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EXPERIMENTAL APPLICATION OF LEAN IN A SERVICE-BASED COMPANY 'X'

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ABSTRACT

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The concept of Lean has been intriguing ever since its introduction with Toyota Motor Corporation. From the manufacturing industry, it has since made its way across various other industries including the service-based industry. The author who was employed in a service-based industry was therefore motivated to perform research on the subject.

This thesis is a journal on a pilot project to establish a lean business process and was commissioned by a case company 'X'. The company 'X' is a provider of services; mainly housekeeping. Company X operates in Sweden and Finland. The project was carried out by the author, who worked as the Group leader for 14 weeks.

The methodology applied for the research and thereby also projects was a literature review followed by empirical implementation. The principles were compiled from various works of literature. However, for the experimental introduction, the author made independent research and concluded to explicitly apply the 4P model and 17 principles from the literature 'The Toyota Way to Service Excellence: Lean Transformation in Service Organizations' by Jeffery K. Liker and Karyn Ross.

The progress, as well as the shortcomings during the study and experiment, were documented, and the overall project was also monitored by the company's supervisor. The findings that can be utilized for value creation were implemented by the company's management, employee, and customer.

Even as the project concluded for the author, the endeavor to achieve lean for the company continued. Lean was not one man's goal but rather of the company's goal.

Keywords	Lean Service, Value Creation, Continuous Improvement, Waste Elimination.
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1 INTRODUCTION

The global economy has shared a greater portion of service-based industry than its counterpart, the manufacturing industry. An increasing number of services are needed before and during any manufacturing production. Examples of these services include research and development, maintenance, storage, quality control, distribution and so on. Any product which did not rely on the functioning of services ceases the condition to be utilized (Giarini, 1994). The service systems, therefore, were no longer viewed as peripheral activities of the manufacturing sector (Wirtz, 2000). Further, as the Online services grew, it exemplified an effortless means to conduct business-to-business (B2B) transactions. The Internet made it possible to market and deliver a variety of services from anywhere in the world and many barriers to international trade were reduced (Javalgi et al., 2004). Consequently, a need for a new business model was realized across the service industry by elites, service providers, and governing bodies all around the globe.

According to Ministry of Employment and the Economy, the United States has the most advanced service economy; in the country, services constitute almost 80 percent of total production. European countries- like France, England, and the Netherlands- the share is 75 percent. In Finland, the share is slightly smaller (70 percent), partly reflecting historical development: industrialization and service began relatively late in the country, later than in other Nordic countries. Thus, Existing services offerings should be made more systematic by using business models and productization and by gathering best practices. (Ministry of Employment and the Economy et al. 2015, 69-70)

The internationalization potential of service should be made more credible, for example, by collecting success stories and describing them as systematic processes and models. (Ministry of Employment and the Economy et al. 2015, 15)

Therefore, the author was motivated to perform research on the application of lean into the business process and in the service sector.

1.1 Lean

Invention and innovation have been the foundation of human progress and prosperity. Numerous process innovations were accomplished during the first and second industrial revolutions. The current trillion-dollar economy of the automotive industry had its history in making during the second industrial revolution (1870–1914) when the possibility of the mass production process was achieved. However, the period of affluence was quickly followed by the first world war. The war changed the distribution of raw materials and resources in the context of international business. While it was readily available to some country, other faced the severe deficiency. The automotive industries facing scarcity realized that a process innovation was necessary to sustain their production; if they want to realize the local and global demand while at the same time compete with their industrial counterpart. One of such automotive industries was Toyota and it proactively innovated a process of production known as the Toyota Production System (TPS). (Womack, J.P., Jones, D.T. and Roos, D., 2007)

After introducing Toyota Production System, Toyota's automotive manufacturer thrived despite the challenging circumstances. So, it attracted various studies and research and later came to be known as Lean. The term 'Lean' was first coined by a researcher John Krafcik from the Massachusetts Institute of Technology (MIT) who at the time was studying the Toyota Production System under the International Motor Vehicle Programme (Krafcik 1988, 41-52).

Lean had since been evolving across various industries as its potential for positive transformation was realized. Although its root of origin was in the manufacturing industry, the philosophy, the process innovation, and the tools of lean had been utilized also by the service-based industry. One prominent example of the lean transformation was achieved by the Finnish telecommunication company ELISA (Liker and Ross 2016, 240).

1.2 Service Company X

The service provider, hereinafter mentioned as company X provided professional cleaning, housekeeping, and maintenance solution. However, for the pilot, the term 'service' mentioned explicitly referred to only housekeeping service provided to its customers. The two customers hereinafter shall be stated as Hotel H1 and Hotel H2.

Company X was established in 2004 in Finland. It has had a subsidiary operating in Sweden since 2011. And since 2019 most of the company was owned by the Swedish company. The company envisioned to be the best service provider in the Nordic region by collaborating with industry-leading cleaning agents and cleaning equipment suppliers.

It had a net sale of Forty Million Euro in 2018 and employed two thousand individuals. During the time of the project, it maintained Business to Business (B2B) partnership throughout Finland with some prominent names in the hospitality industry that included Scandic Hotel, Sokos Hotel, Radisson Blue, Lapland Hotel, Hilton Hotels and Resorts, Omena Hotels, Ideapark, and Holiday Club. It also provided its service to West Group and Silja Line and was operating in One Thousand One Hundred and Seventy-Five locations.

Company X operated under the partnership motto "our staff is your staff, and your facilities are our facilities". The employees were from the various cultural background. The company has a matrix organizational structure with limited hierarchy, enabling bureaucracy and encourage autonomy.

1.2.1 Positioning the Company X by its Service Type

Four distinct service types had been recognized in terms of service offerings. It has been realized considering two dimensions. The first dimension was if the offerings

provided by the service company were tangible or intangible and the second dimension distinguished if the offerings were standard or customized. Therefore, four distinct service types derived were A) Mass Good Distribution Service, B) Personalized Good Distribution Service, C) Standard Experience Offering and D) Personalized Experience Offering. (Liker et al. 2016, 20-23)

Company X for its housekeeping service identified itself as the type C service provider (Figure 1) that is, it provided an intangible offering with standard Experience. Given the complexity of service types, the author needed to understand the service type offered by company X before implementing the pilot project. As the perceived value for distinct service types varied with the general expectation of the customer.

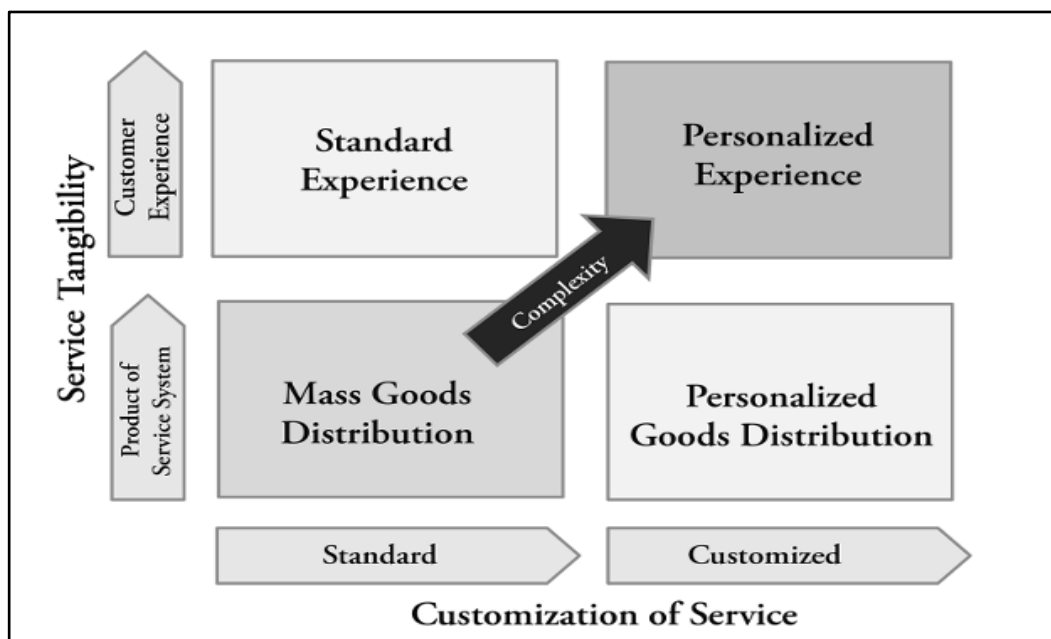


Figure 1. Four Types of Services. (Liker et al. 2016, 20)

Company X is therefore the provider of standard service experience associated with housekeeping to its customers- hotel H1 and hotel H2.

1.2.2 Housekeeping Service

The housekeeping service for the hotels, in general, included cleaning of rooms, bathroom, jacuzzi, sauna, and associated utilities. Replacing of used linen and towels with the new one. Restocking of complimentary items such as coffee, chocolate, and teas, restocking the items in the minibar, and other items in the bathroom such as soap, shampoo, toilet papers, and sauna tablets. Service also included maintaining the ambiance of the room by adjusting the temperature of the room by controlling the Air Conditioner, adjusting the curtains for light to enter the room, and revising the overall ambiance. Service could also be extended to cleaning corridors and other hotel premises such as gym, swimming pool, dining area, hotel lobby, and bars. It was also the responsibility of housekeeping staff to reserve the hotel maintenance staff if any utility such as Television, Fridge, Air Conditioner, and Hair Dryer in the room was out of order or required replacing if the agreement was made with the hotel in advance.

Apart from this, any personalized experience services demanded by the Hotel's customer were the responsibility of hotel H1 and hotel H2 for their fulfillment. These services included booking of taxis, transfer of luggage, airport pick up and drop off, decorating the room or conference hall for any occasions such as birthday, wedding, or corporate gatherings.

1.2.3 Stakeholders for company X

Company X maintained several direct and indirect relationships with its stakeholders. These were depicted by the flow of services and information. While company X provided the services to Hotel H1 and H2, it had to maintain the operational relationship with its suppliers for needed tools and resources. The Laundry Service providers and cleaning equipment suppliers were recognized as the strategic partners for Company X, hence maintained a strong business relationship. It was necessary because the capability of company X to provide its service directly depended upon these suppliers. Equally, the supplier's own business was also signif-

icantly dependent upon Company X. Apart from maintaining the strategic partnership the Company X, Hotel H1, and H2, Laundry Service provider and cleaning equipment and solution provider all depended upon the logistic operator for the transfer of resources.

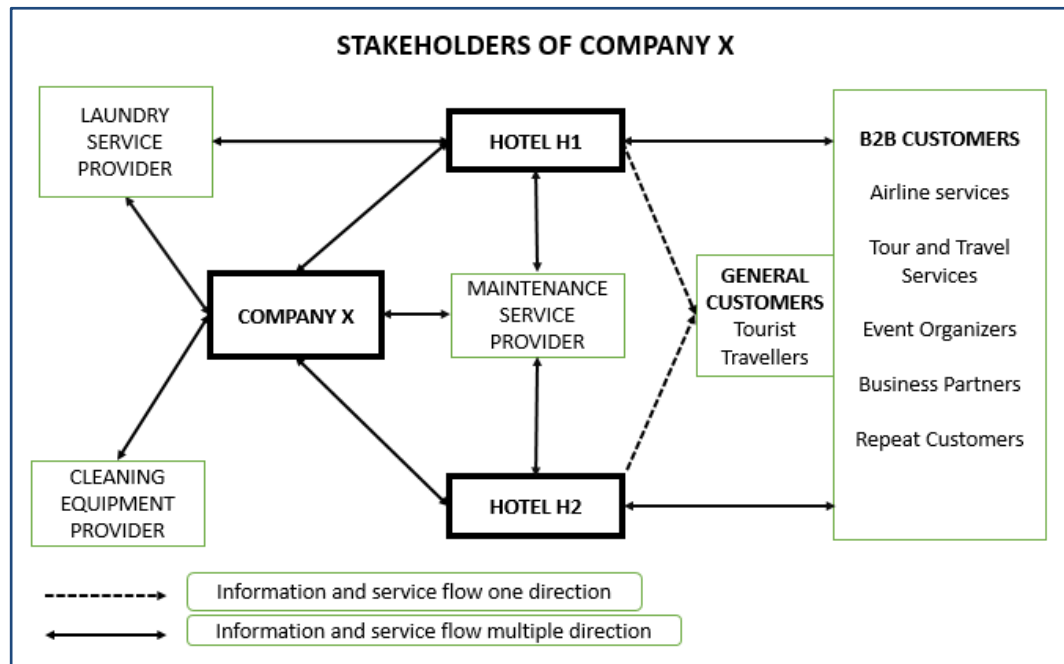


Figure 2. Stakeholders of Company X.

Other prominent stakeholders were Company X's competitors. However, for clarity and anonymity, the competitors had not been represented in the figure above. There were three prominent competitors whilst implementing this project offering a similar service as Company X.

1.2.4 Organizational Structure

During the literature review, four distinct types of organizational Structure had been identified namely Functional Organization, Customer Facing Organization, Matrix Organization, and Network Organization. Toyota was identified to have a matrix organization for a decade. (Liker et al. 2016, 36-39)

Company X also has matrix organizational structure. For any given customer, company X had an employee, team leader, group leader, and a supervisor present at the site of work. The team leader of the employees performed the standard house-keeping duties for a customer. A Group leader provided the supporting role by establishing the goal for the day, allocating and providing necessary resources, working with the team on the floor when necessary, training the team leaders and employees on new tools or business processes as planned, performing the quality control, troubleshooting any problems, and updating the supervisor. The supervisor scheduled the group leader and the team to a customer for the requisite hour, executed procurement activities, administered the budget distribution.

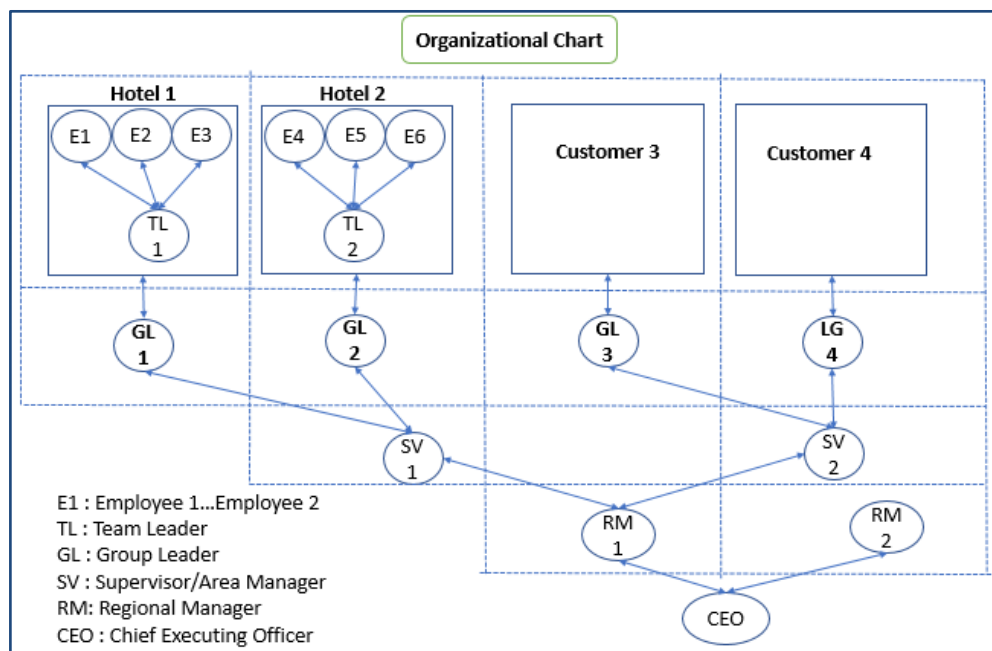


Figure 3. Organizational Chart of Company X depicting the Matrix Structure.

For the author, it was interesting to note that the organizational structure for the service company aligned to incorporate the Lean principle tends to depict their organizational chart in reverse as shown in Figure 3. The primary reason for being so was that the decision to abide by the processes on how to increase the value or derive the solution for the customer comes from the employees rather than the management.

Traditional management systems specified the solution and left the development of a solution to the team members, but Toyota's management system (lean process) also specified how to develop the solution using Plan-Do-Check-Act (PDCA) cycle (Liker and Ross 2016, 133).

2 BACKGROUND AND PURPOSE OF THE PROJECT

In the year 2019 with the transfer of ownership, Company X anticipated the change in organizational structure and business model. The company inherited the structure of matrix organization; however, the supporting business model was nevertheless missing. The company was confronting challenges. The primary concerns regarding the housekeeping service were related to operational processes. Solutions were sought against unnecessary inventory buildup, increase in lead time due to over-processing, non-value-adding motions by the employee during work hours, and occasionally complaints by customers regarding the service quality (defects). The author was aware that in the terms of Lean Principle these shortcomings were regarded as 'waste' and therefore Lean could be just the solution the company was exploring for.

While the elimination of waste seems obvious and straightforward, it should be noted that the waste is often difficult to determine because of operator conservatism. This dramatically reduces the potential of such an important yet simple goal. The Toyota Production System, and later the concept of Lean, was developed around eliminating the three types of deviations that show the inefficient allocation of resources- "Muda, Muri, and Mura". (Do. D, 2017).

The author, at the time working as a group leader for the company, submitted the proposal for a pilot project of implementing lean in the business process. The company realizing the potential of lean delegated the idea among executives, and after receiving positive feedback on the topic from the supervisors and other group leaders accepted the proposal for the pilot project.

Company X provided the author two weeks to A) Compose a plan on how the pilot project can be started, implemented, and experimented. B) Identify the stakeholders of the project. C) Determine the resources and tools required and related financial expenses. D) Determine the personal necessity. And E) To estimate the total duration to implement the project.

2.1 Project Objective

The objective of the project was to integrate the lean principle into the business process of company X. The author made the independent research for suitable literature from which the lean principle can be derived and concluded to explicitly apply the 4P Model and 17 Principles from the book 'The Toyota Way to Service Excellence: Lean Transformation in Service Organizations' by Jeffery K. Liker and Karyn Ross.

There were two reasons why the author deduced the model and principles from the book were suitable for the project. A) the book was published in the year 2016 and therefore contained the latest principles at the time of writing of this report. And B) the book was explicitly written for the lean transformation of the service organization as the title suggested.

2.2 Project Hypothesis

If Company X could apply the principle of lean-to successfully deliver the service excellence for the primary customer (Hotel H1), then the same principle can be applied also for the comparable customer (Hotel H2) despite the difference in their location and structural build.

It was important to note that the customers of service company X, hotel H1, and hotel H2 are different in their structural layout. Hotel H1 is larger in area and capacity. It owned two private buildings and has its parking lots. It has a reception, bar, fitness gym, and dining area. The financial turnover for H1 is also comparatively higher. It had 210 rooms capacity. The rooms were divided into seven types in the term of cost and comfort for the guest.

The hotel H2 on the other hand did not have a reception. It operated on two leased floors of a multi-story building in the city center. It did not possess its own parking

lot. It has 32 rooms capacity. It offered three different types of rooms in the term of cost and the comfort. The financial turnover is lower than that of hotel H1.

2.3 Project and Research Questioner

The author at the time of implementing the project was pursuing the answer to primarily two questions. A) What were the advantages of using the Lean Principle in Company X's Business Process? And B) What was the limitation of lean in general?

2.4 Project Phase and the Report Structure

The author has attempted to structure this report complementing the project which was executed for 14 weeks in total. The 'Weeks' henceforth mentioned was not continuous as in the first week followed by the second week but rather the week dedicated to the actual project considering the pre-agreed duration. The reason was that the project had been interrupted on several occasions by the COVID pandemic.

Project Phase 1: Preparation, Time duration: Week 1 and Week 2

Report Content: Introduction

In the introductory part of the report, the development of the service sector had been discussed. Then the origin and capability of the Lean Principle to improve the service process had been acknowledged. The general facts, organizational structure, the positioning of Company X in the service industry were also documented. Then the service of company X that is 'housekeeping' in general was defined. For the pilot project, the various challenges related to business processes in company X were also identified. The correlation between those challenges and the term 'waste' in the Lean principle was recognized and documented as part of this report.

Project Phase 2: Planning, Time duration: Week 3, Week 4, and Week 5

Report Content: Background and Purpose of Project.

The author was made aware by Company X's management that Company X had been perusing to establish itself as a lean organization. The author purposed the pilot project of implementing lean in the service process and the proposal was accepted. The author as the group leader collaborated with the supervisor of Company X and verified the current conditions and established the target conditions for the pilot project. During this phase, the project objective, project hypothesis, and the relevant research questions had been identified. It was also during this phase that the total project duration of 14 weeks was agreed upon by the author as the group leader and the company X. Therefore, the project stakeholders, project resources, budgets, and personal were updated, confirmed, and documented.

Project Phase 3: Implementation, Time Duration: Week 6 to Week 11

Report content: Literature Review and Empirical Implementation

In this phase, the author made the review of pertinent literature that could be utilized to streamline the business process and improve the current state and consequently achieve the target state as planned in phase 2 of the project. For this, the author then provided the conceptual framework between the constructs whereby experimental application was possible. Therefore, this part of the report had two sections A) Literature review and B) Experimental Application in a diary format.

Although the pertinent literature by Jeffrey K Liker and Karyn Ross "The Toyota Way to Service Excellence: Lean Transformation in Service Organization" was based upon the 4P model and associated 17 Principles, it was decided to focus just on one of the P, that is, Process and corresponding 8 Principles. This was necessary to accomplish the project objective within the estimated project time.

The methodology whereby applying the principles of the pertinent literature in the service process was conducted. The report for this phase of the project is maintained in a diary format

Project Phase 4: Reporting, Time Duration: Week 12 to Week 14

Report Content: Project Analysis, Conclusion and Discussions.

In this phase, the author provided an analysis of the project. The author also tested the project hypothesis and attempted to derive the answers to the project questioner. It was essential for the author to write an unbiased report therefore the project report was also submitted to company X's supervisor. The initiative was taken also to report the project shortcomings and drawbacks. Finally, findings that were proven to add the values were shared and implied within company X. The conclusions drawn from the project were discussed and the limitation of the study was also derived.

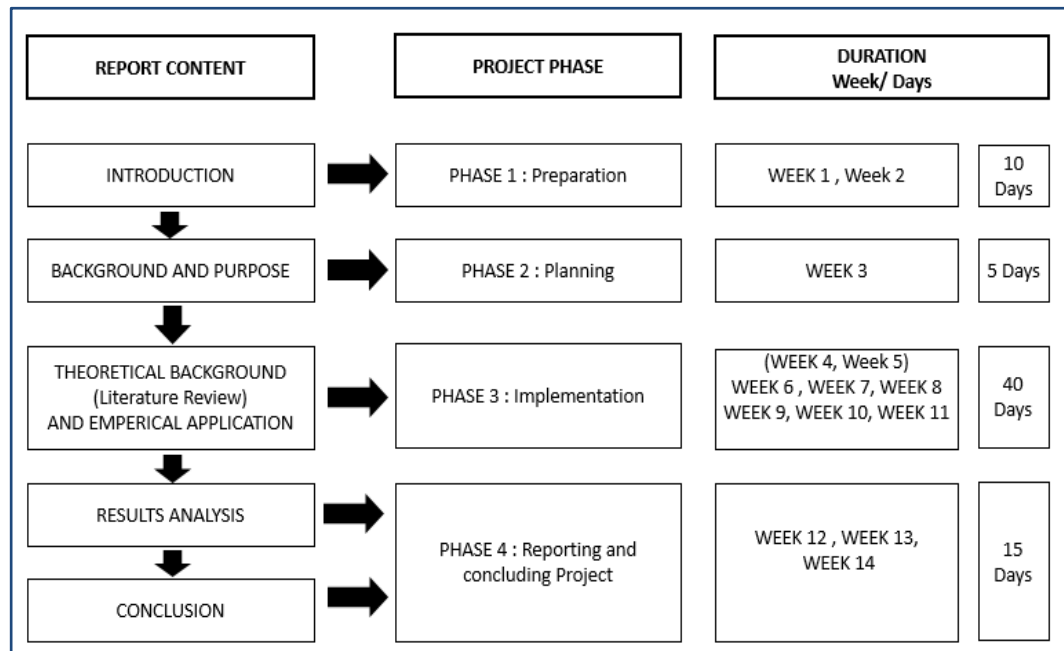


Figure 4. Report Structure and Project Phase

3 LITERATURE REVIEW

During the interview conducted on 29 September 2016 by Katie Anderson, the co-author of the literature, Jeffery K Liker stated that the pertinent literature 'The Toyota Way to Service Excellence: Lean Transformation in Service Organizations' was the more updated version and oriented toward the service industry. Apart from mentioned literature, there was additional literature that defined the principle of lean for manufacturing-based industries. Therefore, the author had attempted to study all the major lean principles from numerous pieces of literature and summarize them. Then the literature dedicated to the service-based industry was applied for the pilot.

3.1 Principles of Lean

Since Lean was originated in Japan, there are phrases in the Lean lexicon that had their derivation in the Japanese language.

3.1.1 House Of Lean (TPS HOUSE)

According to the Lean Enterprise Institute, the Toyota Production System diagram depicted as a house (TPS House) was the first model of the TPS system and had been widely regarded as the House of Lean. It had a foundation with three elements and two main pillars, and they supported the overarching goal of TPS as the roof of the house. The three foundational elements were as follows:

1. *Heijunka*: With literal translation as 'leveling' in Japanese, when applied in Lean it refers to smoothing of production, in volume or in product mix over a certain period, to reduce the chance of overburden.
2. Standardized work: It implies standardization of procedures and the business processes to promote reproducibility of the production of goods or services.

3. *Kaizen*: With literal translation as 'continuous improvement', this philosophy implied that the minor, but incremental changes routinely applied and sustained over a long period result in significant improvements.

And the two pillars of the House of Lean were as follows:

1. Just-In-Time Production (JIT): It is a principle of producing the product/service that the customer wanted when they want them and in the amount they want them. Just In Time production system frequently relies on the use of physical inventory control cues also known as *Kanban* to signal the need to move raw materials or produce new components from the previous process.

2. *Jidoka*: Also, sometimes referred to as "autonomation" has two principles. Providing machines and operators the ability to detect when an abnormal condition has occurred and immediately stop work whereby quality can be built in the processes for eliminating the root causes of defects.

The foundation and Pillars supported the goal that is depicted in the diagram as the roof. In the house of lean the roof has been depicted as the High Quality, Low cost, and Shortest Lead Time.

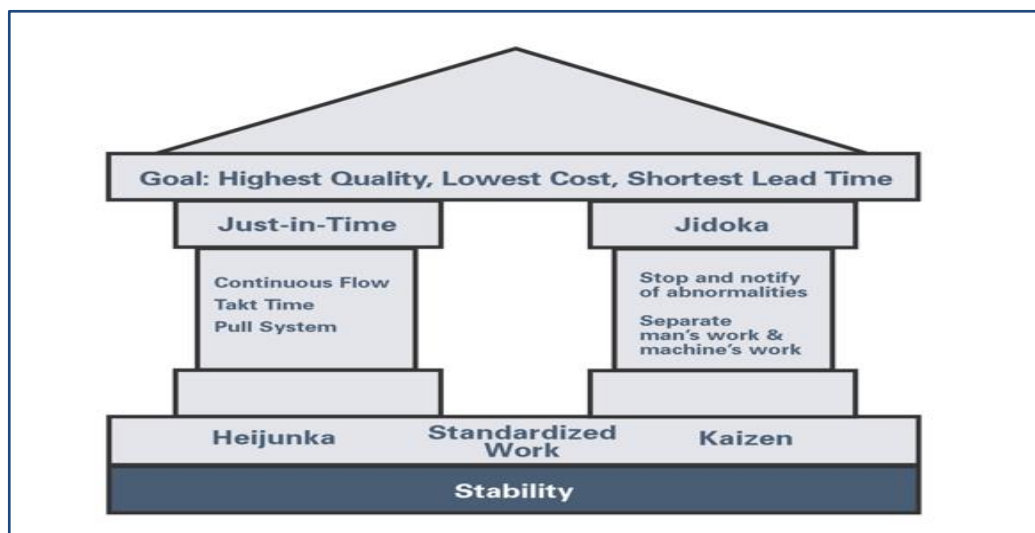


Figure 5. House of Lean (Lean Enterprise Institute, 2016).

3.1.2 The Toyota Way 2001: 2 pillars and 5 Principles

During the year 1990, there was the pervasive deployment of Lean. Nevertheless, there emerged some criticism. Lean and the Toyota Production System appeared extremely technical and was considered lacking the necessary principle related to the human dimension. Therefore, Fuji Cho, President of Toyota from 1999 to 2005, published a document in 2001 the "Toyota Way 2001". This document officially described the principles of the Toyota Production System incorporated with the human dimension which he considered to be extremely essential.

Therefore, the "Toyota Way 2001" described five principles articulated within two pillars.

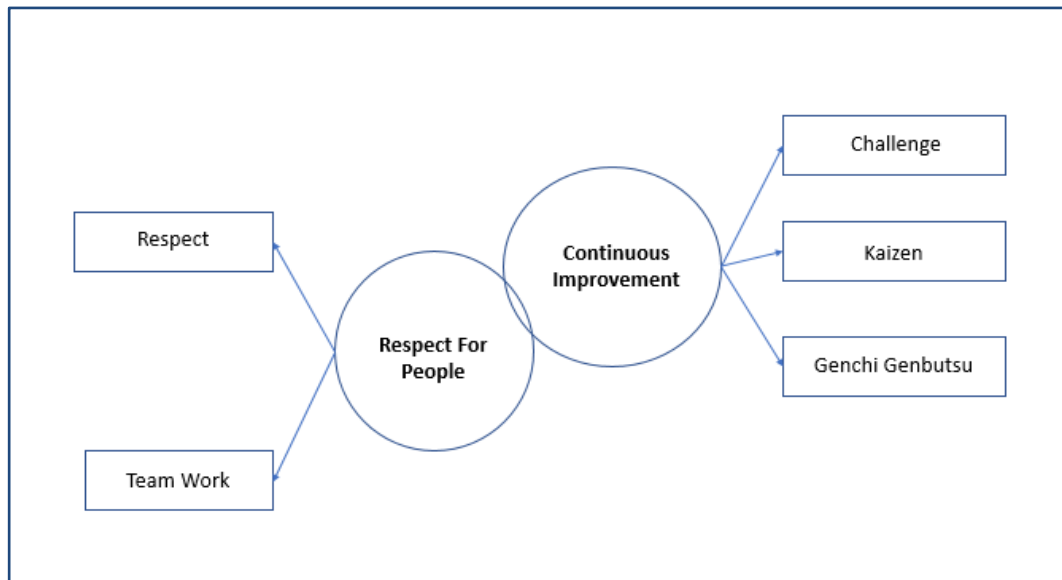


Figure 6. Toyota Way 2001.

The Pillar “Respect for People” signifies two Principles: Respect and Teamwork. ‘Respect’ meant respecting everyone and making effort to understand each other, taking personal responsibilities, and doing best to build mutual trust. The ‘Team-work’ meant stimulating personal and professional growth, sharing the opportunities of development, and maximizing individual and team performances. And the Pillar ‘Continuous Improvement’ signifies three Principles: Challenge, kaizen, and Genchi Genbutsu. ‘Challenge’ meant setting up a long-term vision, meeting them

with courage and creativity. 'Kaizen' meant continuously improving the business operations and guided by innovation and evolution. The principle 'Genchi Genbutsu' meant going to the source where value was created to find the facts and make the correct decision, building the consensus and achieve the goal at the best possible speed.

3.1.3 The Five Principles: Lean Thinking

The five principles of Lean Thinking were built on each other, creating a cycle of continuous improvement. The underlying principles were 1) Specifying Value, 2) Identifying the Value Stream, 3) Creating a Flow, 4) Establishing Pull, and 5) Seeking Perfection.



Figure 7. Five Principles on Lean Thinking (Womack, J.P. et al. 1996)

Principle 1) Specifying Value

Value was defined as 'what a customer would willingly and knowingly pay for'. To specify the value, it was necessary to identify evidently who the customer was and their needs and demands. A tool such as 'Voice of the Customer (VoC)' could be utilized to gather feedback to unequivocally recognize and define value. It was vital to understand what happens to the product or service at each stage of the process to deliver the value as specified. This stage also provided an opportunity to improve attributes of goods and services to the best in the term of cost, quality, and final perceived solution. At this stage, it would be challenging to understand how the customers define and priorities the various needs and expectations they perceived from products and services.

Principle 2) Identify the Value Stream

The Value stream was defined as the end-to-end (E2E) sequence of steps taken to create customer value, and it enables the team to visualize the steps needed from product creation to customer delivery. This stage was closely related to the Value Stream Mapping tool. The tools specified the needs to 1) Map the end to end steps in the process 2) Identify the Value Added (VA) steps and the Non-Value Adding (NVA) steps, 3) Quantify the time, resources, and quality in these steps, 4) Analyze the material and information flow, 5) Focus on waste removal, 6) Focus on the end-to-end process design, not just a 'silo' that meant improving the whole process for the best way to create value and not just optimizing the parts.

Principle 3. Creating Flow

This Principle reflected on the idea that the product and services should move fluently through the value stream without disruption. The scientific procedure to establish flow could be possible by eliminating else reducing the 'waste' from the

system. In Lean thinking seven classic wastes had been identified: Transport, Inventory, Motion, Waiting (Queue Time), Over Production, Over Processing, and Defects. These wastes were defined/identified from the customer's perspective.

Principle 4. Establishing Pull

The principle was a responsive approach and states that the rate of supply of product and service should be optimized to exactly match the demand but without interrupting the flow in the value stream. The principle can be implemented by processing only what the customer needs so that products and services were synchronized to the real demand, if there is an interruption in the preceding step the following steps were also stopped thereby fulfilling the demand as per the Takt time.

Principle 5: Seek Perfection

A Continuous Improvement in Lean was termed as kaizen was the foundational element to establish Lean. It referred to incremental improvement of products, processes, or services over time. It was a continuous process to identify and eliminate waste to enhance ultimate value. This process was only viable when everyone in the company was aligned to the idea that included the senior and middle management to front line staff.

Therefore, implying the principle had advantages, including greater productivity, flexibility and responsiveness, improved quality, reduced defects, and lead-times, along with increased customer satisfaction and improved staff morale. (Womack, J.P. et al. 1996)

3.1.4 The 4 P and 17 Principles

The 4 P and 17 Principles model was the content of the pertinent literature 'The Toyota Way to Service Excellence: Lean Transformation in Service Organizations' which the author had selected for applying in the process of the company X. Unlike the *House of lean* the whole concept is represented as a pyramidal structure.

However, the model had exemplified the foundational elements as well as the principle from other prementioned models.

Therefore, the foundational structure was composed of accepting challenges, continuous improvement (*kaizen*), workplace learning, Teamwork, accountability, and respect for people which were the principle of the Toyota Way 2001 document. Upon those foundations was built the four main elements (4P) which were vital to being taken into consideration while implementing Lean in an organization. The 'four P', represented Philosophy, Process, People and Problem Solving. Each of those elements had associated principles.

The first 'P' of the pyramidal structure represented **Philosophy** and had one associated Principle. **Principle 1:** To Passionately Pursue Purpose based on guiding Values. This principle was primarily used as a guide in creating the Vision and Mission statements and aligning the company to long-term goals even at the cost of scaring the short-term financial profit. The key was in answering the question: What was the organization's purpose and how would it contribute to society through the service that was delivered.

The second 'P' represented **Process** and had 8 associated principles (from 2 to 9) which were further divided into two categories as Micro and Macro. There were four macro principles. They were, **Principle 2:** Deeply understand Customer Needs, **Principle 3:** Strive for One Piece Flow, **Principle 4:** Strive for Leveled work Pattern, **Principle 5:** Response to Customer Pull. And four micro principles were, **Principle 6:** Stabilize and Continuously Adapt Work Pattern, **Principle 7:** Manage Visually to See Actual compared to Standard, **Principle 8:** Build in Quality at Each Step, **Principle 9:** Use Technology to Enable People.

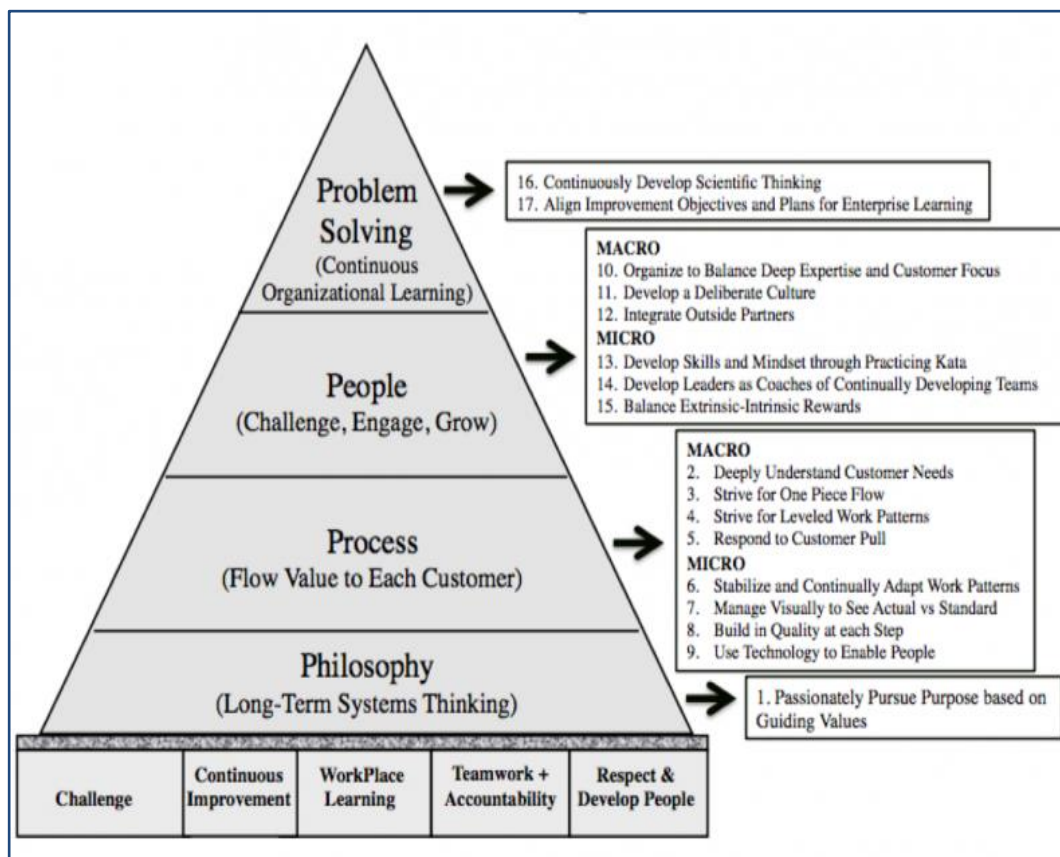


Figure 8. Toyota Way to Service Excellence 4P Model (Liker and Ross 2016, 48)

The third 'P' represented **People** and had six associated principles which were further divided as macro and micro. The three macro-Principles were **Principle 10:** Organize to Balance Deep Expertise and Customer Focus, **Principle 11:** Develop a Deliberate Culture, **Principle 12:** Integrate Outside Partners and the three micro-Principles were **Principle 13:** Develop Skills and Mindset through Practicing Kata, **Principle 14:** Develop leaders as Couches of continually Developing teams, **Principle 15:** Balance Extrinsic-Intrinsic Rewards.

The fourth 'P' represented **Problem Solving**. It was associated with two principles; **Principle 16:** Continuously Develop Scientific Thinking and **Principle 17:** Align Improvement objectives and Plan for Enterprise learning.

Furthermore, to add more to the second 'P'- Process, it had been stated in the literature that the approach for the process improvement differs from the tradi-

tional company to that of Lean oriented. In the Lean management system, the solution by which value can be created was left open to the team but the ways to develop that solution were specified, guided, and coached. Therefore, the solution is achieved by using a scientific method and taking into consideration all the constraints and have greater workability. Whereas under a traditional management solution to create value was specified but the ways to develop those solutions were left open. This would limit the company to a specified solution and seizes the opportunity for innovation. (Liker and Ross, 2016)

4 EMPIRICAL APPROACH AND IMPLEMENTATION

During the empirical phase of the project, one of the simplest yet subtle questions remained on how to develop a lean process in the company X. Author after reviewing literature was aware that the implementation of lean was not merely the implementation of tools or striving to eradicate the 'waste' from the system but rather a colossal initiative to the overall advancement of the company. The scope of Lean included preparing the company to accept new challenges, achieving continuous overall improvement, creating the learning atmosphere by an experiment where anyone can contribute to elevating the value for the end customers. The process could only be achieved by generating the flow in the system while ensuring the quality, training the employees to engage in teamwork and at the same time be responsible for individual accountability, cultivating mutual respect, and develop people by providing motivation.

The Toyota Way is a philosophy, way of thinking, and system of interconnected processes and people who are continuously striving to improve how they work and better deliver value to each customer.

There is no generic "recipe" or one "best-practice way" to mechanically "install" or "implement" lean in an organization. The Toyota Way principles, as described in this book (*The Toyota Way to Service Excellence: Lean Transformation in Service Organizations*), can, however, help you reflect on your organization where gaps are to your true north, and begin the process of striving toward perfection: delivering the services that your customer wants, exactly as they want them, now and for the long term. (Liker et al. 2016, 29)

The author, therefore, decided to evaluate and apply the lean Process and associated 8 Principles from the book the literature to the corresponding business processes of the Company. However, supplementarily author also anticipated discovering the necessary 'Lean tools' that can be then utilized across similar service sectors and can be applied to test project hypotheses.

The Lean Process and related principles from the 4P and 17 principles model consisted of a total of 8 principles (2–9) and was divided as Macro and Micro Principles. The author considered utilizing those principles to analyze what would those principles translate in the context of case company X. The Following diagram represented the Process and associated 8 Principles.

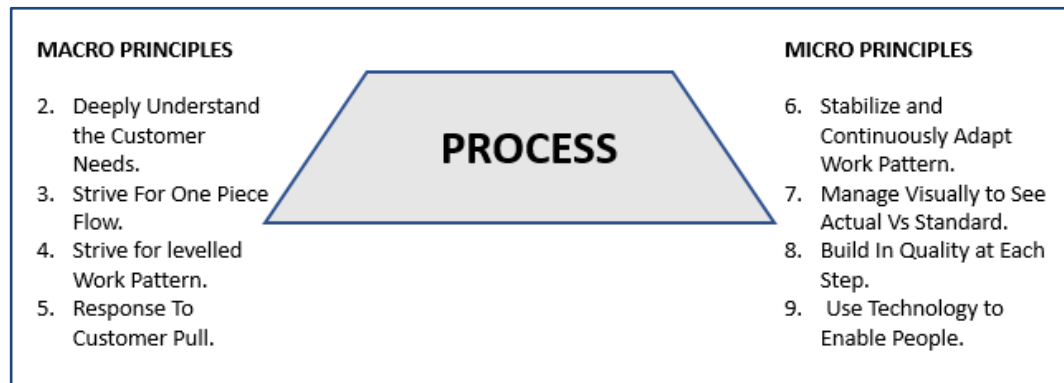


Figure 9. The Process and Related 8 Principles. (Liker and Ross, 2016)

4.1 Diary Entry: Integrating Principles in Company X

The empirical implementation part of the project had been represented in a diary format. It started on week 6 and extended up to week 11 as intended for the pilot.

4.1.1 WEEK 6

Principle 2. Deeply Understand the Customer Need.

This week all the employees of Company X consisting of the team member, group leaders, and supervisor were requested to participate in the task of identifying the Customer's need. However, an active role was also played by company X's Customer; Hotel H1 and Hotel H2, and in turn their customers.

The assessment was established that the function of any business such as service company X was to deliver the needs that can be translated as the perceived value in the form of products or services to the customer and in return make a profit. The predicament was in the identification of those values. The value or service

solution offered may differ from what was needed by the customer. The elements that were perceived as the value were subjective but rational across the variants such as customers' expectations, the advertisement made by the service providers, personal biases, and even environmental conditions such as season.

To understand the context, for company X the value it delivered to its first customer (Hotel H1) differed from the second customer (Hotel H2). For Hotel H1 the Company X exclusively provided the housekeeping service whereas for Hotel H2 the company X provided housekeeping service and managed the linen delivery and storage. The linen delivery and managing its inventory were necessary for providing the primary service however it did not add any value to the Hotel H2's customers. Considering all the possibilities to define the customer's actual need, it was methodical to define the demanded value from the end customer/user's perspective. In Lean value has been considered as demand that the customer is willing to pay for. We decided to use tools to identify the need of customers.

Tool: Voice of Customer (VOC)

We used a simple tool, the Voice of Customer (VoC) to gather understanding on what would be of value for the end customer. We applied several methods.

Method A: Creating a focus group. We had identified three focus groups of customers: businessperson, backpacker, and family on vacation. They were then questioned What different services would they need from a hotel?

Method B: Interviewing. We interviewed the employees of company X as well as the hotel H1 and H2 on what they perceive the value to be for the end customers.

Method C: Monitoring the social media page of Hotel H1 and H2 as well as its competitors for the customer's reviews to identify the latest potential values.

Method D: Studying and acknowledging the request made by the customer to the customer service Personals.

Method E: Feedback forms were offered to the customer who have used the service and we asked them to provide and suggestions for the service improvement.

Analysis

The study of the focused group demonstrated the perceived standard services needed by all categories of customers from a hotel. However, some service requirements were unique to the specific customer group and had greater value. For all the focus group of customers, the core needs were a clean room, comfortable beds, clean bathroom with amenities, and availability of Wireless Fidelity (WIFI). They also needed a comfortable lobby.

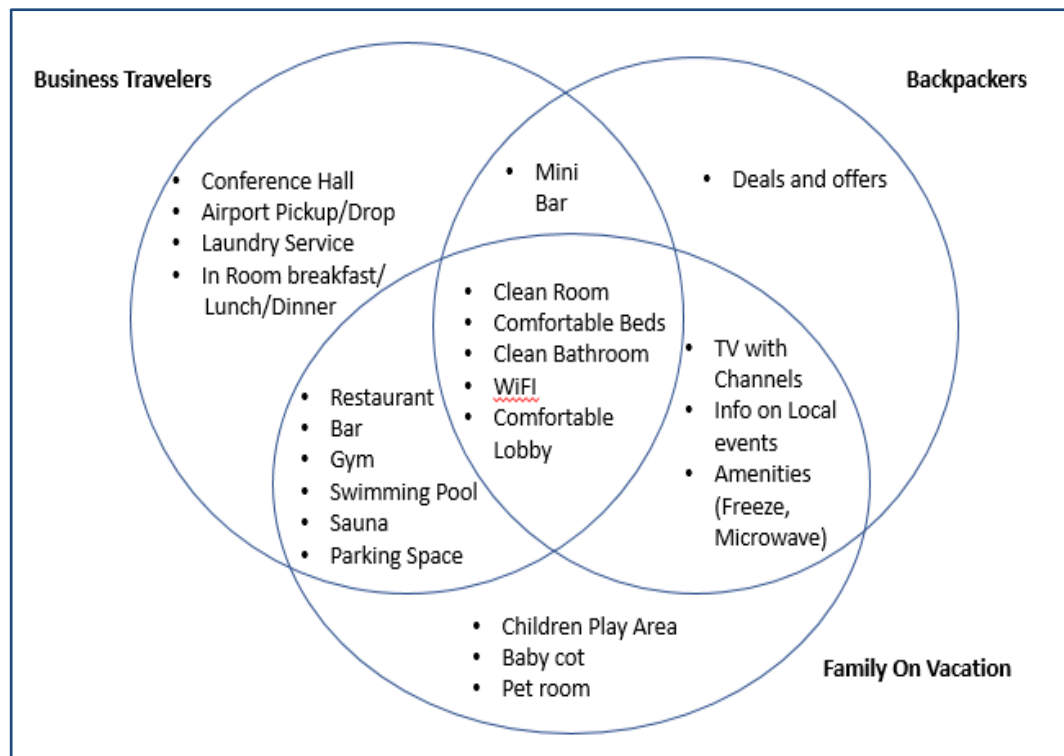


Figure 10. Focus Group and Their Needs.

Besides the core needs, the customer had the group-specific needs that they valued. For instance, the business travelers required a Conference Hall, Airport Pickup and drop-off services, and laundry services. The family on vacation needed

a Children's play area, Baby Cot, and pet room. The backpackers showed keen interest in deals and offers. Therefore, even for the end customers the specific needs greatly differ.

After listing several needs as demand from customers it was also clear that the fulfillment of those needs required the collaborative efforts of various service providers. It was not the responsibility of Company X to provide service of airport pick up, restaurant, deals, and offers. Those were specified to hotel H1 and H2 employees. Moreover, there were customers' needs that were dependent on the hotel premises itself such as bars, restaurants, swimming pools, gyms, and parking spaces.

While interviewing the employees, the service they perceived that customer would value were subjective. The company X employees were engaged in providing core values. On the other hand, the hotel employees were more inclined toward the focus group-specific unique services. From the interaction with customers and customer service personal it was evident that they made the request for group-specific services such as baby cot for the family on vacation and laundry service for the business travelers.

While monitoring social media we had a chance to learn about the new possible value-adding services. The possibility of early check-in and late check-out and pre-booking had been highly emphasized. And the attitude toward accepting and adding the food delivery services such as Wolt and Foodora into the hotel premises was a new idea.

Hence, using Voice of Customer (VoC) as the tool we had successfully executed the objective of Week 6 themed on Principle 2: To deeply identify the customer needs.

4.1.2 WEEK 7

Principle 3. Strive for One Piece Flow

From the study completed in Week 6 on principle 2, we had refined the customer perspective of value and identified the different stakeholders that are required to fulfill them. We also established that company X shared the responsibility in delivering the major component of the core value to the end customer that is a clean room, comfortable bed with clean linen, and clean bathroom. This Week's agenda was to understand and utilize Principle 3, which is to strive for one-piece flow.

To strive for one-piece flow in a service system is to be able to incessantly produce value without disruption. The final deliverable of service was a set of different constituting values. The total value of delivered service also depended upon how and when it was provided thereby included quality, cost, and time factors. However, it was not practically possible to achieve a perfect one-piece flow because of disruptions. The disruption in the lean system was frequently associated with the concept of waste or *Muda* in Japanese. During the literature review in Lean thinking seven classic waste (*Muda*) had been identified: Transport, Inventory, Motion, Waiting (Queue Time), Over Production, Over Processing and Defects (Liker and Ross 2016, 156-157).

Therefore, we aimed to identify the waste present in the core service process that is housekeeping offered by Company X to its customer Hotel H1 and Hotel H2. We then tried to develop the countermeasure. Following was the identified waste in the context of company X service, the conundrum associated, and their countermeasure.

1. Transport: Housekeeping task needed transportation of cleaning trolleys with necessary items, tools, cleaning solutions, and transportation of fresh Linen and Towels trolleys from the storage room to different floors of the Hotels several times a day.

Conundrum: Each time the housekeeper moved between the floors to clean the room they had to carry the trolleys thereby time that could be utilized to perform the housekeeping task was diverted elsewhere. The lead time at the end of the day increased.

Countermeasure: We requested our customer Hotel H1 and H2 to provide a small storage room on every floor where necessary trolleys can be stored thereby reducing the effort of transporting the trolleys by individual housekeepers. Housekeepers can then move seamlessly between the floor focused on creating the core value that was the cleaning and preparing the rooms for the guest. Moreover, the group leader can bring the necessary items to the individual floor's storage at the housekeeper's request so that the housekeepers can further limit their non-value-adding movement.

2. Inventory: Company X had the inventories of Trolleys of linen and towels, cleaning tools, cleaning machinery, and cleaning solutions.

Conundrum: The linen and towel trolleys were not used so that is First in and First Out thereby some trolleys even though delivered earlier were utilized late. The storage room had an overstock of cleaning tools and solutions occupying the useful spaces.

Countermeasure: Space and location were assigned in the storage room for the cleaning tools, machinery, and solutions calculating the optimal amount required. Any amount extra was eradicated. The linen and towel trolleys were arranged in designated areas whereby the trolley's rotation was always First-In-First-Out. Moreover, the area near the storage room door was kept cleared to move the item uninterrupted. Also, the system based upon the Just-In-Time production and Pull was utilized to minimize the inventories.

3. Motion: The housekeepers needed to move between rooms for cleaning, back and forth from the storage room and even in between floors.

Conundrum: Significant energy and time were expensed because of the unnecessary motion. Some housekeepers chose to change the linen in the beds first in all the rooms then start back cleaning being unaware that in the process they had made the extra motions then required.

Countermeasure: The housekeeper was provided with the secondary storage room on each floor of the hotel that had all the necessary items required for the day. The duty for each housekeeper was limited to a particular floor unless completed. The cleaning of the general area was specified to the different housekeepers. The housekeeper in charge of cleaning the rooms on each floor was advised to completely clean the room first before moving to the next room thereby limiting the motion.

4. Waiting: The housekeepers had to wait for the group leader to make the plan for the day so that they get the floor or designated area to start work. They had to wait for the elevator whilst transferring the linen and towel trolleys from the main storage to secondary storage.

Conundrum: The delay in the hotel to provide the estimation of required rooms, in turn, caused the delay for the group leader to make the plan. Further, once the housekeepers arrived the time for using the elevator to stock the necessary item from the primary storage room was identical thereby creating the traffic conjunction. Moreover, the hotel staff and the hotel customers were also using the same elevator. This summed up the aggravated delay in the core value-creating activities.

Countermeasure: The hotel was requested to make the estimation room available as early as possible. The estimation could be provided to the group leader via email. The author as the group leader proposed to start work earlier than the other housekeeper and requested other group leaders to do the same. This enabled the group leader to prepare the advance plan for arriving housekeepers. Further group

leaders then work to transport the required item between the main storage to secondary storage when the use of elevator lesser in use than in early rush hour.

5. Over Production: The problem of over-production was not significant in services such as housekeeping for company X. The rooms prepared for the guest were planned every day. Even though the rooms were sometimes overproduced due to the booking cancellation, the room is contained on itself and did not require secondary storage. Moreover, the room prepared after the service did not expire like goods. The prepared extra room can be utilized by the future arriving guest with no to very little effort. However, the large amount of overproduced rooms may present a problem against using the lean principle (Principle 5: Response to customer pull) as the rooms should be pushed for a sale.

6. Over Processing: There were several factors that the housekeepers were required to consider while cleaning and preparing the room. It had often come to question of how much time and effort can be considered optimum to invest in a room. Sometimes rooms can be extra dirty thereby requiring extra time and effort and other times rooms might just need minor maintenance. When such rooms are dedicated more time and effort it could be considered over-processing.

Conundrum: The state of the room was unknown in advance. One can only assume the average time taken. Further, trainees might not know how much and what tasks are required to fulfill for room to be changed to occupiable.

Countermeasure: The supervisor and group leaders allocated the standard task required for every type of room for example single person, duo room, family room, room for the disabled guest by performing experimentation cleaning. The group leaders were advised to check the status of all the rooms before planning the task of the day. If any room required extra effort or less effort than the standard it was noted and kept in the office for all the housekeepers to visually acknowledge. Further, trainees and those who are over processing were made aware of standard service expectations, associated time, and were trained while performing Gemba by group leaders.

Gemba in lean is an act of being present in a location or going to the source where the core value is created. For company X and its employees, it is to be present where housekeepers are cleaning and maintaining the room for the arriving guest. Gemba for trainees can be the act of learning from the trainer and for group leaders, it can be the act of quality check while suggesting and demonstrating the correct procedure.

7. Defects: Defects in the context of housekeeping can be referred to everything which is out of standard service that was promised to the customers by company X. It can be related to complaints made by the customer about the room not meeting the standard criteria of cleanness or the room missing the standard services promised such as towels, television channel connection, internet connection, Air condition as such.

Conundrum: The standard service promised to the customer and the training provided to the housekeepers were not synchronized. The guest made a complaint if items such as television, microwave, air conditioner, heater not working or if the complimentary items in the rooms such as coffee, sugar, chocolate, cups were missing.

Countermeasure: The team leaders, group leaders, and supervisors are requested to provide the subordinates with suitable training in respect to the customer expectation. Further, they were requested to make the quality check at Gemba and making any required corrections before listing the room as occupiable. They were also requested to make the order for maintenance if the task was not associated with the housekeeping. These include ordering maintenance for fixing the air conditions, heaters, internet connection, television if they were broken.

4.1.3 WEEK 8

Principle 4. Strive for Leveled Work Pattern.

The fundament of this principle is to eradicate the waste (*Muda*) and prevent the Over Burden (*Muri*) and Unevenness (*Mura*). These three terms are interrelated in Lean practices and the process of eradicating one would eventually affect others. Thereby, we focused on eradicating the waste. While performing the Gemba walk as a group leader to remove the defect from the process it was the task in contrast with the very objective of the lean process that is to eradicate the non-value adding task from the customer perspective. There was doubt if it was in the spirit of Lean to revisit a performed task. However, in the following days, it was understood to be the necessary type of waste.

Waste (*Muda*) in lean had been defined as any activity that consumes resources without adding value to the paying customer. Muda had been further divided into two types. The type 1 Muda consists of all the activities that were necessary even though there is no direct value transfer to the customer. The example can be included from the task done in week 7, the inspection and quality check performed to remove the defect. The type 2 Muda however are the unnecessary activities that did not add any value to the customer. From week 7, it can be related to the unnecessary motion made by employees during housekeeping. Therefore, it was concluded that the seven-waste recognized in week 7 could be Type 1 or type 2 Muda and the goal was to eradicate the type two Muda as much as possible.

Mura or Unevenness in an operation; for example, a gyrating schedule not caused by end-consumer demand but rather by the production system, or an uneven work pace in an operation causing operators to hurry and then wait. Unevenness often can be eliminated by managers through level scheduling and careful attention to the pace of work. (Lean Enterprise Institute, 2016).

We had experienced the Mura in week 7, the cancellation of rooms booking resulted in overproduction of rooms. Mura can be avoided through the Just-In-Time,

Kanban systems, and other pull-based strategies that limit overproduction and excess inventory. The key concept of a Just-In-Time system is delivering and producing the right part, at the right amount, and at the right time (Do. D, 2017).

Muri means overburden, excessiveness, impossible, or unreasonableness. *Muri* can result from *Mura* and in some cases be caused by excessive removal of *Muda* (waste) from the process. *Muri* also exists when machines or operators are utilized excessively to complete a task or in an unsustainable way. *Muri* resulted in employee absenteeism, illness, and breakdowns of machines. Standardize work can help avoid *Muri* by designing the work processes to evenly distribute the workload and not overburden any employee or equipment. (Do. D, 2017)

In housekeeping, we can avoid Overburden (*Muri*) by accurately scheduling the employee and by allocating a balanced amount of tasks. As an example, we acknowledge that during the summer, the booking of hotel rooms was significantly higher thereby required excessive work hours. It was not suitable to schedule the employee for a longer duration, but rather summer employees were hired to assist with the work.

Principle 5. Response to Customer Pull.

Earlier this week, while we strived on lean principle 4 to achieve the leveled work pattern, we discussed that *Mura* (unevenness) can be one of the setbacks. It was also realized that the system based in response to Customer Pull was useful to tackle the *Mura*.

For example, in the context of housekeeping, the Hotel providing company X with the estimated number of rooms required based upon the prebooking is a system based on the Pull principle. Company X had to merely plan and schedule the resources and workforce avoiding any overproduction of rooms while at the same time avoiding overburden (*Muri*) on the employees.

If the system of pull was not used the Company X would have simply processed all the rooms available dedicating much larger resources and workforce resulting in overproduction (Muda) while overburdening (Muri) the housekeepers. The next day the resulting demand for the rooms would be significantly low since a large number of processed rooms were available thereby creating the artificial unevenness in demand (Mura). Company X would no longer be able to plan the optimum resources and workforce.

The use of a pull-based system also assisted in maintaining the inventory more systematically. Most importantly, the trigger point for replenishment and the necessary batch size for the new order of linen, towels, cleaning tools, and solutions can be easily calculated based on actual need rather than estimation.

4.1.4 WEEK 9

Principle 6: Stabilize and Continuously Adapt Work Pattern.

This Micro Principle is associated with creating the Standardize work based upon which the employees of Company X can perform the guided duties.

Once the service contract between company X and its customers: hotel H1 and H2 were made the Company X needed to engage in the scope of duties defined and required by the contract. Standardized work provides the solutions to the matters regarding the cost, quality, and time required to perform certain duties. It also defined in detail the responsibilities housekeepers needed to perform and the quantity for an instant if the task needed to be done was daily, twice a week or once a month and as such.

Nevertheless, in Lean the standardized work was not confined or stagnant but rather the minimum necessity from which the process can improve. Further, the standardized work was the result of enabling bureaucracy that enabled and overpowered the employees rather than the coercive bureaucracy that limited them. (Liker and Ross 2016, 187-207)

The standardization of any work to be performed at Company X was thereby decided to be accomplished at the Gemba where the group leaders or coaches provided the necessary training to the employees to achieve the work standard. It was also made clear that the standardized work was not a permanent solution but rather the collective best practices from which the processes were to be evolved into the better ones.

Principle 7. Manage Visually to See Actual Vs Standard.

Neuroscientist John Medina stated in the literature 'Brain Rules' that Vision trumps over all the other senses. A Piece of information that was heard when tried to be remembered only ten percent was recovered but when the picture was added to it sixty-five percent was remembered.

This principle also supports the classical tools used in Toyota Production System (Lean) such as *Kanban* and *Andon*. A *Kanban* referred to any signaling device that gave authorization and instructions for the production or withdrawal (conveyance) of items in a pull system. The term literal translation in Japanese was "sign" or "signboard." And *Andon* referred to a visual management tool that highlighted the status of operations in an area at a single glance whenever an abnormality occurs. (Lean Enterprise Institute, 2016). However, *Andon* is frequently used to build in the quality to achieve flow.

There were many visual management tools used by company X of which the Kanban board was the simplest, yet most frequently used. The Kanban board was a rectangular chart where vertically the status or the progress of completion of any task nominated was represented. The horizontal areas could be used to represent the urgency of the task or the employees responsible. Visually representing the works that were required to be completed for the day and revealing their status or current state made a positive impact on the performance. Employees, as well as management, could know which task to priorities briefly.

DATE:			
TASK STATUS TASK URGENCY	TO DO	IN PROGRESS	COMPLETED
URGENT	TASK 2	TASK 3 TASK 4	TASK 1
IMPORTANT	TASK 8 TASK 9	TASK 5 TASK 6 TASK 7	
NORMAL	TASK 13 TASK 14 TASK 15 TASK 16	TASK 11 TASK 12	TASK 10

Figure 11. Kanban Board of Company X for Task Management

During week 9, while discussing the use of Kanban and its advantages, a house-keeper suggested yet another unsophisticated but effective Kanban card that could be used. It was the checkout sign that was available in every room. It was observed that not all the customers placed the checkout sign on the door when they leave. While customers checked out the reception in the hotel can notify the team leader and in turn, they could hang the checkout sign out in the door. This provided the simple clue to the housekeeper responsible for the floor that the room was available to be processed instead of waiting (*Muda*) for the actual check-out time. The other Visual management tools included the root cause analysis charts or the fishbone chart during the identification of defects in the quality.

4.1.5 WEEK 10

Principle 8. Built in Quality at each Step.

Principle 8 that stated building in quality at each step was interconnected with the fourth 'P' and associated two principles. Evidently in the pertinent literature, P

stood for 'Problem Solving' and associated principles were Principle 16: To continuously develop scientific thinking and Principle 17: To align improvement objectives and plan for enterprise learning.

To build in quality at each step was to recognize the defect and eliminate it. The defect was also the seventh waste (Muda) of a lean system. So, to recognize any defect in the term of quality the service offered was needed to be evaluated against the standard. The concept was akin to the *Jidoka* from the lean principle based upon the house of lean that we had observed during the literature review.

A standard can be a policy, an engineering specification, or an aspirational target, and can come from inside or outside of the organization. The current state is then compared with the standard and any gap was acknowledged. The gap was the defect that degraded the quality of service or system. Therefore, the action was required for an organization to close the gap between actual and standard (Liker and Ross 2016, 240).

Exploiting the knowledge, the project team decided to use it in the context of Company X, that is to build in the quality for core value-producing activities, processing the room. And purposed the following steps: 1) Company X defined the standards for cleaning the rooms accomplished by the Gemba walk to witness the actual value-producing task performed by the housekeepers. The standard definition included each type of room duty the housekeepers needed to perform as well as the optimum time necessary to perform it. 2) Any defects in quality were compared with standard using the Current situation analysis. That is to compare and measure the actual state against the standard. 3) Once defects were identified the root cause analysis was performed to understand why quality deviated from the standard. This can be done by using tools such as five WHYS, that is to ask why the defect occurs continuously until the core answer was reached. Alternatively, using visual management tool can also be achieved using the Fish Bone diagram or the Root cause Analysis Chart. 4) Taking into consideration the findings from the root cause

analysis, Company X purposed the Specific- Measurable- Achievable- Reliable- Timely (SMART) countermeasure. These countermeasures also included the coaching and training process if required and 5) The Countermeasure were executed using the Deming wheel or Plan-DO-Check-Act/Adjust (PDCA) cycle developed by Dr. W. Edward Deming. Using this cycle also ensured that the process followed the Kaizen principle of lean.

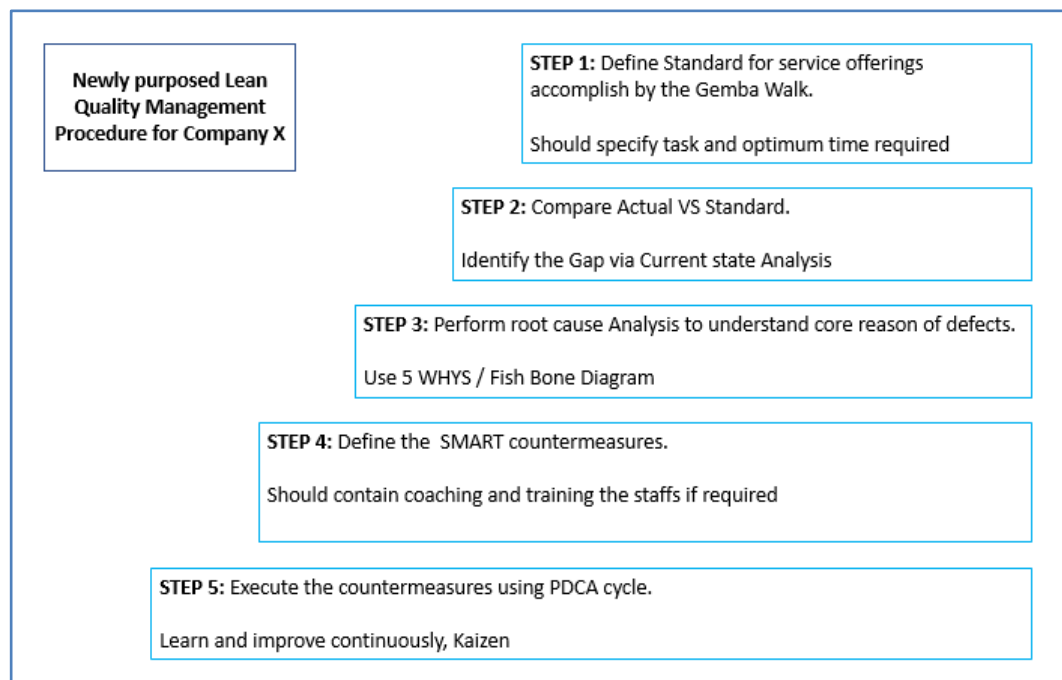


Figure 12. Lean Quality Management Steps for Company X.

On the individual or micro level while performing housekeeping a team member purposed the use of the '5S Lean practice' to ensure the quality of the hotel rooms. In the mention lean practice, the first 'S' denoted Sort (*seiri* in Japanese), where all the unnecessary items such as litter, used linen, towels, utensils were to be removed and only necessary items such as clean linen, towel were brought in. Second 'S' with Shine (*seiso*), the actual cleaning and inspecting of rooms were to be made by using proper procedure, skills, and tools. Third 'S' with Set in Order (*seiton*), housekeepers attempted to make work smoother and easier by introducing a meaningful sequence of the movement in and about the room, avoiding rework and backtracking. Fourth 'S' with Standardize (*seiketsu*), housekeepers standardized the cleaning process such as the amount of cleaning solution to be

used, the tools to be used, the use of a hygienic product such as gloves, work instructions, and visual ambiance and temperature setup for the room. And last for Sustain (*shitsuke*), the housekeeper suggested continuous audits for quality checks, to develop the culture to suggest further improvement or stabilization of the process. (American Society for Quality, 2021)

4.1.6 WEEK 11

Principle 9. Use Technology to Enable People

During this final week of implementing and learning from the Lean principles the author had attempted to understand the role of technology in the lean process of any service organization than in the perspective of Company X. As aforementioned, one of the founding principles of lean was the concept of continuous improvement or Kaizen. The process innovation in lean therefore had been highly complimented by the scope of digitalization because the very goal of digitalization is to enhance the process. Digitalization had predominantly been the part of what was referred to as 'Industry 4.0' that had been characterized by the Internet of things (IoT), Virtual and Augmented Realities (VR/AR), Advance Analytics, Autonomous Vehicles, Robotics and digital manufacturing.

Further, integration between the digitization with lean had been referred to as Lean 4.0. where having a streamlined and under-control process presented and platformed by the lean was the prerequisite for any process digitalization (Buer, Strandhagen, Chan, 2018). Studies have also established the relationship that companies with a higher associated level of lean implementation benefit the most in embracing Industry 4.0 and in grasping its potentials (Hoellthaler, Braunreuther, and Reinhart, 2018).

Acknowledging the concept and in the context of company X, the author had identified some of the technology that was already in use at Company X. Company X and its customers: hotel H1 and H2 had used the Enterprise Resources Planning

(ERP) system to integrate between their process. This had assisted in providing the flow of real-time information utilizing which the objectives could be achieved using limited efforts and conserving time. The supervisor and group leaders of company X can interpret the data provided by the system into an actionable plan and future objectives.

Moreover, the author had acknowledged that technology like Radio Frequency Identification (RFID) can be used to improve the process implementation concerned with inventory management. One of the major challenges in the service sector such as housekeeping had been the rotation of the linen and towels trolleys. The concept was simple; to replace the used linen and towels with the clean and fresh ones from the new Trolleys, the trolleys consequently would then be empty and could be used for transporting back the used linen and towels. However, there were massive underlying challenges. The new or fresh linen trolley can carry higher quantities of linen because the used one took much more space. Also, the demand for the use of new linen differs every day and depends upon the booking. This created the situation where the forecast could not be made to place the new order thereby the solution was to have extra trolleys of linen and towels at the storage. This was against the concept of lean: to minimize the waste (Muda) related to inventory. The use of Radio Frequency Identification (RFID) could easily solve this obstacle. It could be used for instance to tag the empty trolley, full newly arrived trolley, trolley full of used linen. This would in turn establish the system based upon the principle of Pull where suppliers could in advance be notified about the situation of linen inventory. Nevertheless, the concept could be only possible if the suppliers of linen would agree to integrate the system. The technologies like Radio Frequency Identification (RFID) have triggered high expectations for process improvement in retailing operations but have so far only been able to partially fulfill (Gaukler and Seifert, 2007).

Also, ideas were exchanged that the simple mobile application such as Step Counter can be used for the housekeepers to cross-reference and analyze the effective

route of movement during the process of cleaning the rooms and when movements were made between the different locations such as floors or to and from the storage rooms.

Moreover, technology had also enabled the supervisor, group leaders, and the housekeepers to find the real-time room status on the different floors so that they can plan and share the work burden (Muri).

5 PROJECT ANALYSIS

5.1 Overall Reflection (Week 6 – Week 11)

During the six weeks of attempt in implementing the lean principles following the 4P and 17 principles, Company X experienced steady business process improvement. On the first week of empirical implementation that is on the sixth week of the pilot, Company X and its employees had successfully recognized the value they were adding to the overall service solution offered to the customer. This provided them the motivation and sense of achievement when performing their duty on the individual level. The internal, as well as external communication between Company X's employees and the Hotel H1 and H2, was also improved as they came to realize the contribution being made by each party to achieve the definite objective: that was to offer the end customer the service excellence.

Further, in the following weeks of the pilot, the supervisor, group leaders, and employees of company X had been able to identify the 'waste' related to lean from the end customer's perspective. The author along with the pilot team had also differentiated between the value-adding and non-value-adding activities. By elimination and limitation of selected waste, the prospect of flow in the business process was increased. Further, the role of suppliers was also acknowledged in the process to eradicate the waste (Muda) related to inventories. Practicing Lean was intended for the Company X but it encouraged alterations in the supply chain.

Then, attempts were made to eliminate the unevenness (mura) and overburden (muri) in the operation by use of *Kanban* and Pull-based system. The attempt to level out the work was accomplished using the web as well as mobile-based scheduling application -Quinyx.

In the ninth week, the importance of work standardization was observed. It was also acknowledged that the Standardization of work was considered as the milestone from where activities could get better and improved rather than the hard-set rules enforced to adhere. To help in achieving those standards, the use of a

visual management system was considered vital to support the idea and learning process.

In the tenth week, the pilot team pursued to enhance the quality of service. The team acknowledged the significance of employee engagement while establishing the standard at the Gemba walk. Company X then positively rendered its unique Quality management system dedicated to enhancing the quality of its service. By applying it the quality of service had improved.

The team had also productively acquired the use of tools and practices related to lean such as Gemba walk, Kanban card, Kanban board, Current state analysis process, root cause analysis process, Plan-Do-Check-Act (PDCA) cycle, and 5S.

The following figure demonstrated the Lean Practices implemented during the pilot and their resulting mitigating influences on waste.

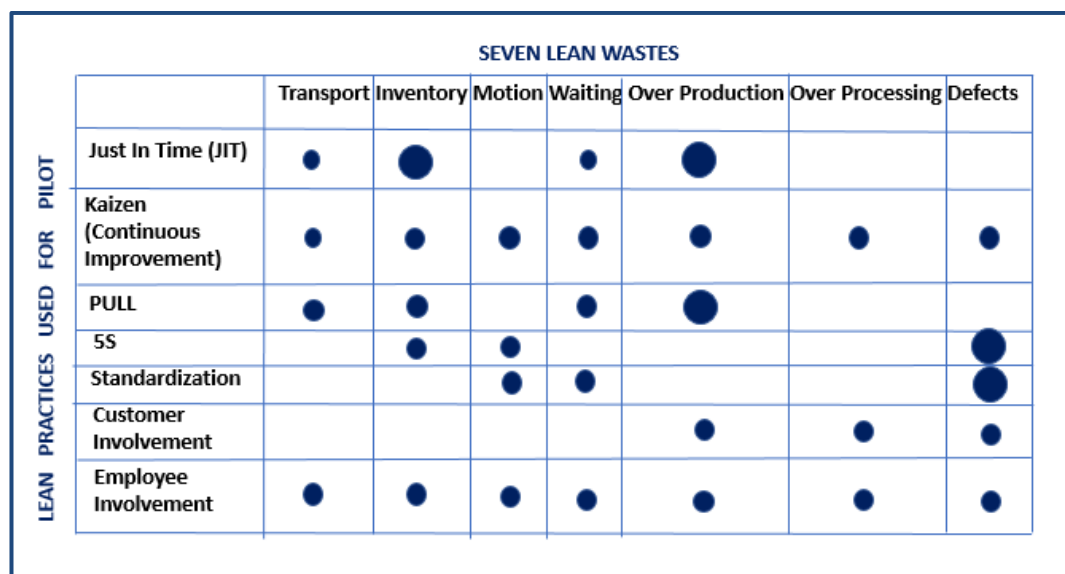


Figure 13. Lean Practices Against Waste in Pilot.

The Figure.13 demonstrated that the Lean practice Kaizen (Continuous Improvement) and Employee Involvement had an impact overall on the seven wastes. The

Principle from Toyota Way 2001 recognizes Kaizen and Respect for People as the two foundational elements of Lean.

Therefore, the pilot had also successfully recognized the foundational principle behind Lean.

5.2 On the Project Hypothesis

The author had presumed that if Company X could apply the principle of lean-to successfully deliver the service excellence for the primary customer (Hotel H1), then the same principle can be applied also for the comparable customer (Hotel H2) despite the difference in their location and structural build.

After the conclusion of the project, the team had a meeting on whether the lean principles including the practices and tools acquired from the project can also be applied for its second customer, Hotel H2. The team consisted of management, group leaders, and a pilot team. They had to decide based on pre-selected criteria: the investment and cost, the visibility of progress in a set amount of time, the impact made on the Key Performance Index (KPI), and finally the sustainability over long-term benefit.

They confirmed the transferability of lean practices and tools despite the difference in customer's location and structure build if the core value remained the same.

5.3 Answers to Project Questioner

5.3.1 Advantage applying Lean Principle in Company X.

Understanding Core Value: Foremost advantage of applying the principles of lean in Company X was that the core value was identified as a multi-channel contentment process rather than the isolated responsibility of an individual.

Change of perspective: The employees including the supervisor, group leaders, and housekeepers were able to comprehend their service sector as the part of

hospitality industry rather than a cleaning business, this change in perspective had motivated and broaden the employees' attitude toward work.

Cost reduction: As the process was optimized and enhanced the waste was eradicated significantly thereby reducing the operational cost associated with work hours, energy uses, cleaning equipment, and machinery maintenance.

Improve in communication: Employees were better connected and motivated as they understood how their responsibilities complement the team goal.

Employee involvement improved and Reduction in the number of sick leave: As the work was leveled and steps were taken to avoid the overburden (muri), the sick leave was significantly reduced. And the employees were better involved as the standardization process encompassed their concerns regarding the best practices and appropriate time duration.

Enhancement of Quality: Quality of service had improved significantly with the standardization, proper training of staff, and personalized quality management audits. (Week 10 of Pilot)

5.3.2 Limitation of Lean in General

Ecological concern was not addressed: Although the pertinent literature in Lean was able to address the concerns regarding Philosophy, Processes, People, and Problem-solving, it had yet to address the ecological concerns. Further study was required that complements the practices that address such concern. It can perhaps be the fifth 'P'-the Planet.

Term and conditions: For the pilot, the team consisted of part-time and full-time employees. Lean demands the necessity of long-term commitment. It constituted the co-process of learning and developing thereby required continuous involvement from the staff. It was not possible for the employees with short tenure such

as summer employees to integrate into the process actively. However, the practices and tools could be utilized.

Lack of Standard Methodology for Lean application: Many lean principles, practices, and tools used are common for both the manufacturing industry and the service industry. The methodology to be used was not cleared. Lean advocates such as the author of pertinent literature argue that the process should not be standard.

Less Adaptable during an emergency: One of the primary principles of lean was to create flow in the process and eradication of waste such as excess inventory, this, however, was challenging during the emergency cases where the supply chain was interrupted by the COVID pandemic, and it triggered the necessity to maintain some extra inventory.

6 CONCLUSION

Company X and its service offering represented a minor portion of the hospitality industry. The hospitality industry was in turn one of many service-based industries. So the question can be asked whether the author had justifiably made application of Lean principles and delivered conclusions that were enough to address for all the service-based industry. Nevertheless, the statute's foundational component of any service industry is built upon their guiding Philosophy, People who work at the company, business Processes, and Problems that the service resolved. The lean principles mentioned in the pertinent literature were conceptualized upon very components and therefore accommodates the solution to any services industry that pursued to strive for excellence.

6.1 Suggestion for Further Study

The author as interim group leader for the pilot strived to implement only one of the four-element from the pertinent literature model that is the 'Process'. The author had acknowledged during the pilot that the other elements including Philosophy, People, and Problem solving were also interrelated and without addressing them Lean process would never be achieved. The author would like to request all the readers of this research to take into consideration those other elements and better possibly other service genera if they are interested to make further study in the application of Lean. Further, in the spirit of the lean foundational principle the kaizen, even though the pilot concluded, the company's expedition for continuous improvement using the lean principle did not cease.

6.2 Reliability

The finding of this research was derived from the experimentation made on an actual service-based company, its business processes, and its employee. Further, the research report was verified also by the company's supervisor to eliminate the possibility of any biased conclusion.

6.3 Transferability

The ideas reviewed in this research were addressed against real-time problems. The lean practices followed and the tools to achieve them was also effectively used for company's other customer when verifying the project hypothesis.

6.4 Usability

The principles cited in this report, the tools applied, and the lean practices can be utilized for all serviced-based companies. However, only limited ideas, practices, and tools had been explored that satisfied the scope of the pilot. There are other useful practices and tools yet to be explored.

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