PRODUCTION IMPROVEMENT IN A SMALL AND MEDIUM SIZED ENTERPRISE (SME) USING LEAN PRODUCTION APPROACH

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A project report submitted in partial fulfilment of the requirement for the award of the Degree of Master of Mechanical Engineering

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This Project Report is lovingly dedicated to my respective parents and in-laws; my beloved wife, Roselinda and my childrens, Hariz Husaini and Hana Arissa who have been my constant source of inspiration. They have given me the drive and discipline to tackle any task with enthusiasm and determination. Without their love and support this project would not have been made possible.
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- All my friends other individuals who have been involved, directly and indirectly.

Thank you for all your contribution and assistance.
ABSTRACT

This project attempts to improve production in Siding Klasik Enterprise. Siding Klasik Enterprise is a Small and Medium Enterprise (SME) at Padang Siding, Perlis which produce traditional cakes, bahulu. The objectives of the study are to: (1) assess current status of production in a manufacturing company, (2) identify opportunities for production improvement in a manufacturing company and (3) propose strategies to improve production using lean production approach. Data collection methods used for this study are interview, observation and document review. The current production status and opportunities for improvement have been identified using Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis and informal 5S audit. Three improvement strategies have been proposed and implemented in the case companies, which include 5S, layout improvement and preparing Standard Operation Procedures (SOPs) to obtain MeSTI certification. Implementation of 5S makes the sales area, production area and store more tidy and clean to enhance quality, productivity, safety and efficiency. Improved production layout makes process distance shortened from 217.5 feet to 162.3 feet and time duration reduced from 109 second to 81 second. Reduction of total process distance is 55.2 feet and total time duration is 28 second. Total time for completing production of 400 bahulu is four hours, 40 minutes and 50 seconds. After improvement, the total time is four hours, 37 minutes and 27 seconds. Therefore, the reduction of production time is three minutes and 23 seconds. Several SOPs have been prepared to obtain MeSTI certification. The impact of obtaining MeSTI certificate includes a system that assures the hygiene and traceability of product, improve customers confidence and easier to penetrate market.
ABSTRAK

Projek kajian ini bertujuan untuk meningkatkan pengeluaran di Siding Klasik Enterprise. Siding Klasik Enterprise adalah Perusahaan Kecil dan Sederhana (PKS) di Padang Siding, Perlis yang mengeluarkan kek tradisional, bahulu. Objektif kajian ini adalah untuk: (1) menilai status semasa pengeluaran di syarikat, (2) mengenal pasti peluang-peluang penambahbaikan pengeluaran di sebuah syarikat dan (3) mencadangkan strategi untuk meningkatkan pengeluaran menggunakan pendekatan pengeluaran bersandar.

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<td>Current State Map</td>
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<td>FSM</td>
<td>Future State Map</td>
</tr>
<tr>
<td>NVA</td>
<td>Non-Value Adding</td>
</tr>
<tr>
<td>NNVA</td>
<td>Necessary but non-value adding</td>
</tr>
<tr>
<td>VA</td>
<td>Value Adding</td>
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<td>MeSTI</td>
<td>Makanan Selamat Tanggungjawab Industri</td>
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CHAPTER 1

INTRODUCTION

1.0 Introduction to the chapter

The chapter explains and focuses on the background of the study, problem statement, objectives of the study, scope of study and the importance of the study.

1.1 Background of the study

Small and medium sized enterprises (SMEs) have played tremendous role in manufacturing sector in Malaysia. In the year 2007, Malaysia has 96% of establishments of SMEs which contributed 30.7% of total manufacturing output and 26.3% of total value added (SME Annual Report, 2007). In addition more than 400,000 or 31% of total Malaysian workforces were employed by SMEs. SME in Malaysia was defined as a company with full time employees between 5 to 150 and annual sales turnover between RM251k to RM25 million (SMECORP). The most important issue faced by Malaysian manufacturing company nowadays is to constantly improve the quality and productivity of its processes and products. Various lean production tools and techniques can be used to identify areas for improvement and eventually improve the production, such as 5S, Kanban System, 7 Waste, Value Stream Mapping, Gemba
Walk, SWOT Analysis and standard operating procedures. This project aims to provide suggestions on how to improve production in a SME using lean production approach. Previous studies showed total lean practices could help manufacturing organisation to gain full benefits such as reduction in inventory, lead time and set up time. As the resources constraint to SMEs, the selected practices should be feasible to the company problem and involve acceptable amount of investment.

1.2 Problem statement

This project attempts to improve production in Siding Klasik Enterprise. Siding Klasik Enterprise is a Small and Medium Enterprise (SME) at Padang Siding, Perlis which produce traditional cakes, Bahulu. SMEs need to be competitive to compete in the era of globalisation. However, many SMEs in Malaysia are facing problems in the production such as waiting time, long lead time and unnecessary motion were identified during the production in order to improve production. To tackle this, lean production methods such as SWOT analysis, 5S, SOP and process flowchart were used to improve the production system.

1.3 Objectives of the study

The objectives of the study are:

i. Assess current status of production in a manufacturing company.

ii. Identify opportunities for production improvement in a manufacturing company.

iii. Propose strategies to improve production using lean production approach.
1.4 **Scope of the study**

The scopes of the study are as follows:

i. This study is carried out at one small food manufacturing company. The case company is Siding Klasik Enterprise.

ii. The main outcome of this project involves suggestions and initial implementation of several Lean production tools and techniques that can be used to improve the production in the case company.

1.5 **Importance of the study**

The important of the study are as follows:

i. To enrich the pool of case study reference materials related to the production improvement in Malaysian manufacturing industry.

ii. To promote the use of lean tools and technique such as SWOT analysis, 5S, SOP and process flowchart.

iii. To identify the problems and wastes in the case company.

iv. To assist case company to improve production and reduce costs.
CHAPTER 2

LITERATURE REVIEW

2.0 Introduction to the chapter

This chapter discusses literature review on lean production. This study focuses on the lean tools and techniques such as SWOT analysis, 5S and Standard Operation Procedure (SOP). The review of journals, articles and books have been done to increase the understanding of these tools.

2.1 Lean production system

The global industry in 21st century has forced most of the leaders in several sectors to implement more competitive production systems. One of the options available as found in the journals is lean production. Initially it was started at Toyota plant, Japan, which is known Toyota Production System (TPS). It has been widely known and implemented since 1960. According to (Rineheart, 1997) lean production will be the standard production mode of the 21st century. There is no alternative to lean production (Dankbaar, 1997). Researchers agreed that lean production could be a cost reduction mechanism and if well implemented it will be a guideline to be world class organization (Papadopoulu & Ozbayrak, 2005). Theoretically, lean production can be applied to all industries (Billesbach, 1991 and Womack, 1990). Meier & Forrester (2001) found lean production was successfully implemented in the tableware industry.
This system is comprised of universal set management principles which could be implemented anywhere and in any company, it doesn’t mean in Japan only (Womack & Jones, 1990). Therefore, SMEs have been encouraged to apply it (Achanga, 2006; Womack, 1990; Womack, 1996). It is now widely recognized that organizations that have mastered lean production methods have substantial cost and quality advantages over those who still practicing traditional mass production (Pavnaskar, 2003). Lean production combines the best features of both mass production and craft production, the ability to reduce costs per unit and dramatically improve quality while at the same time providing an ever wider range of products and more challenging work (Womack, 1990).

The goal of lean production is to reduce the waste in human effort, inventory, time to market and production space to become highly responsive to customer demand while producing world-class quality products in the most efficient and economical manner (Pavnaskar, 2003). Lean production is known as production without waste (Taj, 2005). The waste is consisting of non added value. There are seven type of waste as follows: overproduction, waiting time, transportation, inventory, inappropriate processing, excess motion and product defects (Melton, 2005; Womack & Jones, 2003; Ohno, 1988). Most of the companies waste about 70%~90% of their available resources (Taj, 2005). The Lean Enterprise Research Centre (LERC, 2004) at Cardiff Business School highlighted that for most production operations, the added value and non added value are as follows:

- 5% of activities add value
- 35% are necessary non value added activities
- 60% add no value at all

It shows that the organization no matter the sizes, large or small is crucial to eliminate waste, in order to increase the profit or return on investment (ROI).
2.2 Tools for lean production

In order to reduce or eliminate the above wastes, Lean practitioners utilize many tools (Plenert, 2012). Successful practitioners recognize that, although most of these may be implemented as stand-alone programs, few have significant impact when used alone. Additionally, the sequence of implementation affects the overall impact, and implementing some out of order may actually produce negative results.

Table 2.1: 25 essential lean tools (Vorne Industries, 2010)

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<th>Lean Tool</th>
<th>What is it?</th>
<th>How does it help?</th>
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| 5S        | Organize the work area:  
  - Sort (eliminate that which is not needed)  
  - Set In Order (organize remaining items)  
  - Shine (clean and inspect work area)  
  - Standardize (write standards for above)  
  - Sustain (regularly apply the standards) | Eliminates waste that results from a poorly organized work area (e.g. wasting time looking for a tool). |
<p>| Andon     | Visual feedback system for the plant floor that indicates production status alerts when assistance is needed, and empowers operators to stop the | Acts as a real-time communication tool for the plant floor that brings immediate attention to problems as they occur – so they can be |</p>
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<th>Method</th>
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<td>Bottleneck Analysis</td>
<td>Identify which part of the manufacturing process limits the overall throughput and improve the performance of that part of the process.</td>
<td>Improves throughput by strengthening the weakest link in the manufacturing process.</td>
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<td>Continuous Flow</td>
<td>Manufacturing where work-in-process smoothly flows through production with minimal (or no) buffers between steps of the manufacturing process.</td>
<td>Eliminates many forms of waste (e.g. inventory, waiting time, and transport).</td>
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<td>Gemba (The Real Place)</td>
<td>A philosophy that reminds us to get out of our offices and spend time on the plant floor – the place where real action occurs.</td>
<td>Promotes a deep and thorough understanding of real-world manufacturing issues – by first-hand observation and by talking with plant floor employees.</td>
</tr>
<tr>
<td>Heijunka (Level Scheduling)</td>
<td>A form of production scheduling that purposely manufactures in much smaller batches by sequencing (mixing) product variants within the same process.</td>
<td>Reduces lead times (since each product or variant is manufactured more frequently) and inventory (since batches are smaller).</td>
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<td>Hoshin Kanri (Policy Deployment)</td>
<td>Align the goals of the company (Strategy), with the plans of middle management (Tactics) and the work performed on the plant floor (Action).</td>
<td>Ensures that progress towards strategic goals is consistent and thorough – eliminating the waste that comes from poor communication and inconsistent direction.</td>
</tr>
<tr>
<td>Method</td>
<td>Description</td>
<td>Benefits</td>
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<td>Jidoka (Automation)</td>
<td>Design equipment to partially automate the manufacturing process (partial automation is typically much less expensive than full automation) and to automatically stop when defects are detected.</td>
<td>After Jidoka, workers can frequently monitor multiple stations (reducing labour costs) and many quality issues can be detected immediately (improving quality).</td>
</tr>
<tr>
<td>Just-In-Time (JIT)</td>
<td>Pull parts through production based on customer demand instead of pushing parts through production based on projected demand. Relies on many lean tools, such as Continuous Flow, Heijunka, Kanban, Standardized Work and Takt Time.</td>
<td>Highly effective in reducing inventory levels. Improves cash flow and reduces space requirements.</td>
</tr>
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<td>Kaizen (Continuous Improvement)</td>
<td>A strategy where employees work together proactively to achieve regular, incremental improvements in the manufacturing process.</td>
<td>Combines the collective talents of a company to create an engine for continually eliminating waste from manufacturing processes.</td>
</tr>
<tr>
<td>Kanban (Pull System)</td>
<td>A method of regulating the flow of goods both within the factory and with outside suppliers and customers. Based on automatic replenishment through signal cards that indicate when more goods are needed.</td>
<td>Eliminates waste from inventory and overproduction. Can eliminate the need for physical inventories (instead relying on signal cards to indicate when more goods need to be ordered).</td>
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| **KPI (Key Performance Indicator)** | Metrics designed to track and encourage progress towards critical goals of the organization. Strongly promoted KPIs can be extremely powerful drivers of behaviour – so it is important to carefully select KPIs that will drive desired behaviour. | The best manufacturing KPIs:  
- Are aligned with top-level strategic goals (thus helping to achieve those goals)  
- Are effective at exposing and quantifying waste (OEE is a good example)  
- Are readily influenced by plant floor employees (so they can drive results) |
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<td><strong>Muda (Waste)</strong></td>
<td>Anything in the manufacturing process that does not add value from the customer’s perspective.</td>
<td>Eliminating Muda (waste) is the primary focus of lean production.</td>
</tr>
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</table>
| **Overall Equipment Effectiveness (OEE)** | Framework for measuring productivity loss for a given manufacturing process. Three categories of loss are tracked:  
- Availability (e.g. down time)  
- Performance (e.g. slow cycles)  
- Quality (e.g. rejects) | Provides a benchmark/baseline and a means to track progress in eliminating waste from a manufacturing process. 100% OEE means perfect production (manufacturing only good parts, as fast as possible, with no down time). |
| **PDCA (Plan, Do, Check, Act)** | An iterative methodology for implementing improvements:  
- Plan (establish plan and | Applies a scientific approach to making improvements:  
- Plan (develop a |
<table>
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<tr>
<th>Poka-Yoke (Error Proofing)</th>
<th>Design error detection and prevention into production processes with the goal of achieving zero defects.</th>
<th>It is difficult (and expensive) to find all defects through inspection, and correcting defects typically gets significantly more expensive at each stage of production.</th>
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<td>Root Cause Analysis</td>
<td>A problem solving methodology that focuses on resolving the underlying problem instead of applying quick fixes that only treat immediate symptoms of the problem. A common approach is to ask ‘why’ five times – each time moving a step closer to discovering the true underlying problem.</td>
<td>Helps to ensure that a problem is truly eliminated by applying corrective action to the root cause of the problem.</td>
</tr>
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| Single Minute Exchange of Die (SMED) | Reduce setup (changeover) time to less than 10 minutes. Techniques include:  
  - Convert setup steps to be external (performed while | Enables manufacturing in smaller lots, reduces inventory, and improves customer responsiveness. |
| Six Big Losses | Six categories of productivity losses that are almost universally experienced in manufacturing:  
- Breakdowns  
- Setup/Adjustments  
- Small Stops  
- Reduced Speed  
- Start up Rejects  
- Production Rejects | Provides a framework for attacking the most common causes of waste in manufacturing. |
| SMART Goals | Goals that are: Specific, Measurable, Attainable, Relevant, and Time-Specific. | Helps to ensure that goals are effective. |
| Standardized Work | Documented procedures for manufacturing that capture best practices (including the time to complete each task). Must be “living” documentation that is easy to change. | Eliminates waste by consistently applying best practices. Forms a baseline for future improvement activities. |
| **Takt Time** | The pace of production (e.g. manufacturing one piece every 34 seconds) that aligns production with customer demand. Calculated as Planned Production Time / Customer Demand. | Provides a simple, consistent and intuitive method of pacing production. Is easily extended to provide an efficiency goal for the plant floor (Actual Pieces / Target Pieces). |
| **Total Productive Maintenance (TPM)** | A holistic approach to maintenance that focuses on proactive and preventative maintenance to maximize the operational time of equipment. TPM blurs the distinction between maintenance and production by placing a strong emphasis on empowering operators to help maintain their equipment. | Creates a shared responsibility for equipment that encourages greater involvement by plant floor workers. In the right environment this can be very effective in improving productivity (increasing up time, reducing cycle times, and eliminating defects). |
| **Value Stream Mapping** | A tool used to visually map the flow of production. Shows the current and future state of processes in a way that highlights opportunities for improvement. | Exposes waste in the current processes and provides a roadmap for improvement through the future state. |
| **Visual Factory** | Visual indicators, displays and controls used throughout the manufacturing plants to improve communication of information. | Makes the state and condition of manufacturing processes easily accessible and very clear – to everyone. |

Table 2.1 is a collection of 25 essential lean tools. Each tool is distilled into a simple description of what it is and how it helps. Some are used only in manufacturing
organizations, but most apply equally to service industries. Lean tools that focused in this project are SWOT analysis, 5S and Standard Operation Procedure (SOP).

2.3 SWOT analysis

SWOT is one of those acronyms that many business people use, few understand what it means, and even fewer understand how to use it. Yet an effective SWOT analysis is essential to the continued success of any business.

A SWOT analysis for business should be conducted at least every year (Scott, 2004). SWOT results shape a company's marketing plan, strategies and tactics. The elements of SWOT are as follows (Scott, 2004):

(a) Strengths
These are defined as positive factors within company that may enhance its ability to win future business. Examples of these factors might include specific skills or products, exclusive knowledge or experience, strong customer relationships, special resources, manufacturing advantages, delivery advantages, marketing advantages and monetary advantages.

(b) Weaknesses
These are defined as negative factors within company that may impede its ability to win future business. Examples might include the lack of a specific product, capability, experience or skill-set. Weaknesses might also include deficient knowledge of a customer or a competitor, an unproven product or business in market, lacking the monetary resources of larger competitors or insufficient resources to overcome existing barriers to market entry.

(c) Opportunities
These are defined as positive factors outside company that could possibly be developed an advantage and result in additional future business. Examples of these factors include inexperienced competition, greater-than-predicted expansion of product market, possible tactics to increase product profitability, unexpected opportunities to increase company's visibility, other competitors
going out of business, additional markets opening up, unforeseen favourable publicity and customer demand growing at a greater-than-predicted rate.

(d) Threats

These are defined as negative factors outside company which could result in a negative impact on company ability to achieve sales projections. Examples include being faced with an unanticipated decrease in customer base, perceived obsolescence of product, unexpected new competitors that are experienced or well-financed, an economic downturn, skyrocketing interest rates, or sudden scarcity of a material required for product.

To achieve maximum results, conduct a SWOT analysis every six to 12 months, depending on the changing dynamics of marketplace.

2.4 5S

5S system is a method using for set up and keeps quality of working environment in an organization. Such organization can organize and manage companies which require less space, human effort, time, quality and capital to make products with less faults and make a workplace well ordered, disciplined and clean (Chapman, 2005).

5S is a system to decrease wasting and optimize quality and productivity via monitoring an organized environment and use visual evidences to obtain more firm results (Osada, 1991). The columns of 5S are sort (Seiri), set in order (Seiton), shine (Seiso), standardize (Seiketsu), and sustain (Shitsuke). In routine activity of every organization, daily works that support company and neatness are fundamental to an efficient activities flow (Bayo-Moriones, 2010).

5S is an idea that reshapes how you think about a workplace and provides a foundation for significant improvement but it is not simply about cleaning up a shop floor. The initial stage in 5S is deciding what is essential in the work environment and what is not. The second stage is put the things where they provide the best support for the functions. The third stage is inspection, repairing and cleaning things to find and remove the root causes of damage and dirt. The fourth stage is team working and the
members must have consensus on normal and new way of work. The fifth stage is personal discipline to follow the standards and to perform the personal characteristics, cleanliness and neatness of the organization.

2.5 **Standard Operation Procedure (SOP)**

Standardization is defined as an activity that gives rise to solutions for repetitive application to problems in various disciplines. Generally, the activity constitutes the process of establishing (determining, formulating, and issuing) and implementing standards. Thus, standards are the perfect result of a standardization activity and inside the context of quality systems consist of quality documents or documents related to the quality system. High levels of quality are important to accomplish company business objectives. Quality, a source of competitive benefit, should stay a symbol of company products and services. High quality is not an additional value; it is an important elementary necessity. Each employee in all organizational units is responsible for guaranteeing that their work processes are effective and continually getting better. Top management should provide the training and an appropriate motivating environment to support teamwork both inside and across organizational units for employees to advance processes. Ultimately, everyone in an institution is responsible for the quality of its products and services. An institution in the role of a sponsor of clinical trials can best achieve its business objectives by establishing and managing robust quality systems with their integral quality documents including standard operating procedures (SOPs) (Manghani, 2011). The quality management system must evolve by trial and error, with enlarging experience, by group discussions and with changing understanding. In the beginning, attention will be focused on basic operational SOPs, afterwards moving to record keeping (as more and more SOPs are issued) and filling gaps as practice admits missing links in the chain of quality assurance. Essentially problems will turn up. One way to react to them is to talk with people in other laboratories who have faced similar problems. It should not be forgotten that quality management is a tool rather than a goal. The goal is quality performance of the laboratory. The autonomy is the self-government
that originated from morality, with morality proceeding from knowledge and self-discipline. An appropriate level of authority, discretion, formalization, and rule structure is a requirement for worker empowerment, which we see as consistent with the concept of self-government. Autonomy is the quality or state of being self-governing; especially: the right of self-government; self-directing freedom and especially moral independence’. Necessitated SOP use will be absolutely related to the sense of self-determination experienced by workers. Worker participation in SOP advancement and clarification controls the affiliation between required SOP use and the sense of self-determination experienced by workers.

Standard Operating Procedures (SOP) is a process document that describes in detail the way that an operator should perform a given operation. SOPs involve the purpose of the operation, the equipment and materials required, how to perform the set-up and operations required for the process, how to perform the maintenance and shutdown operations carried out by the worker, a description of safety issues, troubleshooting, a list of spare parts and where to find them, illustrations, and checklists. The SOP is one of many process documents which are needed for consistent operation of a given process, with other documents involving process flow charts, material specifications, and so forth.

The purpose of SOPs today is to guarantee that all workers are performing tasks in the same way, which is a needed for condition to get expected output from the process. When all workers perform their tasks constantly, it becomes possible to run controlled experiments to test the impact of changing various process parameters. When a process change is shown to improve process performance, SOPs are updated and workers are trained to the new procedures. All over the process, it is adorable to involve workers in SOP development and to praise worker ideas for the SOP improvement. For constant organizational advance, organized processes need to be constantly improved, hence necessitating ideas from those workers using those procedures. Ideas are not creative simply because they deviate from organized knowledge; ideas are creative when they are novel and suitable to the task at hand. Workers may have many ideas; nevertheless, what they choose to do with their ideas will depend on various
organizational and individual-difference factors. The most important factor, however, for the advancement of creative behaviours is worker intrinsic motivation—a sine qua non of worker creative contribution. By the help of confirmatory factor analysis, the Spreitzer construct validated the four dimensions of intrinsic motivation such as psychological authorization: (a) Competence (example item includes ‘I am confident about my ability to do my job’); (b) Meaning (example item includes ‘The work I do is very important to me’); (c) Impact (example item includes ‘I have a great deal of control over what happens in my department’); (d) Self-determination (example item includes ‘I can decide on my own how to go about doing my work’). Furthermore, Spreitzer argued and empirically established that an antecedent condition to innovation such as creativity and effectiveness is intrinsic motivation (De Trevil, 2005).

2.6 Previous studies related to lean production

Table 2.2 below summaries previous studies related to lean production.

<table>
<thead>
<tr>
<th>Author</th>
<th>Description</th>
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<tbody>
<tr>
<td>1. Daud (2008)</td>
<td>Objective:-&lt;br&gt;i. To investigate the implementation of lean production system at the case company.&lt;br&gt;ii. To compare the implementation of lean production system between two case companies.&lt;br&gt;iii. To propose a guideline based on the findings of the company. Result:-&lt;br&gt;Successful implemented Lean Production System but the company have different strategies and techniques. Achieve second objective to compare the implementation of lean</td>
</tr>
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</table>
production system between two companies which cover the strategies of implementation, method and tools utilized, critical success factor and benefits of the implementation.

|-------------------|-------------------------------------------------|
|                   | i. To investigate the adaptation of lean production and assess its current state of practice in selected plants in electronics, telecommunication, wireless, computer, food/beverage, garment, pharmaceutical, chemical, petroleum, printing, A/C and heating, and a few others in China.  
|                   | ii. An assessment tool is used to evaluate actual manufacturing practice related to key areas of inventory; team approach; processes; maintenance; layout/handling; suppliers; setups; quality; and scheduling and control. Manufacturing executives at manufacturing plants answered 40 questions in the assessment. Each response in the assessment is scored and a total score for each plant is recorded by adding average scores for all areas.  
|                   | Result:-  
|                   | The results of assessments show that the petroleum industry is in lead among all industries, followed by computer, telecommunication/wireless, and electronics industries. The findings from lean production system design-related questions show low scores in layout design, volume/mix flexibility, setup, visual factory, and point-of-use delivery. However, plants earned high scores in materials flow, scheduling/control, on-time delivery of finished goods, and overall defect rate. The findings have some similarity with recent studies about Chinese manufacturing firms' performance and competitiveness.  

|----------------|-------------------------------------------------|
|                | i. Identify the appropriate Value Stream Mapping tool.  

<table>
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<tr>
<th>Case Study</th>
<th>Objective:</th>
<th>Result:</th>
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i. Undertaken case study as a rehearsals of lean method.  

Results:-  
The new layout was accomplished; many task and improvement which occurred during the process still awaited execution. |

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Objective:</th>
<th>Result:</th>
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</table>
| 5. Yunos (2010) | i. Identify an appropriate value stream mapping tool.  

ii. Develop Value Stream Map for the Paper Based Manufacturing Industry to improve the productivity.  

Result:-  
The study was achieved the objective set it the early stage of study.  
VSM method has shown to be practical and easy to develop.  
Succeed to identify where the waste occurs at the system level and then develop a comprehensive plan to improve it. |

Previous studies showed total lean production practices could help manufacturing organization to gain full benefits i.e. reduction in inventory, lead time, set up time, and etc., provided they’re adopting all practices. As the resources constraint
to SMEs, the selected practices should be feasible to the company problem and low investment.

2.7 Summary

Lean is a way of thinking about the manufacturing process with a specific focus on steps that add value to the end product. In lean companies, any step that doesn't add value is considered. There are many benefits that are associated with lean production such as improved customer service; delivering exactly what the customer wants when they want it, improved productivity; improvements in throughput and value add per person, quality; reductions in defects and rework, Innovation; staff are fully involved so improved morale and participation in the business, reduced waste; less transport, moving, waiting, space, and physical waste, improved lead times; business able to respond quicker, quicker set ups, fewer delay and improved stock turns; less work in progress and Inventory, so less capital tied up. SWOT analysis, 5S system, SOP and process flowchart are some examples of tools that can be used to improve production in SME.
CHAPTER 3

METHODOLOGY

3.0 Introduction to the chapter

Methodology involves a set of procedure in order to complete the study. Therefore, it described the method used to collect data and gather information to reach the aim and the scope of this study.

3.1 Case study

This study used case study approach. Yin (1994) suggested four stages of case study approach:

(i) Design the case study,
(ii) Conduct the case study,
(iii) Analyze the case study evidence, and
(iv) Developed the conclusions, recommendations and implications.

Yin (1994) also listed six sources of evidence for data collection in the case study protocol: documentation, archival records, interviews, direct observation, participant observation, and physical artefacts. Not all of these sources of evidence need to be used in every case study (Yin, 1994). Research procedures for this study are
summarized in Figure 3.1. It started with determine case company by collecting data from observation and interviews by review document of company profile, operator profile, current state map, process flow, production time and current lean applications. All data collected were analyzed to identify opportunities for improvement. SWOT analysis, 5S, SOP and process flowchart as lean tools were recommended to the company and implement if the company agreed. Data were collected after implement and analyzed as improvement in the company.
START

DETERMINE CASE COMPANY

Data Collection: Observation

Data Collection: Interview

ANALYSIS DATA
(before improvement)

Is there any opportunity for improvement?

NO

YES

SWOT Analysis

5S

SOP

Process Flowchart

SUGGESTION

IMPLEMENTATION

DATA ANALYSIS
(after improvement)

END

Document Review:
- Company profile
- Operator profile
- Current state map
- Process flow
- Production time
- Current lean application

Figure 3.1: Research procedure
3.2 Data collection method

There are three main data collection methods used for this study; (1) Interview, (2) Observation and (3) Document review. Yin (1994) suggested using multiple sources of evidence as the way to ensure construct validity. The current study used multiple sources of evidence; survey instruments, interviews, and documents.

3.2.1 Interview

Interview is one of the most widely used methods to gain information about a company, industry or any specific work task. Interview was conducted with Manager of Siding Klasik Enterprise; Mrs. Maznah bt Ahmad and Shahidi bin Razali and their operators; Noor Azura bt Othman and Siti Aida bt Ramle. For instance, based on interview it is significant medium to built cooperation and collaboration between two parties. Thus, interview were conducted to extract rich data from small sample to aid the development of concept and deepen the researcher understanding of the research topic (Mohammad, 2012). Thus interview is useful method to investigate issues that have been occurs in depth way and discover how individuals think and feel about an issues and hold certain opinions. The main objectives for this interview are as follows:

i. Gather detailed information and data about the whole company or organization.

ii. Investigate the process flow of the production.

iii. Identify the problems or issues that have been faced or occurred in organization.

iv. Identify customer requirements.

v. Define method of delivery.
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Dankbaar, B. (1997). *Lean production: denial, confirmation or extension of sociotechnical systems design?*. Human Relations. 50(5).


