Available online at www.elixirpublishers.com (Elixir International Journal)

Production Management

Elixir Prod. Mgmt. 111 (2017) 48869-48875

ISSN: 2229-712X

Approaching Lean Healthcare towards Sustainability in the Healthcare Sector

Azyyati Anuar, Rohaizah Saad and Rushami Zein Yusoff
School of Technology Management and Logistics, College of Business/ University Utara, Malaysia.

ARTICLE INFO

Article history:
Received: 2 August 2017;
Received in revised form:
21 October 2017;
Accepted: 31 October 2017;

Keywords
Lean health care,
Lean health care practices,
Sustainability,
Private healthcare.

ABSTRACT

Healthcare sector in Malaysia has developed progressively since the early 1990s and was recognized under the Tenth Malaysia Plan (2011-2015) as one of the National Key Economic Areas, or NKEA. The introduction of the Eleventh Malaysia Plan has supported this; it places focus on transforming the service sector, giving attention to private healthcare by improving the quality of service and increasing its global competitiveness. However, private healthcare poses a variety of challenges due increasing private healthcare spending, and thus affected the sustainability in the healthcare system. Moreover, sustainability issues are related to increasing costs that lead to waste. In this regard, it was suggested that lean healthcare should be applied in private hospitals and incorporated with sustainability, and needs to be carefully planned to ensure that it is feasible and sustainable in the long run. From previous studies, it is apparent that not many empirical researches have been conducted that pertain to the relationship lean healthcare practices (operational aspects and sociotechnical aspects) and sustainability. Therefore, the main objective of this research is to evaluate does the lean healthcare practices will lead to sustainability based on the triple bottom line; financial, social and environment. Besides, the article will embrace introduction, problem statement, literature review, methodology and conclusion. Finally, it is hoped this research will be extremely insightful for the service sector, specifically from healthcare organizations that are looking into improving their organizational performance and be much more sustainable.

1.0 Introduction

The service industry is expected to be more aggressive and challenging in this era of globalization. In fact, the evolution of the service sector has been considered to be an indicator of a country's economic movement (Boundless, 2016). Moreover, as can be seen in the Tenth Malaysia Plan (2011-2015), the service sector was the major contributor in Malaysia's Gross Domestic Product (GDP), which stood at 53 percent (Economic Planning Unit, 2015b). This remarkable achievement was mostly derived from the wholesale and retail trade, financial services, communication, and other segments including healthcare sector.

Healthcare sector in Malaysia has developed progressively since the early 1990s and was recognized under the Tenth Malaysia Plan (2011-2015) as one of the National Key Economic Areas, or NKEA (Jamaludin, Habidin, Shazali, Ali, & Khaidir, 2012). The introduction of the Eleventh Malaysia Plan has supported this; it places focus on transforming the service sector, giving attention to private healthcare by improving the quality of service and increasing its global competitiveness (Economic Planning Unit, 2015c). According to the Department of Statistics Malaysia's Index of Services, private healthcare has contributed 5.6 percent to the index for the fourth quarter of 2015 (Department of Statistics Malaysia, 2016). Indeed, the private healthcare sector has shown positive annual growth with an average of 5.5 percent, and contributed RM24.1 billion to Malaysia's economy during the period of the Tenth Malaysia Plan (Economic Planning Unit, 2015c). However, private healthcare poses a variety of challenges due increasing private healthcare spending, and thus affected the sustainability in the healthcare system (Ministry of Health Malaysia, 2011).

In Malaysia, it has been found that the country's healthcare system, especially in private healthcare, the main cause which has made improving sustainability a challenge is increasing cost (Nerminathan, Adlan, & Nerminathan, 2014), particularly in the aspects of technology, infrastructures, equipment, and scientific advances. Additionally, high cost is also a major issue that impedes patients from registering in private hospitals (Muhammad Butt & Cyril de Run, 2010). It is proven that the number of private hospitals and beds decreased between 2011 to 2015, while the number of admissions continuously soared, except in 2015 the number has dropped to 1,064,718, as displayed in Table 1.1 (Health Facts 2015, 2015). In fact, private hospitals as money-making organizations have to face competition from public hospitals, which are often the first choice made by Malaysian patients to receive the best medical treatment (Muhammad Butt & Cyril de Run, 2010). Public healthcare is generally not seen as a competitor to private healthcare, and they are substantially subsidized by the government (Suki, Lian, & Suki, 2011).

It noted that to ensure that private healthcare will be more sustainable in generating revenue and providing high quality services, they should improve on their efforts to attract customers into using their services and retain the patronage without imposing costly charges. Increase of cost

Tele:
E-mail address: azyyatiphd@gmail.com

in private hospitals is recognized as an issue that may possibly affect sustainability.

Table 1.1 Statistics on Number of Private Hospitals, Number of Beds and Number of Admissions.

Year	No. of private hospitals	No. of beds	No. of admissions
2015	183	12,963	1,064,718
2014	184	13,038	1,083,201
2013	209	14,033	1,020,397
2012	214	13,667	971,080
2011	220	13,568	904,816

Source: Health Facts 2016, 2016; Health Facts 2015, 2015; Health Facts 2014, 2014; Health Facts 2013, 2013; Health Facts 2012, 2012.

In this regard, it was suggested that lean healthcare should be applied in private hospitals and incorporated with sustainability, and needs to be carefully planned to ensure that it is feasible and sustainable in the long run (Nerminathan et al., 2014). This is a point highlighted by Woodward-Hagg et al. (2013) who noted that lean healthcare will not be successful in the long run without the implementation of sustainability elements within the organizations. Radnor (2011) in her study proposed that willingness to gain knowledge about lean healthcare is essential to ensure that organizations are more sustainable, a notion supported by Langenwalter (2006) who firmly stated that lean practices lead organizations towards sustainability, allowing waste issues to be resolved. Undoubtedly, lean healthcare and sustainability are necessary in the healthcare sector in order to meet growing demands and future needs.

Indeed, The Eleventh Malaysia Plan also has initiated ten initiatives as presented in the Strategy Canvas in Figure 1.1.

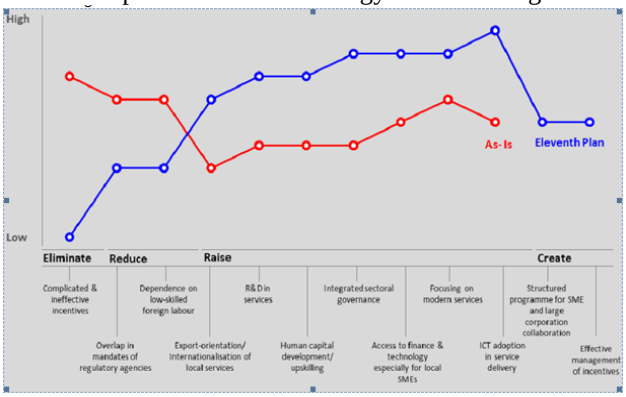

Figure 1.1 Strategy Canvas for Achieving Universal Access to Quality Healthcare

Source: Economic Planning Unit, 2015a

This strategy have targeted the government to improve community healthcare and yet to deliver a better service health outcomes with the strengthening collaboration among private sectors and NGOs. To have a better health outcomes, lean management will be implemented to reach efficiency and optimize resources by improving work processes in the organization. As such, the researcher will look deeply into how lean healthcare practices will lead to sustainability in the private hospital by taking into account the triple bottom line; namely the financial, social, and environmental elements.

2.0 Problem Statement

Looking into the issues of lean healthcare and sustainability in the healthcare industry, it is important to make the research more inclusive to help further the growth of this sector, thus allowing leading hospitals to spearhead the lean practice movement, that can also manage waste more efficiently and be much more sustainable in the future.

Reviews on previous studies highlighted various looks into lean healthcare in different contexts, such as lean management in the health sector (Hajmohammad, Vachon, Klassen, & Gavronski, 2013), lean thinking in healthcare (Chiarini, 2012; Young & McClean, 2009; Joosten, Bongers, & Janssen, 2009), implementation of lean healthcare (Papadopoulos, Radnor, & Yasmin Merali, 2011), lean initiatives (Kollberg, Dahlgaard, & Brehmer, 2006), and evaluating in lean healthcare (Burgess & Radnor, 2013). Also found are studies that emphasized lean healthcare should be studied to build sustainability in the healthcare environment (Schattenkirk, 2012), reflection of sustainability (Radnor, 2011), sustainability (Norazlan, Habidin, Roslan, & Zainudin, 2014) and assessing sustainability of lean adaptation in healthcare (Elshennawy et. al, 2012).

Nevertheless, not many research have been conducted on how lean healthcare enables achieve sustainability within healthcare organizations which also includes the three main pillars; economic, social, and environmental. It was also supported by D'Andreamatteo et al. (2015), where they reviewed, past studies only revealed the relationship between lean healthcare and financial performance, but unfortunately the study did not cover social as well as environmental performances. In order to attain sustainability in healthcare performance, Norazlan et al. (2014) and Jamaludin et al. (2013) clearly stressed that economic, social, as well as environmental performance need to be used equally as measurement in efforts to enhance the quality of service in healthcare organizations. Therefore, this study attempts to investigate the relationship between lean healthcare practices and sustainability in Malaysia private hospitals.

3.0 LITERATURE REVIEW

3.1 Lean healthcare

The original of lean has been developed from TPS in the automotive industry and now lean has progressed into different service sectors such as education, banks, airlines, hotels, restaurants and finally healthcare (Suárez-Barraza, Smith, & Dahlgaard-Park, 2012). Womack and Jones (2005) proposed, lean thinking can be experienced in medical services because the goal is to deliver valuable product to the customer and it has been stated, lean thinking or lean management considered as a latest tool of the current management system in the healthcare sector (Jorma et al., 2016). To date, many scholars have explicitly defined lean healthcare based on their research purposes. Leslie, Hagood, Royer, and Reece (2006) defined lean healthcare is the best concept to require a high quality service and flexibility in the organization by concentrating on how to reduce waste of times and unnecessary travel. While Dahlgaard, Pettersen, & Dahlgaard-park (2011) defined lean healthcare is to participate everybody in the organization by forming a hospital culture in order to fulfil stakeholders desire, increase a number of patient and able to identify waste. Poksinska (2014) states lean healthcare is a system designed that has been uniquely created to make continuous improvement of their work and bring some added value to the customer. However, a common definition of lean healthcare seems unable to establish among academician and it has been suggested by D'Andreamatteo et al. (2015), to produce accurately what is lean as to support future literature.

Thus, the definition has been expanded among scholars by publishing numerous articles and research on exploring lean healthcare which has been found more than 90 papers in ten countries from 2002 to 2008 (de Souza, 2009).

Majority results have shown, lean healthcare has a potential to reduce waiting times and costs (Dannapfel et al., 2014). While study done by Hadid and Mansouri (2014) encountered publication of lean healthcare has growing significantly since 1993 to 2012. Likewise, Plytiuk et al. (2013) has revealed about 79.3 percent publications on the investigation of lean healthcare has steadily intensified for the past five years since 1998 to 2011. Curatolo, Lamouri, Huet, & Rieutord (2014) have identified, most of the previous papers reported lean healthcare has been adopted at a macro level, meso level or at a micro level (Ramlan & Ahmad, 2014; & de Souza, 2009) and moreover special characteristics in hospital setting has been recognized to investigate lean healthcare (Curatolo et al., 2014). Macro level indicates policy issues such as hospitals beds, emergency rooms, physicians, nurses and major imaging equipment (Ramlan & Ahmad, 2014). While meso level focuses on financial and staff morale involvement and finally at micro level refers to operational level comprises managerial support and patients flow by observing reduced inventory, waiting times and average length of stay (de Souza, 2009). It shows the evidenced number of publication indicates that the interest of exploring lean healthcare is still relevant and substantial.

3.2 Sustainability

Traditionally, sustainability adhered on the triple bottom line (TBL) principles; economic, social and environment (Elkington, 1997) which also being called profit, people and planet respectively (Langenwalter, 2006). Research by Vinodh, Arvind, and Somanaathan (2011) have empirically proved among the 50 Small Medium Enterprise (SME) located in India, where the integration between economic, social and environment in the manufacturing sectors, were capable to achieve sustainability. However, Zhou et al. (2013) have suggested technological development as another important dimension to support the three principles due to the research conducted enable to balance between social and economic performance of the construction firm. Sustainability also has made pharmaceutical industry as one of the leader in sustainability over the last two decades (Schneider, Wilson, & Rosenbeck, 2010). It can be seen, the exertion in implementing corporate social responsibility as an initiative of the organization to be more sustainable and further, manage to bring up the business some added value (Schneider et al., 2010).

While, Lacy, Haines, & Hayward (2012) believes based on their interview with the prominent Chief Executive Officer (CEOs) around the world, customers play a vital role to drive a motivation for CEO in delivering progressive action on sustainability. According to Langenwalter (2006), nearly 500 fortune companies have a supervisor in charge on sustainability. It shows, sustainability have placed a strong position in every organization and thus, has enticed amassed attention in the healthcare organization (Naylor & Appleby, 2013). For instance, a case in Baxter International Inc. (Baxter) in US, was one of the leading healthcare company around the world has been recognized of their efforts towards sustainability (Dhanda, 2013). Moreover, Baxter managed to earn about $13.9 billion of sales with approximately has 48,500 workers worldwide and has received numbers of awards (Dhanda, 2013).

Sustainability in the healthcare sector especially in the private healthcare can be reviewed as a strategic issue that might affect the principles of financial, social, and environmental performance. Thus, Norazlan et al. (2014) states, sustainability is one of the imperative strategies in quantifying sustainability at the healthcare sector by seeing economic, social and environmental. Meanwhile, Jameton and McGuire (2002) identified three other factors such as the needs of patient, economic concern and environmental costs have been considered to balance sustainability in the healthcare sector. In contrary, some studies have defined sustainability in different perspectives such as Radnor (2011) has looked sustainability as the realization of the lean implementation in a long term program which she proposed a Rapid Improvement Events or RIE's program that needs to be participated among staff in the hospital. Besides, Elshennawy et al. (2012) have constructed Lean Sustainability Assessment Tools (LSAT) in order to implement sustainable lean-based process and further to increase patient satisfaction in improving service quality offered by the organization.

Prior research comprehensively described the major deterrents to sustain organizational performance in the healthcare sector. Study by Naylor and Appleby (2013) identified some of the barriers occurs in the healthcare sector between managers and workers in engaging with sustainability, containing fail to have an engagement between staff and managers, between organization, patient and public and finally policy barriers. Furthermore, Nerminathan et al. (2014) raised an issue why healthcare sector face several difficulties to sustain in the long term where they discovered high cost in healthcare contribute the most in the developed and developing countries. Indirectly, this contentious issue has affected economic, social and environmental performance in the healthcare sector. In fact, it is argued the implementation of organizational strategies remains a challenge to attain sustainability (Galpin et al., 2015). In this regard, this research tends to focus sustainability which includes, financial, social and environmental in the Malaysia's private hospital.

Table 3.1 Measures of Sustainability in the Healthcare Sector

Authors	Sustainability measures
Jameton & McGuire (2002)	The needs of patient, economic concern and environmental costs
Naylor & Appleby (2013)	Economic, social and environmental
Dhanda (2013)	Economic, social and environmental
Ramirez et al. (2013)	Economic, social, environmental and culture
Norazlan et al. (2014)	Economic, social and environmental

3.3 Empirical studies that linked between lean healthcare and sustainability

3.3.1 Lean healthcare (operational aspects) and sustainability

The lean mantra of eradicating waste undoubtedly fits seamlessly with sustainability (Langenwalter, 2006). Study conducted by Piercy and Rich (2015) reveals, sustainability practices support the transformation of lean in the organization. It shows, lean and sustainability shared a common philosophy to build up a positive environment in the work place. For instance in the manufacturing sector, a positive relationship has found between green supply chain practices, quality management, JIT and economic performance in Chinese manufacturer (Zhu & Sarkis, 2004). Survey such as conducted by Hajmohammad, Vachon, Klassen and Gavronski (2013) showed that there is a linked between lean management and environmental performance in the manufacturing sector and it was fully mediated by environmental practices. The lean management focused on

curtailing countless of waste within plants. Consistently, study by Torielli, Abrahams, Smillie and Voigt (2011) have found foundry sector as well as other sectors have positive interaction between lean and environmental sustainability. However in the same study, the execution of lean manufacturing does not lead to sustainability, comprising environmental, social and economic.

In contrary, lean manufacturing practices were found to have better return on equity (ROE) to increase level of business financial performance (Olsen, 2004). Nevertheless, looking into the lean service, Hadid et al. (2016) discovered lean service in the technical aspect was found not significant to the financial performance. Likewise, Baxter healthcare applying *kanban* as one of the lean practices, which had saved about 70 percent of use packaging materials (supplier ship the goods directly to the factory floor without internal packaging) (Franchetti, Bedal, Ulloa, & Grodek, 2009). While Norazlan et al. (2014) in their findings have shown positive significance between *kaizen* blitz and sustainable performance in the healthcare industry. Moreover, it is believed *kaizen* blitz not only can be applied in the healthcare industry, but most importantly to deliver the quality of patients' service and to fulfill customer satisfaction.

Undeniably, lean thinking capable to reduce waste and defects to bringing up sustainability in the healthcare sector (Ling et al., 2012). Conversely, study by Elshennawy et al. (2012), have quantifying the staff awareness level of lean tools using Lean Sustainability Assessment Framework (LSAF) and it was discovered, about 80 percent hospital managers were conscious several lean tools which include 5s, continuous improvement, waste elimination, 5 why's, VSM and types of waste. It indicates hospital managers concerns in practicing lean to their workplace because it will lead to sustainability and enhance the level of performance.

Ho (2010) had introduced the integrated of lean TQM model for sustainable development with the aiming to minimize waste in the organization and from his findings, it was found lean 5s provides a powerful process tool to convince many types of organizations are able to sustain. Subsequently, Dellifraine, Langabeer Ii and Nembhard (2010) have found two popular tools, namely lean systems and six sigma capable to improve financial performance, instead of clinical outcomes and efficiency. Notwithstanding, it is argued the improvement was based on the conceptual argument, rather than evidence based on empirical research. Thus, this study will look the direct relationship between lean healthcare (operational aspects) and sustainability in the Malaysia's private healthcare.

3.3.2 Lean healthcare (sociotechnical aspects) and sustainability

Indeed, lean and sustainability also have mutual common tools, namely; team working, problem solving, training and production inspection (Anonymous, 2015). However, it has been debated to be more sustainable, the elements of lean consist of leadership, employees role, work characteristics, behavior and engagement have to consider exceptionally among academician (Drotz & Pokinska, 2014). Moreover, recent studies have put much an attention on respect-for-human-system or also being called sociotechnical to ensure the success of lean implementation, instead focus on operational or technical aspects of lean (Joosten et al., 2009).

Lindskog, Vänje, Törnkvist, and Eklund (2016) have encapsulates, most of the sociotechnical principles supported by sociotechnical theory as an indicator of sustainability to analyze lean implementation in the healthcare sector were found inhibited in Swedish psychiatry healthcare. This is due to lack of power among first line managers to deliver the execution of lean, the goals of implementing lean was unclear and the participation to embed sociotechnical aspects was found negatively affected. Grove et al. (2010) have summarized the biggest obstacles in implementing lean was the weak in leadership and lack of communication. Furthermore, study directed by Radnor (2011) had disclosed in the three of National Healthcare Service (NHS), UK, the implementation of lean such as a cohesive leadership by connecting senior and middle managers and using an appropriate communication channel were utmost important in order to sustain. Besides, staff responsibility, training and internal facilitators were also taken into account to make sustainable improvement. Grove et al. (2010) also have pointed out, staff should responsible to solve the problem together the full support from managers to ensure the improvement is sustainable.

According to Lacy et al. (2012), the involvement of leaders is crucial to make sustainability more imperative, and to ensure the business continuously grow, many companies started to adopt leadership position among leaders for business transformation in the future. Consequently, Chiarini and Vagnoni (2016) have empirically reveals, leadership, top management involvement and commitment were the key requirements to achieve environmental sustainability an each of organization. As an example, Henkel Company provides laundry, cosmetics and technologies, has purely concerned leadership as a core value in sustainability (Galpin et al., 2015). Nevertheless, the issues of which leader may lead the organization to be more sustainable remains unclear due to the insulated efforts among employees and leaders sporadic success (Galpin et al., 2015).

Similarly to Longoni and Cagliano (2015) in their study have found the involvement of workers and cross-functional executive positively correlated with the strategic alignment of lean manufacturing bundles (JIT, TQM, TPM and HRM) and sustainability (social and environmental). While research on economics sustainability has resulted significance influenced with lean manufacturing to improve firm performance (Shah & Ward, 2003).

From the review, it was confirmed; lack of evidence on sustainability and lean healthcare in sociotechnical aspects can be seen in the previous studies. Furthermore, the usage of sociotechnical terms are varied with differ theories. Therefore, it is important to investigate the relationship between lean healthcare (sociotechnical aspects) and sustainability in the Malaysia context.

4.0 Methodology

The target population of this study is the private healthcare organizations in Malaysia, especially hospital. According to the latest report by Ministry of Health, Malaysia (MOH) in 31st December 2016, approximately about 187 licensed private hospitals that still operate progressively in this country (Health Facts 2016, 2016). Apart from private hospitals, there are also offers other healthcare facilities to the people such as maternity homes, nursing homes, hospice, ambulatory, blood bank, hemodialysis, community mental, as well as other facilities. Nevertheless, people are now shifting their attention from public to private hospital due to the service, facilities, hospitality and specialization provided, are more conclusive and full of satisfaction. Moreover, the Eleventh Malaysia Plan aims to achieve 10 percent annual

growth in revenue for Malaysia private healthcare (Economic Planning Unit, 2015c).

For the purpose of this study, the sample of licensed private hospital was obtained from the list of Private Medical Practice Control Branch/*Cawangan Kawalan Amalan Perubatan Swasta* (CKAPS) after securing the obligatory support from the Department of Medical Practice, MOH. Thus, probability sampling techniques need to be used as a representative sample of the target population (Kumar et al., 2013).

Indeed, the findings of probability sampling will determine the specify level of confidence. Thus, this study will employ a simple random sampling technique as to choose which an appropriate of private hospital to be the part of the sample by using research randomizer software. The application of this technique is the most basic form (Kumar et al., 2013) that has least bias and offers the most generalizability (Sekaran, 2003). Therefore, the total sample size of 118 was a minimum sample based on the by Krejcie and Morgan (1970) for a population of 170 to 180.

The design of the questionnaire will be prepared, and will be validated by the Subject Matter Experts (SMEs) through content validity using Lawshe's method. This is to ensure the item of each section is reliable and can be accepted. Moreover, to make respondents understand the questions without any confusion. Due to the fact that the response rate for unit analysis of an organization is low, which has demonstrated in the past studies (Hadid et al., 2016; & Gu & Itoh, 2016), the researcher decided to use PLS-SEM with the recommendations of sample size ranging from 30 to 100, compared to CB-SEM generally range from 200 to 800 (Sarstedt, Ringle, & Hair, 2014). Therefore, the data collection will be analyzed using SPSS version 23 and SmartPLS 3.0 for the purpose of descriptive statistics and inferential statistics respectively.

5.0 Conclusion

Sustainability has played a vital role in service industries and currently it was one of the crucial issues for companies that link with sustainability in today's world (Norazlan et al., 2014; & Smith, 2012). In order to attain sustainability in health care performance, economic, social and environmental performance need to be acted as a measurement in enhancing quality service in the health care organization (Norazlan et al., 2014; Jamaludin et al., 2013; & Shazali et al., 2013). Consequently, the influenced of lean healthcare practices have to consider seriously in achieving sustainability if Malaysia is deeply concerned to serve better service in the health care industry (Shazali et al., 2013). Hence to investigate the combination of lean healthcare practices altogether towards sustainability are still limited, particularly in Malaysia. Finally, it is hoped this research will be extremely insightful for the service sector, specifically from healthcare organizations that are looking into improving their organizational performance and be much more sustainable. These firms will also be able to conveniently identify which healthcare practices will impact their organizations positively, in order to achieve sustainability without involving any wastage in the organization.

Acknowledgements

The researchers would like to acknowledge the Ministry of High Education (MOHE) for the financial funding of this research.

References

Boundless. (2016). The service economy.

Burgess, N., & Radnor, Z. (2013). Evaluating Lean in healthcare. International Journal of Health Care Quality Assurance, 26(3), 220–235.

Chiarini, A. (2012). Designing an environmental sustainable supply chain through ISO 14001 standard. Management of Environmental Quality: An International Journal, 24(1), 16–33.

Chiarini, A., & Vagnoni, E. (2016). Environmental sustainability in European public healthcare: could it just be a matter of leadership? Leadership in Health Services, 29(1), 1–11.

Curatolo, N., Lamouri, S., Huet, J.-C., & Rieutord, A. (2014). A critical analysis of Lean approach structuring in hospitals. Business Process Management Journa, 20(3), 433–454.

D'Andreamatteo, A., Ianni, L., Lega, F., & Sargiacomo, M. (2015). Lean in Healthcare: a comprehensive review. Health Policy, 119(9), 1197–1209.

Dahlgaard, J. J., Pettersen, J., & Dahlgaard-park, S. M. (2011). Quality and lean health care : A system for assessing and improving the health of healthcare organisations, (October 2015).

Dannapfel, P., Poksinska, B., & Thomas, K. (2014). Dissemination strategy for Lean thinking in health care. International Journal of Health Care Quality Assurance Dissemination, 27(5), 391–404. http://doi.org/10.1108/IJHCQA-01-2013-0001

Dellifraine, J. L., Langabeer Ii, J. R., & Nembhard, I. M. (2010). Assessing the Evidence of Six Sigma and Lean in the Health Care Industry. Q Manage Health Care Wolters Kluwer Health, 19(3), 211–225.

de Souza, L. B. (2009). Trends and approaches in lean healthcare. Leadership in Health Services, 22(2), 121–139. http://doi.org/10.1108/17511870910953788

Department of Statistics Malaysia. (2016). Press Release: Index of Services Fourth Quarter.

Dhanda, K. K. (2013). Case Study in the Evolution of Sustainability: Baxter International Inc. Journal of Business Ethics, 112(4), 667–684.

Drotz, E., & Pokinska, B. (2014). Lean in healthcare from employees' perspectives. Journal of Health Organization and Management, 28(2), 177–195.

Economic Planning Unit. (2015a). Rancangan Malaysia Kesebelas (Eleventh Malaysia Plan).

Economic Planning Unit. (2015b). Transforming Services Sector.

Economic Planning Unit. (2015c). Transforming Services Sector.

Elkington, J. (1997). Cannibals with forks. The Triple Bottom Line of 21st Century, (April), 1–16. http://doi.org/http://doi.wiley.com/10.1002/tqem.3310080106

Elshennawy, A. K., Bahaitham, H., & Furterer, S. (2012). Assessing Sustainability of Lean Implementation in Healthcare : A Case Study Using the Lean Sustainability Assessment Framework (LSAF), 5(2).

Franchetti, M., Bedal, K., Ulloa, J., & Grodek, S. (2009). Lean and green: industrial engineering methods are natural stepping stones to green engineering. Industrial Engineer, 41(9), 24–29.

Galpin, T., Whitttington, J. L., & Bell, G. (2015). Is your sustainability strategy sustainable? Creating a culture of sustainability. Corporate Governance: The International Journal of Business in Society, 15(1), 1–17.

Grove, A. L., Meredith, J. O., MacIntyre, M., Angelis, J., & Neailey, K. (2010). UK health visiting: challenges faced during lean implementation. Leadership in Health Services, 23(3), 204–218.

Gu, X., & Itoh, K. (2016). Performance indicators: healthcare professionals' views. International Journal of Health Care Quality Assurance, 29(7), 801–815.

Hadid, W., & Mansouri, S. A. (2014). The lean-performance relationship in services: a theoretical model. International Journal of Operations & Production Management, 34(6), 750–785.

Hajmohammad, S., Vachon, S., Klassen, R. D., & Gavronski, I. (2013). Reprint of Lean management and supply management: Their role in green practices and performance. Journal of Cleaner Production, 39, 86–93.

Health Facts 2016. (2016). Retrieved from Ministry of Health Malaysia

Health Facts 2015. (2015). Retrieved from Ministry of Health Malaysia.

Health Facts 2014. (2014). Retrieved from Ministry of Health Malaysia

Health Facts, 2013. (2013). Retrieved from Ministry of Health Malaysia

Heatlh Facts 2012. (2012). Retrieved from Ministry of Health Malaysia.

Ho, S. K. M. (2010). Integrated lean TQM model for sustainable development. The TQM Journal, 22(2), 143–158.

Jamaludin, N. H., Habidin, N. F., Shazali, N. A., Ali, N., & Khaidir, N. A. (2012). Exploring Sustainable Healthcare Service and Sustainable Healthcare Performance: Based on Malaysian Healthcare Industry. Saudi Med J, 33(1), 3–8.

Jameton, A., & McGuire, C. (2002). Toward sustainable health-care services: principles, challenges, and a process. International Journal of Sustainability in Higher Education, 3(2), 113–127. http://doi.org/10.1108/14676370210422348

Joosten, T., Bongers, I., & Janssen, R. (2009). Application of lean thinking to health care: Issues and observations. International Journal for Quality in Health Care, 21(5), 341–347.

Jorma, T., Tiirinki, H., Bloigu, R., & Turkki, L. (2016). LEAN thinking in Finnish healthcare. Leadership in Health Services, 29(1), 9–36. http://doi.org/10.1108/LHS-08-2015-0021

Kollberg, B., Dahlgaard, J. J., & Brehmer, P. (2006). Measuring lean initiatives in health care services: issues and findings. International Journal of Productivity and Performance Management, 56(1), 7–24.

Krejcie, R. V, & Morgan, D. W. (1970). Determining Sample Size for Research Activities Robert. Educational and Psychological Measurement, 310, 607–610. http://doi.org/10.1177/001316447003000308

Kumar, M., Talib, S. A., & Ramayah, T. (2013). Business Research Methods. Selangor: Oxford Fajar.

Lacy, P., Haines, A., & Hayward, R. (2012). Developing strategies and leaders to succeed in a new era of sustainability: Findings and insights from the United Nations Global Compact-Accenture CEO Study. Journal of Management Development, 31(4), 346–357. http://doi.org/10.1108/02621711211218997

Langenwalter, G. (2006). " Life" is Our Ultimate Customer: From Lean to Sustainability. Target, 1–15.

Leslie, M., Hagood, C., Royer, A., & Reece, C. P. (2006). Using lean methods to improve or turnover times. AORN Journal, 84(5), 849–855.

Ling, T., Pedersen, J., Drabble, S., Celia, C., Brereton, L., & Tiefensee, C. (2012). Sustainable Development in the National Health Service: The views and values of NHS leaders. Retrieved from http://www.rand.org/content/dam/rand/pubs/technical_reports/2012/RAND_TR1210.pdf.

Lindskog, P., Vänje, A., Törnkvist, Å., & Eklund, J. (2016). Sustainable lean in psychiatry? Assessment through socio-technical principles. International Journal of Quality and Service Sciences, 8(1), 1–29.

Longoni, A., & Cagliano, R. (2015). Cross-functional executive involvement and worker involvement in lean manufacturing and sustainability alignment. Journal of Managerial Psychology, 30(9), pp. 645–658. http://doi.org/http://dx.doi.org/10.1108/02683940010305270

Ministry of Health Malaysia. (2011). Country Health Plan 2011 - 2015.

Muhammad Butt, M., & Cyril de Run, E. (2010). Private healthcare quality: applying a SERVQUAL model. International Journal of Health Care Quality Assurance, 23(7), 658–673. http://doi.org/10.1108/09526861011071580

Naylor, C., & Appleby, J. (2013). Environmentally sustainable health and social care: Scoping review and implications for the English NHS. Journal of Health Services Research & Policy, 18(2), 114–121. http://doi.org/10.1177/1355819613485672

Nerminathan, V., Adlan, W. N. A. B. W. F., & Nerminathan, A. A. (2014). Hospital at home: Sustainable healthcare in developing countries through reducing average length of stay in hospitals. International Journal of Management and Sustainability, 3(2), 51–61.

Norazlan, A. N. I., Habidin, N. F., Roslan, M. H., & Zainudin, M. Z. (2014). Investigation of kaizen blitz and sustainable performance for Malaysian healthcare industry. Int. J. Quality and Innovation, 2(3/4), 272–284.

Olsen, E. (2004). Lean Manufacturing: The Relationship Between Practice and Firm Level Financial Performance. The Ohio State University.

Papadopoulos, T., Radnor, Z., & Yasmin Merali. (2011). The Role of Actor Associations in Understanding The Implementation of Lean Thinking in Healthcare.

Piercy, N., & Rich, N. (2015). The relationship between lean operations and sustainable operations. International Journal of Operations and Production Management, 35(2), 282–315.

Plytiuk, C. F., Gouvea, S. E., & de Lima, E. pinheiro. (2013). Practices and Performance gains of Lean Healthcare : An analysis of empirical papers. In Proceedings of the 2013 Industrial and Systems Engineering Research Conference (pp. 651–660).

Poksinska, B. (2010). The current state of Lean implementation in health care: literature review. Quality Management in Health Care, 19(4), 319–29.

Radnor, Z. (2011). Implementing Lean in Health Care : Making the link between the approach , readiness and sustainability, 2(1), 1–12.

Ramirez, B., West, D. J., & Costell, M. M. (2013). Development of a culture of sustainability in health care organizations. Journal of Health Organization and Management, 27(5), 665–672. http://doi.org/10.1108/JHOM-11-2012-0226

Ramlan, R., & Ahmad, K. (2014). Business Improvement and Sustainable Service Quality in Healthcare - A Review and Research Agenda, (2003), 3038–3041.

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2014). PLS-SEM: Looking Back and Moving Forward. Long Range Planning, 47(3), 132–137.

Schattenkirk, D. (2012). Building sustainable internal capacity for quality within a healthcare environment. The TQM Journal, 24(4), 374–382.

Schneider, J. L., Wilson, A., & Rosenbeck, J. M. (2010). Pharmaceutical companies and sustainability: an analysis of corporate reporting. Benchmarking: An International Journal, 17(3), 421–434. http://doi.org/10.1108/14635771080001425

Sekaran, U. (2003). Research methods for business. A skill building approach. John Wiley & Sons, Inc.

Shah, R., & Ward, P. T. (2003). Lean manufacturing: Context, practice bundles, and performance. Journal of Operations Management, 21(2), 129–149. http://doi.org/10.1016/S0272-6963(02)00108-0

Shazali, N., Habidin, N., & Ali, N. (2013). Lean Healthcare Practice and Healthcare Performance in Malaysian Healthcare Industry. International Journal of Scientific and Research Publications, 3(1), 1–5.

Suárez-Barraza, M. F., Smith, T., & Dahlgaard-Park, S. M. (2012). Lean Service: A literature analysis and classification. Total Quality Management & Business Excellence, 23(3-4), 359–380.

Suki, N. M., Lian, J. C. C., & Suki, N. M. (2011). Do patients' perceptions exceed their expectations in private healthcare settings? International Journal of Health Care Quality Assurance, 24(1), 42–56. http://doi.org/10.1108/09526861111098238

Torielli, R. M., Abrahams, R. A., Smillie, R. W., & Voigt, R. C. (2011). Using lean methodologies for economically and environmentally sustainable foundries. China Foundry.

Vinodh, S., Arvind, K. R., & Somanaathan, M. (2011). Tools and techniques for enabling sustainability through lean initiatives. Clean Technologies and Environmental Policy, 13(3), 469–479. http://doi.org/10.1007/s10098-010-0329-x

Womack, J. P., & Jones, D. T. (2005). Lean Solutions : How Companies and Customers Can Create Value and Wealth Together. Free Press, (617), 1–3.

Woodward-Hagg, H., Workman-gernmann, J., Bar-On, I., Munshi, I., Taylor, K. T., Bidassie, B., & Johnson, S. (2013). Large System Transformation within Healthcare Organizations utilizing Lean Deployment Strategies. Proceedings of the 31st International Conference of the System Dynamics Society, Multiple h, 458–468.

Young, T., & McClean, S. (2009). Some challenges facing lean thinking in healthcare. International Journal for Quality in Health Care, 21(5), 309–310.

Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. Journal of Operations Management, 22(3), 265–289.