HAL open science

Strengths and weaknesses of small and medium sized enterprises regarding the implementation of lean manufacturing

Alexandre Moeuf, Simon Tamayo, Samir Lamouri, Robert Pellerin, Adrien Lelievre

To cite this version:

Alexandre Moeuf, Simon Tamayo, Samir Lamouri, Robert Pellerin, Adrien Lelievre. Strengths and weaknesses of small and medium sized enterprises regarding the implementation of lean manufacturing. IFAC-PapersOnLine, 2016, 49 (12), pp.71 - 76. 10.1016/j.ifacol.2016.07.552 . hal-01771945

HAL Id: hal-01771945

https://hal.science/hal-01771945v1

Submitted on 15 Apr 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Distributed under a Creative Commons Attribution - NonCommercial - NoDerivatives 4.0 International License

Available online at www.sciencedirect.com

ScienceDirect

IFAC-PapersOnLine 49-12 (2016) 071–076

Strengths and weaknesses of small and medium sized enterprises regarding the implementation of lean manufacturing

A. MOEUF*, S. TAMAYO**
S. LAMOURI*, R. PELLERIN****,**
A. LELIEVRE*****

**SUPMECA QUARTZ, Saint-Ouen, France.(e-mail: alexandre.moeuf@exxeliatechnologies.com)*
*** MINES PARISTECH, CAOR - PSL, Paris, France.(e-mail: simon.tamayo@mines-paristech.fr)*
**** ARTS ET METIERS PARISTECH, LAMIH, Paris, France.(e-mail: samir.lamouri@ensam.eu)*
***** POLYTECHNIQUE MONTREAL, Montreal, Canada.(e-mail: robert.pellerin@polymtl.ca)*
****** EXXELIA TECHNOLOGIES, Paris, France.(e-mail: Adrien.lelievre@exxeliatechnologies.com)*

Abstract: The purpose of this article is to explore the difficulties experienced when implementing Lean Manufacturing in small and medium sized enterprises (SME). In this work, we draw up a dual evaluation focusing first on the key characteristics of SMEs and then on the management principles of Lean Manufacturing. Based on an analysis of the scientific literature, we observe a number of conflicts between the characteristics identified for SMEs and Lean Manufacturing. The absence of functional organization, lack of methodology and deficiency of formal procedures are often the cause of difficulties experienced by SMEs during the implementation of Lean practices. The analysis of the literature suggests that the notions of leadership, expertise and decision-making are crucial when implementing Lean Manufacturing. However, in the framework of SMEs, these elements tend to be concentrated under the responsibility of the head of the enterprise, leading to several strengths and weaknesses for such implementation.

© 2016, IFAC (International Federation of Automatic Control) Hosting by Elsevier Ltd. All rights reserved.

Keywords: SME, Lean Manufacturing, Implementation, Cultural Anchorage, Change Management.

1. INTRODUCTION

The European Union defines a SME (Small and Medium Sized Enterprise) as an enterprise having a turnover lower than €50 M and fewer than 250 employees. In Europe, SMEs represent 99.8% of enterprises and 67.1% of jobs in the private sector, a figure that rises to more than 80% for industrial companies (Commission, 2008).

In 2013, France had 135,000 SMEs, representing an annual turnover of €616,000 M and 2,700,000 jobs (PME, 2013). However, the financial performance of French SMEs has deteriorated constantly since the 2000s. The number of bankruptcies affecting enterprises with more than 10 employees rose from 3,100 a year in 2007 to 4,600 a year in 2012, i.e. an increase of 48%.

In 2012, in Gallois report, authors observed that SMEs suffered from major weaknesses: lack of equity capital, difficulty in opening up capital, fear of investments (Gallois, 2012). These weaknesses were aggravated by the profit results of industry over the ten previous years.

SMEs need to restore their competitiveness, as they represent a large section of the French and European economy.

Lean Manufacturing (LM) is an approach that has been used by large corporations for several years. The source of LM can be found in the Toyota Production System (TPS) and it is based on the principle of eliminating all forms of wasted value within the enterprise (Ohno, 1998). This model has been tried and verified in large corporations (Drew et al., 2004; Panizzolo et al., 2012; Rose, et al., 2011), where productivity has been increased by more than 40%, overall defects reduced by 20% and lead times reduced by 50%.

Our partner is an enterprise that produces passive electronic components in France and elsewhere in the world. This enterprise is a conglomerate of SMEs acquired throughout the recent history of the parent company. At present, it is now a large enterprise from the administrative standpoint, but each entity still behaves like an independent SME. Our industrial partner experienced similar problems and the implementation of continuous improvement procedures had already been attempted. However, the results hoped for, were not forthcoming. Among other things, the enterprise observed:

- problems with employee commitment;
- major obstacles to change;
- difficulties in convincing the managers about the actions to take; and

2405-8963 © 2016, IFAC (International Federation of Automatic Control) Hosting by Elsevier Ltd. All rights reserved.
Peer review under responsibility of International Federation of Automatic Control.
10.1016/j.ifacol.2016.07.552

- over-present managers leading to a lack of delegation in the field.

The success rate of LEAN implementation in SMEs is low since it reaches only 10% according to Backer's study (Backer, 2002). Several LEAN implementation approaches have been developed (Åhlström, 1998; Hobbs, 2011, 2004; Mostafa et al., 2013), but these methods are designed for mass production companies (Deflorin and Scherrer-Rathje, 2012). The size of the company is however an influential factor in the LEAN implementation (Shah and Ward, 2003; Yang et al., 2011). Indeed, SME have distinctive characteristics when compared to big companies, and their pass criteria are specific (Achanga et al., 2006).

In order to refine this analysis, a literature review of the LEAN implementation in SME has been conducted. This review has allowed the identification of the SMEs specific characteristics which have then been compared to the LEAN MANUFACTURING management philosophy principles in order to list the strengths and weaknesses encountered by SMEs.

2. LEAN MANUFACTURING

2.1 Definition of Lean

The term Lean was used for the first time in 1988, during the International Motor Vehicule Program, which aimed at understanding the differences in productivity between Japanese and Western industries. The term was then popularised by Womack & al. in their book "The Machine That Changed the World" (Womack et al., 1990). The source of Lean Manufacturing came from the Toyota Production System (Ohno, 1988), it is based on the principle of eliminating all forms of wasted value within the enterprise.

2.2 Management principles of LM

For many authors, LM is a long-term corporate strategy and a philosophy of corporate management (Liker, 2004; Spear and Bowen, 1999).

Toyota succeeded in integrating LM in its organisation and has continued to do so for more than 40 years (Ohno, 1988). Liker proposed 14 management principles (Liker, 2007), that provide one of the most accepted characterisations of LM:

1. decisions founded on a long-term philosophy, even to the detriment of short term financial objectives;
2. the organisation of processes into single piece flows to identify problems;
3. use of pulled systems (flow triggered only by client orders) to avoid excess production;
4. production smoothing;
5. create a culture of immediate quality problem solving the first time;
6. standardise tasks as the basis of continuous improvement and empower employees;
7. use visual inspection so that no fault remains hidden;
8. use reliable technologies proven over a long time;
9. train managers with perfect knowledge of the work, live the philosophy and teach it to others;
10. train individuals and teams who apply the enterprise's philosophy;
11. respect the network of partners and suppliers by encouraging them and helping them to progress;
12. interact with the field to clearly understand the situation;
13. take decisions consensually, by taking the time necessary, examining in detail all the options and applying decisions quickly; and
14. reflect systematically and improve continuously.

In the rest of this article, we consider Liker's 14 management principles to cross them with the characteristics of SMEs.

3. SMALL AND MEDIUM SIZED ENTERPRISES

3.1 Literature review methodology

In this study, the following databases have been consulted:

- Emerald Insight;
- Elsevier;
- Taylor & Francis.

The articles consulted for the literature review have been selected according to the following keywords: "SME", "Small and Medium", "LEAN" and "Implementation". The initial total number of 513 documents that has been obtained has then been reduced to 223 through the reading of all article abstracts. Finally, only the 77 articles dealing with "SME" and "LEAN" simultaneously have been selected.

3.2 Characteristics of PME

In accordance with the Tranfield's method (Tranfield et al., 2003), the careful analysis of the articles allowed their classification according to different topics. Several authors already proposed characteristics lists for SMEs (Garengo et al., 2005), and Torres approach (Torres, 1999) has been selected, leading the following theme :

- local management;
- short-term strategy;
- lack of expertise;
- Non-functional organisation;
- limited resources; and
- lack of method and procedure.

On the 77 articles dealing with SMEs, only 23 point out (put forward) one or several characteristics of SMEs. The number of occurrences for each characteristic is presented in Table 1.

Table 1: List of SME characteristics in literature

Caracteristics	Number of references
Lack of expertise	17
Limited resources	16
Local management	12
Short-term strategy	10
Lack of method and procedure	9
Non-functional organisation	5

The author's observations give a first indication on the SMEs weaknesses. The purpose of our research is to compare these characteristics with the LEAN management principles.

4. OBSERVATIONS AND DIFFERENCES

4.1 Comparison between the characteristics of SMEs and the management principles of Lean Manufacturing

In this part, we compare the characteristics of SMEs seen previously with the principles of LM set out by Liker (Liker, 2007). In the following, we discuss the need for leadership, expertise and the involvement of decisional authority in an LM project.

We rely on a study of key works and an initial analysis of the literature on "the implementation of continuous improvement approaches in SMEs". In view of the observations made by various authors, we have identified virtuous relations and relations of "strength" between SMEs and LM (for example, the local management existing in SMEs facilitates the LM management principle 12th of interaction with the field); as well as "relations of conflict" (for example, short-term strategy conflicts with principle 1 decision-making, which is based on a long-term philosophy). Figure 1 present the number of conflict between SME characteristics and lean principle. Table 2 presents the correlations identified by the analysis described above with the reference in identifying articles.

Regarding the lack of expertise and short term strategy, the problem stems from the mode of management applied in the SME (Greiner, 1972; Mintzberg, 1982; Torres, 1999). The lack of delegation rooted in the SME prevents employees from improving their competences and the involvement of the chief executive in operational decisions obliges them to have a short-term vision of the options.

The aim of LM is to delegate a large number of responsibilities as close as possible to the operational personnel (Liker, 2006), which conflicts with the centralised power of the chief executive. In this particular point, implementing LM requires changing the organisational culture of the SME.

We hypothesise that the failure of implementing LM in SMEs is due to the fact that the characteristics specific to SMEs are insufficiently taken into account. The informal management mode present in SMEs requires a highly credible team representative of the enterprise, the lack of expertise requires training and a longer period of apprenticeship, and the lack of leadership demands that the rare potential profiles and the power of decision centred on the chief executive make the latter a highly important and indispensable member of the team.

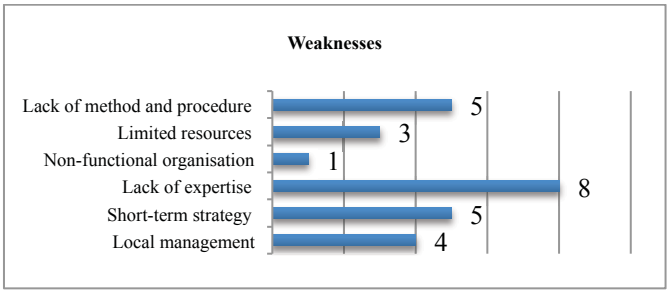

Figure 1 : Conflicts between management principles and SME caracteristics

4.2 The importance of leadership, expertise and power of decision in organisational change

We saw that the characteristics specific to SMEs can contradict the management principles of LM. However, in the analysis of the literature, leadership, expertise and power of decision are not identified as management principles but as competences required for a lean enterprise (Achanga et al., 2006; Höök and Stehn, 2008; Taylor and Taylor, 2014).

To ensure the organisational change required for synergy with LM principles, the SME must ensure, at least in the LM project, a long-term orientation and the availability of expertise required to set up and maintain LM practices and tools (Hines et al., 2004). To do this, it has to form a team that comprises leadership, expertise, and the power of decision. Kotter defined leadership as "*a number of processes that first create organisations or which adapt them through significant changes. Leadership defines how the future can be, aligns the employees with this vision and inspires them to achieve it despite the obstacles.*" (J. Kotter, 1996a).

We find the importance of leadership in the works of Dombrowski (Dombrowski and Mielke, 2013) and Liker (Liker, 2006), who proposes four rules (the 4P) to describe lean principles; rule 4 is: *"Develop exceptional People and Partners"*. It appears clear for Liker that success in launching a lean project starts with leadership. At Toyota, the "group leader" plays a major and crucial role in the continuous improvement process. These leaders are placed at the front line in order to delegate a maximum number of responsibilities to lower levels of the chain of command. Lastly, regarding change management, Liker is highly precise: "Change is impossible without leaders". Leaders must be present and promoted at all levels: the upper, middle and lower levels of the chain of command.

Table 2. Correlation between the 14 principles of Lean Manufacturing and the characteristics of SMEs: strengths and conflicts.

Management Principles of Lean Manufacturing	Local management	Short-term strategy	Lack of expertise	Non-functional organisation	Limited resources	Lack of method and procedure
1. Base decisions on a long-term philosophy, even to the detriment of short term financial targets.	Conflict (Achanga et al., 2006)	Conflict (Kumar and Antony, 2008)			Conflict (Kumar and Antony, 2008)	
2. Organisation of single piece flow processes to identify problems.			Conflict (Womack and Daniel, 2003)			Conflict(Deflorin and Scherrer-Rathje, 2012)
3. Utilisation of pull systems (flow triggered only by client orders) to avoid excess production.			Conflict (Womack and Daniel, 2003)			
4. Production smoothing.			Conflict (Womack and Daniel, 2003)			
5. Creation of a culture of immediate quality problem solving at first try.		Conflict (Mathur et al., 2012)	Conflict (Thomas et al., 2009)			Conflict (Kirkham et al., 2014)
6. Standardisation of tasks as the basis of continuous improvement and employee empowerment.	Conflict (Thomas et al., 2012)		Conflict (Achanga et al., 2006)			Conflict (Kirkham et al., 2014)
7. Utilisation of visual control to ensure no problem remains hidden.						
8. Utilisation of reliable technologies, tried and tested through time.				Conflict (Taylor and Taylor, 2014)		Conflict (Hudson et al., 2001)
9. Training of managers who know the work perfectly, live the philosophy and teach it to others.		Conflict (Matt and Rauch, 2013)			Conflict (Achanga et al., 2006)	
10. Training of exceptional individuals and teams who apply the philosophy of your enterprise.	Strength (Dora et al., 2015)					
11. Respect for the network of partners and suppliers, by encouraging them and helping them to progress.			Conflict (Aitken et al., 2002)		Conflict (Bhasin, 2012)	
12. Interaction with the field to clearly understand the situation.	Strength (Matt and Rauch, 2013)					
13. Consensual decision-making by taking the time necessary, by examining all the options in detail, followed by rapid application of the decisions.	Conflict (Deflorin and Scherrer-Rathje, 2012)	Conflict (Achanga et al., 2006)	Conflict (Kirkham et al., 2014)			Conflict (Kirkham et al., 2014)
14. Systematic reflection and continuous improvement.	Conflict (Prasanna and Vinodh, 2013)	Conflict (Gnanaraj et al., 2012)	Conflict (Hudson et al., 2001)			

Leadership is not the sole important component for ensuring success when changing organisational culture. Implementing LM requires a radical change in the way things are produced. According to Womack & al. (Womack and Daniel, 2003) genuine "technical virtuosity" is essential for any lean approach. We find the importance of expertise in the research of Kotter (J. Kotter, 1996b); expertise ensures that technical decisions are correlated with the activity and constraints of the enterprise.

The lack of expertise that is observed in SMEs is the main element in conflict with the Lean Manufacturing management principles. This lack of expertise affects several fields like computer science and information flow (Iris and Cebeci, 2014), problem solving (Thomas et al., 2009), or even Lean tools (Kumar et al., 2009). This demands a substantial effort on employees training (Simons and Taylor, 2007) on the Lean philosophy and on the different Lean implementation methods (Powell et al., 2013).

The last important factor is the power of decision, which must guarantee a strong impact on time assignment, on employee motivation and on the validation of the investments required (Bakås, 2011). Kotter (J. Kotter, 1996b) emphasised the importance of the power of decision in change management. Indeed, it permits diverging from the "usual" chain of command, since major changes often require working outside formalised systems. In a SME, the power of decision is centred on the leader, hence the importance of their involvement and support for the project to implement LM. What is more, the links are informal, which sometimes give a great deal of power to the actors without them having to be highly placed in the chain of command. This is often the case of workers who have been in the enterprise since it was founded.

5. CONCLUSIONS AND RESEARCH PERSPECTIVES

The main contribution of this article is that it punctually highlights the conflicts between the management principles of LM and the characteristics of SMEs. The lack of resources, lack of expertise, short-term strategy, the lack of procedure and methods, and non-functional organisation prevent the implementation of LM according to the 14 management principles set out by Liker (Liker, 2004).

The last point concerns the decision-making power that the chief executive of the SME centres around him/herself, as it is a key factor for the implementation phase.

We observed that the leader centralises strong decision-making power and expertise frequently acquired from previous experience of founding businesses and/or seniority. The resulting lack of delegation does not allow the expression or emergence of a leader in the company apart from the chief executive. Nonetheless, such leader ensures high level of interaction with the field (an important management principle of LM). This paradox represents both a strength and a weakness, for guiding change within the enterprise.

It will be important in future research to measure the impact of the characteristics of the leader and the SME in the success of implementing LM. Some SMEs succeed in implementing LM, but do they possess the characteristics observed in most cases? Or do these rare successes occur in the rare advanced organisations that do not possess the weakness described above? Are the characteristics specific to the leader analysed? Do they have a direct relationship with success?

It is difficult to find expertise and leadership in a SME other than in its chief executive and, as has been stated above, the implementation phase requires many qualities that SMEs lack. This translates to informal configurations lacking procedures in which the place of leaders is particularly important. Is this dimension taken into account in the implementations that succeed? Is the team responsible for managing change structured on the basis of these observations? What are the team's characteristics during the implementations? The literature on these issues will be analysed in order to confirm their impact.

Lastly, it has been shown that a SME is different from a large enterprise, with its strengths and weaknesses regarding LM as described here. How can advantage be drawn from these strengths to facilitate the implementation of lean culture with different tools, different steps and different milestones?

REFERENCES

Achanga, P., Shehab, E., Roy, R., Nelder, G., 2006. Critical success factors for lean implementation within SMEs. J. Manuf. Technol. Manag. 17, 460–471. doi:10.1108/17410380610662889

Åhlström, P., 1998. Sequences in the implementation of lean production. Eur. Manag. J. 16, 327–334. doi:10.1016/S0263-2373(98)00009-7

Aitken, J., Christopher, M., Towill, D., 2002. Understanding, Implementing and Exploiting Agility and Leanness. Int. J. Logist. Res. Appl. 5, 59–74. doi:10.1080/13675560110084139

Bakås, O., 2011. Challenges and Success Factors for Implementation of Lean Manufacturing in European Smes. Mitip 2011.

Baker, P., 2002. Why is Lean so far off ? Work. Manag. 55, 26–29.

Bhasin, S., 2012. Performance of Lean in large organisations. J. Manuf. Syst. 31, 349–357. doi:10.1016/j.jmsy.2012.04.002

Commission, E., 2008. Putting Small Businesses First. Reproduction.

Deflorin, P., Scherrer-Rathje, M., 2012. Challenges in the transformation to lean production from different manufacturing-process choices: a path-dependent perspective. Int. J. Prod. Res. 50, 3956–3973. doi:10.1080/00207543.2011.613862

Dombrowski, U., Mielke, T., 2013. Lean Leadership - Fundamental principles and their application. Procedia CIRP 7, 569–574. doi:10.1016/j.procir.2013.06.034

Dora, M., Kumar, M., Gellynck, X., 2015. Determinants and barriers to lean implementation in food-processing SMEs – a multiple case analysis. Prod. Plan. Control 7287, 1–23. doi:10.1080/09537287.2015.1050477

Drew, J., McCallum, B., Roggenhofer, S., 2004. Objectif Lean.

Gallois, L., 2012. Pacte pour la compétitivité de l'industrie Française.

Garengo, P., Biazzo, S., Bititci, U.S., 2005. Performance measurement systems in SMEs: A review for a research agenda. Int. J. Manag. Rev. 7, 25–47. doi:10.1111/j.1468-2370.2005.00105.x

Gnanaraj, S.M., Devadasan, S.R., Murugesh, R., Sreenivasa, C.G., 2012. Sensitisation of SMEs towards the implementation of Lean Six Sigma – an initialisation in a cylinder frames

manufacturing Indian SME. Prod. Plan. Control 23, 599–608. doi:10.1080/09537287.2011.572091
Greiner, L., 1972. Evolution and Revolution as Organizations Grow - Harvard Business Review. Harv. Bus. Rev. 76, 55–68.
Hines, P., Holweg, M., Rich, N., 2004. Learning to evolve: A review of contemporary lean thinking. Int. J. Oper. Prod. Manag. 24, 994–1011. doi:10.1108/01443570410558049
Hobbs, D.P., 2011. Applied Lean Business Transformations : A complete project management approach. J.ROSS Publishing.
Hobbs, D.P., 2004. Lean Manufacturing Implementation. J.ROSS Publishing and APICS.
Höök, M., Stehn, L., 2008. Applicability of lean principles and practices in industrialized housing production. Constr. Manag. Econ. 26, 1091–1100. doi:10.1080/01446190802422179
Hudson, M., Lean, J., Smart, P. a., 2001. Improving control through effective performance measurement in SMEs. Prod. Plan. Control 12, 804–813. doi:10.1080/09537280110061557
Iris, C., Cebeci, U., 2014. Analyzing relationship between ERP utilization and lean manufacturing maturity of Turkish SMEs. J. Enterp. Inf. Manag. 27, 261–277. doi:10.1108/JEIM-12-2013-0093
Kirkham, L., Garza-Reyes, J.A., Kumar, V., Antony, J., 2014. Prioritisation of operations improvement projects in the European manufacturing industry. Int. J. Prod. Res. 7543, 1–23. doi:10.1080/00207543.2014.903345
Kotter, J., 1996a. Leading Change. Harvard Business Press, Boston, Massachussetts.
Kotter, J., 1996b. Leading change: Why Transformation Effors Fail. Harv. Bus. Rev. 35, 41–43.
Kumar, M., Antony, J., 2008. Comparing the quality management practices in UK SMEs. Ind. Manag. Data Syst. 108, 1153–1166. doi:10.1108/02635570810914865
Kumar, M., Antony, J., Douglas, A., 2009. Does size matter for Six Sigma implementation?: Findings from the survey in UK SMEs. TQM J. 21, 623–635. doi:10.1108/17542730910995882
Liker, J.K., 2007. The Toyota way: 14 management principles from the world's greatest manufacturer, Action Learning: Research and Practice. doi:10.1080/14767330701234002
Liker, J.K., 2006. The Toyota Way Fieldbook, A practical guide for implementing Toyota's 4Ps. The McGraw-Hill Companies, Inc, New York.
Liker, J.K., 2004. The Toyota Way: 14 management principles from the world's greatest manufacturer. McGraw-Hill, New York.
Mathur, A., Mittal, M.L., Dangayach, G.S., 2012. Improving productivity in Indian SMEs. Prod. Plan. Control 23, 754–768. doi:10.1080/09537287.2011.642150
Matt, D.T., Rauch, E., 2013. Implementation of lean production in small sized enterprises. Procedia CIRP 12, 420–425. doi:10.1016/j.procir.2013.09.072
Mintzberg, H., 1982. Structure et Dynamique des organisations, Vingt-troi. ed. Eyrolles.
Mostafa, S., Dumrak, J., Soltan, H., 2013. A framework for lean manufacturing implementation. Prod. Manuf. Res. 1, 44–64. doi:10.1080/21693277.2013.862159
Ohno, T., 1998. Toyota Production System: Beyond large-scale.
Ohno, T., 1988. The Toyota Production System — Beyond Large-Scale Production, CRC Press.
Panizzolo, R., Garengo, P., Sharma, M.K., Gore, A., 2012. Lean manufacturing in developing countries: evidence from Indian SMEs. Prod. Plan. Control 23, 769–788. doi:10.1080/09537287.2011.642155
PME, observatoire des, 2013. RAPPORT SUR L ' ÉVOLUTION des PME.
Powell, D., Alfnes, E., Strandhagen, J.O., Dreyer, H., 2013. The concurrent application of lean production and ERP: Towards an ERP-based lean implementation process. Comput. Ind. 64, 324–335. doi:10.1016/j.compind.2012.12.002
Prasanna, M., Vinodh, S., 2013. Lean Six Sigma in SMEs: an exploration through literature review. J. Eng. Des. Technol. 11, 224–250. doi:10.1108/JEDT-01-2011-0001
Rose, A.M.N., Deros, B.Md., Rahman, M.N.Ab. & Nordin, N., 2011. Lean manufacturing best practices in SMEs. Int. Conf. Ind. Eng. Oper. Manag. 1, 872–877.
Shah, R., Ward, P.T., 2003. Lean manufacturing: Context, practice bundles, and performance. J. Oper. Manag. 21, 129–149. doi:10.1016/S0272-6963(02)00108-0
Simons, D., Taylor, D., 2007. Lean thinking in the UK red meat industry: A systems and contingency approach. Int. J. Prod. Econ. 106, 70–81. doi:10.1016/j.ijpe.2006.04.003
Spear, S., Bowen, H.K., 1999. Decoding the DNA of Toyota Production System. Harv. Bus. Rev. 77, 96–106. doi:http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=2216294&site=ehost-live
Taylor, A., Taylor, M., 2014. Factors influencing effective implementation of performance measurement systems in small and medium-sized enterprises and large firms: a perspective from Contingency Theory. Int. J. Prod. Res. 52, 847–866. doi:10.1080/00207543.2013.842023
Thomas, A., Barton, R., Chuke-Okafor, C., 2009. Applying lean six sigma in a small engineering company – a model for change. J. Manuf. Technol. Manag. 20, 113–129. doi:10.1108/17410380910925433
Thomas, A., Francis, M., John, E., Davies, A., 2012. Identifying the characteristics for achieving sustainable manufacturing companies. J. Manuf. Technol. Manag. 23, 426–440. doi:10.1108/17410381211230376
Torres, O., 1999. Les PME.
Tranfield, D., Denyer, D., Smart, P., 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review *. Br. J. Manag. 14, 207–222. doi:10.1111/1467-8551.00375
Womack, J.P., Daniel, T.J., 2003. Lean thinking, First Free. ed. Simon & Schuster, Inc.
Womack, J.P., Jones, D.T., Roos, D., 1990. The machine that changed the world. Simon & Schuster, Inc.
Yang, M.G. (Mark), Hong, P., Modi, S.B., 2011. Impact of lean manufacturing and environmental management on business performance: An empirical study of manufacturing firms. Int. J. Prod. Econ. 129, 251–261. doi:10.1016/j.ijpe.2010.10.017