PRODUCTIVITY IMPROVEMENT IN MANUFACTURING INDUSTRIES

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ABSTRACT

Productivity is a measure of how efficiently resources, both human and material, are converted into valuable services and goods. The primary goal of the current work was to examine the elements involved in improving productivity in all of its forms, including material, capital, labour, machine, and total productivity at the plant. This was accomplished by lowering manufacturing costs per component by shortening its cycle time and increasing monthly production rate. The experiments demonstrated that by adopting the proposed procedures and better tooling, the monthly production rate increased by 16.2% due to reduced cycle time, and the number of faulty components, i.e. the rejection rate, decreased by up to 2%. The production cost per component was reduced by 6.78%. The cost of tooling has been decreased by more than 12%. Close dimensional tolerances and good surface quality on components have resulted in inspection cost savings of up to 50%. Total production increased by 4.84 percent.

Keywords: *Productivity Improvement; Manufacturing; Productivity; Motion and Time Study*

INTRODUCTION

Productivity is used to determine the efficiency and efficacy of procedures in an economy business. The systemic plant layout is a good and advantageous arrangement of operating workstations, storage space, material handling equipment, and other services to aid product design. The plant can be designed using line balancing, which lowers transportation time and also provides a one-piece flow process, reducing man and machine idle time.

Fabrication, manufacturing, and industry are primarily concerned with increasing productivity. Many elements, such as project cost overruns, time management, training approach, changeover time / work set-up time, are crucial to the productivity of these businesses. Additional work results in low quality. a lack of concentration and priorities in work Insufficient resources at the proper time, Productivity is defined as the rate at which goods and services are produced per unit of input (labour, capital, raw materials, and so on). Productivity measurements are utilised at the firm, industry, and economy levels. Productivity calculations can have several implications depending on the context and the choice of input and output metrics. Productivity is a standard measure of how well resources are used, or the effective use of resources, and is commonly stated as a ratio of output to input. [1]

THE IMPORTANCE OF PRODUCTIVITY IMPROVEMENT

Only by boosting productivity in all parts of a business or industry, including sales, finance, manufacturing, engineering, cost, maintenance, and management, can a business or organisation grow and raise its profitability (Niebel, 1988). As important as the production function is, it is important to remember that other components of the enterprise contribute significantly to the cost of operation and are equally acceptable areas for the application of cost-cutting techniques.

Productivity, according to Atkinson et al (1995) and Krajewski and Ritzman (1998), is defined as the value of outputs (goods or services) produced divided by the value of input resources (wages, costs of equipment, and so on) used:

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

According to Barnes (1980), productivity is a phrase with a variety of connotations, although it is most usually connected with labour effectiveness in industry. Productivity is defined as the ratio of output to some or all of the resources utilised to produce the output.

Labour productivity may be defined as “output per unit of time” or “output per labour hour”.

Labour productivity = units produced ÷ hours worked

Capital productivity = output ÷ capital input

Material productivity = output ÷ material input

Productivity is heavily influenced by operations managers. Their task is to raise the value of output in relation to the cost of input. Productivity rises when workers can produce more or higher-quality output with the same amount of input (Krajewski and Ritzman, 1998). Productivity rises when they can maintain the same level of output while using fewer resources. Management need measuring processes for monitoring productivity performance and identifying improvement possibilities in order to profit from productivity improvement.

Figure 1 depicts a model of productivity increase through motion and time studies. The study focused on productivity activities, such as productivity approaches and company priorities, as well as productivity problems and difficulties. This study recommends the motion and time study technique for increasing productivity. Productivity growth is assessed by an increase in the productivity index, annual turnover, and market share. [2]

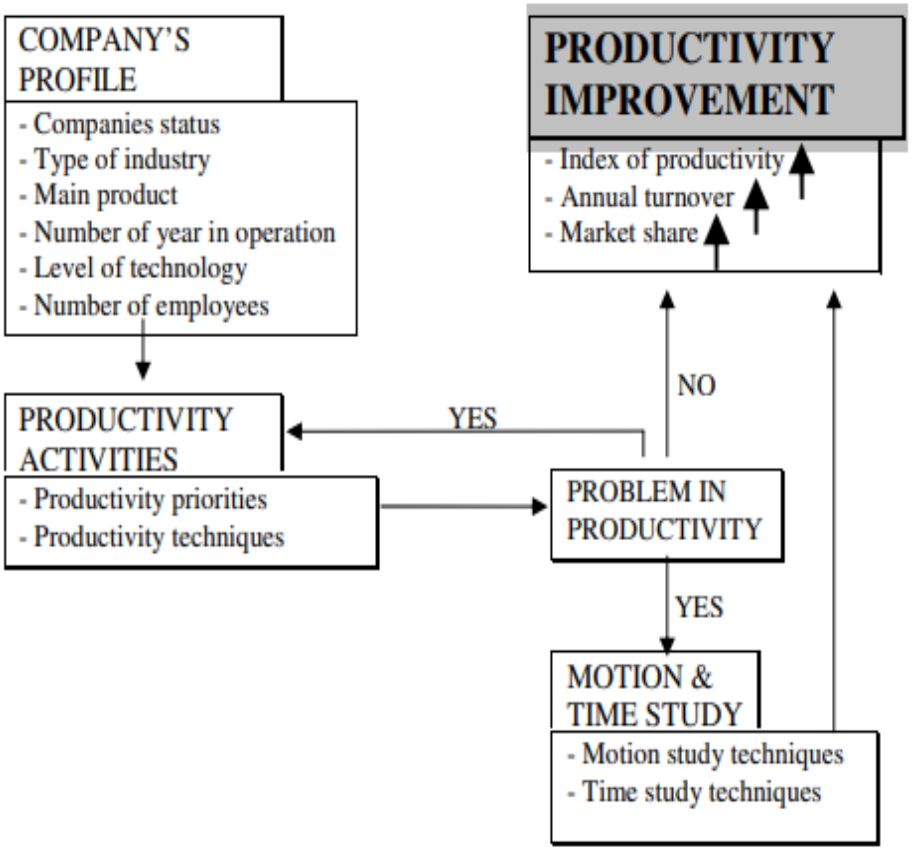

Figure 1: Model of Productivity Improvement through Motion and Time Study

PRODUCTIVITY IMPROVEMENT IN MANUFACTURING INDUSTRY USING WORK STUDY TECHNIQUE

Productivity is defined as the ratio of output to input. It is the quantifiable relationship between what we produce and how much we spend to produce it. 70 Productivity is simply the elimination of waste of resources such as men, materials, machines, time, space, capital, and so on. It can be defined as human attempts to produce more and more with fewer and fewer resource inputs in order to maximise benefit distribution among the greatest number of people. Productivity refers to the relationship that exists between output and one or more connected inputs. According to the European Productivity Council, "productivity is a state of mind." It is a mentality of ongoing improvement of what already exists. It is the conviction of always being able to achieve better than yesterday. It is the ongoing adaptation of economic and social life to changing circumstances. It takes a consistent effort to implement new approaches and processes. It is hope for human growth. According to Peter Drucker, productivity is defined as a balance between all aspects of production that results in the highest output with the least amount of work. Productivity, on the other hand, is defined as the ratio between the volume of output as measured by production indicators and the corresponding volume of labour input as measured by production indices and the corresponding volume of labour input as measured by employment indices 2 by the

International Labour Organisation. This definition relates to an entire enterprise, industry, or economy. [3]

For many years, work study was known as "time and motion study," but with the advancement of the approach and its application to a wide range of activities, many individuals thought that the earlier label was both too restrictive and inadequately descriptive.

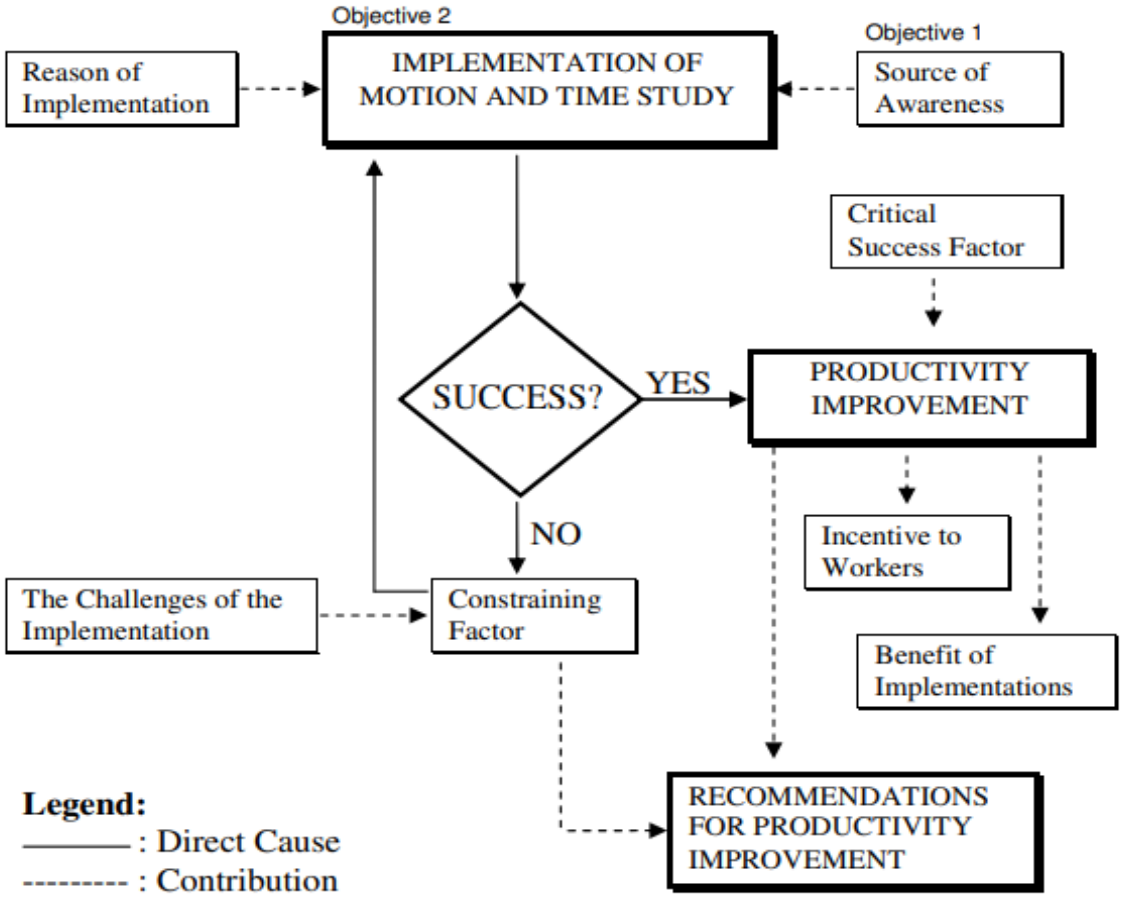

Figure 2: Framework to improve the productivity

Figure 2 depicts the framework for increasing productivity. First and foremost, the research assesses the respondents' level of motion and time study awareness, as well as their productivity priorities. Thus, the difficulties linked to the implementation of motion and time research were recognised, including the reason for implementation, challenges, success factor, and so on.

Six ways to improve productivity & efficiency in manufacturing:

1. Check what problem your workers are facing

Workers are at the heart of manufacturing productivity; thus project managers should start with a staff assessment. You must understand the issues that are causing workers to be less productive.

First, ensure that the right individuals are working in the teams so that they can fully utilise the given resources and tools.

These modifications will have a positive impact on manufacturing productivity. You can also hold regular discussions with employees about how to improve production productivity. Workers on the floor who handle machines and equipment are more aware of what isn't working. To improve long-term production, workers must be engaged during the planning process.

2. Train your employees

If you discover that your staff lack important abilities, it is critical that you invest in employee training. Companies can increase production efficiency by providing a training programme to ensure optimal worker and process synchronisation.

Employee training, according to industry experts, is the foundation of any productivity plan. Manufacturing organisations should prioritise employee training and keep complete training logs. As a manager, you can put up a personalised plan for employees to track their progress over time to increase staff productivity.

Plan for specialised employee training if you install new equipment. You should provide more industry materials and internet tools to employees so that they can learn on their own time. This is critical for establishing a team that is constantly learning to enhance efficiency and problem-solving abilities. According to a survey of the manufacturing industry, a 10% increase in workforce education results in an 8.6% improvement in productivity.

3. Increase communication within and outside the company

Manufacturing productivity can also be improved through improving communication with employees, important suppliers, vendors, and partners. Because the supply chain is such an important element of the production process, collaboration between suppliers and customer reaction time should be as quick as possible.

Several tools can be used to improve communication both within and outside of the firm. By providing a steady flow of real-time data, an ERP may assist you in maintaining open communication with all stakeholders. Workers' performance, supply networks, and operations can all be tracked and monitored.

With an ERP, you can monitor the entire process, from procurement to manufacturing to distribution, allowing you to make more informed decisions. When all of the data is in one place, you can rapidly spot shortages or performance issues that are impeding production productivity.

4. Maintain the machines properly

Productivity may suffer if your organisation does not inspect tools for efficiency on a regular basis. It is remarkable how many managers seek ways to improve operational efficiency in manufacturing operations while ignoring the machines' critical maintenance.

This is regarded as a cardinal sin in the industrial industry. We recognise that maintenance schedules are unpleasant because they require time and money, but they are an important component of keeping operations running and equipment safe for workers in the long run. Furthermore, businesses should continue to look for new and better technologies for the job in order to increase production without increasing work hours.

Train your employees to keep an eye on what's going on with each machine. Maintenance programmes should be followed consistently. You should also maintain spare parts, cables, and other components on hand in case something goes wrong. Time lost due to failures is a major contribution to lower manufacturing productivity.

5. Schedule shifts of employees

Manufacturing shift scheduling can boost productivity by ensuring that the right number of workers are available to meet the workload at any given moment. This can decrease workers' idle time, increasing overall efficiency and production. Furthermore, well-designed shift patterns can assist reduce absenteeism and turnover, which can boost productivity. Advanced scheduling software, such as Truein, can make it easier to build and manage shift schedules, increasing efficiency even more.

Objectives:

1. Identify the implementation of the Motion and Time Study for productivity improvement.
2. To improve productivity & efficiency in manufacturing process.
3. To Analysis of Framework to improve the productivity.
4. To Improvement in Productivity of Manufacturing Industry Using Work Study Technique.

RESEARCH METHODOLOGY

The study depicted in this work not only measures the work content and cycle times, but it also aids in the analysis of the various elements using non-value aided time in the whole operation. Initially, the entire production line is examined for machine-specific cycle times.

REVIEW OF LITERATURE

A thorough research of the scientific literature was required to investigate all of the numerous ways that are either presented by academia or have previously been successfully utilised in the real industrial sector. Several scientific literature search engines were employed to conduct the literature review.

According to Norihiko Saiga's report, the productivity of the service industry is low, which reduces Japan's worldwide competitiveness. There are numerous reasons why a service industry's productivity is low. Productivity enhancement through Lean manufacturing entails optimising and coordinating input resources to minimise waste and lower total production costs. This can be accomplished through Lean Thinking (identifying and eliminating wastes) and Lean Manufacturing (improving equipment efficiency and effectiveness) [4].

G. S. Nhlabathi et al. discuss the use of a production tool known as manufacturing kaizen. Manufacturing kaizen is a method of enhancing a work process by removing waste inside a company. According to the findings, the kaizen tool can help improve organisational productivity [5].

Productivity measures the efficiency with which inputs are turned into outputs. It assesses how effectively resources are used (Nada, 2013). There is tremendous competition in the global economy to achieve and maintain a competitive advantage in productivity and quality, hence the planning and management of productive maintenance activities in industrial and manufacturing organisations should be prioritised (Mathew, 2010). Productivity assesses an organization's performance and can be used by businesses to gauge their growth. In general, productivity is defined as the ratio of a manufacturing system's output to its input. Productivity is defined as the link between the quantity of goods and services produced (output) and the amount of labour, capital, land, energy, technology, and other resources utilised to produce them (input) (Zandin, 2001). Productivity improves a company's total efficiency, allowing its production capacity to be used to its full potential. To achieve the optimum results, all resources are employed effectively and efficiently. [6][7]

Productivity is the efficiency with which a corporation or economy converts resources into goods in order to produce more with less resources. Higher efficiency results in higher margins due to fewer expenses, allowing for better employee remuneration, increased working capital, and improved competitive capability. High productivity offers the advantage of producing more outputs while using the same or fewer inputs. Lower average costs, enhanced competitiveness and trade performance, more profits, and higher pay can all result from increased productivity (Sharma, 2008). Productivity is a vital component of an organization's success; hence, improving productivity helps to an organization's profitability (Kongkiti, 2013). [8] In terms of lean implementation challenges in Indian manufacturing businesses, there is little exploratory research focusing on India's process industry. The current empirical study will fill this research gap by addressing the major difficulties surrounding lean implementation in Indian process industries, and it will provide crucial results for general application and future research. [9]

RESULT AND DISCUSSION

The key characteristics of the respondents are shown in Table 1. In terms of manufacturing activities, the bulk of firms are active in the electrical and electronic industries. Those involved in the manufacture of plastic products come next. The bulk of responses are Malaysian-based businesses. Japanese corporations appear to have a substantial presence among foreign-owned companies. [10]

Table 1: Respondents Profile

No	Items		Percentages (%)			Notes
			MNC	SME	Total	
1	Products Index	Electronic & Electrical	30.8	23.1	53.8	The main products index of manufacturing sector in Melaka Industries
		Engineering / Casting	3.8	7.7	11.5	
		Plastic	-	19.5	19.5	
		Iron & Steel Products	7.7	7.7	15.4	
2	Country of Origin	Malaysia	3.8	50.0	53.8	-
		Singapore	11.5	-	11.5	
		Taiwan	3.8	-	3.8	
		Japan	3.8	7.7	23.1	
		Others	7.7	-	7.7	
3	Number of Years In Operation	Less than 10 yrs	7.7	26.9	34.6	Mean = 17 years
		11 – 20 yrs	15.4	23.1	38.5	
		21 – 30 yrs	15.4	7.7	23.1	
		More than 30 yrs	3.8	-	3.8	
4	Number of Employees	Less than 100	-	19.2	19.2	Mean = 615
		101 – 300	3.8	23.1	26.9	
		301- 500	15.4	11.5	26.9	
		More than 500	23.1	3.8	26.9	
5	Annual Turnover	Less than 25 M	11.5	50.0	61.5	Count in Malaysian Ringgit (RM); M : Million Mean = RM58,134 615
		25 M – 49 M	7.7	7.7	15.4	
		50 M – 75 M	7.7	-	7.7	
		More than 75 M	15.4	-	15.4	
6	Level of Technology	Low Tech	-	11.5	11.5	Not computerized, Low application of modern tools
		Moderate Tech	15.4	46.1	61.5	Moderately computerized, Beginning to adopt automation
		High Tech	26.9	-	26.9	Highly computerized, Application of flexible automation

The level of awareness for motion and time studies is "high" according to Figure 3a. Figure 3a shows that 65.4 percent of the 26 respondents are aware of motion and time study as a technique for productivity improvement, compared to 34.6 percent who are not aware of motion and time study as a technique for productivity enhancement. In comparison to SME, the figure reveals that practically all MNCs are aware of motion and time study.

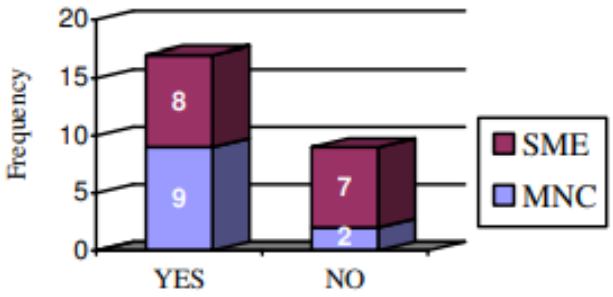

Figure 3a: Level of Awareness for Motion and Time Study

Figure 3b depicts the respondents' motion and time study implementation. According to the data, only 58.8 percent of the 17 respondents (who are aware of the motion and time study) use motion and time study. MNCs (35.3%) outperform SMEs (23.5%) in terms of implementation. [11]

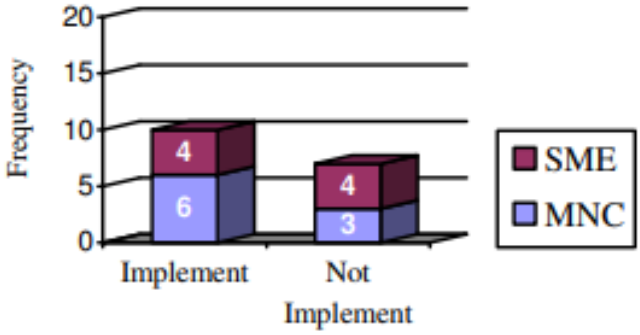

Figure 3b: Motion and Time Study Implementations

CONCLUSION

According to the survey, there are numerous advantages to pursuing productivity enhancement efforts. Respondent's main goal in implementing motion and time study is to boost productivity, work efficiency, quality improvement, minimise operation time per part, compete in local market, and fulfil market need. Several success factors such as top management commitment, interdepartmental cooperation, good planning and control system, company technique capability, effective training, experienced work forces, consistent fund inflow, and clear product strategy contributed to the success of the implementation motion and time study. Unfortunately, firms conducting motion and time studies encounter numerous problems, including worker participation, an inexperienced project leader, a lack of relevant consultants, staff training, and a lack of inter-departmental cooperation.

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