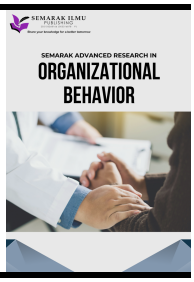
SEMARAK ILMU PUBLISHING

Semarak Advanced Research in Organizational Behaviour

Journal homepage:
https://semarakilmu.my/index.php/sarob/index
ISSN: 3030-6264



Empowering Organizational Learning with Philosophical Tools of Lean Six Sigma in Service Sectors

Tan Yi Chyn Ezra[1], Nur Amalina Muhammad[1,*], Aulia Ishak[2]

[1] School of Mechanical Engineering, Universiti Sains Malaysia, Engineering Campus 14300 Nibong Tebal, Penang, Malaysia
[2] Department of Industrial Engineering, Universitas Sumatera Utara, Medan 20155, Indonesia

ARTICLE INFO

Article history:
Received 25 May 2024
Received in revised form 8 June 2024
Accepted 15 June 2024
Available online 22 June 2024

Keywords:
Lean Six Sigma; organizational learning; philosophical tools; service sectors

ABSTRACT

Lean Six Sigma (LSS) has become a prominent methodology for improving efficiency and quality across various industries, including the service sector. However, its philosophical foundations are often overlooked, with many organizations focusing solely on its practical tools. This study aims to bridge that gap by integrating LSS philosophical tools into organizational learning (OL) processes, enhancing understanding and application. The research examines the relationship between key LSS philosophical tools—such as Lean Leadership, Lean Management, Lean Culture, Change Management, and Employee Engagement—and core constructs of OL: commitment, knowledge, and performance. LSS training modules were implemented in an IT and software development company in Penang, Malaysia, designed specifically for the service sector using the Analyze-Design-Develop-Implement-Evaluate (ADDIE) model. A quantitative approach was used, with Analysis of Variance (ANOVA) applied to questionnaire data collected from the organization. The results show that the LSS philosophical tools positively impacted OL, leading to improved performance, better knowledge dissemination, and increased organizational commitment. Although the findings demonstrate the benefits of integrating LSS into OL, the study is limited to a single service sector and focuses on only five LSS tools. Future research should explore additional LSS themes and test the modules across different service sectors to broaden the applicability of the results.

1. Introduction

LSS has gained significant traction as a methodology for continuous improvement, drawing on principles from Lean manufacturing and Six Sigma to enhance efficiency and quality [1,2]. While traditionally associated with manufacturing, LSS has increasingly found application in the service sector, where its structured approach holds promise for optimizing processes and delivering value to customers. However, translating LSS principles into service-oriented contexts poses unique challenges, particularly in integrating its philosophical underpinnings. One of the primary obstacles to LSS implementation within the service sector is the tendency to view it solely as a toolkit—a

* *Corresponding author.*
E-mail address: nuramalinamuhammad@usm.my

https://doi.org/10.37934/sarob.2.1.1336a

collection of tools and techniques devoid of a deeper philosophical understanding [3]. This reductionist perspective overlooks the holistic nature of LSS, which encompasses technical tools and a philosophical framework to foster a culture of continuous improvement and learning within organizations. Consequently, organizations often struggle to realize the full potential of LSS initiatives, hampering their ability to drive meaningful change and achieve sustainable results.

To address these challenges, there is a growing recognition of the importance of integrating LSS philosophy into OL, particularly in service-oriented industries. By embracing the LSS philosophy, organizations can cultivate a culture of learning and adaptation, empowering employees to identify and address inefficiencies, innovate solutions, and drive organizational excellence [4,5]. Moreover, LSS philosophy tools catalyze organizational transformation, fostering cultural change and aligning organizational values with strategic objectives. In this context, developing and implementing LSS training modules explicitly tailored for the service sector emerges as a critical intervention. These modules should go beyond tool training and delve into the philosophical underpinnings of LSS, emphasizing principles such as customer focus, waste reduction, and continuous improvement [2]. By equipping employees with a deeper understanding of LSS philosophy, organizations can foster a culture of learning and collaboration, motivating individuals to contribute their insights and ideas toward organizational excellence.

The success of LSS training initiatives hinges on the active engagement and participation of employees at all levels of the organization. Efforts should be made to create a conducive learning environment, provide resources and tools for training delivery, and establish mechanisms for ongoing feedback and evaluation. By investing in LSS training and development, organizations can empower their workforce to drive meaningful change, enhance customer satisfaction, and achieve sustainable business success in the service sector and beyond.

Despite the promising application of LSS in the service sector, much of the existing research has focused primarily on its technical tools, with limited emphasis on the deeper philosophical elements essential for sustainable improvement and OL [3,5,7]. Moreover, there is a notable lack of literature examining specific impact of LSS on OL within service sectors, highlighting a critical gap in understanding how LSS principles can enhance employee engagement and drive long-term improvements. Addressing this gap is crucial, as it underscores the need for tailored training modules that effectively integrate LSS philosophy with OL in service-oriented contexts. This study aims to bridge this gap by developing and implementing LSS training modules that incorporate LSS philosophical tools specifically for service-oriented organizations. By evaluating the impact of these modules on OL, the research seeks to determine the extent to which LSS philosophy can drive OL, culture change, and continuous improvement in the service sector.

2. Literature Review

2.1 Lean Six Sigma

The limitations of Lean Manufacturing and Six Sigma have prompted organizations to combine these approaches into LSS. This unified methodology draws on the focus of Lean on waste reduction and statistical Six Sigma rigor to optimize processes. Lean alone lacks the tools to solve complex quality issues, while Six Sigma often requires extensive data collection that may be excessive for simpler problems [6,7]. Antony *et al*., [8] further noted that while Lean streamlines operations, Six Sigma strengthens process quality, making integration especially effective in complex environments.

Total Quality Management (TQM) also has its limitations, which LSS aims to address. TQM often emphasizes customer satisfaction without strong ties to profitability, lacks a formal methodology, and has limited infrastructure and quantitative metrics, resulting in piecemeal improvements rather

than systemic change [8]. The term "Lean Six Sigma" emerged around 2003 to describe this integrated approach [9]. Yadav and Desai [10] defined LSS through two lenses: cost reduction and business process enhancement. From a cost perspective, LSS identifies and eliminates waste, while from a business perspective, it enables organizations to meet customer demands by reducing variability and non-value-added activities. LSS transforms organizations from isolated, reactive operations into collaborative, process-focused entities [7,10]. This unified framework has gained traction across sectors, helping organizations move from isolated improvement efforts to cohesive strategies that drive quality, efficiency, and lasting organizational change.

2.2 LSS in Service Sectors

Grönroos [11] defined service as "an activity or series of activities of more or less intangible nature that normally, but not necessarily, occur in interactions between the customer and service employees and systems of the service provider, which are provided as solutions to customer problems.". Although there are some differences between the core of manufacturing and service industries, from an improvement perspective, service organizations are likened to other sectors where they have processes that can be upgraded by collecting data and applying scientific methods and tools of LSS [12].

Due to the vast advantages of lean implementation in the manufacturing industry, some researchers have started to think about whether it can be transferred to other areas, such as service sectors, to reap its benefits. Bowen and Youngdahl [13] were the first to conduct studies about transferring lean principles and techniques to the service sector. Later, it was implemented in service organizations such as healthcare, sales and marketing, banking services, education, logistics, finance, and real estate [14,15). Besides, Vijaya Sunder [7] reported that the LSS methodology is preferred over Lean, Six Sigma, or other continuous improvement methodologies in the service industry. One of the encouraging factors is that improvement is independent of process complexity [16].

Antony *et al*., [8] highlighted LSS benefits in the service sector, such as improved customer satisfaction, employee morale, and teamwork. Sunder and Antony [17] found that LSS is preferred due to its Six Sigma tools for identifying process variations and Lean principles for waste reduction, leading to enhanced customer satisfaction. They also noted the structured deployment approach of LSS, involving stakeholders in problem-solving stages, and its combination of walk-the-floor and statistical methods for sustainable improvements and customer delight.

Although LSS has a proven set of tools and techniques that help practitioners solve their issues, Arumugam *et al*., [18] indicated that LSS should be viewed from the perspective of tools and as a business improvement strategy. While tools are important for LSS implementation, they are just a means for problem-solving, not solutions to problems. According to Trakulsunti and Antony [19], a tool has a narrower scope as it is utilized to solve a particular task. They also discovered that recent studies define "LSS tools" as the tools used in the DMAIC method. LSS not only consists of tools used to solve a task but also contains the philosophical part that shapes the behavior, character, thinking, and mindset of a person. For instance, Lean Leadership in LSS consists of the tools (i.e., A3 charters) and its philosophical approach (i.e., the mindset and models of Lean Leadership). It is necessary to classify LSS into practical and philosophical tools. A practical tool refers to the tool that is utilized to solve specific issues. Some examples are the Voice of the Customers, Value Stream Mapping (VSM), Pareto chart, A3, 5 Whys, root cause analysis, Kanban, 5S, and PDCA [20,21]. On the other hand, a philosophical tool is a set of ideas, concepts, or principles that help people to think, feel, and act [22]. In the LSS context, it encompasses the ethics, thinking, attitudes, and mindset of LSS philosophy. It requires the practitioner to understand LSS philosophy and principles and adapt to them before

implementing the tools in an organization. Some examples of LSS philosophical tools are Lean Culture, Lean Management, and Lean Leadership.

2.3 Critical Success Factors of LSS Implementation in Service Sectors

Although many companies succeed after deploying LSS, some companies still suffer losses after implementing LSS [23]. Hence, understanding the critical success factors (CSFs) of LSS implementation is necessary. After an intensive literature review of the CSFs of LSS implementation, the top five CSFs of LSS implementation, leadership, management, culture, change, and employee engagement, are identified. Table 1 below summarizes CSFs gathered from research papers from 2011 to 2022. Leadership, Management, change, culture, and employee engagement are crucial factors contributing to the successful implementation of LSS. The term "training" is added to consolidate the vitality of providing appropriate LSS training to every employee in an organization.

Table 1
The CSFs of LSS

CSFs	References
Leadership	10, 17, 23-33.
Management	8, 10, 25, 29, 30, 34-43.
Change	17,27-29, 32, 34, 41, 43-45.
Culture	10, 17, 23-26, 28, 30-32, 34-35, 38, 41, 49.
Employee Engagement	10, 24, 26, 30, 33, 42, 43, 44, 47, 48.
Training	10, 23, 25, 27, 29, 30, 31, 33, 34, 36, 38, 43, 45, 50.

2.3.1 Lean culture

According to Mann [51], culture is "a concept that people make up to organize and handle what they have seen or experienced." Culture depicts the personality of an organization and shows the values and principles upheld by its employees [52]. A Lean culture is formed when people habitually involve themselves in the Lean Management process. There is difficulty in describing Lean Culture due to its complex construct encompassing various dimensions such as knowledge sharing, continuous improvement, and implementation of Lean tools [53]. Alston [49] viewed Lean Culture as one that contains all the elements and attributes necessary to sustain and implement Lean process improvement initiatives. Dorval *et al*., [54] have gathered a series of definitions proposed by researchers. They found that over 80 percent of the researchers view Lean Culture as an organizational aim. In other words, Lean Culture is not a tool or an extra from organizational change but a mirror of the Lean transformation journey and proficiency. Lean Culture is progressively built by every action and decision made by the members of an organization according to Lean principles.
Jeyaraman and Teo [35] also endorsed the importance of the organizational culture in making LSS implementation successful. Zhang *et al*., [55] surveyed LSSs and obtained a positive correlation between LSSs and organizational beliefs and culture. Kundu and Manohar [56] studied the CSFs from the perspective of the IT service sector and proposed an organization as one of the CSFs of LSS. Tsironis and Psychogios [25] explored the literature that discussed CSFs of LSS implementation and found that quality-driven organizational culture is one of the essential CSFs. A successful LSS implementation in an organization requires the expansion of the LSS philosophy to shape culture and the environment. Pathiratne *et al*., [29] suggested that culture should be considered the most

significant factor for LSS implementation. MacIel-Monteon *et al*., [31] categorized quality culture implementation under management involvement and commitment, one of the CSFs of LSS.

2.3.2 Lean leadership

Leadership is critical in Lean implementation as it ensures the system of an organization and its employees are committed to daily improvement activities [57]. Dombrowski and Mielke [58] define Lean Leadership as a well-organized system that ensures continuous improvement and implementation of the Lean system. A successful Lean leader forms a culture of striving for perfection in an organization. The two dimensions of perfection include customer-centered in every process and continuous development among employees and leaders. They have identified five fundamental principles of Lean Leadership: improvement culture, self-development, qualification, Gemba, and Hoshin Kanri. Improvement culture points to the mindset of striving for perfection, while self-development indicates a constant upgrading of individual competencies and skills. Qualification refers to consistently training employees by involving them in solving problems, whereas Gemba focuses on making decisions based on first-hand knowledge. Finally, Hoshin Kanri refers to strategic planning to ensure the goals of the company are executed at every level [57,58].

The review by Tsironis and Psychogios [25] found that committeed leadership is one of the CSFs in LSS implementation. Al-Najem *et al*., [30] conducted an extensive literature review and concluded that leadership is one of the eight CSFs for successful LSS implementation. Pathiratne *et al*., [29] consolidate the vital role of leadership in CSFs of LSS by analyzing more than 90 CSFs. Research from Hilton and Sohal [37] highlighted the importance of leadership in successfully deploying LSS. Laureani and Antony [23] have proved the correlation between leadership approaches and LSS deployment. A study by Pamfilie *et al*., [24] reveals that a leader who is efficient in communication and plays a prominent role in employee support and motivation will lead to successful lean implementation. MacIel-Monteon *et al*., [31] conducted a study on measuring CSFs of LSS in higher education institutions and endorsed the CSFs that ensure successful improvement projects, including leadership from top management. Zarbo [59] has proposed a checklist of lean leaders that shows how a good leader can create a constancy of purpose toward improving work product and service outcomes at all levels as the basis of a culture of continuous improvement.

2.3.3 Lean management

According to Sony [60], Lean Management is the medium through which Lean thinking is executed. The core of Lean thinking is providing the most outstanding value to a customer by eliminating waste within a process and the organization. Therefore, Lean Management within an organization strives to identify and eliminate waste. In terms of value maximization, five principles are used: (1) Determine the value from the customer's perspective. (2) Identify and map all values along a process chain. (3) Create a flow for the value stream. (4) Give only what the customer wants through the pull system. (5) Move towards perfection [61]. In Lean Management, there are eight types of waste: transportation, inventory, motion, waiting, overproduction, over-processing, and defects [62]. Many valuable tools have been developed to effectively apply Lean Management, such as VSM, Pull systems, Kaizen events, Visual Control and Management, Jidoka, and 5S [60]. Although most of the research investigated the Lean Manufacturing environment, other research shows that Lean Management fully applies to various areas, including healthcare, IT services, public administration, and education [63].

Jeyaraman and Teo [35] studied the CSFs proposed by researchers from 1996 to 2010 and found that Management is a CSF endorsed by all researchers. Without consistent support and commitment from the management team, doubt and ambiguity will weaken the LSS implementation initiative. Antony *et al*., [36] also summarized the CSFs of LSS and surveyed them to determine the top CSFs of LSS implementation. The results showed that Management is in the top six CSFs. Laureani *et al*., [39] summarized the CSFs in four main areas: management involvement and organizational commitment; project selection, Management, and control skills; and acceptance of cultural change continuous training. The need for a process management system, especially the tracking and review of projects, was highlighted in the research. Bakar *et al*., [64] identified five significant CSFs of LSS out of 97 CSFs listed in 13 papers. They concluded that management commitment and leadership are among the five significant CSFs [29]. A recent CSF review by Yadav *et al*., [43] found that commitment from top management is the top CSF of LSS implementation.

2.3.4 Change management

A change without Management will lead to chaos. Asnan *et al*., [41] define change management as "a structured approach to shift individuals, teams, and organizations from a current state to a desired future state to fulfill vision and strategy." Every change will involve a transition phase where people must let go of the old working methods and embrace the new ways of thinking. However, resistance to change always occurs as change requires people to move out of their comfort zone. Since lean implementation requires a radical change in various aspects, understanding change management is the key to preventing failure in lean implementation [41]. One of the most popular change management models is Kurt Lewin's change model, which consists of three stages: (1) Unfreezing, (2) Changing, and (3) Refreezing [65]. However, due to the lack of focus on dealing with people issues, numerous change models, such as John Kotter's 8 Steps Change Model, 7S ADKAR Model, and The McKinsey 7-S Model, were developed to enhance the change management process [27].

The change will inevitably occur during the implementation of LSS. Galli *et al*., [27] have found a significant correlation between change management and leadership in each phase of DMAIC. Asnan *et al*., [41] found the importance of change management in LSS implementation as LSS requires a shift and transformation from the current state to a desired future state to fulfill vision and strategy. A case study from Jaca *et al*., [45] insisted that the challenges of lean adoption in the distribution sector are the volatility of customer demand and the high degree of human participation in the job. According to the authors, change management must link to specific lean activities to ensure actual change. Juliani and de Oliveira [32] found six significant challenges in LSS deployment and considered proposed guidelines for the public sector.

2.3.5 Employee engagement

Since Kahn proposed the first concept of employee engagement in 1990 as the "harnessing of organization members' selves to their works," the researcher has proposed various definitions of employee engagement [66]. Sendawula *et al*., [67] refer to it as the involvement and commitment of employees toward the values of an organization. Chanana and Sangeeta [68] indicated that it is a workplace attitude that ensures every employee is giving their best in everyday tasks and is committed to the objectives of their organization. They also mentioned that the term "engagement" contains numerous facets such as cognitive (i.e., beliefs of leaders), emotional (i.e., positive or negative attitude toward the organization), and physical (i.e., devotion to accomplish a role). Hence,

employee engagement occurs in the inner state of mind of an employee that brings commitment, satisfaction, and work effort to an employee [68]. When employees are engaged in their work, they are more willing to collaborate with colleagues to enhance the performance of their organization. Besides, engaged employees make fewer work-related mistakes and errors as they have a positive attitude and mind toward their work [67].

Pamfilie *et al*., [24] have revealed the critical factors needed to create a unique framework to lead the organization to business excellence through personnel improvement. One of the keys is employee motivation or engagement. Iberahim *et al*., [42] have determined the factors that enhance employee engagement in LSS, indicating its importance in a successful LSS project [42]. Other than leadership and involvement of top Management, Al-Najem *et al*., [30] also found that empowering employees is critical to establishing a lean culture. Besides, an extensive literature review by Yadav *et al*., [43] found that the term employee involvement appeared in 19 out of 32 articles related to CSFs in LSS that they reviewed.

2.3.6 Organizational learning

Learning is an ability given to humans to adapt to the changing environment and gain new insights to enhance their quality of life. If a human is given the ability to learn, the same goes for an organization built by a group of people. Sony and Naik [69] suggest that OL occurs when the team members use learning to solve a common problem. Hasson *et al*., [72] insisted that learning and knowledge generated by individuals need support from the team through actions to be sustained in an organization. It differs from individual learning as OL involves sharing, action, and shared understanding among a team. Hence, OL can be defined as a change in the knowledge of the organization that occurs as a function of experience [70,72]. It is an ongoing process that involves continuous changes in the cognitions and behaviors of individuals [70].

Based on the literature review, most scholars suggest that OL occurs at three levels: individuals, groups, and organizations [72-74]. Barba Aragón *et al*., [74] discuss the learning levels in detail: Individual-level learning refers to how individuals generate new insights and knowledge from existing implicit or explicit information and knowledge. Group-level learning involves individuals transferring their knowledge within a group so that all members develop a shared understanding. Organizational level learning occurs when individual and group knowledge is institutionalized and interrelated, where individual learning is the prerequisite for the other two levels of learning. Sony and Naik [69] noticed two types of OL: exploitative and explorative. Exploitive learning involves the acquisition of new behavioral capacities framed within existing insights, known as "single-loop" learning. On the other hand, explorative learning happens when organizations acquire behavioral capacities that differ fundamentally from existing insights. Both types of learning are required to maintain constant growth. Organizations need to enhance their learning capabilities to compete in this competitive era by establishing a system where individual learning can be shared among members as it is the basis of group and OL.

2.4 Key Constructs of OL

By reviewing CSFs of LSS listed by academic researchers, practitioner publications, and recommendations by LSS experts, five LSS constructs were developed: Lean Leadership, Lean Culture, Lean Management, Change Management, and Employee Engagement. Three key constructs were developed after reviewing various research publications in OL. Below are the descriptions for the three key constructs.

Knowledge - Learning occurs in every organization regardless of training. Some researchers proposed that OL is the source of constructing new organizational knowledge [75,76]. Argote [70] found that most researchers agree with defining OL as a change in the knowledge of the organization that acts as a function of experience. The researcher categorizes OL into three sub-processes: creating, retaining, and transferring knowledge. When learning from experience occurs, an organization is gaining new knowledge. As sharing occurs, the knowledge will be retained and transferred within and between units. As OL is a process of knowledge acquisition, sharing, and application, knowledge is tightly related to OL [77]. During the learning process, the knowledge of the organization changes and manifests itself in the cognitions and behaviors of the employee. Argote and Miron-Spektor [71] mentioned that OL is an ongoing cycle that involves converting performance experience to knowledge that impacts the context of the organization and affects the future experience. Research by Basten and Haamann [78] indicates that other than learning culture, knowledge is a decisive factor in the effectiveness of implementing OL approaches. Hence, knowledge is the crucial key measure of OL.

Commitment – Organizational commitment is a "psychological state that binds the individual to the organization" [79]. Most researchers categorized commitment into affective, normative, and continuance [79,80]. All these three types of commitment interact with each other. When OL works with commitment, it helps organizations cope with interruptions and restore normalcy [79]. A literature review by Hanaysha [81] found that OL positively correlates with organizational commitment. The research also proved the relationship between commitment and OL and concluded that a higher OL culture would lead to higher organizational commitment. When an organization forms a culture of continuous learning, it will cultivate job satisfaction and organizational commitment among employees, leading to long-term stability and positive work outcomes. Usefi *et al*., [80] pointed out that commitment mediates OL and performance because OL expands the skills of employees and improves work efficiency and performance. Besides, it also develops bonds with other members, which makes the employee committed to the organization. Therefore, OL is closely connected to commitment.

Performance – In terms of OL and performance, the overall performance of a company will improve when employees obtain and apply knowledge in their everyday tasks. Performance can be referred to as the outcomes of the business process, the tasks of the operations in the organization, and the attainment of internal and external goals [82]. Argote [70] indicated that learning is the cornerstone of a successful organization and thus claimed that a deeper understanding of OL will improve the performance of the organization. Another research by Hindasah and Nuryakin [82] also indicates a notable impact of OL on financial performance, especially on small and medium enterprises (SMEs). According to research, most studies provide evidence for their correlation by Jiménez-Jiménez and Sanz-Valle [77], Noruzy *et al*., [83], and Hanaysha [81], but some studies show a weak relationship between OL and performance [84]. However, Barba Aragón *et al*., [74] proved that OL mediates the relationship between training and performance.

2.5 LSS and OL

Among the elements of LSS, one of the most popular marks of LSS is continuous improvement. According to Sony and Naik [69], continuous improvement cannot be made without OL. They also insisted that training will not succeed unless regular training and follow-up sessions are conducted. Since LSS is not merely a toolbox but a holistic philosophy, it is impossible to grasp and implement the core concepts in everyday activities without consistent learning and mutual sharing. Literature on the topics was studied to understand their relationship.

2.5.1 Lean culture and OL

One of the core concepts of the successful implementation of Lean philosophy is cultural shaping. Lean culture maintains the philosophy of continuous improvement and teamwork to ensure that customers and employees receive the most significant benefits. Lee and Myung [85] conducted a study identifying the relationship between organizational culture and OL. Their results showed that organizational culture is significantly associated with OL. In other words, the stronger the lean culture and values instilled in an organization, the more significant the impact it has on the behavior of employees [86].

H1. Lean Culture is positively related to OL

2.5.2 Lean leadership and OL

Leadership is expected to be one of the vital factors for LSS implementation that cannot be ignored. Leaders are a positive and influential factor in organizational performance [30]. Leadership can be regarded as a source of beliefs and values influencing participation in achieving set goals [24]. Much research shows the importance of leadership in the LSS field [23]. LSS is not a cost-reduction initiative but a philosophy embedded into doing things like Toyota, so it certainly involves an OL. Besides, several researchers have conducted various extensive literature reviews to determine the relationship between leadership and OL and concluded that leadership styles impact the overall performance of an organization as leaders affect how a team learns, primarily transformational leadership [88,89]. Poksinska *et al*., [87] found that many leadership behaviors exhibited by Lean managers can be classified as transformational leadership behaviors.

H2. Lean Leadership has a positive correlation with OL

2.5.3 Lean management and OL

Lean Management not only promotes standardization but also invites participation and learning. According to Stimec [46], continuous improvement in LSS is a concrete process of learning from experience, a key feature of OL. Like LSS philosophy, OL focuses on "the process by which organizations change or modify their mental models, rules, processes or knowledge, maintaining or improving their performance." [78]. Alagaraja and Herd [90] have shown how Lean thinking can relate to the characteristics of a learning organization from the three primary levels. For instance, Lean philosophy promotes collaboration, especially cross-functional learning, at the team level because Lean views a team-based working environment as an essential mechanism for enhancing learning and performance. Besides, Lean Management encourages empowerment toward a collective vision by cultivating the mindset of continuous improvement. When a team has a shared vision and mindset, OL will be developed so that the desired state of the organization can be achieved. Hence, Lean Management provides the opportunity for OL at every level.

H3. Lean Management is positively related to OL

2.5.4 Change management and OL

OL is a change in the organization to acquire a new experience. Every OL involves beliefs, cognitions, actions, or behavior [70]. Freitas *et al*., [91] mentioned that OL is a change due to gaining experience. New knowledge is created and manifested as routines, cognition, and behaviors change. Hence, it is inevitable that change management is required, especially if an enormous change is required in an organization. Pamfilie *et al*., [24] stated that resistance to change in an organization surrounding LSS improvement projects is exceptionally high. This is because an LSS implementation requires a lot of changes, including changes in the organizational culture. If a change includes improvement from one phase to another, there can be no improvement without learning.

H4. Change management is closely related to OL

2.5.5 Employee engagement and OL

Employee engagement is one of the significant concepts in organizational behavior as it concerns the level of involvement, interaction, intimacy, and influence an employee has over time [81]. For an employee to engage in their work, they need to connect through various communication methods, including sharing knowledge. The distribution and sharing of learning that reinforces and supports continuous learning will occur when an OL culture is developed. This will lead to nurturing job satisfaction and organizational commitment of the employees and ensure a stable employee workforce in the long term [81]. Besides, an opportunity for career development is essential as it enhances the working knowledge and ability of an employee, which leads to commitment and engagement [92]. Employees will feel valued and respected when they find the organization cares for their continuous growth. Since OL is impacted by the culture and all human resource management activities, an organization must manage its culture and activities to enhance employee engagement [93].

H5. Employee engagement has a positive correlation with OL

2.6 LSS Training in the Service Sector

Transforming LSS knowledge into structured training is essential for building employee skills and supporting effective implementation. Well-designed modules guide practitioners and employees through the LSS process, ensuring its success. A deeper understanding of module development and the significance of LSS training in service sectors is crucial. Madhavan *et al*., [50] noted the increasing focus on LSS models and frameworks, but a lack of comprehensive training opportunities remains a challenge, limiting LSS adoption and organizational culture transformation.

Implementing LSS in service organizations often encounters several common barriers that can hinder its effectiveness. Employee resistance is a significant challenge, as staff may feel threatened by changes to established workflows or may not fully understand the principles of LSS [23]. This resistance can stem from a lack of awareness regarding the potential benefits of LSS, leading to skepticism about its value. Insufficient management support can further complicate implementation efforts; when leaders do not actively champion LSS initiatives or allocate necessary resources, it can result in low engagement and commitment from employees [23,47]. Inadequate training resources can impede the development of essential skills, leaving employees ill-equipped to apply LSS tools effectively [23,43]. Together, these barriers can create a significant obstacle to fostering a culture of

continuous improvement within service organizations, ultimately limiting the successful adoption of LSS implementation.

2.6.1 Module development

Madhavan *et al*., [50] highlight the need for LSS training modules in the service sector, as inadequate training often hampers LSS success. The ADDIE model—comprising Analysis, Design, Development, Implementation, and Evaluation—offers a flexible and iterative framework for creating effective training modules. Well-structured training, emphasized by Albliwi *et al*., [40], is critical for embedding LSS as a holistic culture-building approach rather than a simple toolkit. The five steps of the ADDIE model are:

- Analyze: Understand the problem statement and current level of understanding
- Design: Outline the learning objectives, type of content, and method of delivery
- Development: Process of creating the module or instructional material
- Implementation: Delivery of the module to the identified target audience
- Evaluation: Assess the effectiveness of the module

2.6.2 Training and development in Lean Six Sigma

Table 1 shows that training is undeniably one of the CSFs of LSS implementation. Madhavan *et al*., [50] insisted on adequate employee training to implement LSS efficiently. Albliwi *et al*., [40] highlighted training as a crucial factor in obtaining successful results from LSS implementation. Raja Sreedharan and Raju [94] conducted a literature review of LSS in various industries and identified that most organizations use LSS as a tool or technique rather than a holistic approach. A structured review by Singh and Rathi [6] found that many LSS studies focus on LSS tools and techniques instead of the philosophy of LSS. Besides, the challenge in deploying LSS in the service sector is the lack of an in-depth understanding of LSS methodology. LSS should be a holistic approach. LSS is not applying a toolkit for improvement but a culture-building vehicle for imbibing quality excellence [17]. A team needs a correct understanding of LSS philosophy and knowledge in applying the LSS tools, especially in the service sector context. Therefore, this study aims to investigate the impact of the key aspects of LSS on OL. The study is conducted by developing relevant LSS modules for the service sector and providing training in LSS to a company in the service sector. Then, an evaluation of the impact of LSS on OL will be conducted by determining its relationship with three key OL measures: commitment, knowledge, and performance.

3. Methodology

The research starts from the literature review to the analysis of the results. After identifying research gaps through a literature review and interviews with industry experts, hypotheses were developed to investigate the impact of LSS on OL. To maximize the benefits of the module and explore the relationship between LSS and OL, questionnaires were designed and administered to a service sector company to assess and evaluate the module content.

3.1 Research Design

A thorough review of LSS literature revealed a scarcity of studies on LSS module development and its relationship with OL. Most existing module developments focus on practical LSS tools, such

as 5S and Root Cause Analysis, rather than LSS philosophy. As understanding the LSS philosophy is crucial for successful implementation, this study aimed to develop training modules that emphasize the LSS philosophy for service sector employees. The research design considered both qualitative and quantitative methods. The qualitative approach was used to design and develop the LSS modules. In contrast, the quantitative approach was employed to construct Likert Scale-based questionnaires and analyze survey results statistically.

3.2 Literature Review

The literature review, supplemented by discussions with experts, revealed that most research related to LSS is focused on Lean Manufacturing. Furthermore, LSS is often treated as a tool or technique rather than a holistic approach. One critical factor affecting LSS implementation is the lack of training, especially at the lower management level in service organizations. The review highlighted a gap between understanding LSS philosophy and its application in service organizations. Barba Aragón *et al*., [74] confirmed that training positively impacts OL, which enhances overall performance. However, research on the relationship between LSS and OL in the service sector remains limited, creating an urgent need for LSS modules that help employees understand LSS philosophy and its potential to enhance OL.

3.3 Module Design and Development

Training plays a significant role in improving employee performance, commitment, and job satisfaction. Therefore, developing high-quality LSS training modules requires careful consideration of the literature on LSS elements. Based on expert recommendations and CSFs from the literature, five main dimensions of LSS philosophy—Lean Culture, Lean Leadership, Lean Management, Change Management, and Employee Engagement—were included in the modules. The modules were adapted and modified from reliable sources, with citations provided. The ADDIE model guided the module development, including analysis, design, development, implementation, and evaluation. The content was tailored for beginners, especially at the lower management level, ensuring easy understanding with minimal use of Japanese terminology.

3.4 Case Study

After developing and validating the modules, a service sector company, VeecoTech Web & E-Commerce, in Penang, Malaysia, was contacted to participate in the project. Due to the COVID-19 pandemic, the modules were delivered online through video formats with narration. This method allowed for the continuation of the project despite physical restrictions, ensuring that the modules could still be tested in a real-world setting.

3.5 Survey Setting

Questionnaires were developed using a five-point Likert scale to assess the relationship between LSS and OL. This scale was chosen to reduce respondent frustration and increase response rates. The survey measured key constructs related to LSS philosophy—Lean Leadership, Lean Culture, Lean Management, Change Management, and Employee Engagement—and OL constructs such as commitment, knowledge, and performance. These constructs aimed to determine how LSS concepts influence knowledge flow, performance, and organizational employee commitment.

3.6 Questionnaire Development and Distribution

Based on the key constructs, five sets of questionnaires were developed and validated by LSS experts before being distributed to the participating company, as presented in Table 2. The questionnaires focused on evaluating the impact of LSS on OL through targeted questions that assessed Lean Culture, Leadership, Management, Change Management, and Employee Engagement about knowledge sharing, commitment, and performance within the organization. A Likert scale ranging from "1" (strongly disagree) to "5" (strongly agree) was used to measure the key constructs related to LSS philosophy.

Table 2
The questionnaire to the selected respondents

No	Description	Likert scale
	Lean Culture and OL	1 = strongly disagree
1	Lean culture raises the organization's commitment.	2 = disagree
2	Lean culture enhances the flow of knowledge in an organization.	3 = neither disagree
3	Lean culture boosts organizational performance.	nor agree
	Lean Leadership and OL	4 = agree
1	Lean leadership enhances the level of commitment of an organization.	5 = strongly agree
2	Lean leadership can significantly improve the flow of knowledge in an organization.	
3	A leader equipped with lean leadership abilities boosts organizational performance.	
	Lean Management and OL	
1	Lean Management motivates workers to commit consistently to their organization.	
2	Lean Management encourages employees to acquire new knowledge continuously.	
3	Lean Management helps to enhance the performance of the work process.	
	Change Management and OL	
1	Commitment from leaders, managers, employees, and stakeholders is necessary when managing a change.	
2	Without the knowledge of change management, it is impossible to manage a change effectively.	
3	Adequately managing a change process can boost an organization's performance.	
	Employee Engagement and OL	
1	Employees will be more committed to their work when they are engaged.	
2	Knowledge is a crucial factor in creating employee engagement in an organization.	
3	The performance of an organization will improve when employees are engaged.	

3.7 Follow Up

The follow-up with participants was conducted two years after their LSS training to assess the long-term effects on their practices and OL. Unstructured interviews were utilized to gather qualitative data on their experiences and perceptions regarding the implementation of LSS principles. Participants were encouraged to share their insights on how the training influenced their day-to-day operations and interactions within their teams and departments. This approach aimed to capture nuanced perspectives and facilitate a deeper understanding of the sustained impact of LSS training on OL over time.

4. Result

After implementing the module, 15 participants who completed the modules were asked to complete a questionnaire to assess the impact of LSS on OL. Table 3 presents the demographics of the sample. Demographic analysis was used to provide an overview of the profile of the respondents

at the selected service company. The respondent profile shows a fairly balanced gender split, with 53.33% male and 46.67% female. Most respondents are aged 26-30 (46.67%), followed by those 36-40 and above 41 (20% each) and 31-35 (13.33%). Most hold Executive positions (66.67%), with 20% as Officers and 13.33% as Senior Executives. Regarding service, 46.67% have 2-4 years of experience, while 26.67% have either 1-2 years or over 5 years, highlighting a young, mid-level workforce ideal for assessing Lean Six Sigma training impacts across varied experience levels.

Table 3
The respondent's profile

Variable	Frequency
Gender	
Male	53.33%
Female	46.67%
Age	
26-30	46.67%
31-35	13.33%
36-40	20%
41 and above	20%
Position	
Senior Executive	13.33%
Executive	66.67%
Officer	20%
Year of service	
1-2 years	26.67%
2-4 years	46.67%
5 years and above	26.67%

Five sets of questionnaires were created based on the module topics. This section presents the statistical analysis and results from these questionnaires. The outcomes are categorized and tabulated by module topics, and ANOVA was used to identify any significant differences between and within groups. P-values less than 0.05 were considered statistically significant, and F-values greater than 6 were used as indicators of strong evidence against the null hypothesis. Both low p-values and high F-values indicate robust results.

The impact of Lean Culture on OL was evaluated, and the findings are presented in Table 4. Lean Culture strongly correlated with organizational commitment, with 93.3% of respondents agreeing. The mean scores for commitment, knowledge flow, and performance items were 4.07, 3.93, and 3.93, respectively. The correlation between Lean Culture and organizational commitment had a p-value of 0.00 and an F-value of 512, both statistically significant. Lean Culture was also significantly correlated with knowledge flow and performance, with p-values of 0.01 and F-values of 124.7. 80.0% of respondents agreed that Lean Culture enhances knowledge flow and improves organizational performance. The overall impact of Lean Culture on OL was statistically significant, with a p-value of 0.00 and an F-value of 542.6.

Table 4
Statistical analysis of the Lean Culture impact on OL

Items	X ± SD	Σ	P	F	Likert Scale Points				
					5 (%)	4 (%)	3 (%)	2 (%)	1 (%)
Lean culture raises the organization's commitment.	4.07±0.26	61	0.00	512	1 (6.7%)	14 (93.3%)	0	0	0

Lean culture enhances the flow of knowledge in an organization.	3.93±0.46	59	0.01	124.7	1 (6.7%)	12 (80.0%)	2 (13.3%)	0	0
Lean culture boosts organizational performance.	3.93±0.46	59	0.01	124.7	1 (6.7%)	12 (80.0%)	2 (13.3%)	0	0
Lean Culture is positively related to OL	3.98±0.40	179	0.00	542.6	3 (6.7%)	38 (84.4%)	4 (8.9%)	0	0

X = mean of points, SD = Standard Deviation, Σ = sum of points, p = P-value, F= F-value

The impact of Lean Leadership on OL was analyzed, as shown in Table 5. All respondents agreed that Lean Leadership enhances organizational commitment, and the mean scores for commitment, knowledge flow, and performance were 4.33, 3.87, and 4.40, respectively. The p-value for commitment was 0.01, and the F-value was 224, indicating significant differences. Although 33.3% of respondents only partially agreed that Lean Leadership improves knowledge flow, the p-value of 0.01 and F-value of 40.8 confirmed a significant impact. Furthermore, 46.7% of respondents strongly agreed that Lean Leadership boosts organizational performance, with a p-value of 0.00 and an F-value of 147 confirming a significant correlation. Overall, Lean Leadership significantly impacted OL, as the total p-value was 0.01 and the F-value was 297.

Table 5
Statistical analysis of the Lean Leadership impact on OL

Items	X ± SD	Σ	P	F	Likert Scale Points				
					5 (%)	4 (%)	3 (%)	2 (%)	1 (%)
Lean leadership enhances the level of commitment of an organization.	4.33±0.49	65	0.01	224	5 (33.3%)	10 (66.7%)	0	0	0
Lean leadership can significantly improve the flow of knowledge in an organization.	3.87±0.74	58	0.01	40.8	3 (20.0%)	7 (46.7%)	5 (33.3%)	0	0
A leader equipped with lean leadership abilities boosts organizational performance.	4.40±0.63	66	0.00	147	7 (46.7%)	7 (46.7%)	1 (6.6%)	0	0
Lean Leadership has a positive correlation with OL.	4.20±0.66	189	0.01	297	15 (33.3%)	24 (53.4%)	6 (13.3%)	0	0

X = mean of points, SD = Standard Deviation, Σ = sum of points, p = P-value, F= F-value

The impact of Lean Management on OL is presented in Table 6. The mean commitment, knowledge flow, and performance scores were 4.39, 4.15, and 4.00, respectively. Of the respondents, 61.5% agreed that Lean Management motivates workers to commit to the organization consistently. Lean Management also encouraged continuous knowledge acquisition, with a p-value of 0.00 and an F-value of 245.5. Additionally, 84.6% of respondents agreed that Lean Management enhances organizational performance. The p-value of 0.01 and F-value of 156 indicated significant results. Overall, Lean Management had a statistically significant impact on OL, with a p-value of 0.00 and an F-value of 532.5.

Table 6
Statistical analysis of the Lean Management impact on OL

Items	X ± SD	Σ	P	F	Likert Scale Points				
					5 (%)	4 (%)	3 (%)	2 (%)	1 (%)
Lean Management motivates workers to commit consistently to their organization.	4.39±0.51	57	0.01	194.4	5 (38.5%)	8 (61.5%)	0	0	0

Lean Management encourages employees to acquire new knowledge continuously.	4.15±0.38	54	0.00	245.5	2 (15.4%)	11 (84.6%)	0	0	0
Lean Management helps to enhance the performance of the work process.	4.00±0.41	52	0.01	156	1 (7.7%)	11 (84.6%)	1 (7.7%)	0	0
Lean Management is positively related to OL.	4.18±0.45	163	0.00	532.5	8 (20.5%)	30 (76.9%)	1 (2.6%)	0	0

X = mean of points, SD = Standard Deviation, Σ = sum of points, p = P-value, F= F-value

The impact of Change Management on OL is shown in Table 7. The mean commitment, knowledge flow, and performance scores were 4.27, 4.09, and 4.27, respectively. More than 72.7% of respondents agreed that effective change requires commitment from all stakeholders. The p-value of 0.00 and F-value of 163.3 confirmed a significant correlation between commitment and Change Management. Additionally, proper knowledge of Change Management was deemed essential for managing change effectively, as the p-value of 0.01 and F-value of 90 indicated statistically significant results. Change Management also positively impacted organizational performance, with a p-value of 0.00 and an F-value of 163.3. The overall impact of Change Management on OL was statistically significant, with a p-value of 0.01 and an F-value of 412.9.

Table 7
Statistical analysis of the Change Management impact on OL

Items	**X ± SD**	**Σ**	**P**	**F**	**Likert Scale Points**				
					5 (%)	**4 (%)**	**3 (%)**	**2 (%)**	**1 (%)**
Commitment from leaders, managers, employees, and stakeholders is necessary when managing a change.	4.27±0.47	47	0.00	163.3	3 (27.3%)	8 (72.7%)	0	0	0
Without the knowledge of change management, it is impossible to manage a change effectively.	4.09±0.54	45	0.01	90	2 (18.2%)	8 (72.7%)	1 (9.1%)	0	0
Adequately managing a change process can boost an organization's performance.	4.27±0.47	47	0.00	163.3	3 (27.3%)	8 (72.7%)	0	0	0
Change management is positively related to OL.	4.21±0.48	139	0.01	412.9	8 (24.2%)	24 (72.7%)	1 (3.1%)	0	0

X = mean of points, SD = Standard Deviation, Σ = sum of points, p = P-value, F= F-value

The impact of employee engagement on OL was examined, and the results are presented in Table 8. The mean commitment, knowledge flow, and performance scores were 4.53, 4.13, and 4.13, respectively. 53.3% of respondents strongly agreed that Employee Engagement motivates workers to commit to their work, and the p-value of 0.01 and F-value of 264.5 confirmed significant differences. Additionally, 93.3% of respondents agreed that knowledge is crucial for creating employee engagement, with a p-value of 0.00 and an F-value of 144.5 supporting the result. Furthermore, the positive correlation between Employee Engagement and organizational performance was confirmed, with a p-value of 0.00 and an F-value of 144.5. Overall, Employee Engagement significantly impacted OL, with a p-value of 0.01 and an F-value of 496.3.

Table 8
Statistical analysis of the Employee Engagement impact on OL

Items	X ± SD	Σ	P	F	Likert Scale Points				
					5 (%)	4 (%)	3 (%)	2 (%)	1 (%)
Employees will be more committed to their work when they are engaged.	4.53±0.52	68	0.01	264.5	8 (53.3%)	7 (46.7%)	0	0	0
Knowledge is a crucial factor in creating employee engagement in an organization.	4.13±0.52	62	0.00	144.5	3 (20.0%)	11 (73.3%)	1 (6.7%)	0	0
The performance of an organization will improve when employees are engaged.	4.13±0.52	62	0.00	144.5	3 (20.0%)	11 (73.3%)	1 (6.7%)	0	0
Employee engagement has a positive correlation with OL.	4.27±0.54	139	0.01	496.3	14 (31.2%)	29 (64.4%)	2 (4.4%)	0	0

X = mean of points, SD = Standard Deviation, Σ = sum of points, p = P-value, F= F-value

4.1 Correlation between LSS and OL

A path diagram, as shown in Figure 1, was made to show the relationship between the LSS and key constructs of OL by displaying the p-values. The result of a p-value between 0.00-0.01 indicates that Lean Culture, Lean Leadership, Lean Management, Change Management, and Employee Engagement have a positive correlation to OL. Meanwhile, the overall p-value of the ANOVA result is 0.01, proving that LSS has a significant impact on OL.

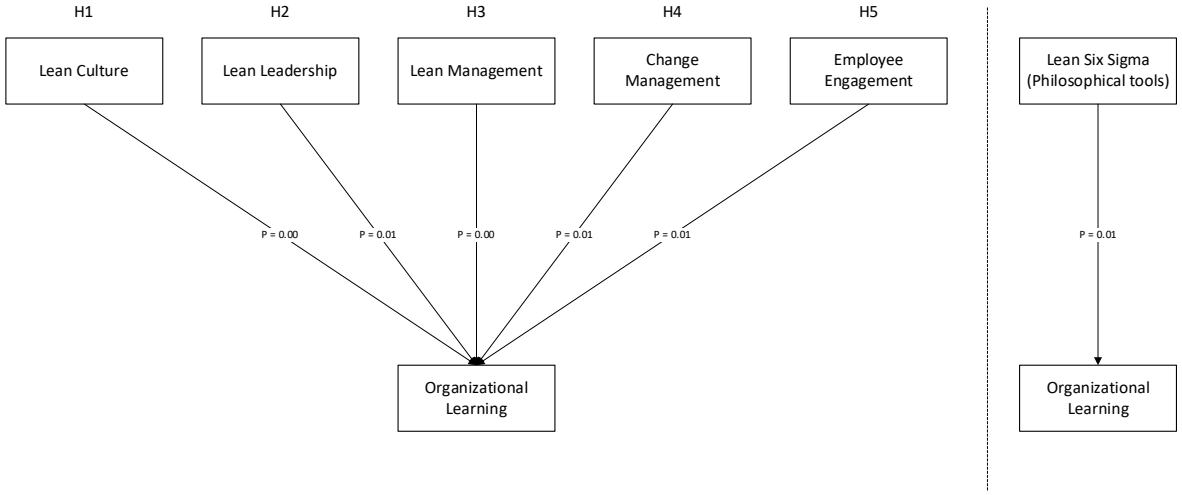


Fig. 1. Path diagram relationship of LSS and OL

5. Discussion

Since the emergence of LSS as an integrated methodology within service sectors, there has been a notable increase in organizations embracing its principles. However, a significant gap remains between the awareness of the importance of LSS and its practical application within organizations. Each organization has distinct learning processes that influence the effectiveness of LSS implementation. To address this, five LSS modules were developed and implemented in a service sector organization, specifically targeting personnel at lower and middle management levels, as they constitute the primary workforce. Questionnaires were designed, and statistical analyses were

conducted to evaluate the impact of LSS on OL. This section discusses the results of the topics covered and connects them to the changes observed within the partner company.

5.1 The linkage of Lean Philosophy Tools to OL

The findings indicate a significant connection between Lean Culture, Lean Leadership, Lean Management, and OL. Lean Culture has been shown to enhance employee commitment by creating an environment where employees feel valued and secure. Research indicates that a strong Lean Culture fosters commitment through waste elimination, continuous improvement, and knowledge sharing [79]. For instance, when employees are involved in decision-making processes and encouraged to share ideas, their commitment to the organization increases productivity and efficiency.

Lean Culture plays a critical role in knowledge acquisition and transfer. It necessitates that employees continuously learn and adapt to the Lean philosophy, which includes practices like Just-In-Time (JIT) and Kaizen. An example from the partner company illustrates this: Before implementing Lean practices, employees often worked in isolation, unaware of opportunities for improvement. However, with the introduction of Kaizen, employees actively began to participate in discussions about process enhancements, leading to an increase in collaborative knowledge sharing and overall OL.

Lean Leadership significantly influences OL by promoting a culture of continuous improvement and accountability. Leaders who embody Lean principles foster commitment by valuing employee input and encouraging team members to take ownership of their work. This approach enhances trust and security among employees and aligns their daily tasks with the strategic goals of the organization. For example, a team leader in the partner company empowered team members to express their creativity in content creation, resulting in higher-quality outputs and greater engagement from the team.

Lean Management, through its structured approach to process improvement, also contributes to OL. It emphasizes eliminating waste and focusing on value from the customer's perspective. When employees understand the principles of Lean Management and are actively involved in value creation, their commitment to the organization increases. The daily progress meetings between employees and supervisors encourage active participation, ensuring every employee is engaged in continuous improvement.

Change Management has emerged as a vital component in facilitating OL. It directly influences employee commitment and knowledge acquisition. Effective change management practices ensure that employees are supported during transitions, enhancing their commitment to the organization. For example, the partner company faced high turnover rates among interns due to insufficient training. The management team provided tailored support by implementing one-on-one training sessions, helping interns navigate their roles more effectively. This initiative resulted in an increased commitment from the interns, who felt supported and valued during their transition.

Moreover, knowledge plays a crucial role in successfully implementing change management. Before any change, organizations must possess the relevant knowledge to identify existing challenges and understand the needs of their employees. According to Kurt Lewin's Change Management model, employees often resist change due to uncertainty. Organizations can mitigate resistance and foster a smoother transition by prioritizing knowledge sharing and providing comprehensive training. The company emphasizes on continuous learning during change initiatives has proven beneficial in enhancing overall OL.

5.2 The impact of LSS in OL over time

The results of the longitudinal study, conducted two years after the implementation of LSS, provided significant insights into its impact on OL. Participants reported a transformation in their problem-solving approaches, indicating that LSS principles, including lean management, change management, employee engagement, and lean culture, had become embedded in the organizational culture rather than being viewed as mere tools. One participant highlighted improvements in operational efficiency, attributing this to a commitment to learning from each project and sharing insights across teams, reflecting the philosophical underpinnings of LSS. Another emphasized that the structured framework of LSS encouraged a continuous learning mindset and regular review sessions to discuss lessons learned, fostering openness and innovation among team members. Team leaders noted a cultural shift from a blame-oriented approach to one focused on analyzing failures for valuable lessons, ultimately enhancing morale and resilience. Participants also recognized systematic documentation and knowledge-sharing practices that improved accountability and contributed to collective success, demonstrating the lasting influence of LSS on the organization's learning culture.

6. Conclusion

This study underscores the significance of the LSS philosophy within the service sector and explores its relationship with OL through the development of targeted LSS training modules. While the importance of LSS implementation in service sectors has been widely acknowledged in academic literature, a notable gap persists between understanding LSS principles and their practical application within organizations.

To address this gap, the study investigated the interconnections between five key LSS philosophical topics and three essential constructs of OL. This was achieved by developing LSS training modules tailored for the service sector using the ADDIE model, which was then implemented in an IT and software development company in Penang, Malaysia. Furthermore, the study assessed the impact of LSS on OL by constructing questionnaires and conducting statistical analyses, including ANOVA. The findings reveal a positive relationship between the five LSS philosophical tools and OL, indicating that integrating these tools significantly enhances learning processes within the organization. Despite these promising results, the study is limited to only five LSS philosophical tools and focuses exclusively on one service sector—IT and software development.

To build upon the insights gained from this research, future studies should explore additional LSS topics and broaden the scope of the training modules. Investigating the applicability of these modules across multiple service sectors—such as healthcare, finance, and hospitality—will enhance the generalizability of the findings and provide a more comprehensive understanding of the impact of LSS on OL. Comparative studies can identify sector-specific challenges and benefits associated with LSS implementation, yielding valuable empirical evidence that enables organizations to adapt and apply LSS principles more effectively. Additionally, future research could incorporate longitudinal studies to assess the long-term effects of LSS training on OL and performance. By addressing these areas, practitioners and scholars can bridge the gap between LSS understanding and application, ultimately fostering a culture of continuous improvement across various service industries.

Acknowledgement
This research was not funded by any grant.

References

[1] Gupta, Shradha, Monica Sharma, and Vijaya Sunder M. "Lean services: a systematic review." *International Journal of productivity and performance management* 65, no. 8 (2016): 1025-1056. https://doi.org/10.1108/IJPPM-02-2015-0032

[2] Mustapha, Mohamad Reeduan, Fauziah Abu Hasan, and Mohd Shaladdin Muda. "Lean Six Sigma implementation: multiple case studies in a developing country." *International Journal of Lean Six Sigma* 10, no. 1 (2019): 523-539. https://doi.org/10.1108/IJLSS-08-2017-0096

[3] Raja Sreedharan, V., R. Raju, and S. Srivatsa Srinivas. "A review of the quality evolution in various organisations." *Total Quality Management & Business Excellence* 28, no. 3-4 (2017): 351-365. https://doi.org/10.1080/14783363.2015.1082421

[4] Anttila, Juhani, and Kari Jussila. "Organizational learning in developing the integrated quality management." *Production engineering archives* 18, no. 18 (2018): 3-13. https://doi.org/10.30657/pea.2018.18.01

[5] Enoch, Okpala Kenneth. "Lean six sigma methodologies and organizational profitability: a review of manufacturing SMEs in Nigeria." *American Journal of Industrial and Business Management* 3, no. 06 (2013): 573. https://doi.org/10.4236/ajibm.2013.36066

[6] Singh, Mahipal, and Rajeev Rathi. "A structured review of Lean Six Sigma in various industrial sectors." *International Journal of Lean Six Sigma* 10, no. 2 (2019): 622-664. https://doi.org/10.1108/IJLSS-03-2018-0018

[7] Vijaya Sunder, M. "Lean Six Sigma in higher education institutions." *International Journal of Quality and Service Sciences* 8, no. 2 (2016): 159-178. https://doi.org/10.1108/IJQSS-04-2015-0043

[8] Antony, Jiju, Ronald Snee, and Roger Hoerl. "Lean Six Sigma: yesterday, today and tomorrow." *International Journal of Quality & Reliability Management* 34, no. 7 (2017): 1073-1093. https://doi.org/10.1108/IJQRM-03-2016-0035

[9] Albliwi, Saja, Jiju Antony, Sarina Abdul Halim Lim, and Ton van der Wiele. "Critical failure factors of Lean Six Sigma: a systematic literature review." *International Journal of Quality & Reliability Management* 31, no. 9 (2014): 1012-1030. https://doi.org/10.1108/IJQRM-09-2013-0147/FULL/PDF

[10] Yadav, Gunjan, and Tushar N. Desai. "Lean Six Sigma: a categorized review of the literature." *International Journal of Lean Six Sigma* 7, no. 1 (2016): 2-24. https://doi.org/10.1108/IJLSS-05-2015-0015

[11] Grönroos, Christian. *Service management and marketing*. Vol. 27. Lexington, MA: Lexington books, 1990.

[12] Snee, Ronald D. "Lean Six Sigma–getting better all the time." *International Journal of Lean Six Sigma* 1, no. 1 (2010): 9-29. https://doi.org/10.1108/20401461011033130/FULL/XML

[13] Bowen, David E., and William E. Youngdahl. "“Lean” service: in defense of a production-line approach." *International journal of service industry management* 9, no. 3 (1998): 207-225. https://doi.org/10.1108/09564239810223510

[14] Chaplin, Lara, and Simon TJ O'Rourke. "Lean Six Sigma and marketing: a missed opportunity." *International Journal of Productivity and Performance Management* 63, no. 5 (2014): 665-674. https://doi.org/10.1108/IJPPM-09-2013-0155/FULL/PDF

[15] Antony, Jiju, Sandeep Gupta, Vijaya Sunder M, and E. V. Gijo. "Ten commandments of Lean Six Sigma: A practitioners' perspective." *International Journal of Productivity and Performance Management* 67, no. 6 (2018): 1033-1044. https://doi.org/10.1108/IJPPM-07-2017-0170

[16] Ashok Sarkar, Shri, Arup Ranjan Mukhopadhyay, and Sadhan Kumar Ghosh. "Improvement of claim processing cycle time through Lean Six Sigma methodology." *International journal of lean six sigma* 4, no. 2 (2013): 171-183. https://doi.org/10.1108/20401461311319347/FULL/PDF

[17] Sunder M, Vijaya, and Jiju Antony. "A conceptual Lean Six Sigma framework for quality excellence in higher education institutions." *International Journal of Quality & Reliability Management* 35, no. 4 (2018): 857-874. https://doi.org/10.1108/IJQRM-01-2017-0002

[18] Arumugam, Vector, Jiju Antony, and Alex Douglas. "Observation: a Lean tool for improving the effectiveness of Lean Six Sigma." *The TQM Journal* 24, no. 3 (2012): 275-287. https://doi.org/10.1108/17542731211226781

[19] Trakulsunti, Yaifa, and Jiju Antony. "Can Lean Six Sigma be used to reduce medication errors in the health-care sector?." *Leadership in Health Services* 31, no. 4 (2018): 426-433. https://doi.org/10.1108/LHS-09-2017-0055

[20] Costa, Luana Bonome Message, and Moacir Godinho Filho. "Lean healthcare: review, classification and analysis of literature." *Production Planning & Control* 27, no. 10 (2016): 823-836.https://doi.org/10.1080/09537287.2016.1143131

[21] Islam, Md Shahidul, and Shamsuddin Ahmed. "Work Standardization in Lean Manufacturing for Improvement of Production Line Performance in SME." *Malaysian Journal on Composites Science and Manufacturing* 13, no. 1 (2024): 68-81. https://doi.org/10.37934/mjcsm.13.1.6881

[22] Morris, Tom. (2015, February 12). *Philosophical Tools*.
[23] Laureani, Alessandro, and Jiju Antony. "Leadership characteristics for lean six sigma." *Total Quality Management & Business Excellence* 28, no. 3-4 (2017): 405-426. https://doi.org/10.1080/14783363.2015.1090291
[24] Pamfilie, Rodica, Andreea Jenica Petcu, and Mihai Draghici. "The importance of leadership in driving a strategic Lean Six Sigma management." *Procedia-Social and Behavioral Sciences* 58 (2012): 187-196. https://doi.org/10.1016/j.sbspro.2012.09.992
[25] Tsironis, Loukas K., and Alexandros G. Psychogios. "Road towards Lean Six Sigma in service industry: a multi-factor integrated framework." *Business Process Management Journal* 22, no. 4 (2016): 812-834. https://doi.org/10.1108/BPMJ-08-2015-0118
[26] Allen, Janis, and Michael McCarthy. *How to engage, involve, and motivate employees: Building a culture of lean leadership and two-way communication*. Productivity Press, 2017. https://doi.org/10.1201/9781315154954
[27] Galli, Brian J., Mohamad Amin Kaviani, and Chloe Salome Margulis. "Impacts of change management on Six Sigma team leadership style." *Middle East Journal of Management* 4, no. 4 (2017): 267-282. https://doi.org/10.1504/mejm.2017.10008292
[28] Antony, Jiju, Bryan Rodgers, Inness Coull, and Vijaya Sunder M. "Lean Six Sigma in policing services: A case study from an organisational learning perspective." *International Journal of Productivity and Performance Management* 67, no. 5 (2018): 935-940. https://doi.org/10.1108/IJPPM-07-2017-0173
[29] Pathiratne, Sonali Udeeka, Ali Khatibi, and Md Gapar Md Johar. "CSFs for Six Sigma in service and manufacturing companies: an insight on literature." *International Journal of Lean Six Sigma* 9, no. 4 (2018): 543-561. https://doi.org/10.1108/IJLSS-08-2017-0092
[30] Al-Najem, Mohamad, Hom Dhakal, and Nick Bennett. "The role of culture and leadership in lean transformation: a review and assessment model." *International Journal of Lean Thinking* 3, no. 1 (2012): 119-138.
[31] Maciel-Monteon, Marco, Jorge Limon-Romero, Carlos Gastelum-Acosta, Diego Tlapa, Yolanda Baez-Lopez, and Héctor Antonio Solano-Lamphar. "Measuring critical success factors for six sigma in higher education institutions: Development and validation of a surveying instrument." *IEEE Access* 8 (2019): 1813-1823.https://doi.org/10.1109/ACCESS.2019.2962521
[32] Juliani, Fernando, and Otávio José de Oliveira. "Lean six sigma in the public sector: overcoming persistent management challenges." *Quality Management Journal* 28, no. 2 (2021): 58-75. https://doi.org/10.1080/10686967.2021.1886022
[33] Hasim, Nur Aiman Hanis, Suriati Akmal, Sayed Kushairi Sayed Nordin, Ruzy Haryati Hambali, Mohd Fauzi Mamat, Abdulla Thamer Jumma Aldharif Alshamsi, and Supawi Pawenang. "Modelling Total Quality Management in the Malaysian Composite Manufacturing Industry." *Malaysian Journal on Composites Science and Manufacturing* 7, no. 1 (2022): 11-22. https://doi.org/10.37934/mjcsm.7.1.1122
[34] Fadly Habidin, Nurul, and Sha'ri Mohd Yusof. "Critical success factors of Lean Six Sigma for the Malaysian automotive industry." *International Journal of Lean Six Sigma* 4, no. 1 (2013): 60-82.https://doi.org/10.1108/20401461311310526
[35] Jeyaraman, K., and Leam Kee Teo. "A conceptual framework for critical success factors of lean Six Sigma: Implementation on the performance of electronic manufacturing service industry." *International Journal of Lean Six Sigma* 1, no. 3 (2010): 191-215. https://doi.org/10.1108/20401461011075008
[36] Manville, Graham, Richard Greatbanks, Radica Krishnasamy, and David W. Parker. "Critical success factors for Lean Six Sigma programmes: a view from middle management." *International Journal of Quality & Reliability Management* 29, no. 1 (2012): 7-20. https://doi.org/10.1108/02656711211190846
[37] Hilton, Roger John, and Amrik Sohal. "A conceptual model for the successful deployment of Lean Six Sigma." *International Journal of Quality & Reliability Management* 29, no. 1 (2012): 54-70. https://doi.org/10.1108/02656711211190873
[38] Psychogios, Alexandros G., and Loukas K. Tsironis. "Towards an integrated framework for Lean Six Sigma application: Lessons from the airline industry." *Total Quality Management & Business Excellence* 23, no. 3-4 (2012): 397-415.https://doi.org/10.1080/14783363.2011.637787
[39] Laureani, Alessandro, and Jiju Antony. "Critical success factors for the effective implementation of Lean Sigma: Results from an empirical study and agenda for future research." *International Journal of Lean Six Sigma* 3, no. 4 (2012): 274-283. https://doi.org/10.1108/20401461211284743
[40] Albliwi, Saja Ahmed, Jiju Antony, and Sarina Abdul Halim Lim. "A systematic review of Lean Six Sigma for the manufacturing industry." *Business process management journal* 21, no. 3 (2015): 665-691. https://doi.org/10.1108/BPMJ-03-2014-0019/FULL/PDF
[41] Asnan, Rabiha, Norani Nordin, and Siti Norezam Othman. "Managing change on lean implementation in service sector." *Procedia-Social and Behavioral Sciences* 211 (2015): 313-319. https://doi.org/10.1016/j.sbspro.2015.11.040

[42] Iberahim, Hadijah, Izmahariz Azman, Mohd Haniff Shahri, and Nur Fara Ellyanie Abdul Hamid. "Employee engagement for high firm performance: the case of lean six sigma at a Malaysia trading company." *e-Academia Journal* 9, no. 1 (2020). http://journale-academiauitmt.uitm.edu.my/v2/index.php/home.html
[43] Yadav, Neeraj, Ravi Shankar, and Surya Prakash Singh. "Critical success factors for lean six sigma in quality 4.0." *International Journal of Quality and Service Sciences* 13, no. 1 (2021): 123-156. https://doi.org/10.1108/IJQSS-06-2020-0099
[44] Baker, Jared V. *The effects of change management on employee engagement: Using lean principles to increase engagement*. California State University, Long Beach, 2011.
[45] Jaca, Carmen, Javier Santos, Ander Errasti, and Elisabeth Viles. "Lean thinking with improvement teams in retail distribution: a case study." *Total Quality Management & Business Excellence* 23, no. 3-4 (2012): 449-465. https://doi.org/10.1080/14783363.2011.593907
[46] Stimec, Arnaud. "Lean management and occupational health: team learning as a key factor." *Journal of Workplace Learning* 32, no. 5 (2020): 363-375. https://doi.org/10.1108/JWL-08-2019-0104
[47] Sunder, M. "Six sigma-a strategy for increasing employee engagement." *The Journal for Quality and Participation, ASQ Publications* (2013).
[48] Laureani, Alessandro, and Jiju Antony. "Leadership and Lean Six Sigma: a systematic literature review." *Total Quality Management & Business Excellence* 30, no. 1-2 (2019): 53-81. https://doi.org/10.1080/14783363.2017.1288565
[49] Alston, Frances. *Lean implementation: Applications and hidden costs*. CRC Press, 2017. https://doi.org/10.1201/9781315154497/LEAN-IMPLEMENTATION-FRANCES-ALSTON
[50] Sreedharan V, Raja, Vijaya Sunder M, Vandana Madhavan, and Anand Gurumurthy. "Development of lean six sigma training module: evidence from an emerging economy." *International Journal of Quality & Reliability Management* 37, no. 5 (2020): 689-710. https://doi.org/10.1108/IJQRM-08-2018-0209
[51] Mann, David. *Creating a lean culture: tools to sustain lean conversions*. Productivity Press, 2005. https://doi.org/10.1201/b17563
[52] Iranmanesh, Mohammad, Suhaiza Zailani, Sunghyup Sean Hyun, Mohd Helmi Ali, and Kwangyong Kim. "Impact of lean manufacturing practices on firms' sustainable performance: Lean culture as a moderator." *Sustainability* 11, no. 4 (2019): 1112. https://doi.org/10.3390/su11041112
[53] Osman, Azim Azuan, Norani Nordin, and Mohd Faizol Abd Rahman. "Measuring lean culture: designing a research instrument." *Journal of Modern Manufacturing Systems and Technology* 5, no. 1 (2021): 7-17. https://doi.org/10.15282/jmmst.v5i1.5821
[54] Dorval, Marc, Marie-Hélène Jobin, and Nadia Benomar. "Lean culture: a comprehensive systematic literature review." *International Journal of Productivity and Performance Management* 68, no. 5 (2019): 920-937.https://doi.org/10.1108/IJPPM-03-2018-0087
[55] Zhang, Qun, Muhammad Irfan, Muhammad Aamir Obaid Khattak, Jaffar Abbas, Xiaoning Zhu, and Muhammad Sanaullah Shah. "Critical success factors for successful lean six sigma implementation in Pakistan." *Interdisciplinary journal of contemporary research in business* 4, no. 1 (2012): 117-124.
[56] Kundu, Goutam, and B. Murali Manohar. "Critical success factors for implementing lean practices in it support services." *International Journal for Quality Research* 6, no. 4 (2012).
[57] Aij, Kjeld Harald, and Maurits Teunissen. "Lean leadership attributes: a systematic review of the literature." *Journal of health organization and management* 31, no. 7/8 (2017): 713-729. https://doi.org/10.1108/JHOM-12-2016-0245
[58] Dombrowski, Uwe, and T. J. P. C. Mielke. "Lean leadership–fundamental principles and their application." *Procedia cirp* 7 (2013): 569-574. https://doi.org/10.1016/j.procir.2013.06.034
[59] Zarbo, Richard J. "Creating and sustaining a lean culture of continuous process improvement." *American journal of clinical pathology* 138, no. 3 (2012): 321-326. https://doi.org/10.1309/AJCP2QY1XGKTSNQF
[60] Sony, Michael. "Industry 4.0 and lean management: a proposed integration model and research propositions." *Production & Manufacturing Research* 6, no. 1 (2018): 416-432. https://doi.org/10.1080/21693277.2018.1540949
[61] Womack, James P., and Daniel T. Jones. "Lean thinking—banish waste and create wealth in your corporation." *Journal of the operational research society* 48, no. 11 (1997): 1148-1148. https://doi.org/10.1057/palgrave.jors.2600967
[62] Ohno, Taiichi. *Toyota production system: beyond large-scale production*. Productivity press, 2019.https://doi.org/10.4324/9780429273018/TOYOTA-PRODUCTION-SYSTEM-TAIICHI-OHNO-NORMAN-BODEK
[63] Kadarova, Jaroslava, and Michal Demecko. "New approaches in lean management." *Procedia Economics and Finance* 39 (2016): 11-16. https://doi.org/10.1016/s2212-5671(16)30234-9

[64] Bakar, Fairul Anwar Abu, Khairanum Subari, and Mohd Amran Mohd Daril. "Critical success factors of Lean Six Sigma deployment: a current review." *International Journal of Lean Six Sigma* 6, no. 4 (2015): 339-348. https://doi.org/10.1108/IJLSS-04-2015-0011

[65] Cummings, Stephen, Todd Bridgman, and Kenneth G. Brown. "Unfreezing change as three steps: Rethinking Kurt Lewin's legacy for change management." *Human relations* 69, no. 1 (2016): 33-60.https://doi.org/10.1177/0018726715577707

[66] Sun, Li, and Chanchai Bunchapattanasakda. "Employee engagement: A literature review." *International Journal of Human Resource Studies* 9, no. 1 (2019): 63-80. https://doi.org/10.5296/ijhrs.v9i1.14167

[67] Sendawula, Kasimu, Saadat Nakyejwe Kimuli, Juma Bananuka, and Grace Najjemba Muganga. "Training, employee engagement and employee performance: Evidence from Uganda's health sector." *Cogent Business & Management* 5, no. 1 (2018): 1470891. https://doi.org/10.1080/23311975.2018.1470891

[68] Chanana, Nisha, and Sangeeta. "Employee engagement practices during COVID-19 lockdown." *Journal of public affairs* 21, no. 4 (2021): e2508. https://doi.org/10.1002/pa.2508

[69] Sony, Michael, and Subhash Naik. "Six Sigma, organizational learning and innovation: An integration and empirical examination." *International Journal of Quality & Reliability Management* 29, no. 8 (2012): 915-936.https://doi.org/10.1108/02656711211258535

[70] Argote, Linda. "Organizational learning research: Past, present and future." *Management learning* 42, no. 4 (2011): 439-446. https://doi.org/10.1177/1350507611408217

[71] Argote, Linda, and Ella Miron-Spektor. "Organizational learning: From experience to knowledge." *Organization science* 22, no. 5 (2011): 1123-1137. https://doi.org/10.1287/orsc.1100.0621

[72] Hasson, Henna, Ulrica von Thiele Schwarz, Stefan Holmstrom, Maria Karanika-Murray, and Susanne Tafvelin. "Improving organizational learning through leadership training." *Journal of Workplace Learning* 28, no. 3 (2016): 115-129. https://doi.org/10.1108/JWL-06-2015-0049

[73] Jyothibabu, C. D., Ayesha Farooq, and Bibhuti Bhusan Pradhan. "An integrated scale for measuring an organizational learning system." *The Learning Organization* 17, no. 4 (2010): 303-327. https://doi.org/10.1108/09696471011043081

[74] Aragón, María Isabel Barba, Daniel Jiménez Jiménez, and Raquel Sanz Valle. "Training and performance: The mediating role of organizational learning." *BRQ business research quarterly* 17, no. 3 (2014): 161-173.https://doi.org/10.1016/j.cede.2013.05.003

[75] Cheng, Hilary, Ming-Shan Niu, and Kuei-Hsien Niu. "Industrial cluster involvement, organizational learning, and organizational adaptation: an exploratory study in high technology industrial districts." *Journal of Knowledge Management* 18, no. 5 (2014): 971-990. https://doi.org/10.1108/JKM-06-2014-0244/FULL/PDF

[76] Chiva, Ricardo, Pervez Ghauri, and Joaquín Alegre. "Organizational learning, innovation and internationalization: A complex system model." *British Journal of Management* 25, no. 4 (2014): 687-705. https://doi.org/10.1111/1467-8551.12026

[77] Jiménez-Jiménez, Daniel, and Raquel Sanz-Valle. "Innovation, organizational learning, and performance." *Journal of business research* 64, no. 4 (2011): 408-417. https://doi.org/10.1016/j.jbusres.2010.09.010

[78] Basten, Dirk, and Thilo Haamann. "Approaches for organizational learning: A literature review." *Sage Open* 8, no. 3 (2018): 2158244018794224. https://doi.org/10.1177/2158244018794224

[79] Somaskandan, Karthikeyan, Savarimuthu Arulandu, and Satyanarayana Parayitam. "A moderated-mediation model of individual learning and commitment: part I." *The Learning Organization* 29, no. 4 (2022): 341-356.https://doi.org/10.1108/TLO-12-2021-0139

[80] Usefi, Somayeh, Rasool Nazari, and Tayebeh Zargar. "The Relationship between organizational learning and organizational commitment in sport organizations." *Management and Administrative Sciences Review* 2, no. 6 (2013): 682-688.. https://doi.org/10.29210/3003673000

[81] Hanaysha, Jalal. "Testing the effects of employee engagement, work environment, and organizational learning on organizational commitment." *Procedia-Social and Behavioral Sciences* 229 (2016): 289-297. https://doi.org/10.1016/j.sbspro.2016.07.139

[82] Hindasah, Lela, and Nuryakin Nuryakin. "The relationship between organizational capability, organizational learning and financial performance." *The Journal of Asian Finance, Economics and Business* 7, no. 8 (2020): 625-633.https://doi.org/10.13106/JAFEB.2020.VOL7.NO8.625

[83] Noruzy, Ali, Vahid Majazi Dalfard, Behnaz Azhdari, Salman Nazari-Shirkouhi, and Aliasghar Rezazadeh. "Relations between transformational leadership, organizational learning, knowledge management, organizational innovation, and organizational performance: an empirical investigation of manufacturing firms." *The International Journal of Advanced Manufacturing Technology* 64 (2013): 1073-1085.https://doi.org/10.1007/S00170-012-4038-Y/TABLES/1

[84] Hendri, Muhammad Irfani. "The mediation effect of job satisfaction and organizational commitment on the organizational learning effect of the employee performance." *International Journal of Productivity and Performance Management* 68, no. 7 (2019): 1208-1234. https://doi.org/10.1108/IJPPM-05-2018-0174

[85] Lee, Jaeyong, and Myung H. Jin. "Understanding the organizational learning culture—Innovative behavior relation in local government: The roles of knowledge sharing and job autonomy." *Public Administration* 101, no. 4 (2023): 1326-1348. https://doi.org/10.1111/padm.12884

[86] Aghakhani, Atena, Golamreza Hashemzadeh Khoorasgani, and Ashraf Shahmansoury. "The impact of lean thinking on organizational learning case study: SAIPA automobile manufacturing group." *Mediterranean Journal of Social Sciences* 7, no. 4 (2016): S1. https://doi.org/10.5901/mjss.2016.v7n4s1p219

[87] Poksinska, Bozena, Dag Swartling, and Erik Drotz. "The daily work of Lean leaders–lessons from manufacturing and healthcare." *Total Quality Management & Business Excellence* 24, no. 7-8 (2013): 886-898. https://doi.org/10.1080/14783363.2013.791098

[88] Xie, Lei. "Leadership and organizational learning culture: a systematic literature review." *European journal of training and development* 43, no. 1/2 (2019): 76-104. https://doi.org/10.1108/EJTD-06-2018-0056

[89] Do, Thanh Tung, and Ngoc Khuong Mai. "Review of empirical research on leadership and organizational learning." *Journal of Knowledge Management* 24, no. 5 (2020): 1201-1220.https://doi.org/10.1108/JKM-01-2020-0046

[90] Alagaraja, Meera, and Ann M. Herd. "Understanding multi-level learning in organizations: a comparison of lean and the learning organization." *Performance Improvement Quarterly* 34, no. 4 (2022): 521-546.https://doi.org/10.1002/PIQ.21364

[91] Freitas, Rodrigo de Castro, Maria do Carmo Duarte Freitas, Glauco Gomes de Menezes, and Ricardo Siebenrok Odorczyk. "Lean Office contributions for organizational learning." *Journal of Organizational Change Management* 31, no. 5 (2018): 1027-1039. https://doi.org/10.1108/JOCM-06-2017-0221

[92] Hussain, Ibiwani Alisa, Noormala Amir Ishak, and Benjamin Yin Fah Chan. "The relationship between organizational learning and employee engagement: The perspective of young employees from commercial banks in Malaysia." *Advances in Business Research International Journal* 2, no. 1 (2016): 1-11. https://doi.org/10.11648/j.jbed.20170201.17

[93] Danish, Rizwan Qaiser, Yasin Munir, Asifa Kausar, Momna Jabbar, and Nida Munawar. "Impact of change, culture and organizational politics on organizational learning." *Review of Contemporary Business Research* 3, no. 1 (2014): 115-126.

[94] Raja Sreedharan, V., and R. J. I. J. Raju. "A systematic literature review of Lean Six Sigma in different industries." *International Journal of Lean Six Sigma* 7, no. 4 (2016): 430-466. https://doi.org/10.1108/IJLSS-12-2015-0050