

A SYSTEMATIC REVIEW OF FINANCIAL FACTORS AFFECTING IMPLEMENTATION OF LEAN PRINCIPLE IN SMALL AND MEDIUM ENTERPRISES OF SAUDI ARABIA

Abdullah Abdulaziz Alkhoraif
College of Administrative and Finance
Saudi Electronic University

Abstract:

The application of the lean principle can play an important role in enhancing the competitiveness and performance of small and medium-sized enterprises (SMEs). The lean principle can reduce the cost of production, maximize resource optimization, and enhance the firm's ability to provide superior value to the customers. The empirical research studying the effect of the implementation of lean principles in the SMEs has been widely studied. The researchers have used varying amounts of contextual variables as antecedents and consequences of the lean principle implementation in SMEs. The purpose of the present research study is to address this gap by reviewing the literature on Lean implementation in SMEs with a focus on finance-related variables as antecedents and consequences. To achieve the purpose of our study, the current research has employed a systematic literature review as a methodology to collect the studies from academic databases of ABI/INFORM world, Taylor & Francis, Emerald, Sage, Inderscience, Premier, ScienceDirect, and Scopus Business Supplies. The results of the study have yielded insight and knowledge into four different themes. Finally, an area for future research has also been developed.

Key words: *Lean implementation (LI), Small and Medium Enterprise (SMEs), Literature review, Financial aspects, Critical successful factors (CSFs)*

INTRODUCTION

Nowadays, markets are defined by robust competitive forces over a period of time [1]. The competitive nature of organizations has been inspired by macro-forces that greatly influence both demand and supply [2, 3]. The demand and supply by consumers and firms are being shaped by the increase in globalization, the freeing of trade, and the lowering of trade [4]. Further, demands have also been formed by the changing pattern of consumer choices and preferences, which are shaped by increasing digitalization, purchasing power and consumer welfare [5]. Thus, organizations should now realize they must increase their competitive capabilities to trade fruitfully within the markets. Therefore, success in business operation completely depends on the customers' needs and want and maximizing effective manufacturing and exporting techniques [6]. Thus, in such a context, "Lean" business philosophy can be very effective in prioritizes effectiveness, cutting down on waste, and having a thorough grasp of what customers need [5, 7].

Nowadays, a lot of businesses follow the lean principle and focus on streamlining processes regardless of the size or nature of their organizations [8]. This Lean adaption serves a

variety of sectors with the goal of increasing competitiveness and reaching a wider audience, both domestically and internationally. Customizing Lean methods to meet the needs of specific clients is emphasized in Cooney's work [8]. Furthermore, Zhou's [9] study centers on the adoption of lean in small and medium-sized businesses (SMEs) [9], whereas more general studies emphasize its application in major firms, particularly in certain industries [10]. It should be noted, however, that SME companies can also benefit from the Lean management methodologies and philosophies. SMEs are now facing numerous challenges, and therefore, the Lean philosophy provides different ways to enhance operation performance, particularly within the production and supply spheres. The empirical evidence clearly suggests that the number of SME firms adopting lean practices and philosophies has achieved considerable success in enhancing the operating and financial results [11, 12, 13, 14].

Business enterprises and companies, as far as size are concerned, can typically fall into two categories, i.e. Large Enterprises (LEs) and Small-Medium Enterprises (SMEs) [15]. The lean philosophy tends to be more prevalent in terms of adoption in LEs, but its integration into SMEs remains

notably low, with a very limited number of studies especially empirical studies, providing an understanding of its challenges [16, 17]. While existing studies focus primarily on larger enterprises [18, 19, 20, 21, 22, 23], there exists a significant research gap with regard to the integration and application of lean production SMEs, necessitating further research exploration. Therefore, the present research aims to address this gap by conducting a comprehensive literature review on Lean implementation in SMEs, focusing particularly on financial barriers and common challenges. Thus, the present research attempts to explore and find the answer to one of the important research questions: 1. Which particular categories come out of research on lean in SMEs? 2. What monetary obstacles prevent SMEs from implementing lean? 3. From a financial standpoint, which critical success factors (CSFs) support Lean implementation in SMEs? 4. Which untapped Lean implementation opportunities could be advantageous to SMEs? 5. Is it possible for this review to close the gap by providing a thorough examination of lean tactics in SMEs? 6. What useful advice and suggestions may be given to managers and owners of SMEs about the application of lean? 7. Lastly, what avenues for future study in this field ought to be taken into account? The primary goal of this study is to make a substantial contribution by providing the first thorough literature assessment on lean tactics in SMEs in the manufacturing industry. Therefore, the present research aims to address the literature gap, which points out the study of the financial factor that plays a significant role in implementing lean principles in SMEs. Secondly, the present research aims to develop insights that help managers of SMEs look at these factors while undertaking decisions related to the lean implementation of lean principles at their respective SME firms. Finally, the present research aims to develop comprehensive areas for future research. The literature review is divided into three sections and can begin with the introduction. The literature review is divided into three sections and can begin with the introduction. Section 1: Lean: a discussion on literature; the primary can introduce and make a case for the Lean conception, its key attributes, and its impact; the second half can concentrate on applying SMEs versus LEs. Section 2: Finance, which describes and justifies the employment of the analysis technique employed in this analysis. Section 3: SEM describes the literature analysis and the results deduced from these. The systematic analysis method invented by Tranfield [24] is then mentioned in Chapter 4. Chapter 5 discusses the impact of implementing Lean strategies inside an organization. This chapter summarizes the analysis concerning the financial aspects and queries an overview of lean, where lean implementation refers to a business management philosophy and a semi-permanent approach [25, 26].

LITERATURE REVIEW

Lean

Krafcik [27] first used the word "lean", in his study for the Massachusetts Institute of Technology, and he used it to describe the Toyota production system. (TPS) [7]. It was then discussed in two novels, *The Computer Transforming*

the World [28, 29], and *Lean Thought* [28], which contributed to the introduction of the Lean concept into main literature streams. Lean was a term developed to characterize the various activities of Japanese firms that described their improved competitiveness advantages at the time. This was known as the "Japanese Working Way". The elements of the 'Lean Idea' include methods of service (such as zero inventories [30, 31, 32]; just-in-time (JIT) [33] and lots of small volumes [34]; reinforcement of quality processes illustrated by Total Productivity Management (TPM), and Quality Management (TQM). Further, adding to the discussion, the perspective of the employee and their contributions were also included in the lean philosophy, which in turn challenged the traditional hierarchical top-down management structures and functional organizational systems that had previously governed many organizations [35].

It is also important to keep in mind that the Lean mindset goes beyond these fundamental ideas, particularly when it comes to outsourcing and financial implications. In order to simplify operations and increase efficiency, outsourcing – a crucial technique in the Lean implementation process – involves handing over responsibility for some activities to outside partners. This feature of lean has been more well-known recently, changing the corporate environment throughout the world. Outsourcing not only helps firms optimize their existing mix of resources but also helps in cutting costs, which can ultimately lead to higher organizational performance [36].

Lean philosophy, which emphasizes waste removal, process optimization, and continuous improvement, has changed accounting, financial, and reporting procedures. Lean principles encourage firms to automate jobs, simplify processes, and get rid of inefficiencies in order to save a lot of time and resources [37]. Finance professionals may also use analytics and financial modeling to get important insights into market trends and operational performance, thanks to the emphasis on data-driven decision-making. Businesses may achieve greater productivity, reduced costs, and improved financial results by fostering a culture of continuous improvement and utilizing Lean approaches, thereby enhancing their sustainable development and competitive edge [38]. This strategy adds greatly to the sustainability and expansion of the organization while also improving financial outcomes.

Thus, it can be concluded that, lean implementation has a variety of financial impacts. Organizations may save expenses, increase profitability, and achieve operational excellence by decreasing waste [39]. Lean approaches also improve decision-making procedures, guaranteeing efficient use of financial resources. Innovative financial methods have emerged as a result of the application of Lean concepts to finance, helping companies to traverse challenging economic circumstances effectively. The Lean concept offers a comprehensive strategy for organizational excellence, embracing financial applications and outsourcing tactics [40]. Businesses may achieve sustainable development and maintain a competitive edge in today's dynamic market by using Lean concepts in both operational and financial aspects [41].

An Overview of Finance

In finance, 'lean' is relatively new, while lean in production environments has been deployed for several decades. It's time to show finance departments the benefits of lean work [42, 43]. The solution will benefit finance people and controllers because they can quickly combine all sorts of financial data they can't combine in SAP. The lean methodology perfectly applies in finance and should be much broader implemented. Applying lean principles to the finance processes, such as accounting, controlling, and reporting, would be a way to optimize these processes [44, 45].

Another aspect required to make lean finance successful is that all users should understand the reporting language. Too often, management KPIs aren't understood by employees at a lower level in a firm [46, 47]. To make lean finance successful, financial statements should be presented in a language understandable for everybody in the organization. Once this is achieved, it will trigger the appropriate actions too [42, 48].

Lean Finance is essential because it helps avoid the processing of invoices in batches and creating inventory between each step in the process. It also helps organize functions and minimize the typical finance peaks in activity levels such as month-end closing, budget cycle, and forecasting [47]. Most financial accounting systems are based on a traditional department structure. Accounting uses its financial accounting systems as a source of all internal financial analysis, such as departmental expense reports & profitability analysis. Accounting also uses financial accounting systems to maintain compliance with external reporting [49, 50, 51].

A lean organization needs to transition from departmental to value stream-based analysis for internal financial analysis. This is necessary to create alignment between internal financial statements, financial management practices, and value streams, which are the primary units of organization and management in a Lean organization [52, 53]. Calculating the financial impact of continuous improvement aligns the lean strategy and lean operating practices directly with the actual impact on profitability [54, 55]. The economic analysis is dynamic in that value stream operating performance, capacity, and profitability must be analyzed simultaneously for every improvement event [56, 57]. Following is the standard work for commission, such as a financial analysis. Firms routinely have different goals when introducing the lean concept, and not every lean tool or principle is equally helpful in every situation. It takes time to introduce lean manufacturing principles to a finance function – four to six months to make them stick in individual units and two to three years on an organizational level [43, 47, 49]. A new mindset and capabilities are also needed, and the effort won't be universally appreciated, at least in the beginning. Ultimately, a leaner finance function will reduce costs, increase quality, and better align corporate responsibilities within the finance function and between Finance and other departments [48, 58]. Today, organizations are squeezing their finance functions like never before.

Expectations are at an all-time high, yet resources are increasingly scarce. Finance leaders must deliver various filings, reports, and critical information. They must maintain controls and compliance and keep up with complex accounting rules – all this while meeting business demands for faster turnaround and lower costs [43, 45, 47, 59].

Overview of SMEs

Organizations, such as small and medium-sized enterprises, play an enormous role and work in the manufacturing sector worldwide to create production jobs. Moreover, new technology and globalization majorly affect small and medium enterprises. SMEs apply a modern approach/methodology/principle like lean to boost ongoing outcomes. Unfortunately, many small and medium-sized companies (SMEs) have failed to adopt the lean manufacturing model for fear of time, expense, and potential benefits. Authors investigated Crucial Positive Factors CSFs of Lean implementation within SMEs, including the organization's culture, the role of Finance, Expertise and skills, assessment system results, and management and leadership style [17, 60]. Panizzolo [61] studies the lean manufacturing permeation in Indian small and medium-sized enterprises and explores that the organizational culture, vision, and strategy are driving significant changes in organizational efficiency, while the majority of the failures to adopt lean in small and medium-sized enterprises (SMEs) are due to using the wrong approach, using one method to solve problems, misunderstanding the situation, poor decision-making processes, poor external support such as customers, [62, 63]. In comparison, LEs are more effective than SMEs in incorporating Lean Manufacturing [64, 65, 66, 67].

RESEARCH METHODOLOGY

A systematic review of literature using the SLR (Systematic Literature Review) approach will be used for this research [68, 69, 70]. It has three significant benefits: the primary benefit of the SLR approach is that it analyses earlier literature per a specific procedure [71]. It also helps gather vast volumes of available literature per the prescribed methodology and provides a particular outcome of the subject knowledge that can be reported quickly [72]. Further, this method is based on a flow-chart pattern clearly outlining the crystalized and unique stages. Danese [73] also outlined a few more benefits of the SLR approach, e.g., error reduction and better accuracy, better structuring and presentation in specific fields or sub-fields, universalization, and better outcomes and implications. The stages are arranged sequentially, starting from planning, conducting, and reporting the reviews of considered literature [24]. The three stages of planning, conducting, and final reporting of the results are elaborated in Figure 1. The first stage talks about the planning phase, which is divided into three sub-stages: Inclusion criteria, Exclusion Criteria, and Search Criteria. Second stage includes the final sample selection and execution of the review. Final stage compiles the outcomes, tries to visualize the same, and provides future directions.

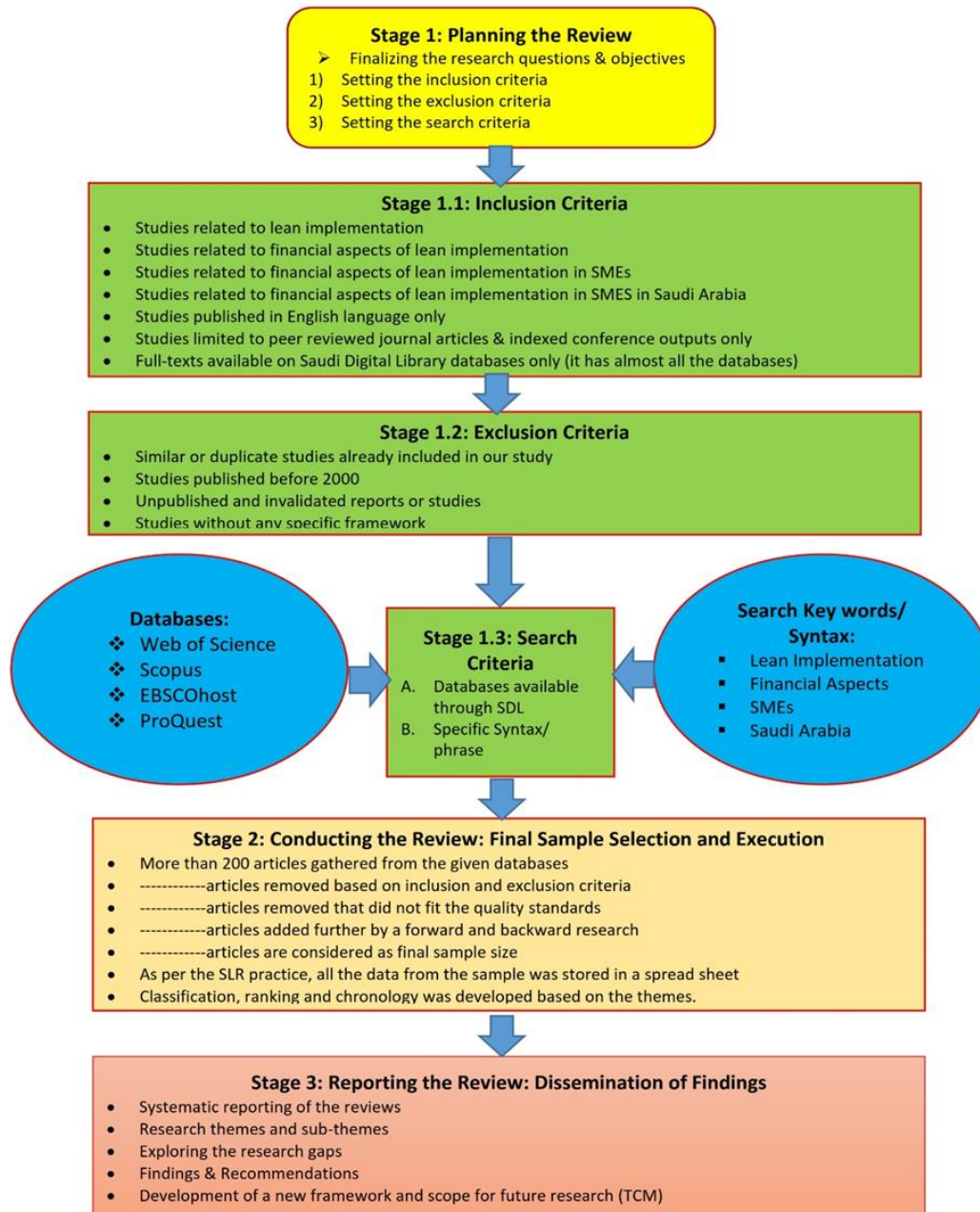


Fig. 1 The SLR process

Planning the review

The planning began with finalizing the individual research questions and objectives about the selected topic. It is crucial to set the goals first to conduct any SLR [70]. Few specific financial aspects of lean implementation in SMEs were used, although the study is not limited to the chosen elements only. Various trends and issues were also analysed in this study, along with the questions and objectives.

Inclusion Criteria (IC)

The authors decided to set the IC first to make the sample selection easier. Inclusion criteria typically choose the study's 'must have' literature. The following eight ICs were considered for this study. IC (a): Studies related to lean implementation; IC (b): Studies related to financial

aspects of lean implementation; IC (c): Studies related to financial aspects of lean implementation in SMEs; IC (d): Studies related to financial aspects of lean implementation in SMEs in Saudi Arabia; IC (e): Studies published in English language only; IC (f): Studies limited to peer-reviewed journal articles & indexed conference outputs only; IC (g): Full-texts available on Saudi Digital Library databases only (it has almost all the databases); IC (h): Studies published till 2020.

Exclusion Criteria (EC)

After setting the inclusion criteria, we developed a few exclusion criteria to filter the sample for suitable articles. EC gives guidelines on making the literature ineligible for a study. The following four ECs were taken: EC (a): Similar

or duplicate studies already included in our study; EC (b): Studies published before 2000; EC (c): Unpublished and invalidated reports or studies; EC (d): Studies without any specific framework.

Search Criteria (EC)

Once both IC and EC were set, the authors decided to fix the criteria for searching the literature for this research. We divided the requirements into two parts: the selection of databases and the selection of syntax or phrases. The Saudi Digital Library (SDL) has proved immensely helpful for databases. It is one of the largest libraries (online) with a centralized repository of almost all the databases. Out of all the databases, we focused on four widely accepted and popular databases: Web of Science, Scopus, EBSCOhost, and ProQuest. The search was conducted through these databases (on the SDL platform), whereas SDL had access to almost all the publishers, e.g., Elsevier, Emerald, Sage, Taylor & Francis, and Wiley, to name a few.

Further, coming to the second part, syntax or phrase, the following keywords were used: Lean Implementation, Financial Aspects, SMEs, and Saudi Arabia. The components of financial aspects were used as keywords: sources of capital, investments and return on assets, incremental capital expenditure, sourcing financial resources (e.g., procurement, production, sales, and recycling), debt financing, credit substitutes, and accounting methods. After setting all these three criteria, the authors moved to the next phase to execute the reviews.

Conducting the review

After setting the stage for the execution of the process by fixing the triple criteria for selecting relevant literature, the second stage started. The mentioned databases were used with the specified keywords related to our research objectives see Table 1.

Table 1
Keyword search

Search string combinations	Database
(small and medium enterprises) AND (Lean implementation)	ABI
(Lean implementation) AND (finance aspects)	EBSCO
(Just in Time (JIT)) AND (finance aspects)	ScienceDirect
(Lean) AND (finance aspects)	Emerald
(Toyota Production System (TPS)) AND (finance aspects)	SAGE
(Lean) AND (small and medium organization)	Scopus
(small and medium enterprise) AND (Lean implementation)	Inderscience
(Just in Time (JIT)) AND (small and medium organization)	Taylor & Francis
(Sources of capital) AND (lean implementation)	SDL
(Investments and return on investments) AND (lean implementation)	Elsevier
(Incremental capital expenditure) AND (lean implementation)	Wiley
(Sourcing financial resources) AND (lean implementation)	
(Credit substitutes and accounting methods) AND (lean implementation)	

To begin with, a broad collection of 312 articles was prepared. Then, the list was filtered and tweaked with relevance criteria using the abstracts and specified vital words and titles. Further, using IC and EC, the list was pruned to 278 articles. A quality check was conducted, and the list was re-checked, but the quality was okay. Then, full papers were reviewed to find fitness as per our study. This round was repeated twice, with all four authors involved in a cyclical pattern. Then, the numbers came down to 127. After reviewing a few high-quality review articles, we also decided to do an in-depth search of the articles used in these studies. This process increased the count to 91. Finally, the sample was fixed at 34 articles for our research. As per the SLR practice, all the data from the finalized sample was collated in a spreadsheet. Themes and sub-themes were finalized, and the classification, ranking, and chronology were developed based on the same. After gathering all the required basic information about the sample, we moved to the final stage, which is the most important.

REPORTING THE REVIEW

According to the Tranfield [74] process, it is proposed that this stage should include two sections: a descriptive analysis and a category input analysis on an Excel spreadsheet to provide a descriptive analysis of the "current state diagram" of the selected papers. The results of the present systematic literature review study have yielded the four major research areas and themes. First, the emphasis was on research procedures, assessing the methodologies used in studies pertaining to the adoption of lean. Second, the research looked at how current studies were divided, classifying them into pertinent subgroups for a thorough understanding. The third subject focused on the financial elements of how Lean implementation affected Small and Medium Enterprises (SMEs), offering light on the financial and economic ramifications of Lean adoption in these settings. Through two sub-themes, defining the Critical Success Factors (Theme 4.1) and examining the actual implementation techniques connected to financial elements (Theme 4.2), the study also looked into crucial areas of Lean implementation in SMEs. With an emphasis on both methodological techniques and the financial aspects of this organizational strategy, this systematic literature review study has enabled a nuanced understanding of how Lean is implemented in SMEs. A critical review study also discusses how any aspect significantly impacts Lean Implementation adoption.

DISCUSSION

The results of a systematic review of the Lean SME literature regarding the financial aspects discussed in this section. Tranfield [75] encouraged a descriptive methodology of undertaking the systematic review, which clearly emphasises its role in categorizing literature into distinct groups. According to Tranfield [75] the descriptive methodology of undertaking the systematic review aims to interpret the level of consensus within the relevant literature streams, which help to identify the emerging themes

and potential areas for future research recommendations. From such kind of categorization and subcategorization of literature, the present research has identified four kinds of distinct themes [76] in the previous lean literature review.

- Theme 1: Research methods;
- Theme 2: Division of the research;
- Theme 3: The impact of Lean implementation on SMEs in terms of financial aspects;
- Theme 4: Critical Success Factors of Lean implementation in SMEs in terms of financial aspects;
- Theme 5: How is Lean implemented in SMEs regarding financial aspects?

Theme 1: Research methods

As far as the research methods and, most importantly, the data collection and operationalization is concerned, the results show that case study was the primary and widely used method of data collection and operationalization have been used i.e. in the 34 papers, making up 44% of the overall documents [14, 77, 78, 79]. Surveys made up 34% of the papers (e.g. [80, 81, 82, 83]). At 17%, Concept papers focused on the development of the theoretical structures, models, or guides for the implementation of Lean SMEs (e.g. [84, 85, 86, 87, 88]). The lack of research into lean performance in SMEs now becomes evident in numerous case studies, mixed methods studies, and intervention studies. Only (5%) used multiple case studies (e.g. [53]). Many mixed approaches were used, including surveys, interviews, or case studies [60, 89, 90, 91, 92].

Theme 2: Division of the research

The results of a systematic review of literature on the financial dimensions within Lean implementation of SMEs have revealed that the majority of scholarly inquiry and assessment predominantly rely on data collected and analyzed from the manufacturing sector. Among the collective pool of researchers engaged in this exploration, a substantial majority – specifically, 28 researchers, accounting for roughly 82.78 per cent – operate within academic spheres, actively shaping and expanding the discourse on financial aspects [9, 19, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91]. In contrast, a comparably minute percentage, merely two authors constituting approximately 4.78 percent, emerge as practitioners actively involved in the field [92, 93, 94, 95, 96, 97, 98]. This pronounced academic dominance prompts a noteworthy discussion regarding the sources, credibility, and practical implications of financial insights within Lean implementation.

Theme 3: The impact of Lean implementation on SMEs in terms of financial aspects

In general, Lean implementation is studied in the context of firm's acquiring the ability to (in-house development or operating processes in small and medium-sized enterprises) eliminate waste, which is also considered to be the critical objective of Lean implementation in SMEs [77, 80, 93, 94]. Lean philosophies in the SMEs have been applied for the purpose of decreasing available space, storage,

and reducing the overall time (i.e., substitution time, distribution time, time interval, and outturn time) at the same time enhancing the value chain. The perspective benefits for SMEs with regard to lean stem from the value of their products and services offered to the customers [95, 96]. Within the systematic literature reviewed, two fundamental areas have emerged with regard to SMEs and lean. These areas can be categorized as quality enhancement and workforce efficiency [64, 97, 98]. Notably, our systematic inquiry of literature suggests that Lean implementation within SMEs' supply chains is limited, with only one study examining its effects, while others primarily focus on its impact on suppliers and customers [99, 100]. One additional noteworthy study gap is the financial advantages of implementing Lean in SMEs, an area that warrants further investigation [101]. Chiarini's study challenges conventional accounting methods in assessing the genuine impact, even though there may be a delay between implementation and noticeable financial advantages [102].

Additionally, there is a dearth of research in the literature on critical success factors (CSFs) that are explicitly designed or connected with financial elements for Lean implementation in small and medium-sized enterprises (SMEs). A thorough review is necessary due to several elements such as staff participation, task dedication, senior management support, training, and financial performance upgrades [58, 103, 104]. Remarkably, little research discusses staff empowerment [105], increased employee motivation, interests, and abilities [68, 99, 106, 107]. Manoochehri stands out among them for demonstrating how Just-In-Time (JIT) adoption may alter corporate culture [108]. Table X provides a detailed summary of this data and explains why Lean SME research mostly focuses on improving efficiency rather than effectiveness.

Theme 4: Critical Success Factors of Lean implementation in SMEs in terms of financial aspects

The findings suggest that very few existing research focused on the financial aspects of CSFs for lean implementation in SMEs [29, 30, 42, 109]. The results further reveal an essential cycle of funding and the role of finance [91, 92]. Achanga [110] Highlighted the financial constraints of small and medium-sized enterprises in the papers, but only a single study identified the available finances as CSF. This would suggest the lack of a definite agreement on the importance of the funds available to SMEs for effective implementation of Lean [30, 58, 86, 111]. A common finding for Lean implementation is the establishment of lean engagement and education among managers and employees of financial departments to prepare them for Lean. [60, 87, 88, 112] agreed with this when they suggested beginning with training and improving employees and managers instead of immersing themselves directly in Lean instruments. Collis [113] also proposed continuing this education and learning through Lean implementation. Dombrowski [10] Finalized an experiment in which he evaluated three methods of gathering Lean information that could be taught at various process stages. A

review of the findings and conclusions drawn in this research will be given, which will be demonstrated later to inform SMEs on how to execute Lean once more; an opinion paper addresses the financial advantages of Lean implementation in SMEs, which tend to be an apparent field of interest [101]. This mentions that there could be a delay between execution and any monetary benefits. Still, Chiarini's [114] accounting benefit review shows that the effect of traditional met cannot be observed in accounting methods.

The results further show that most research studies have demonstrated that the majority of SMEs neglect the financial resources [89, 90, 115, 116] and the facilities of the building, which are required and play a greater role for facilitating the Lean's implementation [68, 95]. For SMEs, the continued adoption of a Lean approach and philosophies requires significant financial investment. Most SMEs cannot have such a level of funding and financial resources at their disposal, in addition to the time necessary for education and knowledge growth. (see, e.g. [116]). Consider the establishment of conducive building facilities as a crucial key performance benchmark or indicator promoting Lean practices. Such facilities, while integral for Lean practices, might present an obstacle for SMEs as they might not have significant resources to design and redesign building facilities for implementing the lean production methodologies. Numerous studies indicate that small and medium-sized businesses face a great deal of difficulty in responding to evolving needs because of their restricted ability to influence market trends owing to their size. As a result, they frequently find it difficult to have a significant impact on consumer trends, which makes them predictable and steady but may also limit their capacity to adjust to changing markets [95, 117, 118, 119].

In the pursuit of financing significant initiatives like lean implementation, researchers such as Dowlatshahi & Taham [120] have emphasized the greater and more important role of the availability of financial resources. The resource can be made available to the SMEs from other sources such as governmental or specialized organizations [121]. Secondly, the size of an organization is crucial when evaluating the benefits and difficulties faced by SMEs using lean principles. Smaller scales have some intrinsic advantages, but because of their size, SMEs frequently have inherent challenges when implementing lean. It becomes imperative to address these barriers, requiring a plan that optimizes benefits and minimizes barriers [84, 122, 123]. Thirdly, personal understanding and communication between the operations management and finance departments are two key success factors (CSFs) that require attention [124, 125, 126, 127, 128, 129]. Al-lily [130] highlights that efficient Just-In-Time (JIT) adoption necessitates direct communication between management and the labor. Furthermore, Achanga [17, 110] emphasizes how important employee interest and engagement are as critical components of lean success. Finally, Private ownership is usually the source of leadership in SMEs [17]. This may be a beneficial element. This idea is reinforced by Al-najem [86], who emphasizes the need for senior support

and commitment, competency, skill development within teams, adapting to a new culture, and willingness for successful lean implementation in SMEs. Various CSFs are presented in Table 2.

Table 2
Critical Success Factors

CSFs	Authors
Employee involvement and participation	[97], [131], [132], [133], [134], [135], [136], [137], [138], [139]
Sufficient funding and capital	[77], [86], [110], [138], [140], [141], [142], [143], [144], [145]
Government support is more likely to be available	[120]
Effective Leadership	[17], [95], [96], [98], [99], [100], [101], [146], [147], [148], [149]
Top management support and commitment	[2], [17], [61], [92], [102], [103], [104], [132], [136], [140], [145]
Training and Education	[53], [105], [106], [107], [108], [110], [136], [150]
Organizational culture (change, strategy, vision, and performance evaluation system)	[10], [57], [82], [83], [92], [111], [115], [117], [140], [145], [151], [152], [153], [154], [155]
Financial capability Supply chain integration	[2], [50], [51], [56], [77], [105], [110], [116], [118], [145], [146]
Personal experience	[17], [57], [92], [102], [156]

Theme 5: How is Lean implemented in SMEs regarding financial aspects?

Since firms are confronted with low levels of productivity [122], high labor costs, and high levels of inventory [123], as well as advances in technology, science, and innovation [124], business leaders and managers need to explore strategies that can increase the value to their goods and decrease losses as much as possible [157]. Since Toyota implemented lean manufacturing effectively, it has gained much attention within two decades. Lean production implementation is related to operational performance improvement. However, the most normally mentioned advantages associated with lean implementation are advancement in employee productivity and the quality of products, along with a decrease in manufacturing costs, cycle time, and customer lead time [158].

Although some studies assert the relationship between lean practice and financial performance [60, 129, 159, 160]. The relationships among lean production, operational, and financial performance are still vague. Therefore, this study proposes to add comprehension of these linkages by investigating the simultaneous relationships among lean production, operational performance, and financial performance in SMEs in KSA. Lean instructs companies to constantly enhance all of their organizational elements by continuously generating value and eliminating non-value-added or waste-related operations from the ultimate end-customers role through efforts by a whole body of skilled, empowered staff [29, 161, 162]. It is also branded as an appealing 'common sense' approach and tends to be deceptively easy to learn [19, 163, 164]. However, Lean remains hard to implement, with a recorded adoption failure rate of up to 90%. [89]. It is surprising

that, while it's been more than 40 years since Sugimori [165] published the first English account on TPS, lean's seminal update and prime inspiration for Toyota, managers and academics are still struggling to crack open their code and duplicate similar success as Toyota. Culture has been repeatedly evoked as an explanation, a source, and a key solution among all recorded possible causes of this enigma [156, 166].

Operational excellence must be achieved not only in factories but also in office settings. Lean methods are a potential approach to solving this challenge [167, 168], and the number of studies about implementing lean methods in different fields has recently increased (e.g., [97, 169]). However, there is currently no standard method of applying poor values, principles, and tools to the knowledge-based workforce, leaving many companies struggling to implement successful lean projects [170]. These projects often fail to deliver value to organizations' pursuits of productivity, operational excellence, and competitive advantage. To employ lean thinking and approaches, it is crucial to understand the context of their application. Eliminating waste in knowledge work requires adaptation from traditional lean approaches. The more work is standardized and routine-based (i.e., originating from the left side of the knowledge work continuum), the more easily waste is recognized [171, 172]. Rachman and Ratnayake [173] identify the need to redefine waste categorization to meet engineering services' contextual needs better. In their case study (engineering service), data management practices can cause significant waste; this issue could be tackled by standardizing work (specifically documents) and using a 5S methodology for data management. Such an approach would systematize and simplify data handling practices.

It is necessary to find research that focuses on value creation. This is challenging because the contexts and practices of knowledge work are rarely well described. The cases seldom describe the complex nature of work or the different phases of the knowledge process, even though the lack of clarity has been identified as a significant issue in work [174]. Task specification [175], [176] is another unique challenge when applying lean methods to knowledge work, as it is difficult to specify different tasks and understand their connections. This contrasts Power and Conboy's [177] request that modern lean thinking begin with understanding flow and its obstacles. This often leads to challenges where workloads gradually expand until workers are overwhelmed and handle too many low-value activities [175]. It has also been noted that contextual factors affect the implementation of lean. Still, only Rachman and Ratnayake [173] have described what this adaptation might look like in the field of waste identification compared to traditional lean waste in manufacturing. The extensive literature study of lean services done by Gupta et al. [97] shows that lean service context is implemented the most in healthcare or IT sectors and in education, finance, and the public sector. Lean methods in knowledge work are found to be present in engineering, product development, and healthcare (e.g., [172, 173,

175, 177]). Also, a few more philosophical papers generally examine lean in a knowledge work context. The cases from the healthcare sector are more challenging because they do not focus on knowledge work as much as patient process flow and waste elimination from a patient's viewpoint [174].

Waste elimination is one of the most commonly applied lean practices, according to lean knowledge studies [171, 173, 175, 178]. Although waste is present in knowledge work, waste elimination is not the direct goal – adding value is [179]. The waste in knowledge work is also largely invisible when tackling it is more challenging. In practice, all knowledge workers know that interruptions, misinformation, or poor collaborative practices may cause waste that can be eliminated. To tackle these workplace challenges, lean methods provide many systematic tools to improve such workplace practices. Furthermore, the lean approach offers a set of visualization tools that tackle the intangibility of knowledge work and improve collaboration by implementing critical knowledge in work settings [174, 175, 180].

Many researchers, such as McDermott and Venditti [174], Gupta et al. [97], and Rahman and Ratnayake [173], have realized that there is a certain need to adjust traditional lean practices and methods to tackle various industry-specific characteristics better.

Several researchers split lean management into “low lean management” and “high lean management” to determine if differences exist between these two profiles on operational performance [181] and financial performance [159]. This approach is exciting and gives original results compared to regression analysis. This method is well suited when the concept is unidimensional, but it is not appropriate for a multidimensional concept. Indeed, in the second case, more complex profiles must be created to understand the nature of the different impacts on outcomes.

The empirical literature that focused on applying lean techniques and their effect on financing has significantly reduced waste and improved performance in construction projects [182].

RESEARCH GAPS AND AVENUES FOR FUTURE RESEARCH

This research aims to fill this gap by completing a thorough systematic analysis of academic research findings referring to the financial aspects of Lean being implemented in SMEs. In addition, it outlines ideas for possible orientations in the study.

Limitation of research

This research has several limitations. The first relates to the terms settled for the literature search, which may have implied that such papers were excluded. In addition, there may have been limitations due to the systematic review methodology regarding the availability of literature references [69]. The authors used six central databases to compile the articles of literary review, which meant that some non-online books or theses were not available for this study. Four researchers were used for the review

panel, which led to an issue of disagreements between them and how to solve them. Tranfield [75] proposed that panel meetings should be used to solve any differences of opinions. For this research, 'unsure papers' were cross-referenced among the researchers, and the review panel and criteria were established for sorting these 'unsure papers' before any conclusions were made. Unfortunately, bias still exists over the final decisions, which is a limitation. Another problem in the study concerns the fusion of different data structures [183, 184] due to the different processing methods used for the papers. Survey techniques have produced quantitative data, but most case study research papers have generated qualitative results. This study, therefore, uses qualitative analysis to organize and analyze the significant categories of literature instead of meta-analysis, which is more common in medical science [75]. This research has a more authoritative and detailed approach to lean implementation in SMEs, rather than just a traditional narrative analysis, on the subject of lean implementation in SMEs and answered the seven research questions posed in the introduction.

Future Studies

This research has shown the lack of information and expertise related to implementing Lean in SMEs regarding financing aspects compared to the implementation of large companies. Another region worthy of attention is the financial challenges that SMEs face. In addition to the financial benefits of lean, the monetary potential and the impact of lean in small and medium-sized businesses should all be checked. There is a lack of a quest focusing on the Middle Eastern region, where research should also be carried out on operational benefits that go beyond improvement innovations, and most of the SME lean research base has focused on lean implementation in smaller Western manufacturing companies. This would suggest the importance of more research on Saudi Arabian SMEs and their success with lean implementation and a need for additional SME lean research in other developing countries, such as South America, Africa, and the Middle East.

Finally, since much of the organizational size problem was made when lean was introduced, this was recognized as a specific and critical concern for SMEs. Even more information on similarities and differences in the scale of implementation of lean between small and medium-sized enterprises and large enterprises is needed. Further observational studies, such as longitudinal studies, will be helpful in other studies to analyze CSFs discovered in previous research and determine their efficacy for SMEs and large companies. Moreover, a structure for manufacturing SMEs is required to promote large enterprises by leveraging aspects of financial aspects. The explanatory factor is that SME lean research consists mainly of single case studies and survey methods. This has contributed to opportunities for scholars to apply other methodologies, such as grounded theory and ethnography.

CONCLUSIONS

There is agreement that small and medium-sized enterprises are critical to a large, sustainable economy. Lean is a well-established organizational theory system that helps organizations develop processes and export more efficiently with greater efficiency and less waste. In light of this, it is no wonder that the question of lean implementation in small and medium-sized enterprises is such an important issue and a matter of concern that such poor learning is occurring among small and medium-sized enterprises [76]. This work has shown the lack of knowledge and understanding related to implementing Lean in SMEs compared to implementation among large companies. This research aims to bridge this gap by completing a thorough and inclusive analysis of academic research on implementing Lean in SMEs.

Theoretical implications

Another aim of this analysis was to identify areas for further research on lean implementation. Such an area will be discussed in detail below. Initially, three areas became evident from the 'descriptive' literature analysis. Second, there was very little study using grounded theory and ethnography, mixed approach, or practice work while studying the application of lean in small and medium-sized enterprises (SMEs). These approaches are beneficial for providing a more in-depth view of lean implementation in small and medium-sized businesses. Third, much of the lean work focuses on Western countries and avoids developing countries like the Middle East and Asia. Suitable study aspects focused on this may include comparative case studies of small and medium-sized businesses adopting lean in developed and developing countries to assess the application of lean methods in emerging economies. Fourth, lean's primary emphasis is on education, primarily because of its academic history, but research is needed in this context as it is now gaining prominence in the manufacturing sector.

Practical Implications

The first thing a small and medium-sized company must remember when implementing Lean is the benefits from the final aspects. The owners or administrators need to ensure that Lean implementation is positive and actively involved. Operational concerns must be tackled during lean's planning phase, including operational problems such as implementing an investment strategy (by acquiring new equipment or upgrading current equipment processes) essential to a strategic growth plan for SMEs. Small and medium-sized businesses need enough resources to help lean and do not require immediate success awards. Furthermore, due to the different forms of lean, the owners/managers need to decide on the version they want to introduce before starting. This version is subject to review and alteration during the process. In addition, small and medium-sized businesses or managers must actively seek external funding and support sources from government entities or lean specialists.

Additionally, it is recommended that a quality audit be performed to decide whether an organization can start lean. Due to financial and human resource constraints faced by small and medium-sized organizations, the most suitable lean instruments must initially be implemented (e.g., visual management, 5S/6S, VSM, and standard work, in addition to organizational changes such as performance management systems and evaluation standards, more complex structures (TPMs) and support programs (ITs) are required). It is necessary to note that there is no noticeable change in organizational efficiency until the basic methods have been used, at least. This represents the time gap between the Lean implementation and any visual benefits. This was demonstrated by Chiarini's [114] analysis of the standard accounting procedure, which eliminates any immediately observable gains from lean's implementation. The "performance enhancement" stage needs constant financial input, but the benefits are obvious. Another trait of SMEs is their inability to control their supply chain. Therefore, it is recommended that they use lean internally to the level of their manufacturer. These authors conclude that lean implementation is a long-term strategy and that SMEs must follow a long-term approach by slowly strengthening their organizational structure.

REFERENCES

- [1] R. Veliyath and R.A. D'Aveni, "Hypercompetition: Managing the Dynamics of Strategic Maneuvering," *Acad. Manag. Rev.*, vol. 21, no. 1, p. 291, Jan. 1996.
- [2] P. McLaughlin and A. Alkhoraif, "Explore and evaluate organizational culture aspects that affecting Lean implementation within manufacturing SMEs: the case of Saudi Arabia," *Int. J. Serv. Oper. Manag.*, vol. 36, no. 2, p. 1, 2020.
- [3] K. Singh, M. Saeed, and A. Bertsch, "Key Factors Influencing Employee Response Toward Change: A Test in the Telecom Industry in India," *J. Manag. Policy Pract.*, vol. 13, no. 3, pp. 66-81, 2012.
- [4] C. Harvey, A. Kelly, H. Morris, and M. Rowlinson, *Academic Journal Quality Guide: Version 4*. 2010.
- [5] J. Bhamu and K. Singh Sangwan, "Lean manufacturing: literature review and research issues," *Int. J. Oper. Prod. Manag.*, vol. 34, no. 7, pp. 876-940, Jul. 2014.
- [6] S.B. Bowersox, D.J., Closs, D.J., Stank, T. and Keller, "How supply chain competency leads to business success," *Supply Chain Manag. Rev.*, vol. 4, no. 4, pp. 70-78, 2000.
- [7] R. Shah and P. T. Ward, "Defining and developing measures of lean production," *J. Oper. Manag.*, vol. 25, no. 4, pp. 785-805, Jun. 2007.
- [8] R. Cooney, "Is 'lean' a universal production system?," *Int. J. Oper. Prod. Manag.*, vol. 22, no. 10, pp. 1130-1147, 2002.
- [9] B. Zhou, "Lean principles, practices, and impacts: a study on small and medium-sized enterprises (SMEs)," *Ann. Oper. Res.*, Jul. 2012.
- [10] U. Dombrowski and T. Mielke, "Lean leadership -15 rules for a sustainable lean implementation," in *Procedia CIRP*, 2014, vol. 17, pp. 565-570.
- [11] Q. Hu, R. Mason, S.J. Williams, and P. Found, "Lean implementation within SMEs: a literature review," *J. Manuf. Technol. Manag.*, vol. 26, no. 7, pp. 980-1012, 2015.
- [12] D. Singh and G. Singh, "Critical success factors for Six Sigma implementation in Indian SMEs: an evaluation using AHP," *Meas. Bus. Excell.*, vol. 25, no. 2, pp. 152-170, Jul. 2020.
- [13] A. Alkhoraif, H. Rashid, and P. McLaughlin, "Lean implementation in small and medium enterprises: Literature review," *Oper. Res. Perspect.*, vol. 6, p. 100089, Dec. 2019.
- [14] A.A. Alkhoraif and P. McLaughlin, "A methodology to surface aspects of organisational culture to facilitate lean implementation within SMEs," *Int. J. Oper. Res.*, vol. 40, no. 1, p. 52, 2021.
- [15] A. Alkhoraif and P. McLaughlin, "Organisational culture aspects that facilitate lean implementation: a pilot study," *Int. J. Agil. Syst. Manag.*, vol. 11, no. 2, p. 103, 2018.
- [16] R. Shah, "Lean manufacturing: context, practice bundles, and performance," *J. Oper. Manag.*, vol. 21, no. 2, pp. 129-149, Mar. 2003.
- [17] P. Achanga, E. Shehab, R. Roy, and G. Nelder, "Critical success factors for lean implementation within SMEs," *J. Manuf. Technol. Manag.*, vol. 17, no. 4, pp. 460-471, Jun. 2006.
- [18] P. Hines, M. Holweg, and N. Rich, "Learning to evolve," *Int. J. Oper. Prod. Manag.*, vol. 24, no. 10, pp. 994-1011, Oct. 2004.
- [19] M. Holweg, "The genealogy of lean production," *J. Oper. Manag.*, vol. 25, no. 2, pp. 420-437, 2007.
- [20] J. Moyano-Fuentes and M. Sacristán-D\`iaz, "Learning on lean: a review of thinking and research," *Int. J. Oper. {&} Prod. Manag.*, vol. 32, no. 5, pp. 551-582, 2012.
- [21] K.L. Brown and R.A. Inman, "Small Business and {JIT}: A Managerial Overview," *Int. J. Oper. & Prod. Manag.*, vol. 13, no. 3, pp. 57-66, 1993.
- [22] S.M. Gnanaraj, S.R. Devadasan, and P.R. Shalij, "Current state maps on the implementation of lean and Six-Sigma paradigms and an exclusive model for deploying Lean Six-Sigma in {SMEs}," *Int. J. Product. Qual. Manag.*, vol. 5, no. 3, p. 286, 2010.
- [23] A.A. Wagire, A. P. Singh Rathore, and R. Jain, "Identification and prioritisation of challenges to Industry 4.0 adoption in the Indian manufacturing industry," *Int. J. Bus. Excell.*, vol. 24, no. 2, pp. 248-274, 2021.
- [24] D. Tranfield, D. Denyer, and P. Smart, "Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review," *Br. J. Manag.*, vol. 14, no. 3, pp. 207-222, 2003.
- [25] F. Abdelfattah, M. Malik, A.M. Al Alawi, R. Sallem, and A. Ganguly, "Towards measuring SMEs performance amid the COVID-19 outbreak: exploring the impact of integrated supply chain drivers," *J. Glob. Oper. Strateg. Sourc.*, 2022.
- [26] J. Liker, "Becoming lean: Inside stories of US manufacturers," *Qual. Prog.*, vol. 32, no. 3, p. 107, 1997.
- [27] J. Krafcik, "Triumph of the lean production system," *MIT Sloan Manag. Rev.*, vol. 30, no. 1, p. 41, 1988.
- [28] J.P. Womack and D.T. Jones, *Lean Thinking: Banish Waste And Create Wealth In Your Corporation*. New York: Simon and Schuster, 1996.
- [29] J. Womack, D. Jones, and D. Roos, *Machine that changed the world*. Simon and Schuster., 1990.
- [30] P.S. Adler and R.E. Cole, "Designed for Learning: A Tale of Two Auto Plants," *Sloan Manage. Rev.*, vol. 34, no. 3, p. 85, 1993.
- [31] B. Halling, "Lean Implementation: The Significance of People and Dualism," *Sustain. Oper. Excell.*, 2013.
- [32] R.W. and A.P. and I.C.S. Hall, *Zero Inventories*. Homewood: Homewood, 1983.
- [33] C. Karlsson and P. Åhlström, "A lean and global smaller firm?," *Int. J. Oper. {&} Prod. Manag.*, vol. 17, no. 10, pp.

- 940-952, 1997.
- [34] P. Burcher, S. Dupernex, and G. Relph, "The road to lean repetitive batch manufacturing," *Int. J. Oper. & Prod. Manag.*, vol. 16, no. 2, pp. 210-220, 1996.
- [35] P. Hines, P. Found, G. Griffiths, and R. Harrison, *Staying Lean*. Productivity Press, 2011.
- [36] A. Mani, D. Barua, & A. Whinston, "An empirical analysis of the impact of information capabilities design on business process outsourcing performance," *MIS Q.*, vol. 34, no. 1, pp. 39-62, 2010.
- [37] B. Nicoletti, "Lean and Automate Manufacturing and Logistics," in *IFIP Advances in Information and Communication Technology*, vol. 415, no. 7, 2013, pp. 278-285.
- [38] J. Ahmed, *Digital Twin, Servitization, Circular Economy, and Lean Manufacturing: A Step toward Sustainability*. In *Human Factors in Engineering*. CRC Press, 2023.
- [39] B. Mrugalska and J. Ahmed, "Organizational Agility in Industry 4.0: A Systematic Literature Review," *Sustainability*, vol. 13, no. 15, p. 8272, Jul. 2021.
- [40] S.R. Swenseth and D.L. Olson, "Trade-offs in lean vs. outsourced supply chains," *Int. J. Prod. Res.*, vol. 54, no. 13, pp. 4065-4080, Jul. 2016.
- [41] H. Nielsen and T.B. Kristensen, "Impact of lean operations on the roles of finance functions and their application of lean," *Eur. Bus. Rev.*, vol. 32, no. 4, pp. 731-763, Jun. 2020.
- [42] J.P. Womack, D.T. Jones, and D. Roos, "The machine that changed the world," *Bus. Horiz.*, vol. 35, no. 3, pp. 81-82, May 1992.
- [43] M. Bertolini, M. Braglia, G. Romagnoli, and F. Zammori, "Extending value stream mapping: The synchro-MRP case," *Int. J. Prod. Res.*, vol. 51, no. 18, pp. 5499-5519, 2013.
- [44] I. Alsyouf, R. Al Aomar, H. Al Hamed, and X. Qiu, "A framework for assessing the cost effectiveness of lean tools," *Eur. J. Ind. Eng.*, vol. 5, no. 2, p. 170, 2011.
- [45] C. Prahalad, G.P. Hamel, and L.C.S. Mehrotra, "Competing for the Future," *Int. J. Res. Found. Hosp. Healthc. Adm.*, vol. 2, no. 2, pp. 133-135, 2014.
- [46] A.J.D. Forno, F.A. Pereira, F.A. Forcellini, and L.M. Kipper, "Value stream mapping: A study about the problems and challenges found in the literature from the past 15 years about application of Lean tools," *Int. J. Adv. Manuf. Technol.*, vol. 72, no. 5-8, pp. 779-790, 2014.
- [47] J. Kotter, "Leading change: why transformation efforts fail," *IEEE Eng. Manag. Rev.*, vol. 37, no. 3, pp. 42-48, 2009.
- [48] K. Lewin, "Frontiers in Group Dynamics: Concept, Method and Reality in Social Science; Social Equilibria and Social Change," *Hum. Relations*, vol. 1, no. 1, pp. 5-41, 1947.
- [49] A. Brown, *Organisational culture*, 2nd ed. Financial Times, 1998.
- [50] T. Al Barrak, "Value relevance and predictive ability of financial statement information: the case of Saudi Arabia," University of Portsmouth, 2011.
- [51] M.G. Aboelmaged, "Reconstructing Six Sigma barriers in manufacturing and service organizations: The effects of organizational parameters," *Int. J. Qual. Reliab. Manag.*, vol. 28, no. 5, pp. 519-541, 2011.
- [52] S.A.M. of Finance, "Recent Economic Developments and Highlights of Fiscal Years 2015 & 2016," *Saudi Press Agency*, vol. 1437, no. 2015, pp. 1-10, 2015.
- [53] V. Gupta, P. Acharya, and M. Patwardhan, "A strategic and operational approach to assess the lean performance in radial tyre manufacturing in India," *Int. J. Product. Perform. Manag.*, vol. 62, no. 6, pp. 634-651, Jul. 2013.
- [54] C. Siehl and J. Martin, "Organizational culture: A key to financial performance?," *Grad. Sch. Business, Stanford Univ.*, 1989.
- [55] A. Laureani and J. Antony, "Leadership – a critical success factor for the effective implementation of Lean Six Sigma," *Total Qual. Manag. Bus. Excell.*, vol. 0, no. 0, pp. 1-22, 2016.
- [56] J. Collis and R. Hussey, *Business research: a practical guide for undergraduate and postgraduate students*, vol. 3rd. 2010.
- [57] M. Saunders, P. Lewis, and A. Thornhill, *Research Methods for Business Students*. Financial Times Prentice Hall, 2009.
- [58] J.P. Womack, D.T. Jones, and D. Roos, *The Machine That Changed the World: The Story of Lean Production*, vol. 1. HarperCollins, 1991.
- [59] S. Sackmann, *Success factor: corporate culture: developing a corporate culture for high performance and long term competitiveness: six best practices*. Gütersloh: Verlag Bertelsmann Stiftung, 2006.
- [60] Y. Pingyu and Y. Yu, "A review on lean manufacturing practices in small and medium enterprises," *Int. J. Innov. Manag. Technol.*, vol. 1, no. 2, pp. 220-225, 2010.
- [61] R. Panizzolo, P. Garengo, M.K. Sharma, and A. Gore, "Lean manufacturing in developing countries: evidence from Indian SMEs," *Prod. Plan. Control*, vol. 23, no. 10-11, pp. 769-788, Oct. 2012.
- [62] B.M.; Rose, A.M.N.; Deros and M.N.A. Rahman, "Development of framework for lean manufacturing implementation in SMEs," *11th Asia Pacific Ind. Eng. Manag. Syst. Conf.*, no. December, pp. 7-10, 2010.
- [63] N. Slack, "Operations Strategy," in *Wiley Encyclopedia of Management*, Chichester, UK: John Wiley & Sons, Ltd, 2015, pp. 1-2.
- [64] J. Lowe and N. Oliver, "High-Performance Manufacturing: Evidence from the Automotive Components Industry," *Organ. Stud.*, vol. 18, no. 5, pp. 783-798, Sep. 1997.
- [65] M.M. Crossan, H.W. Lane, and R.E. White, "An organizational learning framework: from intuition to institution," *Acad. Manag. Rev.*, vol. 24, no. 3, pp. 522-537, Jul. 1999.
- [66] R.E. White, J.N. Pearson, and J.R. Wilson, "[JIT] Manufacturing: A Survey of Implementations in Small and Large U.S. Manufacturers," *Manage. Sci.*, vol. 45, no. 1, pp. 1-15, 1999.
- [67] R. Shah and Ward, "Lean manufacturing: context, practice bundles, and performance," *J. Oper. Manag.*, vol. 21, no. 2, pp. 129-149, Mar. 2003.
- [68] T. Berlec, M. Kleindienst, C. Rabitsch, and C. Ramsauer, "Methodology To Facilitate Successful Lean Implementation," *Strojniški Vestn. – J. Mech. Eng.*, vol. 63, no. 78, p. 457, Jul. 2017.
- [69] P. R. Easterby-Smith, Mark Thorpe, Richard, Jackson, *Management Research*. London: SAGE Publications, 2012.
- [70] D. Denyer, D. Tranfield, and J.E. Van Aken, "Developing design propositions through research synthesis," *Organ. Stud.*, vol. 29, no. 3, pp. 393-413, 2008.
- [71] A. Pashazadeh and N.J. Navimipour, "Big data handling mechanisms in the healthcare applications: A comprehensive and systematic literature review," *Journal of Biomedical Informatics*, vol. 82. pp. 47-62, 2018.
- [72] P. Alamir and N.J. Navimipour, "Trust evaluation between users of social networks using the quality of service requirements and call log histories," *Kybernetes*, vol. 45, no. 10, pp. 1505-1523, 2016.
- [73] P. Danese, M. Molinaro, and P. Romano, "Investigating fit in supply chain integration: A systematic literature review on context, practices, performance links," *J. Purch. Supply*

- Manag.*, vol. 26, no. 5, Dec. 2020.
- [74] D. Tranfield, I. Parry, S. Wilson, S. Smith, and M. Foster, "Teamworking: Redesigning the Organization for Manufacturing Improvements," *Technol. Anal. Strateg. Manag.*, vol. 11, no. December 2014, pp. 143-158, 1999.
- [75] D. Tranfield, D. Denyer, and P. Smart, "Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review," *Br. J. Manag.*, vol. 14, no. 3, pp. 207-222, Sep. 2003.
- [76] M.F. Suárez-Barraza, T. Smith, and S.M. Dahlgaard-Park, "Lean Service: A literature analysis and classification," *Total Qual. Manag. & Bus. Excell.*, vol. 23, no. 3-4, pp. 359-380, 2012.
- [77] A. Alkhoraif and P. McLaughlin, "Organisational Culture that Inhibit the Lean Implementation," in *The European Business & Management Conference*, 2016, vol. 39-58.
- [78] M.A. Karim, M. Aljuhani, R. Duplock, and P. Yarlagaadda, "Implementation of Lean Manufacturing in Saudi Manufacturing Organisations: An Empirical Study," *Adv. Mater. Res.*, vol. 339, pp. 250-253, Sep. 2011.
- [79] S.A. Alshahrani and A.J. Alsadiq, "Economic Growth and Government Spending in Saudi Arabia: an Empirical Investigation," *IMF Work. Pap.*, vol. 14, no. 3, p. 1, 2014.
- [80] A. al Saleh, "Developing a Model to Predict the Performance of Small and Medium-Sized Enterprises: The Case of the Kingdom of Saudi Arabia A," Manchester Metropolitan University, 2016.
- [81] S. Alkhtani, "The Relevance of International Financial Reporting Standards to Saudi Arabia: Stakeholder Perspectives," University of Stirling, 2010.
- [82] S.A. Albliwi, J. Antony, N. Arshed, and A. Ghadge, "Implementation of Lean Six Sigma in Saudi Arabian organisations," *Int. J. Qual. Reliab. Manag.*, vol. 34, no. 4, pp. 508-529, Apr. 2017.
- [83] A. Khalid, "Assessment of total quality management in the Saudi construction industry organisations," Loughbrough University, 2003.
- [84] M.T. Mady, "The impact of plant size and type of industry on manufacturing competitive priorities: An empirical investigation," *Compet. Rev.*, vol. 18, no. 4, pp. 351-366, 2008.
- [85] M.T. Mady, "Quality management practices: An empirical investigation of associated constructs in two Kuwaiti industries," *Int. J. Qual. Reliab. Manag.*, vol. 26, no. 3, pp. 214-233, 2009.
- [86] M. Al-najem, "Investigating the factors affecting readiness for lean system adoption within Kuwaiti small and medium- sized manufacturing industries," University of Portsmouth, 2014.
- [87] M. AL-Najem, H. Dhakal, A. Labib, and N. Bennett, "Lean readiness level within Kuwaiti manufacturing industries," *Int. J. Lean Six Sigma*, vol. 4, no. 3, pp. 280-320, 2013.
- [88] World Population Review, "The Saudi Arabia Population," <http://worldpopulationreview.com/countries/saudi-arabiapopulation/>, 2014. .
- [89] S. Bhasin, "Analysis of whether Lean is viewed as an ideology by British organizations," *J. Manuf. Technol. Manag.*, vol. 24, no. 4, pp. 536-554, Apr. 2013.
- [90] P. Leedy, *Practical research: Planning and design*, 6th ed. Merrill, 1997.
- [91] L. Burke and J. M. Logsdon, "How Corporate Social Responsibility Pays Off," *Long Range Plann.*, vol. 29, no. 4, pp. 495-502, Aug. 1996.
- [92] W. Timans, J. Antony, K. Ahaus, and R. van Solingen, "Implementation of Lean Six Sigma in small and medium-sized manufacturing enterprises in the Netherlands," *J. Oper. Res. Soc.*, vol. 63, no. 3, pp. 339-353, 2011.
- [93] A. Alkhoraif and P. McLaughlin, "Organisational Culture - Enablers and Inhibitors Factors for The Effective Implementation of Lean within SMEs," *Int. J. Lean Think.*, vol. 8, no. 2, 2017.
- [94] S. Pande, R. Sengar, and N.S. Chaudhary, "Evaluating performance of apparel retail stores using data envelopment analysis," *Int. J. Bus. Excell.*, vol. 22, no. 1, pp. 19-32, 2020.
- [95] L. Bamber and B.G. Dale, "Lean production: A study of application in a traditional manufacturing environment," *Prod. Plan. Control*, vol. 11, no. 3, pp. 291-298, 2000.
- [96] M. Sun, A. Fleming, S. Senaratne, I. Motawa, and M.L. Yeoh, "A change management toolkit for construction projects," *Archit. Eng. Des. Manag.*, vol. 2, no. 4, pp. 261-271, 2006.
- [97] S. Gupta, M. Sharma, and V. Sunder M., "Lean services: a systematic review," *Int. J. Product. Perform. Manag.*, vol. 65, no. 8, pp. 1025-1056, Nov. 2016.
- [98] T. Papadopoulou and M. Özbayrak, "Leanness: experiences from the journey to date," *J. Manuf. Technol. Manag.*, vol. 16, no. 7, pp. 784-807, Oct. 2005.
- [99] Y. Larteb, A. Haddout, M. Benhadou, and L. Manufacturing, "Successful lean implementation: the systematic and simultaneous consideration of soft and hard Lean," vol. 3, no. 2, pp. 1258-1270, 2015.
- [100] T.A. Boyle and M. Scherrer-Rathje, "An empirical examination of the best practices to ensure manufacturing flexibility," *J. Manuf. Technol. Manag.*, vol. 20, no. 3, pp. 348-366, Mar. 2009.
- [101] P. Puvanasvaran, H. Megat, T. Sai Hong, and M. Mohd.Razali, "The roles of communication process for an effective lean manufacturing implementation," *J. Ind. Eng. Manag.*, vol. 2, no. 1, Jul. 2009.
- [102] M. Alsmadi, A. Almani, and R. Jerisat, "A comparative analysis of Lean practices and performance in the UK manufacturing and service sector firms," *Total Qual. Manag. Bus. Excell.*, vol. 23, no. 3-4, pp. 381-396, Apr. 2012.
- [103] M.A.N.M. Rose, B.M. Deros, and M.N.A. Rahman, "Lean Manufacturing Perceptions and Actual Practice Among Malaysian {SME}'s in Automotive Industry," *Int. J. Automot. Mech. Eng.*, vol. 7, pp. 820-829, 2013.
- [104] A. Shokri, T. S. Waring, and F. Nabhani, "Investigating the readiness of people in manufacturing SMEs to embark on Lean Six Sigma projects," *Int. J. Oper. Prod. Manag.*, vol. 36, no. 8, pp. 850-878, 2016.
- [105] M. Djerdjori, "2011 TQM Readiness Assessment in the Public Sector in the United Arab Emirates The Case of the Ministry of Environment and Water, the Ministry of Finance and and the Ministry of Public Works," vol. 1, no. 2, pp. 1-41, 2007.
- [106] K. Ramaswamy, R. Veliyath, and L. Gomes, "A study of the determinants of CEO compensation in India," *MIR Manag. Int.*, vol. 40, no. 2, pp. 167-191, 2000.
- [107] J.H. Woehl, "How leadership styles reflect on lean manufacturing practices and culture," Capella University, 2011.
- [108] S. Bardot, "Background on Work Life in the United Arab Emirates and Other Gulf Countries (Gulf Cooperation Council)," *Compens. Benefits Rev.*, vol. 45, no. 1, pp. 21-25, 2013.
- [109] P. Adler and R. Cole, *Designed for learning: A tale of two auto plants*. 1995.
- [110] P. Achanga, E. Shehab, R. Roy, and G. Nelder, "A fuzzy-logic

- advisory system for lean manufacturing within SMEs," *Int. J. Comput. Integr. Manuf.*, vol. 25, no. 9, pp. 839-852, Sep. 2012.
- [111] N. Albliwi, S., Antony, J. and Arshed, "An Empirical Study on Lean Six Sigma in Saudi Arabian Organisations An Empirical Study on Lean Six Sigma in Saudi Arabian Organisations," 2015.
- [112] M. Oudhuis and A. Olsson, "Cultural clashes and reactions when implementing lean production in a Japanese-owned Swedish company," *Econ. Ind. Democr.*, vol. 36, no. 2, pp. 259-282, May 2015.
- [113] J. Collis and R. Hussey, *Business research: A practical guide for undergraduate and postgraduate students*. Palgrave Macmillan, 2013.
- [114] A. Chiarini, "Lean production: mistakes and limitations of accounting systems inside the {SME} sector," *J. Manuf. Technol. Manag.*, vol. 23, no. 5, pp. 681-700, 2012.
- [115] V. A. Raghavan, S. S. Lam, K. Srihari, S. Ramakrishnan, and M. V Testani, "A Methodology for Assessing the Adoption Rates of an Organization ' s Lean Transformation," in *Proceedings of the 2013 Industrial and Systems Engineering Research Conference*, 2013, pp. 998-1006.
- [116] S.A.M. of finance Finance, "Recent Economic Developments and Highlights of Fiscal Years 2015 & 2016," *Saudi Press Agency*, vol. 1437, no. 2015, pp. 1-10, 2015.
- [117] P. Achanga, E. Shehab, R. Roy, and G. Nelder, "Lean Manufacturing for SMEs: enabling rapid response to demand changes," in *International Conference on Engineering Design*, 2005, no. August, pp. 15-18.
- [118] H. Torbjørn, T. Netland, M. Mediavilla, and A. Errasti, "The Insignificant Role of National Culture in Global Lean Programmes," *Adv. Prod. Manag. Syst.*, pp. 454-462, 2013.
- [119] T.H. Netland, "Critical success factors for implementing Lean production: the effect of contingencies," *Int. J. Prod. Res.*, vol. 7543, no. December, pp. 1-16, Oct. 2015.
- [120] S. Dowlatshahi and F. Taham, "The development of a conceptual framework for Just-In-Time implementation in {SMEs}," *Prod. Plan. & Control*, vol. 20, no. 7, pp. 611-621, 2009.
- [121] M. Munir Ahmad and O. Alaskari, "Development of assessment methodology for improving performance in SME's," *Int. J. Product. Perform. Manag.*, vol. 63, no. 4, pp. 477-498, Apr. 2014.
- [122] M. Gong, Y. Gao, L. Koh, C. Sutcliffe, and J. Cullen, "The role of customer awareness in promoting firm sustainability and sustainable supply chain management," *Int. J. Prod. Econ.*, vol. 217, pp. 88-96, 2019.
- [123] M.P. Piyachat, Burawat, Kuntonbutr Chanongkorn, "The relationships among perceived employer branding, employee engagement, and discretionary effort," *Suranaree J. Soc. Sci.*, vol. 9, no. 1, pp. 37-60, 2015.
- [124] J. Guo, Y. Zhang, and C. Cao, "Research on the Driven Path of Ambidextrous Innovation of Science and Technology Enterprises: An Exploration Based on Fuzzy Set Qualitative Comparative Analysis," *Math. Probl. Eng.*, vol. 2022, 2022.
- [125] A.V. Kovacheva, "Challenges in Lean implementation Successful transformation towards Lean enterprise," *Univ. Aarhus*, no. January, pp. 1-58, 2010.
- [126] O. Alaskari, M.M. Ahmad, and R. Pinedo-cuenca, "Critical success factors for Lean tools and ERP systems implementation in manufacturing SMEs," *Int. J. Lean Enterp. Res.*, vol. 1, no. 2, pp. 183-199, 2014.
- [127] S. Patel, D.A. Desai, B.E. Narkhede, K. Maddulety, and R. Raut, "Lean Six Sigma: Literature review and implementation roadmap for manufacturing industries," *Int. J. Bus. Excell.*, vol. 19, no. 4, pp. 447-472, 2019.
- [128] C.P. Holland and B. Light, "Critical success factors model for ERP implementation," *IEEE Softw.*, vol. 16, no. 3, pp. 30-36, 1999.
- [129] R.R. Fullerton and C.S. McWatters, "The production performance benefits from JIT implementation," *J. Oper. Manag.*, vol. 19, no. 1, pp. 81-96, Jan. 2001.
- [130] A. Al-lily, "The Role of Educational Technologies in Linking Saudi Male and Female Campuses," 2012.
- [131] A. Laureani and J. Antony, "Leadership – a critical success factor for the effective implementation of Lean Six Sigma," *Total Qual. Manag. Bus. Excell.*, vol. 3, no. 4, pp. 1-22, Jul. 2016.
- [132] Y.C. Ho, O.C. Chang, and W.B. Wang, "An empirical study of key success factors for Six Sigma Green Belt projects at an Asian MRO company," *J. Air Transp. Manag.*, vol. 14, no. 5, pp. 263-269, Sep. 2008.
- [133] R. Sukwadi, H.-M. Wee, and C.-C. Yang, "Supply Chain Performance Based on the Lean-Agile Operations and Supplier-Firm Partnership: An Empirical Study on the Garment Industry in Indonesia," *J. Small Bus. Manag.*, vol. 51, no. 2, pp. 297-311, 2013.
- [134] W.K. Mirdad, R. Hall, C.I. Eseonu, and D. Ph, "A Conceptual and Strategy Map for Lean Process Transformation Abstract " in *Conference: IIE Annual Conference and Expo 2014*, 2014, pp. 9-13.
- [135] M., "Impact of just-in-time (JIT) inventory system on efficiency, quality and flexibility among manufacturing sector, small and medium enterprise ({SMEs}) in South Africa," *African Journal of Business Management*, vol. 6, no. 17, 2012.
- [136] I.H. Garbie, "Enhancing the Performance of Industrial Firms through Implementation of Lean Techniques," *Proc. 2010 Ind. Eng. Res. Conf.*, pp. 1-7, 2010.
- [137] N.R. Ramaswamy, V. Selladurai, and A. Gunasekaran, "Just-in-time implementation in small and medium enterprises," *Work Study*, vol. 51, no. 2, pp. 85-90, 2002.
- [138] M. Dora, M. Kumar, and X. Gellynck, "Determinants and barriers to lean implementation in food-processing SMEs – a multiple case analysis," *Prod. Plan. Control*, vol. 7287, no. October, pp. 1-23, Jun. 2015.
- [139] S. Almainan, P. McLaughlin, and A. Al-Ashaab, "Interventions to develop an improvement culture within nonprofit organizations: The case of Saudi Arabia," *Adv. Transdiscipl. Eng.*, vol. 6, pp. 283-288, 2017.
- [140] I. Belekoukias, J. A. Garza-Reyes, and V. Kumar, "The impact of lean methods and tools on the operational performance of manufacturing organisations," *Int. J. Prod. Res.*, vol. 52, no. 18, pp. 5346-5366, Sep. 2014.
- [141] O.S. Vaidya and S. Kumar, "Analytic hierarchy process: An overview of applications," *Eur. J. Oper. Res.*, vol. 169, no. 1, pp. 1-29, Feb. 2006.
- [142] D.H.B. Welsh and P. Raven, "Family Business in the Middle East: An Eexploratory Study of Retail Management in Kuwait and Lebanon," *Fam. Bus. Rev.*, vol. 19, no. 1, pp. 29-48, Mar. 2006.
- [143] J. Antony, M. Kumar, and A. Labib, "Gearing Six Sigma into UK manufacturing SMEs: Results from a pilot study," *J. Oper. Res. Soc.*, vol. 59, no. 4, pp. 482-493, Apr. 2008.
- [144] M. Dora, M. Kumar, D. Van Goubergen, A. Molnar, and X. Gellynck, "Operational performance and critical success factors of lean manufacturing in European food processing SMEs," *Trends Food Sci. Technol.*, vol. 31, no. 2, pp. 156-164, 2013.
- [145] A. Alkhoraif and P. McLaughlin, "Lean implementation within manufacturing SMEs in Saudi Arabia: Organizational

- culture aspects," *J. King Saud Univ. – Eng. Sci.*, vol. 30, no. 3, pp. 232-242, Apr. 2018.
- [146] M. Lande, R.L. Shrivastava, and D. Seth, "Critical success factors for Lean Six Sigma in SMEs (small and medium enterprises)," *TQM J.*, vol. 28, no. 4, pp. 613-635, 2016.
- [147] J.E. Boychuk Duchscher and D. Morgan, "Grounded theory: reflections on the emergence vs. forcing debate," *J. Adv. Nurs.*, vol. 48, no. 6, pp. 605-612, Dec. 2004.
- [148] W. Lewchuk, P. Stewart, and C. Yates, "Quality of working life in the automobile industry: A Canada-UK comparative study," *New Technol. Work Employ.*, vol. 16, no. 2, pp. 72-87, Jul. 2001.
- [149] K.L. Sim and J.W. Rogers, "Implementing lean production systems: barriers to change," *Manag. Res. News*, vol. 32, no. 1, pp. 37-49, 2008.
- [150] M.M. Arshida, "Critical Success Factors (CSFs) for TQM Implementation: Current Status and Challenges in Libyan Manufacturing Companies," *GSTF J. Bus. Rev.*, vol. 2, no. 1, pp. 71-79, 2012.
- [151] R. Panizzolo, F. Bernardel, and S. Biazzo, "Lean Transformation in Small and Medium Enterprises," in *Handbook of Research on Design and Management of Lean Production Systems*, IGI Global, 2014, pp. 206-241.
- [152] S. Bhasin and P. Burcher, "Lean viewed as a philosophy," *J. Manuf. Technol. Manag.*, vol. 17, no. 1, pp. 56-72, Jan. 2006.
- [153] M. Oudhuis and A. Olsson, "Cultural clashes and reactions when implementing lean production in a Japanese-owned Swedish company," *Econ. Ind. Democr.*, vol. 36, no. 2, pp. 259-282, May 2015.
- [154] F. Pakdil and K.M. Leonard, "The effect of organizational culture on implementing and sustaining lean processes," *J. Manuf. Technol. Manag.*, vol. 26, no. 5, pp. 725-743, Jun. 2015.
- [155] J.L. Bowen and C.J. Allender, "A Comparative Pulse Accuracy Study of Two Commercially Available Patch Insulin Infusion Pumps," *Eur. Endocrinol.*, vol. 12, no. 2, p. 79, 2016.
- [156] M. Munir Ahmad and O. Alaskari, "Development of assessment methodology for improving performance in SME's," *Int. J. Product. Perform. Manag.*, vol. 63, no. 4, pp. 477-498, Apr. 2014.
- [157] W.S. H. Barney, Jay B., *Strategic management and competitive advantage*. NJ: Prentice hall, 2010.
- [158] T. Chanegrih and J. Creusier, "The Effect of Internal and External Lean Practices on Performance: A Firm-Centered Approach," *Manag. Int.*, vol. 21, no. 1, pp. 114-125, Oct. 2018.
- [159] R.R. Fullerton, F.A. Kennedy, and S.K. Widener, "Lean manufacturing and firm performance: The incremental contribution of lean management accounting practices," *J. Oper. Manag.*, vol. 32, no. 7-8, pp. 414-428, Nov. 2014.
- [160] L. Medbo and D. Carlsson, "Implementation of Lean in SME, experiences from a Swedish national program," *Int. J. Ind. Eng. Manag.*, vol. 4, no. 4, pp. 221-227, 2013.
- [161] D. Mann, *Creating a Lean Culture: Tools to Sustain Lean Conversions, Third Edition*, 3rd ed. CRC Press, 2014.
- [162] J. Liker and M. Rother, "Why lean programs fail," *Lean Enterp. Inst.*, 2011.
- [163] F. Pakdil and K.M. Leonard, "Criteria for a lean organisation: development of a lean assessment tool," *Int. J. Prod. Res.*, vol. 52, no. 15, pp. 4587-4607, Aug. 2014.
- [164] M.A. Almomani, A. Abdelhadi, A. Mumani, A. Momani, and M. Aladeemy, "A proposed integrated model of lean assessment and analytical hierarchy process for a dynamic road map of lean implementation," *Int. J. Adv. Manuf. Technol.*, vol. 72, no. 1-4, pp. 161-172, 2014.
- [165] Y. Sugimori, K. Kusunoki, F. Cho, and S. Uchikawa, "Toyota production system and Kanban system Materialization of just-in-time and respect-for-human system," *Int. J. Prod. Res.*, vol. 15, no. 6, pp. 553-564, Jan. 1977.
- [166] T. Bortolotti, S. Boscari, and P. Danese, "Successful lean implementation: Organizational culture and soft lean practices," *Int. J. Prod. Econ.*, vol. 160, pp. 182-201, Feb. 2015.
- [167] D.H. Park, N.K. Cheriyan, and G. Yeon, "On building up a closer psychic distance as a fundamental ground of relationship between India and Korea: Focusing on Jeonlanam-Do in Korea," *Int. J. Bus. Excell.*, vol. 26, no. 3, pp. 370-377, 2022.
- [168] K.B. Stone, "Four decades of lean: a systematic literature review," *Int. J. Lean Six Sigma*, vol. 3, no. 2, pp. 112-132, Jun. 2012.
- [169] F.A. Carrillat, R. Legoux, and A.L. Hadida, "Debates and assumptions about motion picture performance: a meta-analysis," *J. Acad. Mark. Sci.*, vol. 46, no. 2, pp. 273-299, Mar. 2018.
- [170] N. Ogiwara, *Knowledge Management: Case Studies for Small and Medium Enterprises*. 2009.
- [171] A. Vermeulen, C. Pretorius, and D. Kruger, "Lean Agility Implementation and Process Optimisation Decisions," pp. 1886-1894, 2014.
- [172] D.I. Prajogo and C.M. McDermott, "The relationship between multidimensional organizational culture and performance," *Int. J. Oper. Prod. Manag.*, vol. 31, no. 7, pp. 712-735, Jun. 2011.
- [173] A. Rachman and R.M. Chandima Ratnayake, "Implementation of lean knowledge work in oil and gas industry – a case study from a Risk-Based Inspection project," in *2016 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, 2016, pp. 675-680.
- [174] D.I. Prajogo and C.M. McDermott, "The relationship between multidimensional organizational culture and performance," *Int. J. Oper. Prod. Manag.*, vol. 31, no. 7, pp. 712-735, 2011.
- [175] B.R. Staats, D.J. Brunner, and D.M. Upton, "Lean principles, learning, and knowledge work: Evidence from a software services provider," *J. Oper. Manag.*, vol. 29, no. 5, pp. 376-390, Jul. 2011.
- [176] S. Kalvakolanu, H.R. Sama, M. Mathew, and D. Somasekhar, "Measuring job satisfaction levels of airport employees using entropy, critic and TOPSIS methods," *Int. J. Bus. Excell.*, vol. 27, no. 1, pp. 1-22, 2022.
- [177] K. Power and K. Conboy, "A Metric-Based Approach to Managing Architecture-Related Impediments in Product Development Flow: An Industry Case Study from Cisco," in *2015 IEEE/ACM 2nd International Workshop on Software Architecture and Metrics*, 2015, pp. 15-21.
- [178] B. Agyei-Owusu, D. Asamoah, D. Nuerthey, and I.N. Acquah, "Examining the relationship between dimensions of supply chain integration, operational performance and firm performance: evidence from Ghana," *Manag. Res. Rev.*, vol. 45, no. 12, pp. 1644-1669, Oct. 2022.
- [179] D.F.X. Mathaisel, "A lean architecture for transforming the aerospace maintenance, repair and overhaul (MRO) enterprise," *Int. J. Product. Perform. Manag.*, vol. 54, no. 8, pp. 623-644, 2005.
- [180] J.S. Toussaint and L.L. Berry, "The Promise of Lean in Health Care," *Mayo Clin. Proc.*, vol. 88, no. 1, pp. 74-82, Jan. 2013.
- [181] Y. Li, K. Chen, S. Collignon, and D. Ivanov, *Ripple effect in*

the supply chain network: Forward and backward disruption propagation, network health and firm vulnerability, vol. 291, no. 3. Eur J Oper Res, 2021.

- [182] P. Srinivas, V.V. Gedam, B.E. Narkhede, V.S. Narwane, and A. Gotmare, "Sustainable implementation drivers and barriers of lean-agile manufacturing in original equipment manufacturers: a literature review study," *Int. J. Bus. Excell.*, vol. 26, no. 1, p. 61, 2022.
- [183] R. Thorpe, R. Holt, A. Macpherson, and L. Pittaway, "Using knowledge within small and medium-sized firms: A

systematic review of the evidence," *Int. J. Manag. Rev.*, vol. 7, no. 4, pp. 257-281, 2005.

- [184] L. Pittaway, M. Robertson, K. Munir, D. Denyer, and A. Neely, "Networking and innovation: a systematic review of the evidence," *Int. J. Manag. Rev.*, vol. 5-6, no. 3-4, pp. 137-168, 2004.

Abdullah Abdulaziz Alkhoraif

Chair of Business Administration Department
College of Administrative and Finance
Saudi Electronic University
Riyadh, Saudi Arabia
e-mail: a.alkhoraif@seu.edu.sa