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# Could A Conceptual Framework of Lean Healthcare, Safety Climate and Operational Performance Achieving Sustainability?

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**Abstract**
This study is to propose a conceptual framework that can be used to measure the relationship between the operational and sociotechnical aspects of lean healthcare practices and sustainability among Malaysia's private hospitals. Specifically, it investigates the mediating role of operational performance and the moderating role of safety climate. This study first reviews the literature on lean healthcare practices comprising operational and sociotechnical practices. Then, taking into account the literature on operational performance, safety climate and sustainability, a conceptual framework is established. Research hypotheses were developed based on the proposed conceptual model and review. Questionnaires have been developed through an exhaustive literature review and randomly distributed to 118 private

hospitals in Malaysia, with an approximately 45 percent response rate. The data collected will be analyzed using SmartPLS 3.0. The expected results indicate that operational and sociotechnical aspects and operational performance will improve sustainability, showing that practitioners should take these elements seriously. The mediating role of operational performance in sustainability and moderating role of safety climate is also expected to be established. The study concludes with suggestions for future research. Future research should include longitudinal studies, and lean healthcare should be practiced over several years to ensure sustainability.

**Keywords:** Lean Healthcare, Sustainability, Operational Performance, Operational, Sociotechnical, Private Hospital

## Introduction

Recent developments show that sustainability in the healthcare system is a vital element in managing healthcare assets and delivering good service for customers (Economic Planning Unit, 2015). Furthermore, the National Healthcare Service (NHS) in the United Kingdom claimed that sustainability is crucial for enacting multifaceted changes to ensure that organisations remain sustainable in today's competitive environment (Ling et al., 2012). Ling et al (2012) highlighted that the most critical areas for further sustainability improvement in the NHS include working with other groups and organisations, changing pathways and models of care, and implementing infrastructural changes. A meanwhile recent report in the Twelfth Malaysia Plan has stated some of the gaps in the healthcare service are mismatch of resources across different levels of healthcare services, inadequate facilities and unsustainable healthcare financing have affected the delivery of healthcare services (Economic Planning Unit, 2021).

Indeed, it has affected private healthcare as well, particularly in Malaysia. Most private healthcare systems in Malaysia identified cost increments as the main challenge for sustainability improvement (Nerminathan *et al.*, 2014), mainly in technology, infrastructure, equipment, and scientific advances. Moreover, some patients have been unable to receive treatment in private hospitals due to high costs (Butt and Cyril de Run, 2010). Table I has presented the number of beds is increasing starting from 2015 until 2019; however, the number of private hospitals and admissions were fluctuate from 2015 to 2019 (*Health Facts, 2016*, 2016). Private hospitals always compete with public hospitals (Muhammad Butt and Cyril de Run, 2010), which are commonly supported by the government (Suki *et al.,* 2011). Haque *et al* (2012) claimed that private healthcare faces the dilemma of providing high-quality services while not charging for the full cost of medical treatment. Healthcare providers often fail to sustain and improve services due to waste and rising costs (Ministry of Health Malaysia, 2011; Ramlan and Ahmad, 2014).

Table I
*Private hospitals, beds, and admissions*

| Year | No. of private hospitals | No. of beds | No. of admissions |
|---|---|---|---|
| 2019 | 208 | 16,469 | 1,170,558 |
| 2018 | 210 | 15,957 | 1,099,045 |
| 2017 | 200 | 14,799 | 1,045,592 |
| 2016 | 187 | 13,957 | 1,073,039 |
| 2015 | 187 | 12,963 | 1,064,718 |

*Source: Health Facts (2020; 2019; 2018; 2017; 2016)*

Therefore, lean healthcare should be applied to private hospitals, along with sustainability, and should be carefully planned to ensure long-term feasibility (Nerminathan *et al.*, 2014). Woodward-Hagg *et al* (2013) noted that lean healthcare will not be successful in the long run without implementing sustainability elements within organisations. Radnor (2011) proposed that a willingness to increase knowledge about lean healthcare is essential to ensure that organisations are more sustainable; this view is supported by Langenwalter (2006), who firmly stated that lean practices lead organisations towards sustainability, resolving waste issues. Undoubtedly, lean healthcare and sustainability are necessary to meet growing demands and future needs.

As the importance of lean healthcare with sustainability been intensively investigated, so does the importance of operational performance and sustainability. As such, Ancarani, Mauro, and Giammanco (2011) emphasised the need of managers' engagement in shaping the organisational atmosphere in order to improve hospital performance. It is clear that safety climate is one indicator of organisational climate that scholars have paid the least attention to (Stone et al., 2004). A number of studies have shown a link between lean practises, safety climate, and operational performance (Mark et al., 2007; Kern 2011), and an unacceptably small amount of research has found a link between lean practises, safety climate, and operational performance. But at the same time, evidence from past studies has shown that link between these variables aren't clearly addressed.

Therefore, researchers must investigate how lean healthcare practises and operational performance might contribute to long-term sustainability in private hospitals, taking into account the triple bottom line of financial, social, and environmental performance. Ling *et al* (2012); Peace and Pons (2013); Iranmanesh *et al* (2019) have claimed that lean thinking is an alternative approach to support organisational sustainability. Although many researchers have identified the sustainability in the healthcare sector (Swarnakar et al., 2021; Rodriguez et al., 2020; Hossain & Thakur, 2021; & Sindhwani *et al.*, 2021) but the examination on the lean healthcare and sustainability were found limited (Hallam & Contreras, 2018).

Thus, this gap has been motivated authors to conduct the current study in an attempt to review how lean healthcare practices can improve sustainability in Malaysian private hospitals and further to develop a conceptual framework of lean healthcare practices and connection with other variables. The remainder of this has been structured as follows: the second section discusses the literature review followed by the third section is devoted to a detailed conceptual framework. Section forth include methodology. The five section embraces the conclusion followed by limitations, contributions and future research.

**Literature Review**

*Lean Healthcare Practice*

Lean techniques, methodologies, and tools are based on the principles proposed by Womack and Jones (1996), and have become applicable for a variety of industries (Burgess and Radnor, 2013). Scholars employ the phrases 'lean practises,' 'lean tools,' and 'lean approaches' in a variety of ways, making consensus on a universal standard. This section provides an overview of lean healthcare research.

Chadha *et al* (2015) have demonstrated that the lean healthcare model (LEAN-HC) integrates lean methodology and queueing theory to enhance patient satisfaction and the

quality of care. They further revealed that just-in-time (JIT), customer-oriented, and value-added specialty practices are appropriate lean approaches for walk-in clinics to avoid queueing and long patient wait times (Chadha *et al.*, 2015). Jorma *et al* (2016) found that the Plan-Do-Study-Act cycle, *kaizen*, value stream mapping, and root cause analysis were the most frequently adopted lean tools in Finnish public healthcare, whereas 5S (sort, set in order, shine, standardise, and sustain), visual control, and *kanban* were the least-often adopted.

Lean practices, tools, and approaches have typically been interpreted in similar ways, but research has tended to emphasise technical or operational aspects rather than human or social aspects. Joosten *et al* (2009) remarked that sociotechnical aspects are always ignored, as most researchers are interested in aspects that occur at the operational level. Waterson *et al* (2002) demonstrated that there are two provisions based on sociotechnical principles: technical (human and machine) and social (human and human). However, studies show that the 'respect-for-human-system' (i.e. sociotechnical) outlook has drawn most of the attention among scholars and practitioners as a way to make lean implementation successful (Joosten *et al.*, 2009).

Lorden *et al* (2014) discussed how sociotechnical principles including leadership support, communication, and task management help to reduce waste and increase efficiency. A study by Sohal *et al* (2021), discovered that Oman's healthcare sector has robust leadership support, appreciative value and customer groups, capability to accept an endways process and engaging in the necessary training for lean. Other studies have shown that lean principles have led to a focus on people through studying the elements of customer definition, lean leadership, goal setting, a focus on value, teamwork by mapping the existing situation, and deploying continuous improvements for sustainability (Machado *et al.*, 2014). Rossum et al. (2016) emphasised leadership in lean healthcare as a technique to bridge the gap between strategy and execution in order to improve efficiency and quality of care while also transforming the healthcare setting. In contrast, Ajmera and Jain (2020) claims that managerial leadership which includes financing, planning and organizing rules were not sufficient with lean although it has been most popular form of leadership so far.

In sum, (1) operational aspects are process improvements that reduce waste at the organisational level, and (2) sociotechnical aspects achieve humanisation in the workplace by eliminating repetitive work that leads to waste. Additionally, Have *et al.* (2016) stressed the importance of technical and social aspects to ensuring a more sustainable healthcare system that improves quality and reduces costs.

*Operational Performance*

The healthcare industry must be modernised on a regular basis in order to last for a longer period of time (Sindhwani et al., 2021). This advancement could be at the facility or in the healthcare industry/organization. There are many approaches to measuring operational performance in the healthcare sector, and several dimensions are considered key criteria for assessing the performance of an organisation (Capkun *et al.*, 2012). Elg *et al* (2013) recommended three approaches for measuring performance in healthcare organisations: management accounting, operational performance, and strategic control. Nerminathan et al (2014); Elg et al (2013); Capkun et al (2012); Stock and McDermott (2011); Gares (2011) used

average length of stay or duration of stay to evaluate operational effectiveness. These approaches count the number of days patients are in the hospital.

Purbey *et al* (2007) highlighted that healthcare performance measurement is still a matter of debate among scholars and researchers. They do not agree which construct should be used for operational performance, and most constructs are combinations of others. However, according to Yasin and Gomes (2008), operational performance (efficiency, quality, flexibility, and reliability) appears to be the main focus among scholars who research service settings. They also argued that less empirical research has been conducted on performance issues. It has been emphasized, there is a necessity to associate strategic and operational aspects of sustainability (Rodriguez et al., 2020).

Therefore, this study examines operational performance through the relationship between lean healthcare practices, sustainability, and safety climate. In this study, operational performance is defined as the capability of the organisation to improve in several dimensions.

*Safety Climat*

The safety climate dimension indicates the level of safety among workers and patients in the healthcare industry. Clark *et al* (2014) suggested that hospital management must assume responsibility for providing a safe and healthy working environment. Supported by Huang *et al* (2021) in their study on the assessing of patient safety culture during COVID-19, safety climate was substantially positively connected with working conditions and teamwork environment.

Alternatively, Srinivasan *et al* (2016) measured safety climate based on two dimensions in manufacturing: management commitment and involvement. They examined the impact of 5S (sort, set in order, shine, standardise, and sustain) as also one of the lean health care practices on the safety climate. However, the differences in the dimensions used by researchers make it difficult to obtain a consensus on a standard for measuring safety climate (Adjei-Appiah, 2008). In addition, the large number of climate dimensions has led to confusion (Patterson *et al.*, 2005). Therefore, this study defines safety climate as an essential strategy for increasing the safety level in the healthcare setting.

*Sustainability*

Organizational initiatives to improve economic, social, and environmental performance are referred to as sustainability, corporate social performance, corporate social responsibility (CSR), and 'going green' (Galpin et al., 2015). In 1987, the United Nations' World Commission on Environment and Development published the Brutland Report, which introduced the notion of sustainability (Albatayneh, 2014). Since then, sustainability has been defined by numerous scholars in various ways, though the foundation is principally the same (Moldan, *et al.,* 2012). The definition provided by the World Commission on Environment and Development has been widely cited: '*Meeting the needs of the present without compromising the ability of future generations to meet their own needs'* (Azevedo *et al.,* 2012).

Originally, sustainability abided by the three triple bottom line principles – economic, social, and environmental (Elkington, 1997)—described as 'profit', 'people', and 'planet' by (Langenwalter, 2006). Naylor and Appleby (2013) identified the barriers to sustainability that occur in the healthcare sector: between staff and managers; between organisations, patients,

and the public; and policy barriers. Furthermore, Nerminathan *et al* (2014) failed to determine why industry players in the healthcare sector are unable to sustain themselves in the market. This contentious issue has had an indirect impact on the healthcare sector's economic, social, and environmental performance. Swarnakar et al (2021) investigated the case of one of India's government hospitals, which was suffering from low service quality and sustainability difficulties. Long waiting queue and the disposal of hazardous materials were among the perilous worries focused at social and environmental issues. Undoubtedly, the implementation of organisational strategies for attaining sustainability remains a challenge (Galpin *et al.*, 2015). This study therefore examines sustainability as the interactions between financial, social, and environmental performance among stakeholders in Malaysia's private hospitals– that help to eliminate excessive activities and upsurge value-added activities.

**Conceptual framework of lean healthcare practices and sustainability**

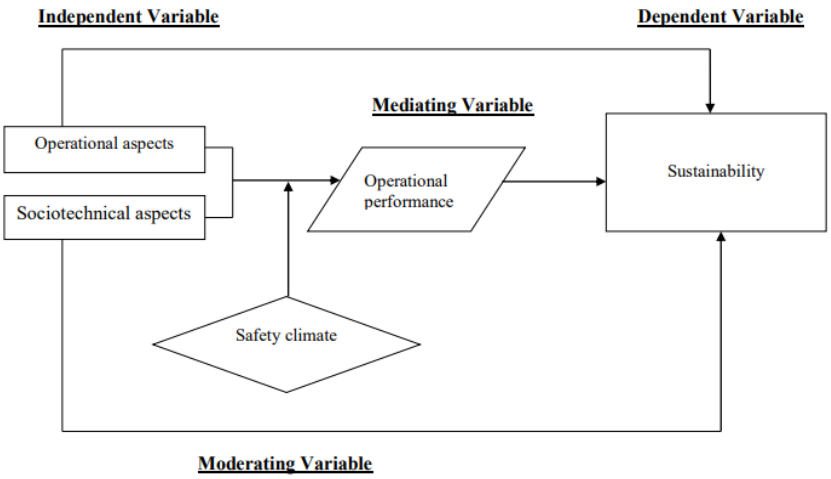


FIGURE I. Conceptual framework

The above of the conceptual framework as illustrated in Figure I is underpinned by one model and two theories; containing TPS Model, Sociotechnical Theory and Stakeholder Theory. Consequently, this study empirically investigates the influence of operational aspects and sociotechnical aspects, operational performance and safety climate on sustainability. previous studies showed that sustainability is influenced by operational aspects and sociotechnical aspects and operational performance. It is also can be seen, operational performance is influenced by operational aspects and sociotechnical aspects.

As proposed by Sekaran and Bougie (2013); Baron and Kenny (1986), the mediating variable surfaces as a function to conceptualize and describe the influence of the independent variable on the dependent variable. Figure II shows the nature of mediator variables introduced by Baron and Kenny (1986) which they have formulated the steps and conditions to ascertain whether full or partial mediating effects are present in a model. Similarly to Hair et al (2017) mediating variable acted as intervening between two other related variables.

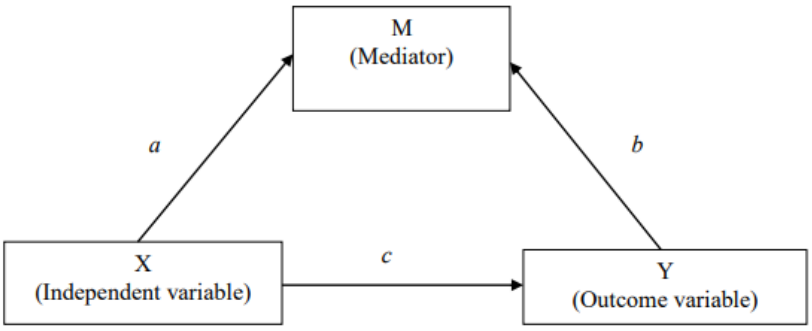


Figure II. Nature of Mediator Variables
*Source: Baron and Kenny (1986)*

However, Hayes (2009) had argued it is not advisable to rely on statistical significance criteria for the individual paths in a mediation model in order to assess whether M functions as a mediator. It is suggested to predict the indirect effect rather than to see the output is significance or insignificance. On top of that, Hayes (2009) continues argued the terms of mediation such as full or complete and partial has no longer relevant for 21st century mediation analysis and it should be avoided. Therefore, it is recommended to apply bootstrapping to test mediating effects that has been recognized as one of the more rigorous and powerful methods for testing the mediating effect (Zhao et al., 2010; Hayes, 2009). This non-parametric resampling procedure totally suited for PLS-SEM because it can be applied to small sample sizes and it makes no assumption about the shape of the variables' distribution (Hair et al., 2013; Preacher & Hayes, 2008).

Thus, this study proposes operational performance as mediating variable that helps to hypothesize and understand how lean healthcare practices (operational aspects and sociotechnical aspects), bring about sustainability. This linkage of these variables derived from the preceding results in the manufacturing sector that shows, operational performance has partially mediates between lean practices and business performance. Unfortunately, not in the healthcare sector, where most of the previous studies in the healthcare were conducted qualitatively, while less empirical research has found a direct relationship between lean healthcare practices with operational performance and operational performance with sustainability.

Correspondingly, safety climate has taken into account that acts as a moderating variable which feasibly will moderate the relationship between lean healthcare practices (operational aspects and sociotechnical aspects), and operational performance. According to Sekaran and Bougie (2013) moderating variable will exist, whenever the relationship between the independent variable and the dependent variable becomes contingent on another variable. Another variable refers to moderating variable that modifies the original relationship between these two variables. While Baron and Kenny (1986) defined moderator as qualitative or quantitative variable that affects the relation between two variables; independent (predictor) variable and dependent (criterion) variable. In addition, moderator variables are typically introduced when there is an unexpectedly weak or inconsistent relation between a predictor and a criterion variable (Baron & Kenny, 1986). Thus, this study suggests safety climate as a moderating variable has a contingent effect on the relationship between operational aspects and sociotechnical aspects with operational performance.

*Empirical research on lean healthcare practices (operational aspects and sociotechnical aspects), operational performance, safety climate and sustainability*

Past studies on lean healthcare have explored the level of awareness (Elshennawy *et al*., 2012), the integration of lean practices with the TQM model (Ho, 2010), the typology of lean implementation (Radnor, 2011), the evidence of lean systems (Dellifraine *et al.*, 2010), and the development of strategies and leaders (Lacy *et al.*, 2012). However, most of these studies qualitatively except the study by Norazlan et al (2014) have indicated that *kaizen* blitz as an operational aspect in lean practices has a positive impact on sustainable performance in the healthcare industry. Another study by Singh (2019) claims that lean healthcare has a high potential to alleviate environmental footprints in organizations. By contrast, an insignificant relationship was found between technical aspects of lean service and financial performance, but not in the context of social and environmental performance (Hadid *et al.*, 2016).

Thus, there is little research on the direct relationship between operational aspects and sustainability in healthcare. Therefore, this relationship was analysed based on the following hypothesis:

**H1: There is a positive relationship between operational aspects and sustainability**
The sociotechnical context of lean practices is important because few studies have highlighted the impact of human factors on operational/technical aspects in the healthcare sector (Joosten *et al.*, 2009). Chiarini and Vagnoni (2016) debated that leadership, top management involvement, and commitment are the key criteria for reaching environmental sustainability in public healthcare organisations. However, the study did not focus on social and economic sustainability. Empirical research conducted by Hadid *et al.* (2016) found a positive impact between social bundles, which are human resource management, in lean service and financial performance. Furthermore, Al-Balushi *et al.* (2014) discovered that sustainability can be achieved by implementing lean practices in training, providing good rewards, and communicating effectively.

These underexplored issues warrant additional longitudinal studies (D'Andreamatteo *et al.*, 2015). Therefore, this relationship was analysed based on the following hypothesis:

**H2: There is a positive relationship between sociotechnical aspects and sustainability**
Operational performance is a vital construct in the significant relationship between managerial and operational levels (Elg *et al.,* 2013). Al-Hyari et al (2016) and Hadid et al. (2016) discovered that lean bundles and lean service technical bundles both improved operational performance in private hospitals and the service sector, respectively. Suryadevara (2015) found that using lean concepts reduced hospital expenses and improved operational performance indirectly. In addition, lean management should be implemented in the healthcare sector to reduce waste and eliminate non-value-added tasks (Santos et al., 2020).

The relationship between operational aspects and operational performance remains unclear and requires further examination. To address this gap, this study tested that relationship based on the following hypothesis

**H3: There is a positive relationship between operational aspects and operational performance**

Sociotechnical systems (STS) theory does not emphasis exclusively on lean literature but looks more generally into the literature on operations management (Hadid *et al.*, 2016). Hence, STS theory offers an enhanced understanding of the impacts of performance and modern improvement systems. Consequently, studies have concentrated on operational aspects without regard to sociotechnical aspects (Ulhassan *et al.*, 2014). Mainly, studies on sociotechnical aspects and operational performance are limited. In the service sector, Hadid *et al* (2016) discovered a positive relationship between operational performance and the motivation factors in social bundles, but not the human factors.

The sociotechnical aspect of leadership seems important for improving operational performance (Abdallah, 2014; Mark *et al.*, 2013). Hence, this study proposes the following:

**H4: There is a positive relationship between sociotechnical aspects and operational performance**

Few scholars have sought to explain the variables of operational performance and sustainability, and the results have been ambiguous. Nerminathan *et al.* (2014) found that operational performance in the healthcare sector contributed to financial performance. Moreover, several companies from various business settings, including Baxter International (Langenwalter, 2006) and Clorox Company (Galpin *et al.*, 2015), have shown tremendous cost reductions that have increased financial performance, but not non-financial performance. Meanwhile, Hong *et al* (2014); Pagell and Gobeli (2009) found that operational performance contributes to the sustainability of financial and environmental performance in the manufacturing sector. However, studies have found no statistical significance in the relationship between operational performance and sustainability. Therefore, more research much be conducted to investigate these relationships. Thus, this study proposes the following:

**H5: There is a positive relationship between operational performance and sustainability**

Nawanir *et al* (2013) proved that in the manufacturing context operational performance partially mediates the relationship between lean practices and business performance. Fullerton and Wempe (2009) similarly found that operational performance mediates between lean practices and financial performance. Unfortunately, their research did not include the healthcare sector, and they adopted a qualitative and conceptual perspective. Capkun *et al* (2012) suggested that subsequent research should test quality service as an operational performance dimension that mediates the relationship with economic performance at the service level.

Hence, operational performance is hypothesised to act as the mechanism determining whether operational aspects and sociotechnical aspects continuously improve the sustainability of private hospitals. This study therefore proposes the following

**H6a: Operational performance mediates the relationship between operational aspects and sustainability**

**H6b: Operational performance mediates the relationship between sociotechnical aspects and sustainability**

Several studies have found that safety climate acts as a moderator in the relationship between the organisational context and patient satisfaction (Kern, 2011; Mark *et al.*, 2007). Several studies have also shown a direct link between safety climate, lean healthcare, and operational performance. Srinivasan *et al* (2016) showed that a 5S event has a positive impact on the safety climate in manufacturing organisations, and proposed consideration of other lean tools beyond the 5S event. Further, Dobrzykowski *et al* (2016) proved a positive relationship between lean orientation and patient safety in the healthcare sector. Hence, safety climate has a positive impact on financial performance.

Regarding sociotechnical aspects, Byrd (2014) demonstrated that organisational communication has a direct impact on the safety climate, while Clark *et al* (2014) underlined the role of leaders as essential for motivating and supporting subordinates and informing them about the importance of the safety climate in the organisation. However, further study on safety climate in terms of the relationship between lean healthcare practices and operational performance is required, as studies have not examined these relationships in depth. Furthermore, hospital lean management generates greater quality and safety improvement (Crema *et al.,* 2015). Therefore, this study proposes the following

**H7a: Safety climate moderates the relationship between operational aspects and operational performance.**

**H7b: Safety climate moderates the relationship between sociotechnical aspects and operational performance.**

## Methodology

This study investigates the relative influence of lean healthcare practices (operational and sociotechnical aspects) on operational performance and safety climate and their effect on sustainable financial, social, and environmental aspects through quantitative research, and analyses the managerial level of private hospitals in Malaysia. A recent report released by the Ministry of Health, Malaysia (MOH) estimated that about 187 licensed private hospitals operate in the market (Health Facts, 2016). However, this study used 174 licensed private hospitals as the sample (Kumar *et al.*, 2013).

Regarding the criteria for sample selection, respondents will be chosen based on probability sampling techniques, which were used to form a representative sample of the target population (Kumar *et al.*, 2013). A simple random sampling technique will be employed to select private hospitals for the sample. This technique is the most basic process (Kumar *et al.*, 2013), has the least bias, and offers the greatest generalisability (Sekaran, 2003). Research-randomising software will be utilised to generate random numbers for this study, which produced a total sample size of 118 out of 174 licensed private hospitals. Previous studies reported low response rates (Hadid *et al*., 2016; Gu and Itoh, 2016); therefore, the researcher decided to use PLS-SEM with a recommended sample size ranging from 30 to 100, in contrast to CB-SEM, which generally ranges from 200 to 800 (Sarstedt *et al.*, 2014).

## Conclusion and Future Studies

Lean is the most essential word for any organisation. Lean has made organisations do more with less. This study investigated how far lean can contribute to sustainability by considering

the effects of lean healthcare practices (operational aspects, and sociotechnical aspects) and safety climate on operational performance, and their impact on sustainability in private hospitals. Previous studies have offered fragmented and inconsistent results, and this study aimed to bridge those gaps.

Since this is the first time of scrutinizing and developing the conceptual framework to measure the relationship of lean healthcare practices (operational aspects and sociotechnical aspects) and operational performance towards sustainability in Malaysia's private hospitals, there are sure to be certain limits or boundaries in this study. Furthermore, the research hypothesis was constructed based on the proposed model and past studies. Firstly, this study is restricted to only private hospitals and not to be fully generalized to public hospitals in Malaysia. Although public hospitals currently are practicing lean healthcare, the characteristics, culture and nature of both hospitals are similar. Certainly, public hospitals in Malaysia have been subsidized by the government to assist and benefit the under privileged into receiving better healthcare. In contrast, private hospitals are profit oriented organizations. To obtain the desired profit target, private hospitals thrives to attract more customers to ensure the organization's sustainability in terms of financial, social and environmental. Secondly, the evidence supporting the results of this study is that most of the studies using qualitative methods are particularly compared to quantitative or empirical studies related to lean healthcare, operational performance, and sustainability. It is from a previous study showing that it was done in a case study.

Due to the above limitations, the findings provide theoretical, practical, and methodological contributions and important implications for scholars, policymakers, and private hospitals. First, this study can be enhanced by increasing the sample population while using the same instrument to measure respondents, while the variables can be tested using moderators, since the moderator used in this study was not supported. Academics can also adopt the practices of lean healthcare for the education sector, since 5S is currently in practice in universities. Policymakers should note that regulations and policies must be strengthened to avoid future service failures. Private hospitals should be made accountable for lean healthcare, operational performance, and sustainability as a part of their organisational system. It is imperative that private hospitals seriously consider and implement lean healthcare in standard operating procedures through the collaborative efforts of leaders, employees, and patients.

Finally, future study should incorporate longitudinal studies. Even if a longitudinal study may be conducted empirically, the population of private hospitals in Malaysia is extremely small, which may limit the study's generalizability. Thus, in order to deepen the implementation of lean healthcare for each organisation, research should be undertaken over a number of years to ensure that lean healthcare and sustainability practises are successful.

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