Asian Journal of Scientific Research

ISSN 1992-1454

science alert
http://www.scialert.net

ANSInet
an open access publisher
http://ansinet.com

OPEN ACCESS Asian Journal of Scientific Research

ISSN 1992-1454
DOI: 10.3923/ajsr.2016.279.283

Case Report
Lean Six Sigma Sustainability Framework: A Case Study on an Automotive Company

[1]Tan Owee Kowang, [1]Tan Su Yong, [2]Amran Rasli and [1]Choi Sang Long

[1]Faculty of Management, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia
[2]Innovation and Commercialisation Center, Universiti Teknologi Malaysia, Johor Bahru, Malaysia

Abstract
Majority of the prior Lean Six Sigma (LSS) researches focused on the study of success factors for LSS implementation. There is lack of research that explores the sustainability factors or factors for the continuation of LSS's drive post the LSS implementation stage. Hence, this study intends to establish the fundamental concept of LSS sustainability based on the principles of sustainability. In addition, the study also aims to develop a LSS sustainability conceptual framework based on literature review and case study on a company that had implemented LSS for 15 years. The proposed LSS sustainability framework consist of 5 important sustainability factors, which are continuous improvement culture, innovative culture, management team's approach, employee knowledge on LSS and communication. The uniqueness of the proposed framework is the framework not only summarized the key finding from literature review in regard with sustainability and factors for sustainability, but the framework also reflects the actual setting of a company that has sustained LSS drive for the last 15 years.

Key words: Lean six sigma, sustainability, innovative culture, continuous improvement culture, employee knowledge

Received: April 21, 2016 Accepted: September 01, 2016 Published: November 15, 2016

Citation: Tan Owee Kowang, Tan Su Yong, Amran Rasli and Choi Sang Long, 2016. Lean six sigma sustainability framework: A case study on an automotive company. Asian J. Sci. Res., 9: 279-283.

Corresponding Author: Tan Owee Kowang, Faculty of Management, Universiti Teknologi Malaysia, 81310 Johor Bahru, Johor, Malaysia

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Business environment in the automotive industries is very competitive. The industries have to continuously strive to explore new improvement approaches in order to enhance and sustain competitive advantage. In conjunction with this, many companies have recently begun to examine their corporate structure, approach, policy and compare versus the principles entrenched within the concept of sustainability. One of the approaches used is to adopt the sustainability principles into the organization business activities through lean six sigma.

The concept of sustainability is broken down into three major focus areas: Economic, social and environmental. These three major focus areas are often referred as the triple bottom line for sustainability. The triple bottom line is also denoted as "Profit, people and planet" by Jackson *et al.*[1].

The main idea behind corporate sustainability is that organizations today should not only focus on the business financial gains or economic sustainability, but should also expand the scope of sustainability and organizational responsibility to assess the businesses impact toward the environment and stakeholders. According to the Brundtland[2], sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This statement made sustainability as a unified concept and idea that organizations should committed to adopt across all business units.

RESEARCH BACKGROUND

Company D is an automotive multinational company (MNC) and is operating in Singapore as a manufacturing plant for 35 years. The company is experiencing phenomenon growth in the meantime suffering on stretching of resources in order to improve market competitiveness. For the last 15 years, lean, six sigma followed by lean six sigma has been successfully implemented in the company as the main business improvement tools.

The main challenge for the company at this moment is to deal with the intense cost pressure in the fierce competitive globalized market as well as internal competition with the two sister companies located at Mexico and China. As such, to maintain the company competitive advantage, the main focus for the management team is to sustain the lean six sigma drives of continuous business improvements, with the ultimate aim to enhance and sustain the company business performance.

However, Lean Six Sigma (LSS) has been traditionally seems to be over focused on training of tools and techniques application and at the same time too little focus on understanding of human factor and sustainability[3]. In addition, prior studies on LSS[4-6] tended to focus on the key or critical success factors of either lean, six sigma or LSS. There is lack of research explore whether these key success factors will sustain the success of the LSS drive. Reverting the old way of doing things is inevitable if sustainability measures are not a part of the LSS methodology[3]. Hence, this study aims to review the literature of sustainability and factors for LSS sustainability. The ultimate objective for this study is to develop a LSS sustainability conceptual framework bases on the setting of company D.

SUSTAINABILITY OF LEAN SIX SIGMA

The term sustainable generally refer to the protection of the attributes and resources that allow an organization to outperform its rivals in the same industry. Within this context, sustainable can assume a number of meanings depending on the frame of reference through which it is viewed. It can be interpreted to mean endurable, defensible, bearable, tolerable, liveable, supportable, passable, acceptable, justifiable, negotiable and penetrable[7].

Sustainable development was initially confined to environmental concerns, as time passed, the focus of sustainability began to evolve beyond what sustainability was and explore on how it could be more widely incorporated. As the result, sustainability subsequently expanded to incorporate social and economic issues. Hence, sustainability is now a composite of economy, social and environment[8].

Sustainable development has been defined by Brundtland[2] as "development that meets the needs of the present without compromising the ability of the future generations to meet their own needs". An organization is considered as sustainable if the organization is inclined to initiate changes related to economic growth, social progress and environmental protection continuously and embrace the changes ultimately as part of organizational policy[9].

From organizational economic perspective, sustainability refers to continuous value creation and addition, which is in line with the principle of lean six sigma[10]. As such, the dimension of economical sustainability from lean six sigma point of view includes variation elimination, add value, reduced complexity, improve accuracy and effectiveness across the entire business process[11].

From social and environment point of view, a growing number of organizations have begun to adopt corporate responsibility strategies to contribute to sustainable development goals. These strategies are aimed at aligning the self-interest of the firms with the greater public good in ways that add value not only to the firms, but also to the society and environment[10].

Asian organizations are far lagging behind those in the West in having supportive policies and sustainable development strategies[12]. Some Asian countries have moved towards sustainable development[13]. However, even though sustainability focuses on the three aspects of economic growth, social progress and environmental protection, the primary effort on sustainability development shall focuses on the development of sustainable economic growth, this is because a sustainable economic growth or financial gains is the fundamental requirement for an organization prior to initiate both social and environmental sustainability development[14].

SUSTAINABILITY FACTORS FOR LEAN SIX SIGMA

There are numbers of critical factors leading to the successful implementation of sustainability strategy[15,16]. These factors are from both internal and external. Internally, the determinants are corporate governance and stakeholder engagement while external determinants include the legal system in the country and the cultural and social factors[17]. By taking into consideration that economic sustainability should be the crucial and fundamental focus for sustainability development; this study focuses on lean six sigma sustainability factors from economy point of view.

Amass finding from literature review of sustainability development and review on LSS approach adopted by the company under study, 5 LSS sustainability factors are proposed in this study, which are continuous improvement culture, innovative culture, top management approach, employees LSS knowledge level and communication.

Continuous Improvement (CI) culture: Continuous improvement is the philosophy pioneered by Deming who defines continuous improvement as a "Consistent improvements that increase success and reduce failures[18]". In addition, Bessant[19] expanded the scope of continuous improvement to as "a company-wide process of focused and continuous incremental innovation".

Continuous Improvement (CI) culture from lean six sigma point of view is a culture of sustained improvement with continuously focuses on eliminating waste in all the business processes within the organization. This continuous effort involves everyone across the organization making improvements and searching for problem root causes, sources of variation and waste and finding ways to minimize and ultimately eliminate them. Continual Continuous Improvement has to be part of what every employee does every day-day in and day out, the process of attaining sustainability as highlighted by Robert[20].

Achanga[21] stated that the creation of supportive LSS organizational culture such as openness, collaboration, receptivity and data sharing is an essential platform for the development of LSS sustainability. Hence, it is imperative for organization to understand the important aspects of cultural factor for LSS sustainability and cultivate the organizational value toward a culture which promote improvement ideas, accelerate improvement process and sharing of improvement experiences across the organization[3,22-24].

Innovative culture: Continuous Improvement (CI) culture is the key element for LSS sustainability; meantime, innovation is the key source of competitiveness via sustainable LSS[25]. Study done by prior research revealed that continuous improvement initiatives promote innovative culture and subsequently enhance company competitiveness. It is through innovativeness that industrial managers devise solutions to business problems and challenges, which provide the basis for firm survival and future success[26].

Both continuous culture and innovative culture promote sustainable approaches to solve customers need. In addition, continuous improvement process can lead to the incremental innovation on products, processes or services. As such, continue improvement culture oriented organization should incorporate the elements of innovation as the organization culture in order to develop the company into an innovative firm. For instance, the use of problem solving tools in continuous improvement initiatives helps to foster creativity and invention, which are the elements that develop innovation. Hence, a culture of continuous improvement within a company acts as a solid foundation on which an innovative culture and organization can be built. Training associated with continuous improvement resulted in increased employee knowledge of customers, competition and markets which, in turn lead to employee-generated innovative ideas.

Management team's approach: Management team's approach towards sustainability development is one of the key factors for the implementation of sustainability development strategies. Prior studies[27-30] on social orientation,

social corporate sustainability and relating concepts from the management perspective revealed that leaders who have a well-articulated set of guiding principles and strong sense of shared values are at higher motivation level, more eager to continuously make changes, as the result drive for sustainability. On the other hand, study done by Gelei *et al*.[31] highlight that micromanager leadership behavior can undermine the long-term sustainability of LSS success and can hinder the development of a LSS culture.

Employees LSS knowledge: Within the context of LSS sustainability, continuous improvement culture within an organization shall be aligned and integrated with the LSS principle and approach to ensure a sustainable LSS drive. As such, employees' knowledge and understanding of LSS principle (i.e. add value and reduce variation), LSS approach (i.e., define, measure, analysis, improve and control or DMAIC process), type of LSS tool and technique are the important aspects for LSS sustainability. In addition, the number of LSS experts in term of LSS green belt, LSS black belt should continuously increase to enhance the knowledge level of LSS within the organization, furthermore to expand the adaption of LSS drive across all business units[32]. Hence, the continuation of employee training on LSS and upgrading LSS skill is critical in order to develop core group of LSS expertise in field required by the organization.

Communication: Communication is another crucial factor for sustaining LSS drive toward company performance improvement. Antony and Banuelas[22] emphasized that efficient and frequent communications provide employees a guideline and maintain the momentum in LSS continuous improvement efforts. The LLS sustainability requires the effective top-down communication in order to provide employee with clear objectives and consistent mission statements[33]. Rather than working individually. In addition, LSS sustainability also required cross-functional teamwork of all employees in the organization. Brainstorming and frequent communication are typically considered important ingredients of various continuous improvement initiatives[32,34].

CONCEPTUAL FRAMEWORK FOR LSS SUSTAINABILITY

Sustainability of LSS is crucial for organization to maintain competitive advantage. Having differentiation through solely product or service price alone will not ensure sustainable competitive advantage. As such, this study proposes a LSS sustainability conceptual framework for company D which incorporated five key factors for LSS sustainability continuous Improvement culture, innovative culture, management team's approach, employees' LSS knowledge level and communication as shown in Fig. 1.

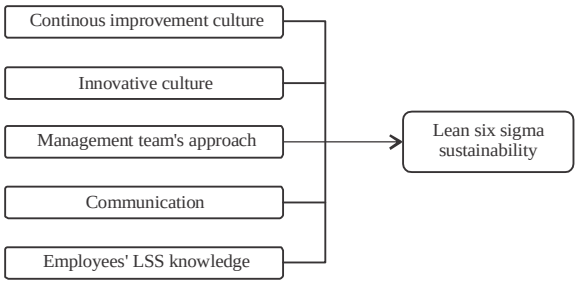

Fig. 1: LSS sustainability conceptual framework

The proposed framework is developed based on the concept of LSS sustainability is driven by the organization culture that promotes continuous innovative and creative improvement which serves as the fundamental for organization survival and future success[26]. In addition, drive from management team approach, effectiveness of communication within the organization and the LSS knowledge level among employees are the others three aspects that stimulate LSS sustainability. The uniqueness of the proposed framework is the framework not only summarized the key finding from literature review in regard with sustainability and factors for sustainability, but the framework also reflects the actual setting of a company that has sustained LSS drive for the last 15 years.

CONCLUSION

The proposed lean six sigma sustainability conceptual framework integrated the finding of sustainability factors proposed by prior research with the actual setting or practices within company D, which had implemented LSS for 15 years. The framework carries a descriptive value in terms of studying and defining the relationships between organizational LSS sustainability factors and LSS sustainability. Hence, the continuation of this study is the field work to test the relevance and validity of the proposed framework with the ultimate aim to assess the correlation between each LSS sustainability factors and company performance.

ACKNOWLEDGEMENT

Authors wish to acknowledge the Malaysian Ministry of Higher Education and Universiti Teknologi Malaysia under the Research grant (Vote No. 4F323) for sponsoring this publication.

REFERENCES

1. Jackson, A., K. Boswell and D. Davis, 2011. Sustainability and triple bottom line reporting- What is it all about. Int. J. Bus. Humanities Technol., 1: 55-59.
2. Brundtland, G.H., 1985. World commission on environment and development. Environ. Policy Law, 14: 26-30.
3. Dahlgaard, J.J. and S.M. Dahlgaard-Park, 2006. Lean production, six sigma quality, TQM and company culture. TQM Mag., 18: 263-281.
4. Enoch, O.K., 2013. Lean six sigma methodologies and organizational profitability: A review of manufacturing SMEs in Nigeria. Am. J. Ind. Bus. Manage., 3: 573-582.
5. Alessandro, L. and J. Antony, 2012. Critical success factors for the effective implementation of Lean Sigma: Results from an empirical study and agenda for future research. Int. J. Lean Six Sigma, 3: 274-283.
6. Zhang, Q., M. Irfan, M.A.O. Khattak, J. Abbas, X. Zhu and M.S. Shah, 2012. Critical success factors for successful lean Six Sigma implementation in Pakistan. Interdiscip. J. Comtemp. Res. Bus., 4: 117-124.
7. Chaharbaghi, K. and R. Lynch, 1999. Sustainable competitive advantage: Towards a dynamic resource-based strategy. Manage. Decision, 37: 45-50.
8. Carroll, A.B., 1999. Corporate social responsibility evolution of a definitional construct. Bus. Soc., 38: 268-295.
9. Shrivastava, P. and S. Hart, 1995. Creating sustainable corporations. Bus. Strat. Environ., 4: 154-165.
10. Taghizadegan, S., 2006. Essentials of Lean Six Sigma. Butterworth-Heineman, UK..
11. Reiling, J., 2008. Lean versus six sigma: What's the controversy? What the difference? October 09,2008, http://www.articlesbase.com/business-articles/lean-versus-six-sigma-whats-the-controversy-what-the-difference-595677.html
12. Welford, R., 2005. Corporate social responsibility in Europe, North America and Asia. J. Corporate Citizenship, 2005: 33-52.
13. Mental S., D. Cheung, R. Welford and P. Hills, 2007. Cooperation for environmental reform: Business-NGO partnerships in Hong Kong. J. Corporate Citizenship, Autumn., Vol. 27 10.1504/IJESD.2007.014202
14. Munier, N., 2006. Introduction to Sustainability: Road to a Better Future. Springer Science & Business Media, Berlin, Germany, ISBN-13: 9781402035579, pp:10-15..
15. Kimber, D. and P. Lipton, 2005. Corporate governance and business ethics in the Asia-Pacific region. Business Soc., 44: 178-210.
16. Kimber, D., P. Lipton and G. O'Neill, 2005. Corporate governance in the Asia Pacific region: A selective review of developments in Australia, China, India and Singapore. Asia Pac. J. Human Res., 43: 180-197.
17. Burke, S. and W.F. Gaughran, 2007. Developing a framework for sustainability management in engineering SMEs. Rob. Comp.-Integr. Manuf., 23: 696-703.
18. Juergensen, T., 2000. Continuous Improvement: Mindsets, Capability, Process, Tools and Results. Juergensen Consulting Group, Inc., Indianapolis, IN..
19. Bessant, J., 2005. Enabling continuous and discontinuous innovation: Learning from the private sector. Public Money Manage., 25: 35-42.
20. Robert, B.P., 2008. Management systems: The bedrock for building a sustainable business. December 23, 2008, GreenBiz Group.
21. Achanga, P., 2006. Critical success factors for lean implementation within SMEs. J. Manufact. Technol. Manage., 17: 11-17.
22. Antony, J. and R. Banuelas, 2001. A strategy for survival. Manuf. Eng., 80: 119-121.
23. Bhasin, S. and P. Burcher, 2006. Lean viewed as a philosophy. J. Manuf. Technol. Manage., 17: 56-72.
24. Bhasin, S., 2011. Measuring the Leanness of an organization. Int. J. Lean Six Sigma, 2: 55-74.
25. Wu, C.W. and C.L. Chen, 2006. An integrated structural model toward successful continuous improvement activity. Technovation, 26: 697-707.
26. Hult, G.T.M., R.F. Hurley and G.A. Knight, 2004. Innovativeness: Its antecedents and impact on business performance. Ind. Market. Manage., 33: 429-438.
27. Clifford, D. and R. Cavanaugh, 1985. The Winning Performance: How America's High Growth Companies Succeed. Bantam Books, New York..
28. Marz, J.W., T.L. Powers and T. Queisser, 2003. Corporate and individual influences on managers' social orientation. J. Business Ethics, 46: 1-11.
29. Quazi, A.M. and D. O'Brien, 2000. An empirical test of a cross-national model of corporate social responsibility. J. Bus. Ethics, 25: 33-51.
30. Rojsek, I., 2001. From red to green: Towards the environmental management in the country in transition. J. Bus. Ethics, 33: 37-50.
31. Gelei, A., D. Losonci and Z. Matyusz, 2015. Lean production and leadership attributes-the case of Hungarian production managers. J. Manuf. Technol. Manage., 26: 477-500.
32. Jeyaraman, K. and L.K. Teo, 2010. A conceptual framework for critical success factors of lean six sigma: Implementation on the performance of electronic manufacturing service industry. Int. J. Lean Six Sigma, 1: 191-215.
33. Arbos, L.C., 2002. Design of a rapid response and high efficiency service by lean production principles: Methodology and evaluation of variability of performance. Int. J. Prod. Econ., 80: 169-183.
34. Staats, B.R., D.J. Brunnerb and D.M. Uptonc, 2011. Lean principles, learning and knowledge work: Evidence from a software services provider. J. Operat. Manag., 29: 376-390.