. 19, 184–197. (*).

Martínez-Jurado, P., Moyano-Fuentes, J., 2014. Lean management, supply chain management and sustainability: a literature review. J. Clean. Prod. 85, 134–150. https://doi.org/10.1016/j.jclepro.2013.09.042.

Mohammad, A.A.A., 2017. Approaching the adoption of lean thinking principles in food operations in hotels in Egypt. Tour. Rev. Int. 21 (4), 365–378. https://doi.org/10.3727/154427217X15094520591349.

Moyano-Fuentes, J., Sacristán-Díaz, M., 2012. Learning on lean: a review of thinking and research. Int. J. Oper. Prod. Manag. 32 (5), 551–582. https://doi.org/10.1108/01443571211226498.

Narayanamurthy, G., Gurumurthy, A., 2016. Leanness assessment: a literature review. Int. J. Oper. Prod. Manag. 36 (10), 1115–1160. https://doi.org/10.1108/IJOPM-01-2015-0003.

Ongkunaruk, P., Kessuvan, A., 2013. A study of large scale food services best practices in Thailand: A case study of HORECAs. Proceedings of the 10th International Conference on Service Systems and Service Management. Hong Kong, China. 831–836. (*).

Paiva Santos, B., Valle Enrique, D., Maciel, V.B.P., Miranda Lima, T., Charrua-Santos, F., Walczak, R., 2021. The Synergic relationship between industry 4.0 and lean management: best practices from the literature. Manag. Prod. Eng. Rev. 12 (1), 94–107. https://doi.org/10.24425/mper.2021.136875.

Pankotay, F.M., Koloszár, L., 2019. Lean Management in the hotel sector – opportunities and threats. Proceedings of the 9th Business & Management Conference. Prague, Czech Republic, 49–61. (*).

Paul, J., Criado, A.R., 2020. The art of writing literature review: What do we know and what do we need to know? Int. Bus. Rev. 29 (4), 101717 https://doi.org/10.1016/j.ibusrev.2020.101717.

Petticrew, M.A., Roberts, H., 2006. Systematic Reviews in the Social Sciences. Blackwell, Oxford.

Pluchevskaya, E., Kuchkartaeva, A., Kabanova, N., Varlacheva, N., 2016. Enhancing staff wellbeing through cost management in the crisis period. Proceedings of the II International Scientific Symposium on Lifelong Wellbeing in the World Wellso 2015. Tomsk, Russian Federation. 7, 193–203. (*).

Rai, S.S., Ansari, I.A., Ganguly, K., Giri, S., Rai, S., 2021. Lean practices in homestay operations: a case study. J. Qual. Assur. Hosp. Tour. 22 (4), 395–424. https://doi.org/10.1080/1528008X.2020.1802388.

Ramphal, R.R., 2017. Lean six sigma framework for the hospitality industry. Afr. J. Hosp. Tour. Leis. 6 (4), 1–15.

Ramphal, R.R., Nicolaides, A., 2018. Intelligent consistency- ethical practices of lean six sigma in quality service provision in the hospitality industry. African J. Hosp. Tour. Leis. 7 (3), 1–15.

Rauch, E., Damian, A., Holzner, P., Matt, D.T., 2016. Lean hospitality - application of lean management methods in the hotel sector. Proceedings of the 48th Cirp Conference on Manufacturing Systems. Ischia, Naples, Italy. 41, 614–619. (*).

Rauch, E., Damian, A., Linder, C., 2020. Lean management in hospitality: methods, applications and future directions. Int. J. Serv. Oper. Manag. 36 (3), 303–326.

Samuel, D., Found, P., Williams, S.J., 2015. How did the publication of the book the machine that changed the world change management thinking? Exploring 25 years of lean literature. Int. J. Oper. Prod. Manag. 35 (10), 1386–1407. https://doi.org/10.1108/IJOPM-12-2013-0555.

Shah, R., Ward, P.T., 2007. Defining and developing measures of lean production. J. Oper. Manag. 25 (4), 785–805. https://doi.org/10.1016/j.jom.2007.01.019.

Shofia, A., Bakhtiar, A., Prastawa, H., 2020. The impact of critical success factor of lean six sigma implementation towards the improvement of business performance on low-cost hotel industry: a literature review. AIP Conf. Proc. 2217 (1), 030072 https://doi.org/10.1063/5.0000707.

Singh, G., Ahuja, I.S., 2012. Just-in-time manufacturing: literature review and directions. Int. J. Bus. Contin. Risk Manag. 3 (1), 57–98.

Snyder, H., 2019. Literature review as a research methodology: An overview and guidelines. J. Bus. Res. 104, 333–339. https://doi.org/10.1016/j.jbusres.2019.07.039.

Suárez-Barraza, M.F., Smith, T., Dahlgaard-Park, S.M., 2012. Lean Service: A literature analysis and classification. Total Qual. Manag. Bus. Excell. 23 (3/4), 359–380. https://doi.org/10.1080/14783363.2011.637777.

Sztorc, M., Savenkovs, K., 2020. The use of lean management instruments to shape business models of service companies. Manag. Prod. Eng. Rev. 11 (3), 128–143. https://doi.org/10.24425/mper.2020.134939.

Takeda-Berger, S.L., Tortorella, G.L., Rodriguez, C.M.T., 2018. Lean supply chain management: a systematic literature review of practices, barriers and contextual factors inherent to its implementation. In: Davim, J. (Ed.), Progress in Lean Manufacturing. Management and Industrial Engineering. Springer, Cham, pp. 39–68.

Timo, N., 2001. 'Lean or just mean'? The flexibilisation of labour in the Australian hotel industry. In: Vallas, S. (Ed.), The Transformation of Work (Research in the Sociology of Work, Volume 10). Emerald Group Publishing Limited, pp. 87–309 (*).

Tortorella, G.L., Rosa, M.V.L.L., Caiado, R., Nascimento, D., Sawhney, R., 2019. Assessment of Lean implementation in Hotels' supply chains. Prod 29, e20190044. https://doi.org/10.1590/0103-6513.20190044.

Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. Br. J. Manag. 14, 207–222. https://doi.org/10.1111/1467-8551.00375.

Vijaya Sunder, M., 2013. Synergies of lean six sigma. IUP J. Oper. Manag. 12 (1), 21–31.

Vijaya Sunder, M., Ganesh, L.S., Marathe, R.R., 2018. A morphological analysis of research literature on lean six sigma for services. Int. J. Oper. Prod. Manag. 38 (1), 149–182. https://doi.org/10.1108/IJOPM-05-2016-0273.

Vlachos, I., Bogdanovic, A., 2013. Lean thinking in the European hotel industry. Tour. Manag. 36, 354–363. https://doi.org/10.1016/j.tourman.2012.10.007.

Womack, J.P., Jones, D.T., 1996. Lean Thinking. Simon and Schuster, New York.

Womack, J.P., Jones, D.T., Ross, D., 1990. The Machine that Changed the World. Ed. MacMillan/Rawson Associates, New York.

Zhang, T., Chen, X., 2018. Lean Thinking & People-oriented Management of State-owned Single Hotel—A Case Study of Nanjing Huangpu Hotel. Proceedings of the 2nd International Conference on Education Technology and Social Science (ETSS 2018). Chongqing, China. 148–152. (*).