# Challenges and Critical Success Factors in 5S System Implementation in Selected Manufacturing Companies in Thailand

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Received 13 Jan 2023; Revised 29 Sep 2023

Accepted 23 Dec 2023; Available online 30 Dec 2023

**Abstract**

Although the five S (5S) methodology may appear to be an uncomplicated, systematic approach for workplace organization, literatures show that many organizations struggle in implementing it successfully and sustainably. The study aims to develop a better understanding of the constraints and challenges, as well as the critical factors for success from the lived experiences and perspectives of 5S implementers. A qualitative approach was utilized in which primary data were collected from 10 respondents from different manufacturing companies in Thailand. Findings showed that human-related, and material and immaterial factors stall 5S efforts. Based on these findings, a multi-dimensional approach for developing 5S culture in the organization is recommended to control, connect and move resources and people towards action to achieve an organized workplace through 5S.

**Keywords:** 5S, workplace organization, quality management

## 1. Introduction

To survive the ever-increasing competition in the marketplace and to meet stringent compliance requirements, locally and internationally, require organizations to operate with high-level of efficiency. Manufacturing companies adapt and implement different techniques and strategies to increase productivity, add value and improve quality. 5S serves as a base foundation for the lean culture in the organization and facilitates the implementation of other lean management tools such as Total Quality Management (TQM), Kaizen, Kanban, Total Productive Maintenance (TPM), Just in Time (JIT), and Six Sigma, among others [1]. It is a technique adapted by many organizations in various sectors - manufacturing, academic or public sectors - to put order and system in the workplace in order to be efficient, effective and safe. Applying 5S rules in the workplace helps to identify value and non-value adding processes and reduces risks of injuries and mistakes.

Existing literature on lean manufacturing, in general, and 5S in particular, are mostly based on conventional quantitative analysis, using regression analysis and structural equation modeling, to determine cause and effect. A qualitative study will provide rich insights and complement existing quantitative analyses on the phenomena. This study, therefore, aims to develop a better understanding of the critical factors affecting the

success and failure from the experiences and perspectives of employees who play key roles in the 5S project implementation in their respective companies. What contributes to success, and how to address the challenges? The findings from this study will pave the recommendation of intervention programs to avoid the pitfalls and successfully deploy 5S system in the organization.

**2. 5S System in the Workplace**

5S implementation can be a company- wide initiative, with a 5S core team created and tasked to lead the project, initiate activities, promote, implement and monitor. Some organizations create their small 5S group in each department which serves as the department's own core team to implement the 5S activities.

One of the tools used in 5S implementation is the Plan-Do-Check-Act or PDCA from Deming's theory of Total Quality Management (TQM). Considered as the golden cycle for improvement, it is the foundation for the effective and successful implementation of 5S. It is a methodical approach used in problem solving and for continuous improvement, with range of implementation starting from top management down to the shop-floor. It denotes a cyclical, non-stop action until the goal has been achieved and activities have been standardized [2].

**3. Relevant 5S Study in Thailand**

Thailand, one of the leading manufacturing centers in Asia, is also at the forefront of lean management, implementing variety of quality standards, including 5S. NHK Spring (Thailand), a manufacturing company meeting wide array of market, including automobile field, motorcycle field, office automation equipment field, and consumer electronics field, among others, claims to be the pioneer of 5S in Thailand [3]. The company, which is one of the overseas operations of the NHK Spring Group, introduced the first 2S in the company 40 years ago, and later published the first 3S Handbook in Thai language in 1984.

Relevant literature shows that 5S is being implemented in Thailand across different industries and sectors. An analysis of the implementation of Industry 4.0 suggests that "all lean production practices increase financial and operational performance of manufacturing firms in Thailand" [4, p. 571]. The adoption of quality management practices, including 5S, significantly increases the probability of product innovation [5]. The study of Kijjadhip et al. [6] observed that 5S is widely implemented in the production processes of sugar mills in the northeast of the country to help waste reduction. This is the same finding in a case study on the application of 5S activities in Phan District, Chiang Rai where 5S lean processes resulted to reduced wastage of community products, both monetary and non-monetary [7]. A study on hospital safety in Thailand showed that the 5S standard is considered as one of the important safety standards used by hospitals in the country [8]. Another study pertaining to the relationship between leadership, lean and performance in Thailand's automotive industry showed that performance was most affected by lean manufacturing practices followed by leadership [9]. In Isuzu Motors (Thailand), it was found that Thai staff participate actively in 5S activities [10].

**4. Challenges in Implementing 5S in the Organization**

Inasmuch as 5S is considered an important quality management systems tool, many companies still struggle in successfully and sustainably implementing it. 5S may appear complicated, but it

is a deceptively simple system [11]. According to Barraza et al. [12], the 5S tools originally included only the first three phases (sort, shine and set in order). This could partially explain why some organizations fail to go beyond the housekeeping stage onto standardizing and sustaining the system. Relevant studies suggest a number of challenges and constraints encountered by organizations when using the 5S system. Some inhibitors preventing success of 5S system implementation in the healthcare industry include lack of communication, commitment, personal responsibility, training, lack of time and lack of resources [13]. Employee resistance and lack of involvement of top management are found to be the main problems in the deployment of 5S practices in an industrial company. Culture and religion were found to have effect on Indian sub-continental workers in the implementation and maintenance of 5S tool in manufacturing setting.

**5. Factors for Success**

The success of projects or programs, such as the lean 5S, depends on many different factors. Critical success factors (CSF) are those few things that must go well and must be given special and continual attention to bring high performance in both current operating activities and future success for an organization [14]. They are the skills, resources (persons), tasks and behavior whose consideration or obeyance are of critical importance for the success of an organization [15].

The studies of Young et al. provided evidence that the most important critical success factor is top management support [16]. It is not simply one of the many factors on project success but is actually the one with greatest influence on whether a project fails or succeeds. Aside from top management support, communication is also often cited as a significant success factor. Failure in communication causes a dysfunction in the process of transmitting information from one person to another [17] which can lead to a serious problem in successfully achieving organizational goals.

Other than human factors, there are material and immaterial things that also affect success or failure of programs or projects [13]. The material things include documentation, instruments used and resources. Immaterial things cover analyses, planning, controlling and coordination. Organizational culture and organizational structure, organizational atmosphere and organization competence are also contributors to success [18].

**6. Methodology**

The study employed qualitative method to develop a better understanding and information of the critical factors for the success or failure of 5S implementation. A general descriptive approach was used in doing this qualitative study. Many of the existing studies about success or failure factors were based on empirical evidences using quantitative method. The use of qualitative approach in this research is considered more appropriate to examine in- depth these factors based on the experiences and views of the respondents.

Through convenience and purposive sampling methods, 10 respondents from 10 manufacturing companies in Thailand were selected. Relevant studies suggest that a sample size of 10 for a qualitative study can be considered suitable. There were studies [19 – 21] that recommended a minimum of six respondents or between 3 –10. Sample size may vary depending on the number of participants who are sufficient to provide evidence on the issue under discussion; some experts argue that one interview is sometimes sufficient while some other experts suggest a minimum sample size of 12 [19 – 21].

Accessibility of respondents and suitability for the purpose of the study were considered in choosing the research informants. This method is appropriate to probe views and opinions and gain rich information that would address the problems that the study wants to examine. Although this type of nonprobability sampling has limitations due to the subjective nature in choosing the sample, it is still useful in this situation where population is large and the resources and time for the study is limited.

The respondents come from four different sectors of Thailand's manufacturing industry – medical devices, electronic manufacturing services (EMS), semi-conductor, and automotive. The country's manufacturing sector accounts for 25.31% of the national GDP in 2019 [22]. It is the largest automotive production center in the ASEAN region and is the leading global HDDs and components producer [23]. The country also has the second largest manufacturing base for electrical and electronics manufacturing in the region [24]. Thailand has several designated industrial estates in different parts of the country, from north to south and east to west. In these industrial estates are located small, medium and large manufacturing companies, both local and international.

In order to adhere to compliance requirements and to improve efficiency, manufacturing companies implement quality management systems. This study examines the 5S experience of selected manufacturing companies in Thailand through the lived experiences of 5S project leaders and supporters.

**7. Participants/Key Informants**

The study selected 10 respondents using convenience and purposive sampling. The respondents were selected based on the following set of criteria: 1) holding the job titles of either manager or engineer, 2) they participated in the 5S project as project leader or project supporter, and 3) have direct knowledge, information, interaction and experiences on the 5S efforts in their respective workplaces.

**8. Data Gathering Procedures**

Participants were informed of the interview and its purpose beforehand. They were made aware of the fact that it was not mandatory and did not have any repercussion on the participant or his/her organization, and that the data would be used for research purposes only and will be handled with confidentiality. There was no need to inform the name and organization to avoid identification of the respondent and keep the objectivity and confidentiality of the survey.

The process of setting appointments for interview was done through initial and follow-up communications via email, telephone calls and messaging on social media platforms. Aside from one-on-one interviews conducted on face-to-face basis, the study also conducted phone and internet interviews of some informants due to the distance and prohibitive costs of personal contact.

**9. Data Gathering Tools and Instrument**

Primary data were gathered from respondents through the unstructured interview method. The questions were broadly focused on gaining insights on the research participants' experiences from their involvement in the implementation of the 5S system in their respective companies. A pilot interview was conducted to validate the interview guide with a colleague who has extensive experience with 5S implementation. The piloting helped to test if the questions were easy to understand and answer. There were few small changes made on some questions to correct the wordings.

The participants were presented with interview questions, which focused around the following: (1) Expectations from the 5S implementation before and during the process (2) Positive experiences while implementing the 5S system (3) Challenging experiences while implementing the 5S system and how these were managed (4) Perceptions on whether their expectations were met and the benefits of the 5S system (6) Recommendations for a successful implementation of the 5S system. They aimed to gain better understanding of the respondents' experiences and challenges in their 5S efforts. From this information, the researcher was able to gain insights that respond to the problem statement after the process of data coding and analysis. To manage large amount of data, the study followed these five key stages based on Kruger's Framework Analysis by Krueger [25]: 1) familiarization; 2) identifying a thematic framework; 3) indexing; 4) charting; 5) mapping and interpretation. These steps were adapted from the study of Rabiee [26] on the application of framework analysis in qualitative research.

The researcher listened to the audibly recorded proceedings and read the transcripts as well as the observations and summary notes a number of times to establish familiarity with the data. The data were then printed, organized, coded, and indexed into parts to identify thematic framework. The organized and coded data were interpreted and analyzed, and the themes were presented in a cohesive manner. Discussion of narratives were complemented with figures and tables for clear presentation.

**10. Demographic characteristics of the respondents**

Of the ten respondents, four were from the electronics manufacturing service (EMS) industry, three from automotive manufacturing industry, two from semiconductor manufacturing industry and one from the medical equipment and devices manufacturing industry. On the respondents' designation in the company, five were engineers, and the other five were departmental managers. Four respondents took the role of 5S project leaders while the other six served as 5S project supporters. Six were female and 4 were male.

**11. Data Analyses and Findings**

The responses were analyzed and coded 5S PEAR, an adaptation of Excel's [27] on which the data instrument used in the study was based. 5S PEAR stands for Preparedness, Engagement, Aptitude and Reformation in 5S Implementation, as shown in Figure 1.

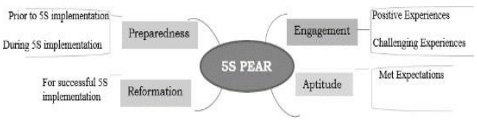


*Figure 1. 5S PEAR*

Preparedness reflects how the respondents were prepared for the 5S implementation, including their expectations and needs. Engagement reflects the respondents' interest in the initiative including the challenges they encountered. Aptitude reflects the benefits of 5S as perceived by participants. Reformation reflects the respondents' suggestions on how the 5S implementation can be further improved in its implementation and sustainable deployment.

**11.1 Preparedness for 5S**

The findings show a number of themes on the respondent' expectations prior and during the 5S implementation. The "prior" expectations were focused on the desire for an organized and safe workplace, reduced customer complaints, and management support. A careful review of expectations "during" the implementation focused on allocation of resources,

employee training and awareness, discipline, and the cooperation of everyone to the 5S efforts, as shown in Figure 2.

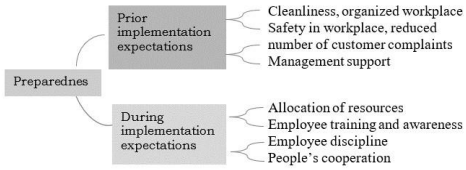


*Figure 2. Preparedness for 5S*

### 11.2 Engagement in 5S

The respondents' engagement throughout the duration of the 5S implementation were examined based on their positive experiences and the challenges they encountered. The informants' comments express the positives in terms of increased productivity, improved product quality, customer approval, and enhanced employee satisfaction. On the challenges, references were made to lack of employee cooperation, lack of management support, and lack of employee awareness and understanding of the 5S system (Figure 3).

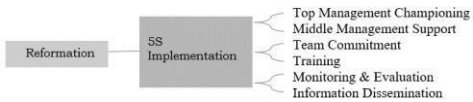


*Figure 3. Engagement in 5S*

### 11.3 Aptitude for 5S

This study reviewed the respondents' perception on whether their expectations were met prior and during 5S implementation (Figure 4). The comments were focused on management involvement, management recognition to deserving 5S teams, increased employee understanding and cooperation through training, and follow up and monitoring of 5S progress. It also examined the participants' views on the benefits of 5S to them in organizational level, particularly in the areas of production quantity, quality, cost reduction, safety, and employee morale.

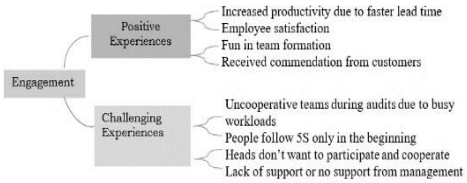


*Figure 4. Aptitude for 5S*

### 11.4 Reformation for successful 5S

The study drew insights from participants on what they think are the factors that contribute towards successful implementation of 5S system (Figure 5). The findings showed varied viewpoints, including mostly around management support from top and middle management levels, team commitment, training and awareness, information and dissemination, and monitoring and evaluation.

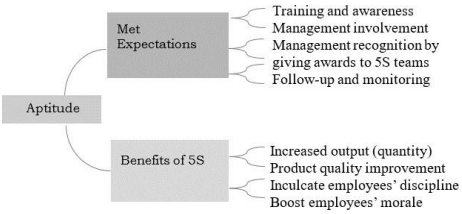


*Figure 5. Reformation for successful 5S*

## 12. Positive effects of successful 5S implementation

The study found a number of positive benefits resulting from successful 5S implementation: (1) improves the quantity or production output of the organization; (2) enhances the quality of the organization's products and system; (3) strengthens manpower safety; (4) instills discipline among employees; and (5) enhances employee morale.

The effect of 5S project implementation is mostly on the product quantity and quality key performance indicators (KPI). Four participants said that 5S is positively affecting quantity and quality. One respondent said that there was a

visible increase in the production lead time even at the early stage of 5S deployment. This meant that positive results can already be seen even if not all the 5S phases are fully completed. Another claimed that his company received recognition from customers for the visible and concrete improvements in the workplace organization. Employees seemed to be happy and satisfied with the good changes brought by the 5S system: “Since we have 5S activity, all tools have specific areas and shadow boards which were placed strategically to avoid downtime” (N2). In terms of quality, respondents claimed that “inspectors can concentrate because the area is clean, comfortable and all needed tools are provided” (N3). It “maximized the workability of production, movement and time, and the compliance to rules and prohibition inside company protocol” (N5).

**13. Challenges and Constraints in 5S efforts**

Unsurprisingly, some of the comments of respondents on the implementation process and expectations reveal challenging and/or negative experiences. Despite the varying stages in the 5S efforts of the respondents, all informants declared that implementing 5S within their workplaces was not easy, but rather full of challenges. Based on the comments, the challenges encountered by respondents in their 5S efforts were all human factors and could be categorized into four: lack of management support, lack of employee cooperation, lack of team commitment, lack of employee discipline, and incomplete understanding of the 5S system.

**13.1 Lack of Management Support**

Four respondents cited lack of management support as a challenge in carrying out the 5S project. By management support the respondents meant top management, such as the Plant Director or Managing Director. Since top management is the most powerful in the organization, it has the greatest influence in organizational and employee behavior [28]. The 5S effort is bound to fail if the employees do not see that the initiative for the 5S implementation in the company is coming from the top. Some respondents voiced concerns of “failure without higher management support” (N6), believing that “management involvement is critical to the success of 5S” (N7).

Respondents pointed out that the lack of operational support of line managers can also lead to failure. Without the active participation and involvement of the heads of each department and section, it will be difficult to implement 5S in their respective areas. This creates a domino effect wherein if the line managers do not support the 5S activity the project suffers from lack of manpower. The manager would not appoint representative nor get involved in the 5S activity. As a result, there will be no implementers of 5S projects. Respondent complained that “the heads of each department and/section don’t like to participate” (N1) and “…lack of resources being given by the heads like manpower, tools…” (N6).

**13.2 Lack of employee cooperation and team commitment**

Respondents mentioned that lack of employee cooperation contributes to failure even at the earlier stage of 5S implementation. Due to busy workload, some employees are uncooperative during 5S audits. They see the 5S initiative as merely a burden and interruption from their regular tasks. Another reason for lack of cooperation is when the employees are unaware of the importance and positive impact of 5S. When employees have incomplete understanding of the system, they are less likely to care whether they achieve the 5S goals or not, as can be seen in the

respondents' comments: "struggles in implementing the project because not everyone is willing to participate or to get involved lalo na dito hindi big deal ang 5S unlike sa atin in which mostly Japanese companies (especially here where it is not a big deal unlike in our country where there are mostly Japanese companies)" (N7).

It has been the experience of some respondents that the commitment of some 5S project leaders and members wanes as time goes by. Their level of active engagement is reduced and their attendance to 5S-related meetings and participation to activities lessens. This makes the implementation difficult, especially when it is the core team members who do not show commitment to the project, with complaint of "uncooperative teams during audit due to busy workload"(N2).

**13.3 Lack of employee discipline**

The respondents also claimed that the lack of discipline among employees can stall the continuance of 5S implementation. Even if the four phases have been achieved and rules have been established and standardized, sustaining them becomes problematic because employees are likely to disengage after some time. Some of the respondents' comments in this regard include the "need to keep reminding the employee by weekly, audit, orientation, announcement, memo and meeting" (N5) and "lack of discipline that results to implementation lapses and poor audit results" (N7).

**13.4 Incomplete understanding of the 5S system**

Some employees have incomplete understanding of the 5S system. They are unaware of the importance and positive impact of 5S. Since they are new to this, they do not have a visual idea of what 5S looks like and how it will help improve their work. This makes them less likely to care whether they achieve the 5S goals or not. There is lack of 5S understanding by associates, thinking that 5S means cleaning which is not 100% correct (N10, N8).

**14. Critical 5S Success Factors**

The participants identified the things that are important to successfully implement the 5S system which were aligned with the taxonomical categorization suggested in the studies of Young et al. [16] and Bundschuch [15]. The first three factors namely, top management championing, middle management support, and team commitment are human factors. The other two, training and awareness, information dissemination, and monitoring and evaluation are material and immaterial factors, respectively.

**14.1 Top Management Championing**

The study findings affirm theories about top management support as a critical factor for success. Respondents mentioned that the buy-in and championing of top management is very important to ensure that all resources will be provided like manpower, tools and budget. Most importantly, top management support to 5S efforts boosts morale, and seeing them as role models can influence employees to emulate and follow. Top management's championing is like giving the much- needed 'blessing' which provides 5S implementers the authority to carry on with the task. The respondents believe that "Top management support is one of the most important factors that contribute to the success of 5S" (N6).

**14.2 Middle Level Management Support**

Aside from support from the top, the operational support and active involvement of middle management, such as the department heads and line managers, is critical because the lack of it can lead to failure. The respondents emphasized the importance of participation of the

heads of each department and section in leading the staff under their authority, checking and monitoring the implementation of 5S activities, allocating time in conducting group audit, and allocating budget necessary for the continuance of 5S projects. Performance recognition in the form of rewards also demonstrates management support. According to Jacobs [29], “One great idea we found in our research was to ask facility managers to 5S their offices first.” This is a powerful step to demonstrate that the managers are fully on board with the initiative.

The respondents feel that “The heads of each department and/section should participate and ensure that the project is implemented in their respective area (N1)”. Consistency is also key, citing that “The leadership must consistently do his function to lead the group especially in checking the implementation of the activities” (N3).

**14.3 Team Commitment**

The commitment of every member of the 5S core team is crucial in ensuring the effective dissemination of information, as well as in monitoring and follow-up. The team’s commitment is necessary because they are the ones who will provide the required resources to implement 5S and who will execute the PDCA cycle. The respondents commented that “Understanding of team member and intention to implement 5S is necessary.” (N9). Representation is also important, citing that “should form a 5S Task Force team from different departments in the factory” (N2).

**14.4 Employee Training**

The lack of cooperation of employees stems from their ignorance or lack of understanding of how the 5S system works and its value-addition to the organization. This makes employee training very important to the 5S efforts, as reflected in the comment of respondents: “But through proper training they are getting used to it. In the end they themselves noticed the importance and difference of having 5s activities” (N8). “Start with training to explain what's 5S, benefits and how to implement, recommend to do 5S competitions to motivate teamwork” (N2).

Training is undertaken at the start of 5S deployment to orient and familiarize the employee or team. This is reinforced by one-day sessions with the team or with each employee “to ensure they are on the same page as far as implementation is concerned” [30]. Jacobs [29] proposed a more straightforward approach - for managers to do 5S with their offices first – in order to provide a clear illustration and vivid example as to how 5S truly works.

**14.5 Information Dissemination**

Keeping employees informed about 5S activities and projects and their progress can make them feel empowered and motivated. Fernandez et al. [31] suggested that empowering employees with information can be a source of motivation and satisfaction. One respondent mentioned that the use of visual aids where employees can see data in graphs and figures, accompanied with photos documenting development and progress in workplace organization, can be very useful in influencing positive behavior towards 5S stating that “consistency in awareness is important” (N3), and “by informing members, setting of visual aid (labels) and setting goals” (N10).

**14.6 Monitoring and Evaluation**

It becomes difficult to sustain the 5S efforts after starting it due to lack of follow- up and monitoring. Employees forget about the initiative and reduce their engagement after some time. Hence, there is a need for constant follow up, monitoring and reminding the employees through weekly audit, orientation, announcement, memo,

and meeting. Raising awareness by setting common goals and information dissemination are some of the strategies that can be used to actively solicit the cooperation of members and maintain interest, discipline, and commitment. Respondents commented that "Follow-up or monitoring of activities must be done" (N4). "It is challenging but being implemented and checked through audit is important" (N8).

Reflecting these findings, Figure 6 shows the critical success factors to 5S implementation.


*Figure 6. 5S Success Factors*

**15. Conclusion and Recommendations**

The study contributes not only to knowledge but also to practice on 5S implementation as the findings provide useful insights to organizations, 5S leaders and employees to learn from the experiences of others. Outcomes of the study further suggest that when the challenges are proactively addressed and channeled toward increasing knowledge and awareness through training and active information dissemination and the support from both top and middle level management, they will contribute to the success of 5S efforts. Findings also suggest that the deployment of 5S system in the company can be sustainably managed by means of constant and regular follow-up, monitoring and evaluation. The study offers a better understanding on the different kinds of support required from various levels of management. The support of top management and middle level management are both crucial, but of different nature. During data transcription and while reviewing the participants' responses, it was observed that demographic factors such as position, 5S participation, type of manufacturing company, and gender did not make any obvious disparity in the responses of participants.

Considering that the 5S success factors are human, material and immaterial in nature, the study recommends that organizations adopt a multi-dimensional approach in order to control, connect and move resources, processes and people towards action for a successful 5S practice. The controlling interventions intend to instill control over resources through the management of time, people, money, and quality. These controlling interventions will be in the form of company guidelines, training program and awareness campaign, and effective 5S monitoring and evaluation strategy. Connecting interventions aspires to connect people, and can be done by 1) rallying the top management to be 5S champions themselves; 2) organizing friendly 5S performance competitions and giving rewards; 3) creating an online 5S community; and 4) sharing 5S best practices with partner organizations such as suppliers or customers. Actuating interventions is directed to move people towards action, which include extending 5S initiatives to employees' homes and developing 5S learning materials.

**16. Direction for Future Research**

It is recommended that future research focus on a cross-section of respondents including operators, technicians and engineers who are directly affected by the 5S implementation and can

provide richer insights and information. It will also be interesting to conduct a comparative analysis of implementing 5S between the manufacturing sector and another sector such as education or government sector.

**References**

[1] Randhawa J, Ahuja I, Singh K. Evaluation the Impact of 5S Implementation on Business Excellence Performance Parameters through Structural Equation Modelling. IJAMR Publications 2017. 9(2): 17-25.

[2] American Society for Quality. [Internet] 2022 [cited 2022 Aug 6]. Available from: https://asq.org/quality- resources/pdca-cycle

[3] NHK Spring (Thailand). [Internet] 2022 [cited 2022 August 2]. Available from: https://www.nhkspg. co.th/en/working_ policies/5s.php

[4] Hotrawaisaya C, Pakvichai V, Sriyakul T., Lean Production Determinants and Performance Consequences of Implementation of Industry 4.0 in Thailand: Evidence from Manufacturing Sector Journal of Supply Chain Management. 2019. 8(5):571.

[5] Intalar N. The Effects of Quality Management Practices and Customer-Supplier Linkages on Innovation in Thai Manufacturing Firms. Thammasat University; 2018.

[6] Kijjadhip T, Rojniruttikul N. The Relationships among 5S Activities and 7 Methods of Waste Reduction in the Production Process at a Sugar Factory in the Northeastern Area of Thailand. Journal of Economics and Management Strategy. 2019.

[7] Chuamaungphan O, Chaweerak A, Akarak P. Influence of 5S activities on cost reduction from wastage of community products, Phan District, Chiang Rai Province. Journal of Management and Local Innovation. 2023.

[8] Chinda T, Tangkaravakun N, Wesadaphan W. Hospital Safety: Investigation of 5S Implementation. In: 4th International Conference on Engineering, Project, and Production Management, 2013.

[9] Thiemthao W. Cross-cultural Conflict at Isuzu Motors (Thailand) Company Limited. Mahidol University. 2015.

[10]Sureerattanan C, Napompech K, Panjakhajornsak V. Model of Leadership and the Effect of Lean Manufacturing Practices on Firm Performance in Thailand's Auto Parts Industry. Research Journal of Business Management. 2014.

[11]Dennis P. Lean production simplified. 2nd ed. New York: Productivity Press; 2007.

[12]Barraza M, Pujol J. An exploratory study of 5S: a multiple case study of multinational organizations in Mexico. Asian Journal on Quality. 2012.

[13] Benjamin BM. Barriers in implementing the 5S system in the healthcare industry. 2012. Libraries and School of Information Studies. Purdue University.

[14]Jalaliyoon N, Bakar N,Taherdoost H. Accomplishment of Critical Success Factor in Organization; Using Analytic Hierarchy Process. IJARM. 2012.

[15]Bundschuh M. Key Factors for Project Success and Failure. In: ESCOM- MAIN-GUFPI Conference, 2003; Rome, Italy.

[16]Young R, Jordan E. Top management support: Mantra or necessity? International Journal of Project Management. 2008; 26(7): 713-725.

[17]Chiavenato I. In Ramos P, Mota C. Procedia - Social and Behavioral Sciences. 2014; 119: 349 – 357.

[18]Taherdoost H, Keshavarzsaleh A. Critical Factors that Lead to Projects' Success/Failure in Global Marketplace. Procedia Technology. 2016; 22: 1066-1075.

[19]Morse J. Designing funded qualitative research. In Denzin N, Lincoln Y, editors. Handbook for Qualitative Research. CA: Sage, Thousand Oaks; 1994:

[20] Dukes S. Phenomenological methodology in the human sciences. Journal of Religion and Health. 1984; 23 (3): 197-203.

[21]Baker SE, Edwards R, Doidge M. How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research. 2012. National Centre for Research Methods Review Paper.

[22]World Bank. (n.d.). Manufacturing, value added (% of GDP) – Thailand [Internet]. 2019 (cited 2022 August 20]; Available from: https://data.worldbank.org/indicator/NV.IND.MANF.ZS?locations=TH&most_recent_value_desc=true

[23]Thailand Board of Investment. Thailand: The World's Electrical and Electronics Industry Investment Destination [Internet]. 2015 [cited 2022 Aug 2]; Available from: https://www.boi.go.th/upload/content/BOI-brochure%202015-E&E_67848.pdf

[24]International Labor Organization. ILO Asia Pacific Working Paper Series [Internet]. 2017 (cited 2022 September 10); Available from https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/---sro-bangkok/documents/publication/wcms_575610.pdf

[25]Krueger R. Analyzing and Reporting Focus Group Results. CA: Sage Publications; 1998.

[26]Rabiee F. Focus-Group Interview and Data Analysis. Proceedings of the Nutrition Society. 2004; 63:655-660.

[27]Nzekwe-Excel C. A qualitative study on the experiences and challenges of MBA students' engagement with a business research methods module. Journal of Work-Applied Management. 2021. Available from: 10.1108/JWAM-08-2020-0040.

[28]Asrar-ul-Haq M, Kuchinke K. Impact of leadership styles on employees' attitude towards their leader and performance: Empirical evidence from Pakistani banks. Future Business Journal. 2016; 2 (1): 54-64.

[29]Jacobs C. How to Get Your 5S Initiative Up and Running [Internet]. 2015 [cited 2022 August 20]. Available from: https://www.industryweek.com/operations/continuous-improvement/article/21965121/how-to-get-your-5s-initiative-up-and-running

[30] Paulise L. Implementing 5S Methodology: The First Step Toward Workplace Efficiency [Internet]. 2021 [cited 2022 August 20]. Available from: https://www.simplilearn.com/implementing-5s-methodology-to-achieve-workplace-efficiency-article

[31]Fernandez S, Moldogazi T. Employee Empowerment, Employee Attitudes, and Performance: Testing a Causal Model. Public Administration Review. 2013; 73.