

Technology Management in Lean Manufacturing Implementation: A case study

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Abstract—The demanding of globalization and the concern to remain competitive in the global economy has driven countries to actively pursue high-technology and knowledge-intensive service in industrialization strategies. To encourage the development of industrial technology, several factors must be considered such as knowledge, skills, technical development and basic infrastructure. This study attempts to investigate the technology management required in implementing lean manufacturing system in a manufacturing company. This system is useful to ensure production process in operation smoothly run without interrupted. A single-case study was employed. The three different methods for data gathering: interview, observation and documents all contributed towards the data analysis. The respondents were asked about their experience in implementing lean manufacturing in the company and also the challenges occurred. The results from the case study show that to implementing a new technology, commitment from all employees in the organization is crucial. Management also should analyze and predict the potential failure as a preparation before starting to adopt the new technology in the organization.

Keywords—technology management, lean manufacturing, aerospace industry, Malaysia

I. INTRODUCTION

Technology is now widely diffused to all organizational levels. Fundamentally, it does not only require a technological understanding, but also a greater understanding of the social, behavioral and cultural factors, which can impede or facilitate change, as users interact with technology. One of the technologies is lean manufacturing system. This system is useful to ensure production process in a manufacturing company to run smoothly without any interruption.

According to Bennet and Vaidya [1] states that Technology Management of planning stage is very important and need to be more focus to achieve the target. To adopt a new technology in an organization, several principles should be taken in consideration such as planning, developing, evaluating and improving. At the planning phase it involves in creating of a set of plans to guide a team through the execution and closure phases of the project. The plans created during this phase will help managing of time, cost, quality, change, risk and issues relevant. In the development phase, several factors

have been considered such as training, coaching, appoints champion, forms working committee, develop pilot project and identify lean tools & techniques. The third step is evaluating process which is a person in-charge (change agents) will perform several initiatives such as gemba walk, audits, presentation, assessments and join competition. The last step has been focus on improvements to ensure the system has been adopted will be sustained and grow. It also can make a company as benchmarking of lean manufacturing systems in the region. Knowledge is essential to all organizations. Knowledge is one of the keys, which affects the success of a business organization where its employees who have been equipped with the necessary and right type of information will give the organization a better competition advantage than its competitors [2].

Therefore, the aim of this paper is to investigate how a company managed the technology during the implementation of lean manufacturing. What are the challenges occurred when adopting this manufacturing system?

II. COMPANY BACKGROUND

This study is mainly focus at Company A, a manufacturing company categorized under aerospace industry. Since its inception in year 2000, the company, which is a joint venture between Boeing, Hexcel, and local companies served as Malaysian development towards aerospace industry through various strategic business operations. Today Company A prides itself in producing of wing parts of Boeing aircrafts such as B737, B767, B777, B747 and B787-9 supported by robust operating system. The company has adopted Lean Manufacturing system and implemented the concept since the process of developing the factory building. It has done a lot of effort in order to produce the world class aircrafts and to gain trust from both the suppliers and customers. Adopting of lean manufacturing has marked the most important part in Company A's milestone. The company has been implemented pull system, kanban, Six Sigma, Jidoka, Poka Yoke, 5S and Total Productive Maintenance as its lean tools and techniques. Aerospace industry has its own standard that is very stringent in order to make sure the safety of the products. Lean tools and techniques applied must be in line with AS9100 standard

in order to meet the requirement and enhance the quality of products or processes.

III. RESEARCH METHOD

This study employed single-case study. The concern of the single-case study is its uniqueness. A manufacturing company was chosen for in-depth interviews. The company was selected based on the experience in lean manufacturing implementation which offers special insights. The researchers prepared the data collection process by first contacting the company to be studied to gain their cooperation, explained the purpose of the study, and recorded the key contact information. The data gathering methods were interviews, observation and documents. A semi-structured interview guide was developed upon a common case study protocol inferred from the review of literature. The interview protocol was developed to probe the lean manufacturing implementation and the challenge that occurred. To improve the research reliability, the same interview protocol was used to different interviewees for triangulation purposes. The need for triangulation arises from the ethical need to confirm the validity of the data obtained [3]. All interviews were in the form of a “one to one” discussion that lasted approximately two hours for each respondent. Each interview was recorded and transcribed. The respondents involved key personnel in the company that directly involved in implementation of lean manufacturing. They were questioned with regard to their actual experiences. For consistency in the data and its interpretation, the interview structure was provided.

IV. FINDINGS AND DISCUSSION

A. Lean Manufacturing System in Company A

In May year 2000, 14 staffs from Company A were sent to attend training at United State of America. They had learnt new technologies from Boeing Company such as process requirements, technical requirement, equipments, quality of products and operation system. It took five months to understand the basic requirements of producing an aircraft. Top management that consists of expatriates and locals has setup a business model for running an operation in Company A. Lean Manufacturing concept is a new work culture introduced and embedded in each strategic planning created. The company’s vision is “to be a world class manufacturing center” has been posted in the facility. The company’s mission is internationally recognized as the premier leader of composites process technology in Asia and the objective principles are Quality, Value, Delivery, Safety and Lean. Figure 1 shows Company A’s Business Management Model.

Fig. 1 Company A Business Management Model



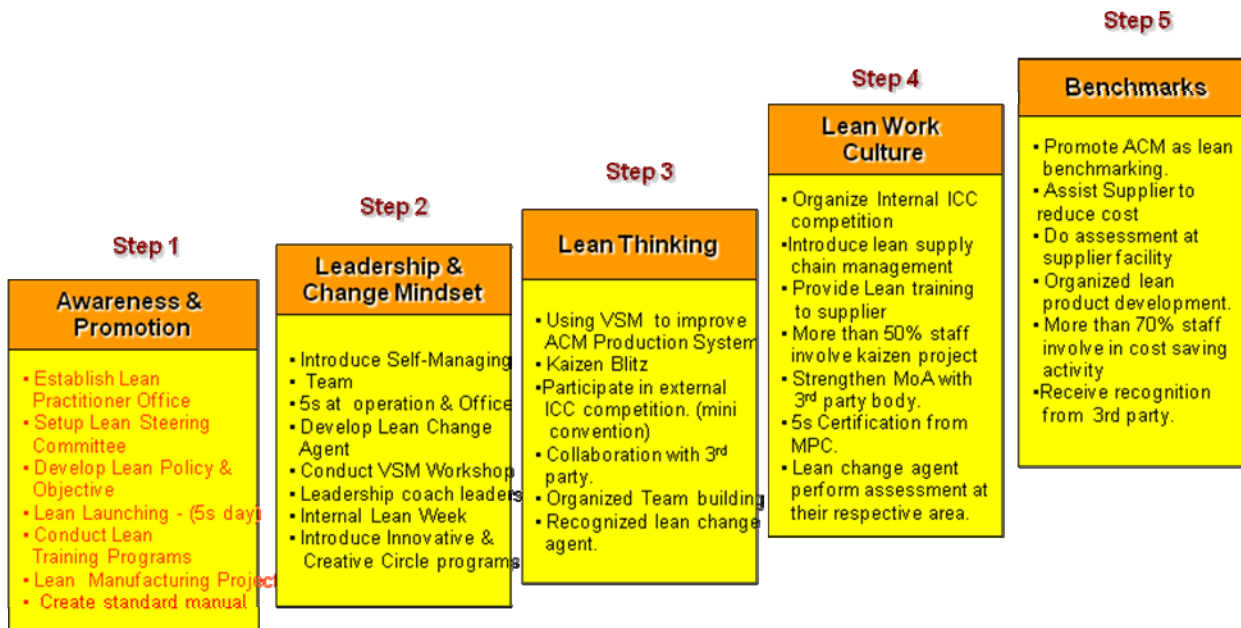
B. Lean Manufacturing Planning Phase

Company A has formed the team to carry out Lean activity throughout company known as Lean Promotion Office (LPO). The team consists of a Manager, three Executives and a Clerk. Their role and responsibility are to provide direction of lean implementation within organization, to ensure everyone committed to eliminate waste, to support company’s vision and mission towards profitability, to ensure top management and leaders play the role towards lean work culture and to catalyst individual talent towards continuous improvement effort.

The lean policy statement was created to ensure all staffs committed to practice Lean work culture through waste elimination activity within organization for profitability and meet customers’ expectation. The company also expects every staffs should uphold Lean values as a work culture. The values are;

- i) Integrity - *the quality of having a sense of honesty and truthfulness in regard to the motivations for one's actions.*
- ii) Visionary - *a person with a clear, distinctive and specific (in some details) goal of the future.*
- iii) Discipline - *the instant willingness and obedience to all orders, respect for authority, self reliance and teamwork.*
- iv) Teamwork - *people working together to share responsibility and have freedom make decision toward a goal.*
- v) Responsibility - *the state or fact of exclusive rights and control over property, which may be an object, land/real estate, intellectual property (arguably) or some other kind of property.*
- vi) Care - *concern with peoples, equipments, materials and work environment.*
- vii) Fair - *treat each other with dignity, respect and compassion.*

Fig. 2 Company A Lean Strategy - Planning



C. Company A Lean Strategy – Milestone

Company A has adopted lean house model from Boeing Company to establish production system in operation area. In order to achieve Lean work culture, the company as carried out structured initiatives as shown in Figure 2. In view of Lean manufacturing as a new work culture, the company was assisted by Lean experts from Boeing. The reason was to maintain the lean manufacturing as the core operating system for smooth operation while reducing waste in the company.

In the Lean Strategy, the first step is awareness and promotion target to ensure all employees attended lean training and understand the concept. The focus at this step is on Knowledge & Skills, Attitude & Behavior, Competence gap and Work environment. The second step is Leadership and Change Mindset. At this step employee should have a vision, mission, and business mindset to shift their paradigm. The objective of this step is to influence the employees to adopt lean work culture by eliminating all waste occurs in daily work activities.

The third step objective is to cultivate continuous improvement activity among the employees. All employees should have a lean thinking and focus on principle that created such as Quality, Value, Delivery, Safety and Lean. All activities and tasks performed should be aligned with these principles.

The forth step is lean work culture target. This step means every people in organization should understand well lean tools or techniques and embedded this concept in their daily activities. The objective at this step is to ensure the company resources in good condition and be a role model among

manufacturing companies within surrounding area. Employee will focus on processes, factory management and the robust system in-place. The final step is to ensure Company A will be a leading company in Lean manufacturing and received recognition from customer's and 3rd party body as a Lean company. The focus at this level to ensure company has a world class facilities, people and materials. Everyone in this company has high level of thinking and company will start looking to develop supplier and products.

The duration of each step is depending on the success at the previous stage. If the goals in any if the stages are not achieved, the company needs to repeat the step. Therefore, Lean work culture is not a project base but it need to have a good commitment from every people in the company across the organizational levels.

D. Challenges of this new technology adopted

Even though this technology has been implemented more than ten years, Company A still facing a lot of challenges to ensure its employees embrace the Lean concept. The challenges that LPO faced and concerned about the company achievement in Lean are as following:

A) Employee involvements

Employee is a company asset to support operation in producing parts for the customer. However, to ensure that all employees practice the Lean work culture in daily activities were difficult. Most of them were only focused on the completion their job without embedding the Lean concept in the task. The LPO has scheduled lean training program in monthly basis but failed to get adequate attendance as the employees are busy their daily job. The same happened in

kaizen activity, where very less employees' participation due to the long duration. Area leaders and managers were reluctant to release their subordinate to join the kaizen project as it could jeopardize the production performance.

B) Top Management concerns

To ensure that Lean manufacturing is implemented widely in the company, adequate provision must be provided such as financial support. However, in Company A, the funding is very limited for the Lean initiatives as the management are more to invest in facility expansion. Less of management support and attention will worsen the lean manufacturing implementation effort and will lead the company fail to achieve expected target.

C) Management Change

The greater the technological developments, and the amount of products and information generated, the more necessary it becomes for corporations to provide effective management and develop solid organizational practices. In Company A, management change is too frequent especially at the top and middle level. These changes have significant impact technology adoption in the company especially lean manufacturing as they are not seriously implementing this concept in the organization. The implementation of Lean is highly relying on the decisions especially from top management level. The efforts will be clearly observed if the management believes that Lean system is a main core to drive the operation strategy in the organization. Therefore the support from management team both top and middle levels is very important to ensure the Lean program will be continuously performed. Another important element is the Lean knowledge among the management team. If the top management is well versed about the benefits, impact, requirements of this Lean strategy, the program will a full support from them.

D) Lack of expertise

Even though Company A has implemented Lean concept since year 2001, it is very tough to retain the Lean knowledge as the employees is always changing. The new employees do not possess deep understanding about the lean concept and philosophy. Therefore, the process to develop employees to be expert in lean tools and technique take longer time. The employees will develop the expertise through implementation of activity and improve the skill when solving problems or issues.

E) High employee turnover

The big problem of organization to sustain the work culture is the frequency of employees left a company. In Company A, the employee turnover rate is 20% average. There are too many reasons of why these employees leave the company. Among the reasons are no additional allowances, lots of work, and the perception of new work culture is a burden. This situation will result in the Lean system that was introduced does not last long and time consuming in training new employees. At the end, the top management will assumed that the program introduced is not effective and burden in the financial perspective.

V. CONCLUSION

New technology management is requiring more commitment from all employees especially in implementation of lean manufacturing system in organization. A solid strategic planning does not guarantee the best achievement from the new technology introduced. Other than the commitment of employees across all organizational level, more efforts are required in terms of money, time, energy, right focus and direction from top management of the company. Management should analyze and predict the potential failure as a preparation before start to adopt the new technology in organization. This finding agreed to Nordin et al. [4] that mentioned there are some factors that need to be emphasised for smooth transition to lean manufacturing system. As lean implementation is a systemic effort, it is important to understand the organisational change issues related to lean manufacturing.

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