

# Sociotechnical Aspects of Lean and Sustainability

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**ABSTRACT :** In recent years, lean healthcare has been used by numerous scholars as a major trend for exploring the purpose of practicing lean healthcare in an operational context but apparently not considering the human or social factors. Furthermore, less studies have been conducted on how social or sociotechnical aspects of lean enables the achievement of sustainability in healthcare organizations, which also includes the three main pillars, namely economic, social, and environmental aspect. Therefore, this paper intended to examine the link between sociotechnical aspects of lean and sustainability in the healthcare sector. It also discussed theoretical approaches that explain these variables, namely Sociotechnical and Stakeholder theories. Finally, this paper has given important significance for academic researchers who intend to study the sociotechnical aspects of lean and sustainability as well as practitioners who deal with complex problems. Conclusions and future works are also included in this paper.

**Keywords**– lean healthcare, sociotechnical aspects, sustainability, sociotechnical theory and stakeholder theory

## 1. Introduction

In recent years, lean healthcare has been used by numerous scholars as a major trend for exploring the purpose of practicing lean healthcare in an operational context but apparently not considering the human or social factors. To date, scholars have identified different adaptations or practices of lean healthcare in terms of human or sociotechnical factors, which were mostly focused on leadership [1],[2],[3],[4], culture change [1],[3],[4], communication [2],[4],[5], training [4],[5],[6], and problem-solving [4],[7].

[2] discovered three sociotechnical factors, as in leadership support, communication and workload, that led to the success of lean healthcare, accompanied with motivation driven by managers and staff in an organization. Nevertheless, [7] emphasized that sociotechnical aspects of lean thinking include professional roles in handling organizational climate, problem-solving, and learning among team members, which was deemed to be important for measuring healthcare performance.

[4] found that widespread involvement and leadership support were the most successful lean practices in the healthcare sector. Meanwhile, [5] identified training, communication, problem-solving and standardizing as some of the most common tools used by previous researchers for elevating organizational productivity. [1] proposed a model for changing lean

healthcare in organizations that require strong bases, such as strong leadership, good teamwork, and strategic planning with a clear objective to fulfil customer satisfaction. However, their study focused only on lean healthcare practices without examining the relationship of sociotechnical factors and sustainability and this is what the current study, intended to examine.

The practice of lean healthcare is not formally adapted in Malaysia's 187 private hospitals, but there are similar concepts that are currently practiced in a few of them. Elements of sociotechnical aspects of lean– also known as internal control – such as training and corporate culture, have been embedded in KPJ as part their working environment [8]. Additionally, Putra Medical Centre also specified in its mission statement that it strives to treat all patients equally and with respect as well as handle all complaints efficiently, which is also an important element in lean practices [9], although they were not officially called as such.

At the same time, all public health clinics in Putrajaya have started implementing lean healthcare in their operations [10]. This provides a positive impact on health clinics that adapt lean practices by significantly reducing patient's waiting time from an average of 92 minutes 35 seconds to 79 minutes 5 seconds. This leads to a decline in crowd congestion at the clinic's waiting area, and significantly minimizes the pressure on doctors, thus, allowing them to provide patients with the required attention [10].

However, [10] also noted some challenges following the implementation of lean healthcare among public healthcare operators, such as sustaining commitment by team and staff, earning extra resources and redundancy with other quality improvement approaches. In this regard, it was suggested that lean healthcare should be applied in private hospitals and incorporated with sustainability, as well as carefully planned to ensure that it is feasible and sustainable in the long run [11].

## 2. Literature Review

### 2.1 Sociotechnical aspects of Lean

[2] discussed how sociotechnical factors such as leadership support, communication and workload could help to diminish waste and develop efficiency. Nevertheless, [7] emphasized that the role of managers is extremely vital from a sociotechnical aspect because it

encourages teamwork and enhances potential skills among the workforce. This was also delineated by [12], whereby the development of leaders enables the creation of a positive environment for staff and leaders and without doubt, the success of lean practices manage to fit their prevailing vision.

Meanwhile, [13] underlined the sociotechnical aspect of teamwork that has resulted in positive results in two Swedish Wards. Firstly, the results indicated that the implementation of lean was successful and improved good teamwork and secondly, it revealed that when lean was implemented partially, teamwork only improved fairly. Besides, [3] proposed four domain categories of lean healthcare practices that comprised employee involvement, organizational culture, leadership and customer focus in Malaysian healthcare industry using Structural Equation Modeling (SEM). These practices have been used to identify critical success factors (CSFs) that ensure the success of implementing lean healthcare practices in the organization.

[4] used thematic analysis in a Delphi study and interviewed healthcare professionals who were directly involved in lean practices in a hospital setting based on themes consisting of widespread involvement, leadership support, communication, training, problem solving, standardizing, culture change, performance regression and unrealistic expectations. This study found that widespread involvement and leadership support were the most successful lean practices in a healthcare sector.

Another study conferred that lean principles had focused on people by looking at the elements of the client's definition, lean leadership, goal setting, focus on value, teamwork, mapping the current situation, deployment improvements and sustainability and continuous improvement [1]. However, [14] had put a distinction between lean tools and leadership, in which he raised issues on how employees were continuously motivated and committed to change their mentality in the working environment. Thus, the study posits to diffuse the strategy of leadership across the organization with commitment among leaders to show good behaviour to the subordinates.

Instead, the elements of communication, standardization, leadership and problem solving should be taken into account in order to avoid any hindrance at the operational level [7]. Consistent with the study of [15], accentuates the aspect of leadership in lean healthcare to bridge the gap between strategy and execution in order to enhance efficiency and quality of care in transforming the healthcare setting. [16] ranked the five main criteria of lean management in a Taiwan hospital as tangible factors, such as products and processes and intangible factors, namely leadership, partnership and people. Indeed, intangible factors were categorized among the lowest ranked where all the human factors constitutes motivation learning, cross-functional team as well as mission and vision presumes were not important in employing lean healthcare.

It is important to consider both aspects when implementing lean healthcare in hospitals because [12] sternly stated that lean is a challenging process where practitioners frequently redesigned and repeated the lean practices based on their social act. Besides, [17] stressed that both technical and social aspects ensure the healthcare system is more sustainable by improving quality and reducing costs. Hence, sociotechnical aspects refer to achieve humanization in the workplace without overdoing any repetitive works within the organization that could lead to waste.

Therefore, this study attempted to look at the theoretical perspective in the link between sociotechnical aspects of lean and sustainability.

## 2.2 Sustainability

Traditionally, sustainability adheres to the triple bottom line (TBL) principle, which involves the economic, social and environment aspects [18] or sometimes referred to the profit, people and planet aspects, respectively [19]. [20] had shown that among the 50 Small Medium Enterprises (SME) in the manufacturing sector in India had integrated the economic, social and environmental aspects and were capable of achieving sustainability. However, [21] suggested that technological development was another important dimension that supported the three aspect based on studies that had balanced the social and economic performance of construction firms.

Sustainability has made the pharmaceutical industry the leader in sustainability for the last two decades [22]. This is evident in the industry's efforts to implement corporate social responsibility as an initiative to be more sustainable and further, manage to bring up the business some added value [22]. [23] stated that sustainability is one of the imperative strategies in quantifying sustainability at the healthcare sector by considering economic, social and environmental aspects. Meanwhile, [24] identified three other factors, such as the needs of patients, economic concern and environmental costs that were used to balance sustainability in the healthcare sector.

On the contrary, some studies have defined sustainability according to different perspectives, such as [25] had looked at sustainability as the realization of lean implementation in a long-term program which she proposed a RIE's program that need to be participated among staff in the hospital. Besides, [26] constructed Lean Sustainability Assessment Tools (LSAT) in order to implement the sustainable lean-based process and to further increase patient satisfaction by improving service quality.

In this regard, this study was inclined to focus on sustainability as the interaction between financial, social, and environmental performance among stakeholders in Malaysia's private hospitals to help eradicate unnecessary activities and increase value-added activities.

### 2.3 Sociotechnical aspects of lean and sustainability

Lean and sustainability employ mutual tools, namely team work, problem solving, training and production inspection [27]. However, it has been debated to be more sustainable in the healthcare setting, the elements of lean consist of leadership, employees role, work characteristics, behaviour and engagement have to consider exceptionally among academicians [28]. Moreover, recent studies have paid much attention on respect-for-human-system or also called the sociotechnical element to ensure the success of lean implementation, instead of focusing on operational or technical aspects of lean [7].

[29] stated that most of the sociotechnical principles supported by sociotechnical theory as an indicator of sustainability to analyse lean implementation in the healthcare sector were found to be inhibited in the Swedish psychiatry healthcare system. This was due to several reasons such as the lack of power among first line managers to deliver and execute lean, the goals of implementing lean was unclear and the participation to embed sociotechnical aspects was found to be negatively affected. summarized that the biggest obstacle in implementing lean was the weak leadership and lack of communication in the health service.

Furthermore, [25] disclosed that in the three NHSs in the UK, the implementation of lean, such as a cohesive leadership by connecting senior and middle managers and using an appropriate communication channel were of utmost important in order to realise sustainability. Besides, staff responsibility, training and internal facilitators were also taken into account to make sustainable improvements. [30] also pointed out that staff should be responsible for solving problem together the full support from managers to ensure the improvement is sustainable.

According to [31], the involvement of leaders was crucial to make sustainability more imperative, and to ensure that the business grows continuously, many companies started to adopt leadership positions among leaders for business transformation in the future. Consequently, [32] revealed that leadership, top management involvement and commitment were key requirements needed to achieve environmental sustainability in an organization. For example, Henkel's company provided laundry, cosmetics as well as technologies, and it had a very committed concerned leadership, which is a core value in sustainability [33]. Nevertheless, the qualities of a leader who can build a sustainable organization remains unclear due to the difficulty in determining the employee's efforts and the leader's sporadic success [33].

Similarly, [34] found a positive relationship between social bundle and financial performance in the service sector. Whereas [35] in their study in the manufacturing section found that the involvement of workers and the cross-functional executive positively correlated with the strategic alignment of lean

manufacturing bundles (JIT, TQM, TPM and HRM) and sustainability (social and environmental). Meanwhile, a study on economic sustainability found that is significantly influenced lean manufacturing to improve firm performance [36].

Hence, from the review, it was confirmed that there was a lack of evidence on sustainability and lean healthcare in sociotechnical aspects in previous studies. Furthermore, the use of sociotechnical terms vary according to different theories. Therefore, it is important to investigate the relationship between sociotechnical aspects and sustainability from a Malaysian context.

### 2.4 Theoretical Perspective

#### 2.4.1 Sociotechnical Theory

The sociotechnical concept was initiated from the first of various field projects conceded by the Tavistock Institute in the British coal mining industry [37] and now, this joint optimization approach has been recognized as an effective system comprising social and technical subsystems [38]. The social subsystem refers to people working in a particular environment, while a technical subsystem comprises tools, structures and knowledge on how to function in the production of a product [38]. [39] also classified work system into two allocations, namely social (human-human allocations) and technical (human-machine allocations). Hence, debates in most of the previous studies had emphasized on human-machine interactions rather than the thinking-technical aspect, which potentially decreases the role of humans.

Consequently, a set of STS principles were established and [40] had compiled nine principles based on preceding studies to explain the work system's design in an organization's social and technical subsystems. [41] had analysed STS principles according to Cherns, Clegg and Trist study, where he claimed Trist had extended the prior work of Cherns by stressing the STS principles based on the level of implementation (e.g organizational, work system and societal elements). Moreover, Clegg overtly provided several STS principles based on the level of implementation that included meta-principles, content-principles and process-principles. Cherns had reviewed his set of principles by adding two new principles (transitional organizations and power and authority) while he dropped the principles of design and human values. According to [42] power, authority and information needed to be consigned in order to condense time delays when reacting to a problem and at the same time ensuring that employees will be more responsible.

Hence, it was suggested that these principles could be pragmatically used in the both levels of the organizations, such as the strategic and operational levels [43]. Furthermore, STS can be observed at other levels too, especially in the healthcare context, including individual caregiver and patient, middle management, clinical microsystem and the entire organization [44]. As a result, it was found that many studies had applied STS principles, especially in the context of lean.

For instance, [41] had explicitly described the comparison between STS and lean production principles in the manufacturing sector in order to determine whether these two approaches might have a potential for synergistic integration. However, in the healthcare context, [7] adopted this theory in their study to comprehensively examine the application of lean thinking in the healthcare industry. They pointed out that a balanced approach between operational and sociotechnical aspects is very important for avoiding any resistance occurring during the implementation of lean. This is because prior studies were found to focus less on human factors. Meanwhile, [29] accepted the STS theory by Chermans and Clegg based on the Swedish psychiatry healthcare system and the objective is to observe the implementation of lean by using sociotechnical principles. Besides, it was used as an indicator of sustainability that contributes to the corpus of knowledge.

In contrary, [45] applied this theory for classifying agents of technological interventions that were divided into two categories, namely social, which includes industry trends, standardization and preferences, and technical, which was divided into two sub categories; financial (efficiency, marketing growth and subsidies) and non-financial (quality, safety and regulatory). In addition, [44] viewed STS theory in the healthcare work environment context, in which they dynamically scrutinized the interaction among organizations, including social subsystem, technical subsystem as well as in the social and organizational context. It was found that organizational (rules and structures, communication, rewards, workflow, interaction patterns and culture) and people (knowledge, skills, attitudes and beliefs), under social subsystem, were the critical elements in the sociotechnical system. Whereas, [45] demonstrated that the sociotechnical approach should emphasize on leadership development incorporated with the senior management of the hospital to solve the problem. The element of leadership was also highlighted in the STS system as an organization component, instead of learning, teamwork, culture and governance [44].

In a nutshell, the term 'sociotechnical' has been attached with different meanings by various scholars, especially in the lean context. For instance, several studies [36], [41], [46], [47] have distinctly measured the socio-technical system in the manufacturing sector, in which 'socio' represent the human aspect, while 'technical' symbolizes the technical or machine aspect, as well as in the service sector. [34], [48] also denoted the same function of the socio-technical system as in the manufacturing sector.

Differ from healthcare sector; the term of sociotechnical refers exclusively to human interaction or human aspects, while 'technical' replaces the operational aspects or tools that can be seen in several studies [2], [7], [13], [29]. Nevertheless, the study opted for the sociotechnical term in this study since most studies concerning healthcare applied this term and considering all the above mentioned points, the technical part of socio-technical in the present study, refers to the operational aspects of lean, which is supported by the Toyota Production System House as elucidated in the subsequent section.

Therefore, this underpinning theory was applied for the purpose of this study to explain the link between sociotechnical aspects of lean, which explicitly refers to human aspects, and sustainability. Consequently, it is believed that STS interactions would affect individual and group behaviours, care quality and organizational performance as a whole [44].

#### 2.4.2 Stakeholder Theory

The term of 'stakeholder' was first introduced by the Stanford Research Institute in 1963, overviewed as stakeholder [49]. This term has been extensively used in many fields, especially in public administration and business [50]. In the 1970s, Russell L. Ackoff and C. West Churchman, who stand as system theorists, rediscovered stakeholder analysis [49]. Ackoff proposed that many societal problems would be solved by strengthening the central institutions with a positive cooperation among the stakeholders in the organization. Consequently, during 1980s, the acceptance of the stakeholder approach was evident in strategic management, corporate social responsibility and organization theory [50]. Now, with the evolution of this theory, many scholars attempt to explain and explicitly define stakeholder theory based on their related fields.

According to [51], stakeholder theory refers to a managerial state that reflects and shows how managers operate an organization. It is evident that numerous companies have successfully run their business based on stakeholder theory. [52] supported this by saying that stakeholder theory emphasizes survival as a prominent goal of any organization by accentuating the relationship among people who are accountable internally and externally in the organization. [51] advocates that the manager is a trusted individual who ensures a relationship continuously between shareholders. In addition, the manager also inspires stakeholders as well as creates a lively environment in the community where everyone endeavours to deliver the best value for the organization [51]. In order for the organization to be more productive and effective, the requirements of stakeholder groups have to be given full consideration [52] without jeopardising any procedures or policies of the organization. This is to guide the organization towards accomplishing the company's goal.

However, [53] debated that issues pertaining to stakeholder theory were elements in ongoing controversies among academicians. Furthermore, they identified several shortcomings in the stakeholder theory, adduced by some respected scholars that should be resolved. For instance, there were some disagreement and contradictory evidence adduced by scholars about the nature and purpose of stakeholder theory [54]. They argued that the adoption of stakeholder theory, stakeholder concept, stakeholder model and stakeholder management as interpreted by various authors had evolved and unfortunately, led to some confusion. Meanwhile, [53] claimed that the terms stated above were defined and applied in diverse ways using different methods. Likewise, [51] critically elucidated the mischaracterization

of stakeholder theory. They had criticised one of the ideas in stakeholder theory written by [54] in which shareholders were not equivalent to stakeholders.

Consequently, [50] presented the implications of extended stakeholder theory and with much concern on business transformation. It is argued, the business should consider sustainability as to preserve and restore the world's natural state towards the human capabilities and future generations. In regards to sustainability, [55] raised a question as to whether the relationship between stakeholder interests and the firm actually effects the firm's business. It is quite challenging to achieve sustainability in an organization due to the need to meet the response and expectations of all the stakeholders (employees, customers, investors, governments, etc.) that may lead to a decline in profit. Thus, a much wider examination should be made to determine the interest of stakeholders in order to meet their expectations [55].

[56] argued that the organization or corporation can perform better in the long-run in terms of sustainability if it deliberates the stakeholder's view, which does not focused on short-term profits. It is suggested that the corporation should emphasis on producing a product without harming the society and strive to strengthen a corporate image. Besides, other elements such as employee well-being, focus on customers as well as corporate social responsibility should also be taken into account. By doing so, it is believed that long term sustainability could be achieved as well as provide better profits for the organization.

Throughout the analysis, it was found that the stakeholder theory had dripped over into different areas. Stakeholder theory adheres and holds relevance to marketing, human resource management, financial management, production, organizational ethics and healthcare management [52]. Indeed, innumerable studies on the healthcare sector have adopted the stakeholder theory since the 1990s and has turned this sector into a 'hyper turbulent' environment like any other sector [57]. [58] investigated the NHS in UK and Scotland, which applied the stakeholder theory, and found that it had some implications. The political climate had drastically changed the environment of the stakeholders, which was mainly due to the devolution of power and the creation of new relationships and bodies.

Meanwhile, [59] highlighted that customers were the imperative stakeholder group as well as lifeblood of the sector, hence, this group should be managed well to ensure healthcare tourism is economically sustainable in the long term by treating them in an ethical manner. Based on the review of previous studies regarding stakeholders in the healthcare sector, [60] found that communication was crucial when dealing with stakeholders. Subsequently, [61] in their case study in a public hospital in France discovered that the involvement of stakeholders, especially senior managers as the backbone of the organization, enable to improve social performance of the hospital. Undeniably, it is critically important that all managers understand the key elements of CSR and the assessment of social performance. Similarly, [57] revealed that the participation of top management and other

stakeholders is seen as an obligation to carry out the social responsibilities of the hospital.

Fundamentally, this theory helped to support the conceptual framework of this research, which included both internal and external stakeholders. [61] divided stakeholders into three categories in the healthcare context, which is shown in Table 2. Although there are limited studies related to stakeholder theory, lean practices and sustainability, this theory describes the relationship between the stakeholders in implementing operational aspects and sociotechnical aspects that might influence operational performance, safety climate and sustainability in a private hospital. Indeed, problems could occur in an organization where, according to [61], the internal stakeholder is least supportive compared to the external stakeholder, who is non-supportive.

**Table 1 Categories of Stakeholders**

Categories	Sub categories	Descriptions
Internal		Management, professional, and non-professional
External	Provide inputs	Suppliers, fund providers, and patients
	Competitors	Other hospitals or any other related to healthcare organization
	Special interest	Government, professional associations, the media, community, labour unions

Source: [61]

### 3 Conclusion and Future Works

The emphasises on the Sociotechnical Theory or STS Theory was based on two vital aspects, namely human and technical, which typically appears to elucidate lean practices in the manufacturing and service sectors. This study had identified human elements and motivation as factors that measure sociotechnical aspects, while technical aspects refer to operational aspects. This is because most scholars in the healthcare sector have discussed the STS Theory with a different outlook by prioritizing human aspects or people in the context of leadership, communication, knowledge, skill, rewards, teamwork and many more.

Meanwhile, Stakeholder Theory was introduced to look at sustainability in an organization instead of profitability or business alone. Sustainability, which comprises financial, social and environmental aspects, has been echoed in the healthcare industry, specifically private hospitals, to emphasise on attention and kindness in protecting the stakeholders to ensure their safety.

Therefore, these reputable theories have been interpreted and more importantly, have been integrated into this study

in order to explain the implementation of sociotechnical aspects of lean and sustainability comprehensively in Malaysia's private hospitals.

Future research should embark on longitudinal studies to explore sociotechnical and sustainability from an Islamic perspective. In particular, the implication of Maqasid al-Shari'ah should be discussed in detail to shed light on the importance of human aspects and to ensure organizational performance is sustainable. The understanding of Maqasid al-Shari'ah is grounded on five basic principles, such as preserving property, religion, life, mind and heredity for the benefit of the ummah (Muslim community). Thus, future studies should propose to replicate the present study in accordance with Maqasid al-Shari'ah.

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