

## Lean-excellence business management for manufacturing SMEs focusing on KRI

Item Type	Journal article
Authors	Mohammad, Ibrahim Salih;Oduoza, Chike
Citation	Ibrahim Salih Mohammad and Chike F. Oduoza (2019) "Lean-excellence business management for manufacturing SMEs focusing on KRI", International Journal of Productivity and Performance Management
DOI	<a href="https://doi.org/10.1108/ijppm-11-2018-0389">10.1108/ijppm-11-2018-0389</a>
Publisher	Emerald
Journal	International Journal of Productivity and Performance Management
Download date	2025-06-25 06:12:46
License	<a href="https://creativecommons.org/licenses/by/4.0/">https://creativecommons.org/licenses/by/4.0/</a>
Link to Item	<a href="http://hdl.handle.net/2436/622531">http://hdl.handle.net/2436/622531</a>



**Lean-Excellence Business Management for Manufacturing SMEs focusing on KRI**

Journal:	<i>International Journal of Productivity and Performance Management</i>
Manuscript ID	IJPPM-11-2018-0389.R2
Manuscript Type:	Standard Paper
Keywords:	LEBM framework, Lean-excellence, Business Management, SMEs, KRI

SCHOLARONE™  
Manuscripts

## Lean-Excellence Business Management for Manufacturing SMEs focusing on KRI

**Purpose:** This paper aims to develop an effective framework for implementing Lean strategies in Small and Medium-sized Enterprises (SMEs) in the Kurdistan Region of Iraq (KRI).

**Methodology:** Based on the integration of LM tools and techniques with the MBNQA criteria a systematic lean implementation framework for manufacturing SMEs has been proposed. The core values, drivers and tools of the proposed framework were further developed based on case studies in three SMEs in the KRI.

**Findings:** Proposed framework is able to provide a simple pathway for SMEs to systematically implement Lean techniques in seven functional areas in order to create Lean culture in the organisation. Business performance measurement in terms of profitability, customer satisfaction, employee's satisfaction, competitiveness growth and ergonomic improvement are presented in favour of evaluating Lean outcomes appropriately. It also presents the experience of small firms in implementing lean programmes to show that Lean is valid in SMEs.

**Implications:** The framework assists improvements for SMEs that either attempt to start lean journey or those that are at more advanced levels towards excellent-lean manufacturing. The framework can also be used as a self-assessment model to determine the degree of lean readiness.

**Limitation:** The framework concentrates only on the internal issues of the organisation, while external variables such as national culture and external support are excluded.

**Originality:** To the best knowledge of the author, it is the first framework that integrates Lean techniques with MBNQA criteria to support Lean implementation in SMEs. It is also the first study regarding Lean-excellence in the KRI.

**Keywords:** LEBM framework, Lean-excellence, Business Management, SMEs, KRI.

### 1- Introduction

The current global hyper-competition and swift technological changes are forcing many companies to optimise their production processes that enable them to produce

1  
2  
3 high-quality and low-cost products. This quest has increased the necessities for  
4 extensive improvements in manufacturing leadership, customer relationship, process  
5 management, strategic thinking, and employees satisfaction (Mason et al., 2015;  
6 **Netland, 2016**; Alhuraish *et al.*, 2014; Alaskari *et al.*, 2012). LM thinking is a  
7 philosophy that addresses advantages obtained from the mentioned sources. The  
8 core idea of LM is to build mutual trust, and unique way of working that ensures  
9 highly responsive to customers' demands while constantly cutting cost and  
10 eliminating wastes throughout the organisation (Bhamu & Sangwan, 2014; Shah and  
11 Ward, 2003).

12  
13 To generate the best possible values and reduce non-value added activities,  
14 manufacturers applied different LM principles, tools and techniques. However, many  
15 organisations find it complex and difficult to do that effectively (Baker, 2002). In the  
16 context of SMEs, LM initiatives pose further challenges. Lack of adequate finance,  
17 leadership deficiencies, shortage in multi-skilled employees, short-term orientation,  
18 inappropriate organisational culture and outdated manufacturing technologies come  
19 in the forefront of these barriers (**Sahoo and Yadav, 2018**; Antosz and Stadnicka,  
20 2017; Jasti and Kodali, 2014; Achanga et al., 2006).

21  
22 In the KRI, SMEs which account for 95% of the manufacturing sector and employ  
23 80% of the industrial labour force play a vital role in the development of the economy  
24 (KRG-MOP, 2012). However, KRI-SMEs have currently faced a lot of difficulties  
25 caused by imported products from the regional countries, and the collapse of the oil  
26 revenue which caused a national economic slowdown. Since 2014, the number of  
27 dissolved SMEs has been steadily rising while the remaining firms have been  
28 struggling for survival (Shehab et al., 2017). Therefore, developing a holistic  
29 framework to improve SMEs productivity is an immediate quest of SMEs managers  
30 and researchers in the KRI.

31  
32 In the literature, various studies have been carried out in proposing frameworks to  
33 improve productivity of SMEs by LM, but they are often conceptual, complex in  
34 structure, incomplete, have no clear links between outlined elements, cannot engage  
35 shop floor workers, and cannot measure the outcomes of LM (Belhadi et al., 2016;  
36 Nguyen, 2015; Mostafa et al., 2013; Anvari et al., 2011). Therefore, this paper argues  
37 and discusses how MBNQA can be used as an overarching framework for  
38 implementing LM initiatives within SMEs to achieve improvements in business  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 performance. In an attempt to assist KRI-SMEs to implement LM successfully, this  
4 research develops a new framework by integrating Lean tools with MBNQA criteria  
5 which is believed to be valuable and suitable for them.  
6  
7

8 To fulfil the aim of this study, three main objectives were developed: (1) to show that  
9 integration between Lean techniques and MBNQA criteria is possible and it can  
10 provide all requirements of successful Lean adoption in SMEs. (2) to examine the  
11 process of Lean implementation in manufacturing SMEs through case studies. (3) to  
12 identify a set of critical success factors and comprehensive Lean tools that support  
13 SMEs to implement Lean effectively.  
14  
15  
16  
17  
18

19 The proposed framework is called Lean-Excellence Business Management (LEBM).  
20 It was developed after conducting a literature review related to the possibility of a  
21 combination of Lean tools with MBNQA criteria to support SMEs development. The  
22 core value, drivers and operation tools are reviewed and checked in the light of case  
23 studies conducted in three manufacturing SMEs in the KRI. It is assumed that the  
24 framework would provide insights and guidelines to SMEs in general and in the KRI,  
25 in particular, to implement a Lean approach effectively.  
26  
27  
28  
29  
30  
31

32 The rest of this paper is organised as follows: First, the review of the literature about  
33 the LM application in general and within SMEs in particular, review of LM framework  
34 for SMEs and MBNQA model is presented. Next, the integration between LM and  
35 MBNQA, and their synergistic benefits are examined. Secondly, the methodology  
36 and rationale of the literature review and case studies are discussed. Then, the  
37 findings from the case studies and an overview of the development of the framework  
38 is provided. Finally, the characteristics and application of the new framework, the  
39 main conclusions from this study, and some possible opportunities for further  
40 research were suggested.  
41  
42  
43  
44  
45  
46  
47

## 48 **2- Literature review**

### 49 *2.1 Lean Manufacturing application*

50 The implementation of LM like other productivity improvement initiatives needs  
51 systematic processes to apply correct Lean tools within different organisational areas  
52 in order to achieve excellent business performance. However, the processes are not  
53 outright to follow, as each organisation has its own culture and policies that might  
54 support or resist the flow of Lean activities (Anvari et al., 2011).  
55  
56  
57  
58  
59  
60

To avoid costly defeats and support organisations to adopt LM, practitioners and researchers have suggested a list of critical success factors (CSF). CSF are those few organisational areas that need constant attention to go well in order to bring success for the companies.

In the literature, the most common CSF of effective lean adoption have been highlighted are top management and leadership, human resources, strategic planning, customer focus, LM knowledge and process management (Alhuraish *et al.*, 2014; Netland, 2016; Alaskari *et al.*, 2012; Rose *et al.*, 2011). Other researchers highlighted different aspects such as visual management, deep understanding of LM principles (Nugyen, 2015), risk management (Jedynak, 2015), internal competence and appraisal system (Ottar *et al.*, 2011), quality improvement and housekeeping (Upadhye *et al.*, 2010), product design and supplier development (Wong *et al.*, 2009), managing culture change, infrastructure and reward systems (Ahuja and Khmaba, 2008), financial ability and expertise participation (Achanga *et al.*, 2006), personal values, beliefs, and ideologies that affect the behaviours of the workers in an organisation (Wong and Cheah, 2011), situational analysis, LM learned lessons review, LM assessment and LM sustaining (Mostafa *et al.*, 2013). Table 1 summarised the most frequent CSF in the literature.

Top management commitment and total employees' involvement to the LM changes come at the top of those factors that support successful LM implementation. Managers have to communicate strategies, facilitate, model the behaviours of LM and share their vision, understanding and experience with the shop-floor employees to pave the pathway to trust, directly adapt and sustain the improved outcomes (Kumar, 2014). Clear Lean strategies and staff training also highlighted frequently. LM system needs a constant and long-term vision to create incremental improvements to the manufacturing processes. LM transformation does not happen overnight: it is an overall change in all areas of the company, regularly giving and receiving feedback, not just the one-course solution. The journey requires continuous training and education to facilitate the process of the intended change (Crute *et al.*, 2003).

### Table 1

#### 2.2 Lean application in SMEs

LM practices in SMEs have a relatively short history (Matt and Rauch, 2013). Some researchers argue that full LM programmes are more likely to be implemented in big businesses rather than SMEs (Ottar *et al.*, 2011; Rose *et al.*, 2011; Shah and Ward, 2003). Achange *et al.* (2006) also believe that SMEs are still not sure about the cost of LM implementation and the tangibility of its outcomes and benefits they may achieve. Most of these companies fear that adopting LM are time and money-consuming.

Hayes (2005) argued that successful adoption of LM projects in SMEs requires previous stability in the organisation and assurance of budget, human resource, training, programmes, strategic planning and reward mechanics. Nguyen (2015) declared that SMEs have to start with the simple and less financially demanding LM tools such as 5S, kaizen and visual control. After that, they can extend to more advanced tools such as kanban and small lot size. He clarified that LM practices mostly depend on human mindset and the workforce behaviours. Thus, the SMEs have to start firstly with raising their employee's awareness of LM nature and requirements.

Mason *et al.* (2015) reviewed 101 papers (until February 2015) regarding different practices of LM in the SMEs and found that all researchers confirmed positive results regarding quality and productivity. They concluded their review as follows:

- LM initiatives in SMEs are closer to the internal process improvement and are not extended to cover the whole supply chain. They are likely JIT production rather than JIT delivery.
- Simple and inexpensive techniques such as Value Stream Mapping (VSM), 5S, Kanban, Standardisation and Total Productivity Maintenance (TPM) are mostly used while other tools such as Accounting Methods, Cellular Manufacturing, Project Management, and Quality Function Deployment (QFD) are applied less.
- LM practices in SMEs often aimed to reduce waste, inventory, time, and cost or to increase product quality, and rarely covered customer relationship and supplier management.
- Factors such as leadership, strategic planning, employee involvement, organisational cultures, employee autonomies, wide communication, training and education, willingness to change are the most CSF for SMEs to perform LM.

- Most of the LM inhibitors are related to the unclear vision toward lean, market demand fluctuation, raw material control, weak customer links, poor production processes, weak quality control system, unaided organisational culture, and lack of funding.

Regarding the implementation of Lean tools and techniques, Matt and Rauch (2013), and Sahoo and Yadav, 2018 stated that even if not all lean techniques are applicable in SMEs, a selection of a suitable method can be recommended as follows:

- First-in-first-out (FIFO)
- 5S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke)
- Benchmarking
- Kaizen - Continuous Improvement meetings
- Just in Time delivery
- Pull-principle and Kanban
- Visual Management in Production
- Zero Defect through process-integrated failure control
- Idea Management to utilise the worker's Know-How
- Setup Time Reduction to reduce waste
- Value Stream Mapping
- Efficient and ergonomic workstations
- Poka Yoke and standardisation in product and process
- Cellular Manufacturing and autonomous teams
- Job rotation to avoid monotony
- Low-Cost automation ("keep it smart and simple").

To implement Lean initiatives in small organisations successfully; therefore, a practical framework that covers all Lean pre-requirements, CSF and correct tools are necessary (Balles, 2005; Esfandyari and Osman, 2010).

### *2.3 Review of the Lean implementation frameworks*

According to Sousa and Aspinwall (2010), the framework is a presentation of the structural relationship of variables of a particular system aims to answer "how to" questions and steers the methodology implementation. Regarding Lean framework,

Anvari et al., (2011) claimed that it should guide the transition from existing production processes to one that ultimately follows the best practices of LM philosophy. While Wong and Wong (2011) defined LM framework from the organisational perspective when argued it has to integrate the best practices in different areas of the company to allow practitioners to understand the full requirements of LM transformation.

Al Manei et al., 2017; Bilhadi et al., 2016; Nguyen, 2015; Jasti and Kodali, 2014; Karim & Arif Uz-Zaman, 2013; Wong and Wong, 2011; Rose et al., 2010 have developed different frameworks to guide organisations on how to implement Lean projects. These frameworks often highlighted Lean tools and success factors to be introduced to the organisation. Table 2 presents the review of a number of the frameworks and their shortcomings in the context of SMEs.

**Table 2**

The researchers in Table 2 have criticised the existing framework in the literature because they are complex in structure, and have no clear links between their components (Bilhadi et al.,2016), top-down approach and cannot engage the shop-floor workers (Nguyen, 2015), quite generic and do not specify the sequences of LM implementation (Rolish and Shahadat, 2014). However, they cannot overcome all these weakness and deficiencies in their developed frameworks. The conceptual framework of Mostafa et al. (2013) has a complex structure of 22 steps, which is hard for SMEs to follow and needs highly-skilled workers to implement. A methodology of LM implementation of Halim et al. (2013) which is based on Toyota's eight steps processes is designed for large enterprises (LEs) and is not suitable for SMEs, especially for beginners. The project-based framework of Anvari et al. (2011) limited most of the LM activities to the top managers, and the role of the workers is not clear. This framework needs a lot of effort to sustain the results which is not easy for SMEs to provide.

This research, therefore, argues that an overarching framework like MBNQA can provide a holistic and simple methodology for LM implementation. LM principles and techniques can easily integrate into the criteria of the framework to generate a new framework that can enhance productivity through the improvements in manufacturing processes in SMEs. An overview of the MBNQA model, thus, here is essential.

#### *2.4 Malcolm Baldrige National Quality Award (MBNQA)*

1  
2  
3 MBNQA is one of the well-known business-excellence awards which aim to  
4 recognise and reward business excellence across all sectors in many countries. It  
5 was released in 1987 to improve the quality of the American products to compete in  
6 an ever-expanding global market. Initially, the reward covered manufacturing, service  
7 and small companies; from 1998, it also covered education and healthcare  
8 associations. Since 2006, non-profit organisations have also been eligible to  
9 participate in it (MBNQA, 2017a). As a result, more than 2 million companies in 100  
10 countries have produced their versions of the award (BPEP, 2013).

11  
12  
13  
14  
15  
16  
17 This model is systematic and documented best practices that can create an  
18 environment for continuous improvement and guide an organisation toward excellent  
19 performance at both strategic and short-term extents (Tickle *et al.*, 2016; Sharma and  
20 Kodali, 2008). Furthermore, it is a globally accepted model, imitated by 27 national  
21 awards around the world (16 of them in Asia). Thus, the model is adaptable to the  
22 various types of organisations despite their size, economies and cultures. Figure 1  
23 presents the criteria of MBNQA.

### 30 31 **Figure 1**

32  
33 MBNQA model has been adopted as a catalyst to improve competitiveness and  
34 develop the culture of quality rather than just an award of excellent performance. It  
35 consists of seven integrated dimensions which namely are Leadership, Strategy,  
36 Customers, Measurement, Analysis and Knowledge management, Workforce,  
37 Operations, and Results of the business.

38  
39  
40 It allows managers to appreciate all the factors influencing their organisations, to  
41 prioritise, develop, and improve essential issues to success, and to establish  
42 practices that enhance and sustain the best possible performance (MBNQA, 2017b).

43  
44  
45 MBNQA is a non-prescriptive qualitative framework; it does not prescribe any specific  
46 methodology or action plan to be followed. Fischer (2010) and Parasat and Jones  
47 (2006) claimed that MBNQA could provide a comprehensive framework that enables  
48 enterprises to eliminate wastes or to streamline their production processes. So, LM  
49 can efficiently address opportunities within all of the MBNQA criteria (DeVries, 2014).

### 50 51 52 53 54 55 56 **2.5 Integration of Lean tools with MBNQA criteria**

57  
58 To support lean transformations of enterprises, many researchers suggested  
59 integrating LM principles with other advanced methodologies such as Six Sigma,  
60

Balanced Scorecard and Business Excellence models (Okhovat *et al.* 2012; Blazey and Grizzell, 2014). Combination of LM tools with MBNQA frameworks can bring better results in terms of quality (Soare, 2012), problem-solving, improving organisational performance (Motwani, 2003), speed up delivery, reduce cost (Ho, 2010) and cut down processing time (Tatsana-iam and Ngaoprasertwong, 2013). The core idea of this research, therefore, is to combine Lean techniques and MBNQA criteria into a single framework to support a systematic lean implementation within SMEs context.

Although the MBNQA and LM follow different development paths, they have some similarities (Anvari *et al.*, 2011; Dahlgard and Dahlgard-Park, 2006) and overlapped objectives (Parast and Jones, 2006). They share common concepts such as continuous improvement (Pettersen, 2009), organisational learning (Bozdogan, 2010), process improvement and customer satisfaction (Andersson *et al.*, 2006) and employee involvement, empowerment and well-being (Grizzell and Blazey, 2006). Table 3 explains the harmony between the MBNQA criteria and LM approach.

**Table 3**

The MBNQA focuses on the critical factors driving excellent business performance, while LM emphasises on eliminating waste through the improvement of the value-added processes. Thus, both have similar objectives. When LM reduces waste from the production process, it promotes the MBNQA's aim of continuous quality improvement (Bozdogan, 2010).

So, The combination of these two strategic approaches into a single framework will bring further advantages to small businesses and can accelerate their transition toward lean-excellence performance.

### **3- Methodology**

Literature review presented in the previous sections confirmed the applicability and advantages that can be achieved from the integration of Lean tools and MBNQA model, but the framework has to be tailored to the specification and limitations of SMEs. For this reason, the conceptual framework is derived from the literature reviewed and validated through the case studies that have been conducted in three manufacturing SMEs in the KRI. Figure 2 shows the methodology undertaken in this research.

**Figure 2**

1  
2  
3 Case studies allow researchers to discover intangible factors that can entirely explain  
4 how the system functions and draw more clear portraits of complex issues which are  
5 always not available for other research methods (Stake, 2006). It often follows a wide  
6 range of open-ended techniques in data collection and analysis such as structured  
7 and unstructured interviews, observation, documentation analysis (Saunders *et al.*,  
8 2009). Thus, the method is valid for this study. Moreover, researchers such as  
9 Bilhadi *et al.*, 2016; Karim and Arif uz-Zaman, 2013; Wong and Wong, 2011 and  
10 Aken *et al.*, 2010 also followed the case study method to develop frameworks that  
11 assist SMEs in implementing Lean approach.

12  
13 The selected companies for the case studies used different lean tools such as 5S,  
14 Work Teams, Total Productivity Maintenance (TPM), Quality Assurance (QA), 5  
15 Whys, Quick customer feedback, Cross Employees Training and Reward and  
16 Motivation activities. They effectively manage waste, time, inventory, raw material  
17 and workforce efforts in their companies. They also employ modest technologies in  
18 their production and control processes. They are well-known, successful, competitive  
19 and leading companies in their industrial market in the KRI, and employ highly skilled  
20 workers. So they can be taken as lean models in the region. Details of participant  
21 companies are presented in Table 4.

22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
**Table 4**

To offer a good range of information, the researcher asked selected persons of the participating companies to get involved in a semi-structured interview which aimed to explore the working environment and managerial style deeply. They were previously motivated to understand the aim of the study, to feel free to provide any responses and comments they preferred and to prepare well for the interview date to ascertain the accuracy of the provided information.

The case studies focused on several aspects which namely are: Core values and ethical principles that motivate them to commit to their production requirements, the MBNQA criteria in their working environment, application of Lean tools and techniques, and their main production problems.

#### **4- Findings of the case studies**

In this section, a summary of the participant's responses is presented in order to meet the cognitive objectives of the present study. Note that a (✓) indicates that the

1  
2  
3 element was applied by the company while (X) means that it was not.

#### 4 5 **4.1 Core values and principles considered in KRI-SMEs**

6  
7 As to the core values and ethical principles, the enterprises in which the case studies  
8 were conducted all depended on values such as customer focus, valuing people and  
9 continuous improvement to run their LM activities. While other principles such as  
10 management by the fact, transparency and flexibility are more applicable to company  
11 C than companies A and B. Table 5 shows the core values adopted by KRI-SMEs.  
12  
13  
14  
15

16  
17 **Table 5**

#### 18 19 **4.2 LM drivers (MBNQA criteria) applied to KRI-SMEs**

20  
21 Table 6 presents Lean drivers or MBNQA criteria that were considered in the focused  
22 companies in order to implement effective Lean within their environment. As can be  
23 seen, managerial areas of the customer relationship, continuous improvement,  
24 human resource development and internal process management are emphasised by  
25 all companies. Each company applied its available LM techniques in those areas in  
26 order to generate the best performance. Effective lean leadership, long-term planning  
27 and measuring business performance were absent within companies A and B, while  
28 Company C which has more resources, skills and experience applied lean  
29 techniques within these managerial sources.  
30  
31  
32  
33  
34  
35  
36  
37

38  
39 **Table 6**

#### 40 41 **4.3 CSF and Lean tools implemented in KRI-SMEs**

42  
43 This part of the case studies aimed to identify CSF that lead LM implementation and  
44 to describe Lean tools and techniques implemented by KRI-SMEs. Table 7  
45 summarises the participant's opinions in this regard.  
46  
47

48  
49 It is clear that all case companies considered top management commitment, long-  
50 term vision, reward and motivation, total employees involvement, and supplier  
51 relationship to support the implementation of LM in their companies. It is also worth  
52 mentioning that all participants were not satisfied with lean strategies, deep  
53 understanding of the LM approach and employees empowerment in their companies.  
54  
55

56  
57 Product Customisation, 5S, Total Productivity Maintenance, and Automation were the  
58 common Lean techniques applied to KRI-SMEs while Visualising Stream Chain has  
59  
60

not been applied in any of the case companies. Company C applied Statistical Process Control, PDCA cycle and customer data to eliminate non-value added activities within its production processes.

#### Table 7

#### 4.4 Problems facing KRI-SMEs in implementing LM initiatives

Implementing LM techniques in KRI-SMEs is proceeding slowly, as they face difficulties in various managerial areas. Table 8 shows the common problems that KRI-SMEs have in adopting LM techniques. Language barriers, unfavourable organisational culture, low qualified workers, poor banking system and strong market competition were the main difficulties that faced the case companies. However, there is evidence in favour of LM use to improve quality, reduce wastes and delivery time, and increase productivity.

#### Table 8

#### 5- Development of LEBM framework

Responses and general practices obtained from the case companies were generalised and were combined with a literature review to build a framework. The framework consists of core values as foundation and pre-preparation for Lean implementation, seven key drivers for Lean performance improvement, five Lean tools under each factor to adopt Lean activities within that area, and five indicators to evaluate the business performance and guide the organisation to the excellent Lean levels. For validation of the framework, the participated companies made inputs and necessary modifications.

Figure 3 shows the LEBM framework developed with a focus on SMEs conditions. In order to keep it manageable and straightforward, clear elements are created.

#### Figure 3

Generally, the framework is a strategic result-based approach that can help managers to systematically implement specific actions in all managerial areas across the company to transfer their plants from the traditional to Lean-excellent producers. The framework consists of four levels:

- **Core values:** Values and ethical principles that motivate identification and

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

commitment to the framework requirements. These values must be understood before implementing Lean as they are the foundations of Lean thinking and acting for all members of the organisation.

- **Drivers:** Critical success factors that cover all managerial areas across the organisation and are the determinant for excellent performance. Drivers of the system can be classified into two basic elements; first, a social element which covers leaders, customers and the workforce. Second, a technical element that includes strategies, manufacturing processes and organisational learning.
- **Processes:** Lean techniques that seek improvement opportunities through drivers. Time, money and efforts need to be invested in educating and training the members of the organisation to select and apply the right techniques at the right time in order to generate the expected outcomes from the driver's area.
- **Results:** Expected development output of lean-excellence through the effective application of the lean tools from drivers.

As continuous improvement is core conjoint principle between LM and MBNQA and strongly recommended by both approaches (Mahmud and Hilmi, 2014; Okay and Semiz, 2013; Al Amin, 2013), it takes a central role in the LEBM model. It must, therefore, be seen as a systematic driver of all other activities in the organisation.

The LEBM aims to increase the understanding of SMEs on how to comprehensively evaluate their current situation, find gaps and identify the correct lean tools to overcome their process problems. It can play three important roles for manufacturing SMEs, as follows:

- Strengthen organisational competitiveness
- Promote organisational performance, capabilities and results
- Serve as a working tool for better understanding, leading and implementing the organisation's aspiration to learn.

The LEBM model shows the approach for deployment of lean practices. Lean leadership directly or indirectly affect all system constructs by managing lean projects, lean strategic planning, organisational learning and human resource development infrastructure. They should always practice lean principles, simplify the problems, and play good lean role models so that the employees understand what

1  
2  
3 actually Lean means in real life and also to emulate their managers to deal with the  
4 manufacturing processes. Moreover, they have to value feedback from the  
5 customers and employees. A fair reward system and effective suggestion scheme  
6 are also needed to motivate them to provide more ideas for better improvements.  
7  
8

9  
10 Process management, continuous improvement and customer relationship  
11 management are key drivers for LM practices. Understanding the current situation,  
12 identifying errors, problems and defects accurately, visualising the manufacturing  
13 process will reveal the weaknesses and create more development opportunities.  
14 Nevertheless, collecting reliable information, conducting in-depth analysis,  
15 communicating and sharing experiences will guide correct decisions which eliminate  
16 errors and wastes throughout the company.  
17  
18  
19  
20  
21

22 Business performance evaluates the progress in terms of customer satisfaction,  
23 profitability increases, employee satisfaction, competitiveness growth and  
24 ergonomics improvement. These indicators are not as equally important as they  
25 depend on the characteristics of the enterprise. It must also be obvious to the  
26 company that reaching excellence lean performance is an endless journey and  
27 continuous improvement is a movement without a destination. Thus, teamwork, trust,  
28 tolerance, total employees involvement, and collective responsibility are significant  
29 across all phases of lean transformation.  
30  
31  
32  
33  
34  
35

36 Overall, the framework fulfils requirements for excellent organisational performance  
37 which in the end, creates, bolsters and delivers the optimised value for the  
38 stakeholders. In addition, benchmarking the outcomes achieved, showing quick  
39 advantages, and celebrating bright results obtained will raise the confidence of the  
40 employees to Lean approach, decrease their resistance to changes happening and,  
41 then, accelerate the transformation processes.  
42  
43  
44  
45  
46  
47

## 48 **6- Characteristics of LEBM**

49 LEBM framework is easy to understand, well-structured and consists of strongly  
50 interlinked components. It can give visible results in a short time. This model is  
51 characterised by the following advantages that make it unique and suitable for  
52 manufacturing SMEs in developing countries:  
53  
54  
55  
56

- 57 • It is an incremental improvement framework that follows KAIZEN philosophy,  
58 which poses that big results come from many small changes accumulated over  
59  
60

1  
2  
3 time (Kazien Institute, 2015). Starting with basic lean in small firms and improving  
4 its application could improve the way of thinking and work for the whole  
5 organisation.  
6  
7

- 8 • The framework will enhance the internal communication in both vertical and  
9 horizontal levels by which the staff relationship will enhance, and Lean  
10 knowledge will distribute across different departments of the organisation  
11 (Wilkinson, Dundon and Grugulis, 2007).  
12  
13
- 14 • The framework cultivates fact-based thinking to SMEs and results in better  
15 understanding, commitments and control of the external and internal environment  
16 of the business which assures long-term survival.  
17  
18
- 19 • The framework is easy to understand; it consists of eight logical and connected  
20 steps that gradually guide the enterprise to overall improvements. The model is  
21 rather generic, long-term oriented and adaptable to various conditions  
22 considering the resource, time and limitations of SMEs.  
23  
24  
25  
26  
27  
28

## 29 **7- Applications of LEBM framework**

30  
31 The framework of this study would prove highly relevant and useful to establish a  
32 successful implementation of the lean approach to increasing organisational  
33 effectiveness and efficiency of the small businesses. It can provide advantages in  
34 many cases.  
35  
36  
37

- 38 • The framework originally developed to assist small manufacturing organisations  
39 in increasing awareness and closing the gaps in lean implementation in the  
40 journey towards the excellent world-class levels.  
41  
42
- 43 • The framework can be used as a self-assessment model to determine the degree  
44 of readiness for Lean approach adoption.  
45  
46
- 47 • Application of the framework can develop a culture of lean thinking through the  
48 continuous evaluation of the performance in the different managerial areas of the  
49 organisation. Thus, with the iteration of the framework, a further step towards  
50 excellent performance can be taken.  
51  
52
- 53 • The framework considered the limitation of SMEs, but a wide range of its criteria  
54 such as in leadership; strategic planning, process management, human resource  
55 and knowledge management make it applicable for the large organisations as  
56 well.  
57  
58  
59  
60

- Based on the flexibility of criteria of LEBM, with slight changes, the framework can be applied to other sectors such as health, education, banking, tourism, telecommunication and public sector's organisations.

## 8- Conclusion

Since reaching excellent performance in developing economies is a far end and strategic objective for SMEs, the quest needs a deep understanding of advanced management approaches and full commitment to the comprehensive methodologies. It is believed that with a combination of Lean techniques into the criteria of MBNQA model outstanding levels of performance can be attained in both manufacturing and excellence extends. It is noticeable that the effective implementation of the two methodologies in an integrated manner will generate improvements in all seven areas of the organisation which results in actual changes in the attitudes of doing business to the long extent. It is worth to mention that, in general, the expected improvements by LEBM framework will take time; reaching excellent performance cannot happen overnight. However, deep understanding, full commitment and direct involvement of the top managers, supported with across training, education and empowerment of the workforce will facilitate the change procedures and maximise the LEBM framework outcomes.

The contextual LEBM model proposed can easily be applied to manufacturing SMEs to promote organisational performance. It can also be used to verify the degree of maturity of the company, determine its readiness towards Lean application and highlight opportunities for further improvements within the covered areas by the framework. So far, it is valuable to adopt the framework in different circumstances to explore the efficient results by doing experiments in real life and justify the reliability and validity of the framework. Real life case studies also can be conducted to provide a deep understanding of Lean application and its barriers within small businesses in developing countries. The empirical studies can be extended to cover moderator variables such as national culture, working conditions, personal value of the employees, supplier relationship management to examine their impacts on the lean adoption and business performance at the same time.

## References

- Achanga, P., Shehab, E., Roy, R. and Nelder, G. (2006), "Lean Manufacturing for SMEs: enabling rapid response to demand changes", *Proceeding of the 15th International Conference on*

- 1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60
- Engineering Design*, Australi, Melbourne, 15-18, August 2005.
- Ahuja, I. P. S. and Khamba, S. J.(2008), "Total productive maintenance: literature review and directions", *International Journal of Quality and Reliability Management*, Vol. 25 No. 7, pp. 709-756.
- Aiken, C. and Keller, S. (2009), "The irrational side of change management", *McKinsey Quarterly*, Vol. 2, June, pp.100–109.
- Aken, E. M., Farris, J. A., Glover, W. J., Letens, G. (2010), "A framework for designing, managing, and improving Kaizen event programs", *International Journal of Productivity and Performance Management*, Vol. 59 No. 7, pp. 641-667.
- Al Amin, M. (2013), "A Systematic Approach For Selecting Lean Strategies And Assessing Leanness In Manufacturing Organisations", *PhD. Thesis, Queensland University of Technology*, Brisbane City, Australia.
- Alaskari, O., Ahmad M.M., Dhafr, N., Pinedo-Cuenca, R. (2012), "Critical Successful Factors (CSFs) for Successful Implementation of Lean Tools and ERP Systems", *Proceedings of the World Congress on Engineering*, 2012, July 4 - 6, London, U.K.
- Alhuraish, I., Robledo, C. and Kobi, A. (2014 ), "Key Success Factors of Implementing Lean Manufacturing and Six Sigma", 17th Toulon-Verona International Conference, Liverpool, England, August 28-29, 2014.
- Alkhoraif, A., Rashid, H. And McLaughlin, P. (2018), "Lean Implementation in Small and Medium Enterprises: Literature review", *Operation Research Perspectives*, <https://doi.org/10.1016/j.orp.2018.100089>.
- AlManei, M., Salonitis, M. And XU, y. (2017), "Lean implementation frameworks: the challenges for SMEs" [online]. *Procedia CIRP*, Vol. 63, pp. 750 – 755.
- Andersson, R., Eriksson, H. and Torstensson, H. (2006), "*Similarities* and differences between TQM, six sigma and lean", *The TQM Magazine*, Vol. 18 No. 3, pp. 282-296.
- Antosz, K. and Stadnicka, D. (2017), " Lean Philosophy Implementation in SMEs – Study Results", *Procedia Engineering*, Vol. 182, pp.25-32.
- Anvari, A., Zulkifli, N., Yusuff, R., Hojjati, M., Ismail, Y. (2011), "A proposed dynamic model for a lean roadmap", *African Journal of Business Management*, Vol. 5 No.16, pp. 6727-6737.
- Baker, P. (2002), "Why is lean so far off?" *Works Management*, Vol. 55, pp. 26–29.
- Balles, M. (2005), "Lean attitude-lean application often fail to deliver the expected benefits but could the missing link for successful implementations be attitude?", *IEE Manuf. Eng*, Vol. 84, pp.14-19.
- Belhadi, A., Touriki, F. E. And ElFezazi, S. (2018), "Lean Implementation in Small and Medium Enterprises in Less Developed Countries: Some Empirical Evidence From North Africa", *Journal of Small Business Management*, Vol. 56, Issue 1, pp. 132-153.
- Bhamu, J. and Sangwan, K.S. (2014), "Lean manufacturing: literature review and research issues", *International Journal of Operations and Production Management*, Vol. 34 No. 7, pp. 876-940.
- Bhuiyan, N. and Baghel, A. (2005), "An Overview of Continuous Improvement: From the Past to the Present", *Measurement Decision*, Vol. 43 No.5, pp 761-771.
- Bilhadi, A., Touriki, F. E., Fezazi, S.E. (2016), "A Framework for Effective Implementation of Lean Production in Small and Medium-sized Enterprises", *Journal of Industrial Engineering and Management*, Vol. 9 No. 3, pp.781-810.
- Blazey, M. and Grizzell, P. (2014), "Alignment of Baldrige with Six Sigma, Lean Thinking, and Balanced Scorecard", *Insights to Performance Excellence 2014*, American Society for Quality, Quality Press, USA.

- 1  
2 Bozdogan, K. (2010), "Integration of the Lean Enterprise System, Total quality management and Six  
3 Sigma", *Encyclopedia of Aerospace Engineering*.  
4
- 5 BPEP (Baldrige Performance Excellence Programme) (2013), "Baldrige FAQs", available at :<https://www.nist.gov>. (accessed 24 May 2017)  
6  
7
- 8 Chelangat, B. (2016), "Critical Success Factors (CSFs) For Implementation of Lean Six Sigma in  
9 Commercial Banks in Kenya", *Journal of Business and Management*, Vol. 18, Issue 12, pp. 23-  
10 30.
- 11 Costa, L. B. M., Filho, M. G., Fredendall, L. D. and Paredes, F. J. G. (2018), " Lean, Six Sigma and  
12 Lean Six Sigma in The Food Industry: A systemic Literature review", *Trends in Food Science &*  
13 *Technology*, Vol. 82, pp. 122-133.  
14
- 15 Crute, V., Ward, Y., Brown, S., and Graves, A. (2003), "Implementing Lean in aerospace –  
16 Challenging the assumptions and understanding the challenges", *Technovation*, Vol. 23, pp.  
17 917–928.  
18
- 19 Dahlgaard, J.J. and Dahlgaard-Park, S.M. (2006), "Lean production, six sigma quality, TQM and  
20 company culture", *The TQM Magazine*, Vol.18 No. 3, pp. 263-281.
- 21 DeVries, J. (2014), "Lean Healthcare Integration with Baldrige criteria", *Lean Healthcare Exchange*,  
22 available at: <http://www.healthcareexchange.com>. (accessed 16 October 2016)  
23
- 24 Emiliani, B. (2008), "Real Lean: The Keys to Sustaining Lean Management", Vol. 3, Wethersfield, CT.  
25 USA: The Center For Lean Business Management, LLC.
- 26 Esfandyari, A. and Osman R. O. (2010), "Success and failure issues to lead lean manufacturing  
27 implementation", *Proceedings of 4th International Management Conference*, Copenhagen,  
28 Denmark, 23-24, May, 2010.  
29
- 30 Fischer, B (2010), "The "Skinny" on Baldrige Versus Lean", available at:  
31 <https://www.nistbaldrige.blogs.govdelivery.com>. (accessed 16 October 2017)  
32
- 33 Golicic, S. L., and Meland, S. S. (2007), "Size might matter a case study of lean implementation in an  
34 SME", *Society for Marketing Advances Proceedings*, pp. 261-264.
- 35 Grizzell, P. and Blazey, M. (2006), "Alignment of Baldrige with Six Sigma, Lean Thinking, and  
36 Balanced Scorecard", *Insights to Performance Excellence 2004, An Inside Look at the 2004*  
37 *Baldrige Award Criteria*, American Society for Quality, USA.  
38
- 39 Gupta, S. and Jain, S. K. (2013), "A literature review of lean manufacturing", *International Journal of*  
40 *Management Science and Engineering Management*, Vol. 8 No. 4, pp. 241-249.  
41
- 42 Halim, N. H. A., Jaffar, A., Yusoff, N. and Naufal, A. (2013), " Case Study: The Methodology of Lean  
43 Manufacturing Implementation", *Applied Mechanics and Materials*, Vol. 393, pp 3-8.
- 44 Hayes, B. J. (2005), "Assessing for lean six sigma implementation and success. Six Sigma  
45 Advantage", Available at: <http://software.isixsigma.com>. (accessed 14 September 2017)  
46
- 47 Jasti, N. V. and Kodali, R. (2014), "A literature review of empirical research methodology in lean  
48 manufacturing", *International Journal of Operations and Production Management*, Vol. 34 No. 8,  
49 pp. 1080-1122.
- 50 Jedynak, P. (2015), "Lean management implementation: Determinant factors and experience",  
51 *Jagiellonian Journal of Management*, Vol. 1 No. 1, pp. 51–64.
- 52
- 53 Kaizen Institutet (2017), "Improve what you have", available at <<https://www.kaizen.com>>. (accessed  
54 13 August 2017)  
55
- 56 Karim, A. and Arif-Uz-Zaman, K. (2013), " A methodology for effective implementation of lean  
57 strategies and its performance evaluation in manufacturing organizations", *Business Process*  
58 *Management Journal*, Vol. 19 No. 1, pp. 169-196.
- 59 Knol, W. H., Slomp, J., Schouteten, R. L., J. and Lauche, K. (2018), " Implementing lean practices in  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

manufacturing SMEs: testing 'critical success factors' using Necessary Condition Analysis", *International Journal of Production Research*, Vol. 56 No.11, pp. 3955-3973

Kumar. S. (2014), "Lean Manufacturing and its Implementation", *International Journal of Advanced Mechanical Engineering*, Vol. 4 No. 2, pp. 231-238.

Mahmud, N. and Hilmi, M. F. (2014), "TQM and Malaysian SMEs Performance: The Mediating Roles of Organization Learning", *Procedia - Social and Behavioral Sciences*, Vol.130, pp. 216 – 225.

Mamat, R. C., Deros, B. M., Ab Rahman, M. N., Omar, M. K., Abdullah, S. (2015), " Soft Lean Practices For Lean Production System Implementation Successful In Malaysia Automotive SMEs: A Proposed Framework", *Journal Teknologi*, Vol. 72, Issue 27, pp. 141-150.

Marodin, G. A. and Saurin, T. A. (2013), "Implementing lean production systems: research areas and opportunities for future studies", *International Journal of Production Research*, Vol. 51, issue 22, pp.6663-6680.

Martínez-Jurado, P. J., & Moyano-Fuentes, J. (2014), "Key determinants of lean production adoption: Evidence from the aerospace sector", *Production Planning & Control*, Vol. 25, 4, pp. 332–345.

Mason, R., Hu, Q., Williams, S. J. and Found, P. (2015), "Lean implementation within SMEs: a literature review", *Journal of Manufacturing Technology Management*, Vol. 26 No. 7, pp.980-1012.

Matt, D. and Rauch, E. (2012), "Implementation of Lean Production in Small-Sized Enterprises", *Procedia CIRP*, Vol. 12, pp. 420-425.

MBNQA The Foundation for the Malcolm Baldrige National Quality Award MBNQA (2017 a), "History", available at:<http://www.nist.gov>. (accessed 26 August 2017)

Mendes, L. and Lourenço, L. (2014), "Factors that hinder quality improvement programs' implementation in SME: Definition of a taxonomy", *Journal of Small Business and Enterprise Development*, Vol. 21 No. 4, pp.690-715.

Miina, A., Saat, M., and Kolbre, E. (2013), "Critical Success Factors of Lean Thinking Implementation Process: Example of Estonian Manufacturing Companies", *3rd international conference Economies of Central and Eastern Europe (ECEE)*, Tallinn, Estonia, 12-14, July 2011.

Minh, D. M., Nguyen, N. D., Tuan, L. A. (2015), "Framework of Critical Success Factors for Lean Implementation in Vietnam Manufacturing Enterprises", *Journal of Science: Economic and Business*, Vol. 31, No. 5E, pp. 33-41.

Mostafa, S., Dumrak, J., and Soltan, H. (2013), "A framework for lean manufacturing implementation", *Production and Manufacturing Research: An Open Access Journal*, Vol. 1 No. 1, pp. 44–64.

Motwani, J. (2003), "A business process change framework for examining lean manufacturing: a case study", *Industrial Management and Data Systems*, Vol.103 No. 5, pp. 339-346.

Netland, T. H. (2016), "Critical success factors for implementing lean production: the effect of contingencies", *International Journal of Production Research*, Vol. 54 No. 8, pp. 2433-2448.

Nguyen, D.M. (2015), "A New Application Model of Lean Management in Small and Medium Sized Enterprises", *International Journal Simul Model*, Vol.14 No. 2, pp. 289-298.

Nidhin, K., Ramkumar, P. N., Satish, K. P. (2014), "Manufacturing Competitiveness through Lean Principles – Analysis of Readiness Level and Comparison in Small and Medium Enterprises by Identification and Modeling the Critical Success Factors", *International Journal of Scientific & Engineering Research*, Vol. 5, Issue. 8, pp. 635-640.

NIST (2015), "Baldrige Excellence Framework", available at <https://www.nist.gov>. (accessed 25 October 2017)

Nordin, N., Md Deros, B., and Abd Wahab, D. (2010), "A Survey on Lean Manufacturing Implementation in Malaysian Automotive Industry", *International Journal of Innovation*,

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

*Management and Technology*, Vol.1 No. 4, pp.374-380

Okay, S. and Semiz, S. (2013), "The effects of ISO 9000 quality management system implementation in small and medium-sized textile enterprises: Turkey experience", *African Journal of Business Management*, VI. 7 No. 42, pp. 4311-4322.

Okhovat, M. A., Ariffin, M. K., Taravatsadat Nehzati, T. and Hosseini, S. A. (2012), "Development of world-class manufacturing framework by using six-sigma, total productive maintenance and lean", *Scientific Research and Essays*, Vol. 7 No. 50, pp. 4230 -4241.

Ottar, B., Tim, G., Landeghem, V., and Hendrik (2011), "Challenges and Success Factors For Implementation Of Lean Manufacturing In European SMEs", *Proceedings of 3<sup>rd</sup> MITIP*, Trondheim, Norway, 22-24, June, 2011.

Papadopoulou, T. C. and Ozbayark, M. (2005), "Leanness experiences from the Journey to Date", *Journal of Manufacturing Technology Management*, Vol. 16 No. 7, pp. 784-807.

Parast, M. M. and Jones, F. C. (2006), "A Relationship between Six Sigma and Malcolm Baldrige Quality Award", *Publication of the University of Texas at Arlington*, USA.

Pearce, A., Pons, D. and Neitzert, T. (2018), "Implementing lean—Outcomes from SME case studies", *Operations Research Perspectives* 5 (2018), pp. 94–104.

Reigado, R. C. and Bento, C. G. V.(2015), "Planning Lean Manufacturing Implementation: A Case Study in A Scottish Engineering", 34th National Meeting of Production Engineering,13-16 October 2015, Fortaleza, Brazil.

Rose, A. N. M., Deros, B. M., Rahman, M. N. A. (2014), "Critical Success Factors for Implementing Lean Manufacturing in Malaysian Automotive Industry", *Research Journal of Applied Sciences, Engineering and Technology*, Vol. 8 No. 10, pp. 1191-1200.

Rose, A.M.N. , Deros, B.Md., Rahman, M.N.Ab. and Nordin, N. (2011), "Lean manufacturing best practices in SMEs", *Proceedings of the 2011 International Conference on Industrial Engineering and Operations Management*, Kuala Lumpur, Malaysia, 22-24, January, 2011.

Roslin, E. N. and Shahadat, S. A. M. (2014), "A Conceptual Model for Full-Blown Implementation of Lean Manufacturing System in Malaysian Automotive Industry", *International Conference on Industrial Engineering and Operations Management Bali, Indonesia*, January 7 – 9, 2014, pp. 1309-1315.

Sahoo, S. and Yadav, S., (2018), "Lean implementation in small-and medium-sized enterprises: An empirical study of Indian manufacturing firms", *Benchmarking: An International Journal*, Vol. 25 No. 4, pp.1121-1147.

Saunders, M., Lewis, P. and Thornhil, A. (2009), "Research Methods for Business Students", 5th ed, Pearson Education Limited, UK.

Shah, R. and Ward, P.T. (2003), "Lean manufacturing: context, practice bundles, and performance", *Journal of Operations Management*, Vol. 21, pp. 129-149.

Sharma, M. and Kodali, R. (2008), "TQM implementation elements for manufacturing excellence", *The TQM Journal*, Vol. 20 No. 6, pp. 599-621.

Shehab, S, A., Habib, M. A. and nawandy, A. (2017), "The Small and Medium Enterprises (SMEs) in The Kurdistan Region Government-Iraq", *Qalaat Zanist Scientific Journal*, Vol. 2, No. 3, pp. 273-292.

Sieckmann, F., Ngoc, H. N., Helam, R. and Kohl, H. (2018), " Implementation of Lean Production System in Small and Medium Sized Pharmaceutical Enterprises", *Procedia Manufacturing* 21 (2018), pp. 814–821.

Singh, B., Garg, S.K., Sharma, S.K. and Grewal, C. (2010), "Lean implementation and its benefits to production industry", *International Journal of Lean Six Sigma*, Vol. 1 No. 2, pp. 157-168.

- 1  
2  
3 Soare, P. (2012), "Opportunities for driving continuous improvement through TQM, lean and six  
4 sigma within business process management", The 6th International management conference,  
5 Bucharest: Romania, 15-16, November 2012.
- 6 Stake R. (2006), "Multiple Case Study Analysis", New York: The Guilford Press.
- 7  
8 Tatsana-lam, W. and Ngaoprasertwong, J. (2013), "A Comparison of Process Improvement between  
9 Lean and Lean-TQM Approach", *Global Engineering, Science and Technology Conference*,  
10 Singapore, 3-4, October, 2013, pp.1-9.
- 11  
12 Tickle, M., Mann, R., Adebajo, D. (2016), "Deploying business excellence – success factors for  
13 high performance", *International Journal of Quality and Reliability Management*, Vol. 33 No. 2,  
14 pp.197-230.
- 15  
16 Uddin, A. (2011), "A conceptual design for lean manufacturing system and its implementation in SME  
17 and LE", Robotics and Factories of the Future proceedings of the 26th International  
18 Conference on CAD/CAM, Kuala Lumpur, pp. 289-296.
- 19  
20 Upadhye, U., Deshmukh, S. G. and Garg, S. (2010), "Lean Manufacturing for Sustainable  
21 Development", *Global Business and Management Research*, Vol. 2 No. 1, pp. 125-137.
- 22  
23 Wanitwattanakosol, J. and Sopadang, A. (2011), "A framework for implementing lean manufacturing  
24 system in small and medium enterprises", *Applied Mechanics and Materials*, Vols 110-116,  
25 pp. 3997-4003.
- 26  
27 Wilkinson A., Dundon, T. and Grugulis, I. (2007), "Information but not consultation: exploring  
28 employee involvement in SMEs", *International Journal Of Human Resource Management*, Vol.  
29 18 No. 7, pp. 1279–97.
- 30  
31 Wong, W. and Cheah, C. (2011), "Linking Organizational Culture to Lean Implementation in the  
32 Malaysian Electrical and Electronics Industry: A Conceptual Framework", *Advances In  
33 Management*, Vol. 4 No. 4, pp. 50-57.
- 34  
35 Wong, Y. and Wong, K. (2011), "Approaches and Practices of Lean Manufacturing: The Case of  
36 Electrical and Electronics Companies", *African Journal of Business Management*, Vol. 5 No. 6,  
37 pp. 2164-2174.
- 38  
39 Wong, Y.C., Wong, K.Y. and Ali, A. (2009), "A study on lean manufacturing implementation in the  
40 Malaysian electrical and electronics industry", *European Journal of Scientific Research*, Vol. 38  
41 No. 4, pp. 521-535.
- 42  
43 Yadav, O. P., Nepal, B., Goel, P. S., Jain, R. and Mohanty, R. P. (2010), "Insights and Learnings  
44 from lean manufacturing implementation practices", *International Journal of Services and  
45 Operations Management*, Vol. 6 No. 4, pp. 398-422.
- 46  
47 Yew, O. F. (2016), "The Mediating Role of Lean Engagement on Lean Practices and Business  
48 Excellence in Malaysia Electrical and Electronics Companies", *International Journal of  
49 Academic Research in Economics and Management Sciences*, Vol. 5 No. 2, pp.35-45.
- 50  
51 Zargun, S. and Al-Shaab (2014), "Critical Success Factors for Lean Manufacturing: A Systematic  
52 Literature Review An International Comparison between Developing and Developed  
53 Countries", *Advanced Materials Research*, Vol. 845, pp. 668-681.
- 54  
55  
56  
57  
58  
59  
60

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

LEBM drivers	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Long-term vision	x		x		x		x	x	x				x		x				x	x	10
Reward and motivation	x					x		x	x	x	x			x			x	x		x	10
Top management commitment	x	x	x		x	x	x	x	x	x	x	x		x	x	x	x	x			16
Management involvement	x		x		x		x	x					x						x	x	8
Leading process simplification				x				x	x		x									x	5
Customer data collection	x				x		x	x		x			x	x					x		8
Quick feedback responsiveness	x				x																3
Customer involvement		x				x	x	x		x			x	x		x		x			9
Clear lean strategies	x		x		x	x	x	x	x			x	x	x	x			x	x	x	14
Use of right Lean tools	x							x	x			x							x		5
Manufacturing planning	x													x	x			x		x	6
Delegated responsibilities	x								x									x			4
Improvement suggestion system	x															x					2
Influence over suppliers	x	x			x		x		x	x						x		x			9
Automation				x														x			3
Training and educating	x	x			x	x	x		x	x	x	x	x	x			x	x	x	x	15
Total employees involvement	x	x	x		x	x			x	x	x		x	x		x	x	x		x	15
Workforce empowerment	x	x		x			x				x	x					x	x			8
Teamwork	x				x			x		x							x		x	x	7
Deep understanding	x		x			x						x		x	x			x	x		7
Communication and knowledge sharing	x		x		x	x	x				x		x	x			x	x		x	11
Financial resource allocation	x		x		x	x	x		x			x	x	x		x		x	x	x	13

1: Zargun and Al-Ashaab, 2014; 2: Rose et al., 2014; 3: Al-Manei et al., 2017; Pearce et al., 2018; 5: Alkhoraifet et al., 2018; 6: Minh et al., 2015; 7: Knol, et al., 2018; 8: Alhuraish et al. 2014; 9: Alaskari et al., 2012; 10: Mamat et I, 2015; 11: Marodin and Sauriin, 2013; 12 Sahoo and Yadav, 2018; 13: Martínez-Jurado and Moyano-Fuentes, 2014; 14: Sieckmann, 2018; 15 Reigado and Bento, 2015; 16: Nidhin, 2014; 17: Costa, et al., 2018; 18: Chelangat, 2016; 19: Bilhadi et al., 2018; 20: Netland, 2016.

**Table 1** Critical success factors of LM implementation

Author	Description	Methodology	Comments
Belhadi et al., 2016	An integrated framework encompasses three phases with 16 steps where each phase contained different tools and CSF to support Lean strategies implementation in SMEs.	Literature review and multiple case studies	No performance indicators described
Nguyen, 2015	A management model wheel includes three main elements (5S, Kaizen and visual control) with a focus on deep understanding of Lean benefits to support Vietnamese SMEs for better Lean implementation.	Two rounds of a survey and follow-up interviews	Sequences for implementing Lean are not specified. Lack of performance measurements Hard for beginners to start up with the model
Roslin and Shahadat, 2014	A conceptual model of three elements to aid Lean adoption in Malaysia automotive parts manufacturing industry.	Literature review	Lack of adoption sequences description The relevant internal stakeholders are not specified
Mostafa et al., 2013	A conceptual project-based framework of four phases including conceptual phase, implementation design phase, implementation and evaluation phase, and the lean transformation phase. A number of Lean tools and practices are assigned to each phase.	Literature review	Complex structure with 22 steps which is hard for SMEs to follow Needs highly-skilled practitioners Lack of total employees involvement
Karim & Arif Uz-Zaman, 2013	A systematic Lean implementation methodology base on the five principles of Womack and Jones (1996) aimed at the application of LM tools in the production processes and developing continuous improvement techniques within the organisation.	Literature review and a single case study	Highly-skilled employees required Complex structure compared to SMEs limited resources
Halim et al., 2013	A methodology of Lean implementation based on Toyota's 8-steps processes with methods and Lean tools assigned to each step aimed at optimising the effectiveness of Lean practices in the organisation.	Case study	Needs specialist practitioners Designed for large companies with huge resources Not suitable for beginners companies with LM initiative
Anvari et al., 2011	A project-based framework with five steps to provide a dynamic approach to Lean transmission in different industries and a high variability environment	Literature review	Most activities are limited to the top managers Needs a lot of effort to sustain the results
Wong and	A framework covers LM principles,	Multiple	Applied to the high matured

Wong, 2011	LM pre-request, LM activities and LM tools to generate continuous improvements in 14 different production areas in Malaysian Electrical and Electronic industry.	case studies	organisation No clear links between the improvement areas
Uddin 2011	A conceptual framework based on different aspects of the strengths and weaknesses of SMEs and LEs aimed at supporting effective Lean adoption	Literature review	Not clear instruction for adoption phases No consideration for the preparation phase No clear links between the elements of the framework
Wanitwattanakosol and Sopadang, 2011	A conceptual framework for Lean transformation in SMEs with high-variety and low-volume environment including two phases with three interrelated components in the first phase	Literature review	Lack of total employees involvement Lack of implementation instructions for internal stakeholders
Rose et al., 2010	A conceptual framework for LM implementation in SMEs comprised of top management commitment, lean practices, external support and process evaluation.	Literature review	Lack of implementation methodology description No clear links between the elements of the framework No internal stakeholders of the Lean tools in each practice are specified
Aken et al., 2010	A framework to assist the design, management and sustain of short-term Kaizen events in the organisation which it can be applied within any lean transformation initiative.	Literature review and multiple case studies	Needs highly-skilled managers No Lean tools and CSF described Team-based event Not suitable for SMEs Cannot be extended easily

**Table 2** Frameworks for LM implementation within SMEs

Concept	MBNQA	Lean
Origin	The evolution of quality in the USA	The quality revolution in Japan and Toyota
Theory	Focus on customers through Continuous improvement	Focus on the customer through waste elimination.
Process view	Improve and uniform processes	Improve the flow of processes
Approach	Teamwork and group commitment.	Respect for people, training and change management.
Methodology	Plan, Do, Control, Act	Defining customer value, Value stream, Analysis, Flow, Pull, Perfection.
Tools	Analytical and statistical based tools	Analytical based tools.
Focus	Excellence performance	Efficiency improvement.
Primary effects	Increase customer satisfaction	Reduce lead time, cost and waste
Secondary effects	Achieves customer loyalty and improves performance	Reduces inventory, increases productivity and customer satisfaction
Criticism	No tangible improvements, resource-demanding, the unclear notion	Flexibility reduction which causes congestion in the supply chain.
Financial Returns	By reducing wastes and production cost	Through better performance and a higher level of competitiveness.
Time required	A long-term view and commitment	Long-term culture and attitudes change

**Table 3** The harmony between MBNQA and LM thinking

( Source: Anderson et al., 2006)

General Information	Company A	Company B	Company C
The main type of industry	Tile	Plastic	Food and drink
Age of the company	23	9	12
Number of full-time employees	10	19	45
Ownership	Private	Partnership	Part of a bigger group
Quality system of the company	Conformity of Iraqi standardisation and quality control	Conformity of Iraqi standardisation and quality control	ISO 9000-2008
The value of the company	\$2,000,000	\$3,500,000	\$15,000,000
Annual turnover	\$800,000	\$1,800,000	\$2,500,000
Area occupied	4,600 m <sup>2</sup>	25,000 m <sup>2</sup>	52, 500 m <sup>2</sup>
Company size	Small	Small	Medium
Production technology followed	Italy	Italy, German, UK	Turkey, Italy and Germany

**Table 4** Details of the companies which participated in the study

No.	Core values and concepts	Company A	Company B	Company C
1	A systems perspective	×	✓	×
2	Visionary leadership	×	✓	✓
3	Customer-focused	✓	✓	✓
4	Valuing people	✓	✓	✓
5	Organisational learning	✓	×	✓
6	Continuous improvement	✓	✓	✓
7	Managing for innovation	×	×	×
8	Management by fact	×	×	✓
9	Ethics and transparency	×	×	✓
10	Challenges and flexibility	×	✓	✓

**Table 5** Core values of LM implementation within KRI-SMEs

No.	Lean drivers	Company A	Company B	Company C
1	Lean Leadership	×	×	✓
2	Customer relationship	✓	✓	✓
3	Strategic Planning	×	×	✓
4	Continuous improvement	✓	✓	✓
5	Human resource development	✓	✓	✓
6	Organisational learning	×	✓	✓
7	Process management	✓	✓	✓
8	Business results	×	×	✓

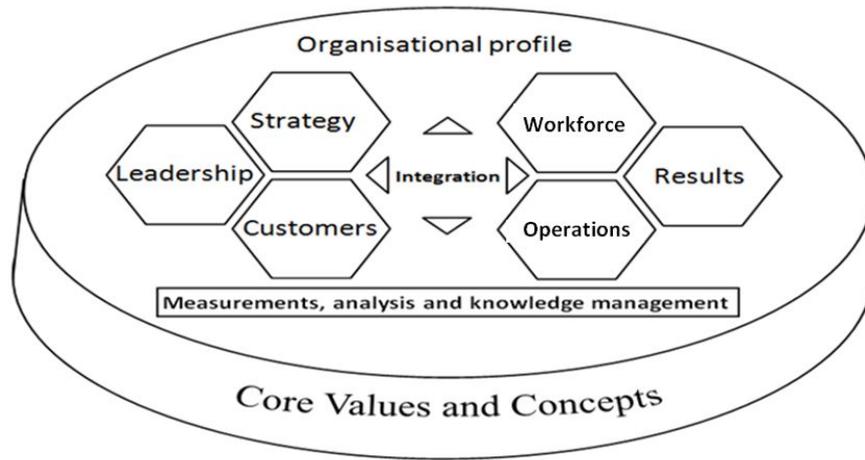
**Table 6** Drivers of LM implementation in KRI-SMEs

No.	LEBM drivers	Company A	Company B	Company C
<b>Critical Success Factors of Lean implementation in KRI-SMEs</b>				
1	Top management commitment	✓	✓	✓
2	Management involvement	✓	✓	✗
3	Clear lean strategies	✗	✗	✗
4	Use of right Lean tools	✗	✗	✓
5	Delegated responsibilities	✗	✓	✓
6	Long-term vision	✓	✓	✓
7	Reward and motivation	✓	✓	✓
8	Training and educating	✗	✓	✓
9	Total employees involvement	✓	✓	✓
10	Workforce empowerment	✗	✗	✗
11	Team-working	✓	✗	✗
12	Deep understanding	✗	✗	✗
13	Financial resource allocation	✗	✗	✓
14	Customer involvement	✓	✓	✓
15	Communication and knowledge sharing	✗	✗	✓
16	Leading process simplification	✗	✗	✓
17	Quick feedback responsiveness	✗	✗	✓
18	Manufacturing planning	✗	✗	✓
19	Improvement suggestion system	✗	✗	✓
20	Influence over suppliers	✓	✓	✓
<b>Lean tools implemented in KRI-SMEs</b>				
1	Customer data collection	✗	✗	✓
2	Wide-market products	✓	✓	✓
3	PDCA cycle	✗	✗	✓
4	Root cause analysis	✗	✓	✓
5	Visualise stream chain	✗	✗	✗
6	Cellular manufacturing	✗	✓	✓
7	5S	✓	✓	✓
8	Total productivity maintenance	✓	✓	✓
9	Automation	✓	✓	✓
10	Statistical process control	✗	✗	✓

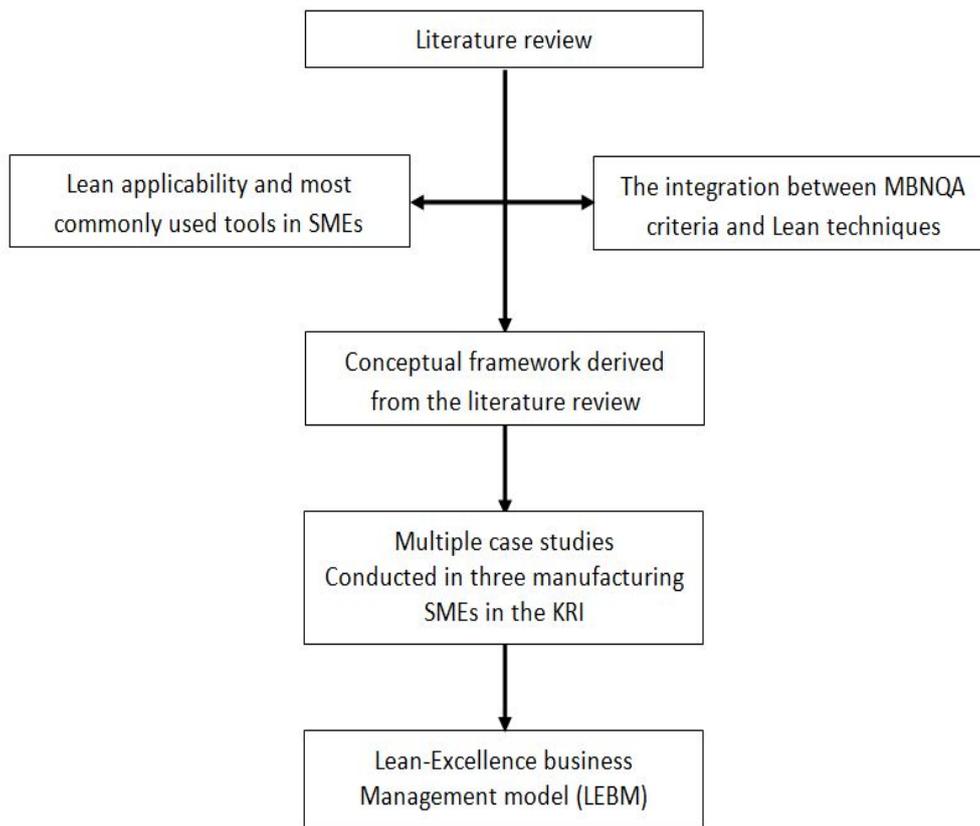
**Table 7** CSF and Lean tools adopted in KRI-SMEs

Problems	Company A	Company B	Company C
Language barriers	✓	✓	✓
Technology development	✗	✓	✗
Company size	✓	✗	✗
Organisational culture	✓	✓	✓
Low qualified workers	✓	✓	✓
Lack of management commitment	✗	✗	✓
Lack of time	✓	✓	✗
Lack of skills	✓	✓	✗
Lack of government support	✓	✓	✗
Change resistance	✗	✗	✓
Lack of financial resources	✓	✓	✗
Lack of infrastructure services	✓	✓	✗
Work-related stress	✓	✓	✗
Lack of awareness	✓	✓	✓
Poor banking system	✓	✓	✓
Market competition	✓	✓	✓
Legislation	✓	✓	✗

**Table 8** Barriers of LM implementation within KRI-SMEs



**Figure 1** MBNQA model for performance excellence (**Source:** nist.gov)



**Figure 2** Research methodology

<b>Core values</b>	Visionary leadership improvement		Customer orientation	Learning and development		Continuous	
<b>Drivers</b>	<b>Lean leadership</b>	<b>Customer Relationship</b>	<b>Strategic Planning</b>	<b>Continuous Improvement</b>	<b>Process Management</b>	<b>Human Resource Development</b>	<b>Organisational learning</b>
<b>Processes</b>	LLE1: Long-term thinking LLE2: Reward and motivation LLE3: Full commitment LLE4: Attending Gemba LLE5: Leading simplification	CR1: Customer data collection CR2: Wide-market products at competitive prices CR3: Quick feedback responsiveness CR4: Customer involvement CR5: Corrective action implementation	SP1: Clear lean strategies SP2: Identification of relevant lean elements SP3: Lean elements priorities SP4: Action plan development SP5: Delegated responsibilities	CI1: PDCA cycle CI2: Root cause analysis CI3: Improvement suggestion system CI4: Visualise stream chain CI5: Total employees responsibility	PM1: Cellular manufacturing PM2: 5S PM3: Total productivity maintenance PM4: Automation PM5: Statistical process control	HRD1: Role design HRD2: Cross-functional training HRD3: Total employees involvement HRD4: Workforce empowerment HRD5: Team-working	OL1: Systematic creation of knowledge OL2: Knowledge acquisition OL3: Knowledge sharing OL4: Knowledge application OL5: Determine and prioritise resource needs
<b>Results</b>	BP1 Customer satisfaction improvement		BP2 Profitability increases	BP3 Employee satisfaction	BP4 Competitiveness growth	BP5 Ergonomics	

Figure 3 LEBM Framework