

## Application of lean six sigma in an electricity distribution company

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### ARTICLE INFO

### ABSTRACT

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This paper presents an inclusive review on the application of Lean Six Sigma methodology in an electricity distribution organization. There are large numbers of references shows about the application of Lean Six Sigma in manufacturing based organization. There are suggestions that the Lean Six Sigma concept can be implemented to any kind of industry. However, there are also studies that suggested that there are still many non-manufacturing organizations those have come to the conclusion that Six Sigma will not work the best for them. For an electricity distribution business, the effectiveness of Lean Six Sigma methodology has yet to be explored. The scope of the study is on one of the electricity distribution company.

#### Keywords:

Lean, Six Sigma, Lean Six Sigma, Business Process Improvement, Structured Methodology

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## 1. Introduction

The scope of the study is on one of the electricity distribution company, located at the vicinity of KL Sentral, Kuala Lumpur. Electricity is purchased in bulk, under the Bulk Supply Agreement with the national owned electricity generation and distribution company under one tariff structure. Electricity is then distributed to consumers depending on their categories. Electricity is then distributed to customers based on the applicable tariff categories approved by the Energy Commission of Malaysia.

## 2. Literature Review

Lean Six Sigma is a synergized managerial concept of Lean and Six Sigma. Lean traditionally focuses on the elimination of the seven kinds of wastes/muda classified as defects, overproduction, transportation, waiting, inventory, motion and over processing. Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in (manufacturing and business) processes. In short, Lean exposes sources of process

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variation and Six Sigma aims to reduce that variation enabling a virtuous cycle of iterative improvements towards the goal of continuous flow [1].

### 2.1 The definition of Lean and Six Sigma

Lean Six Sigma uses the DMAIC phases similar to that of Six Sigma. Lean Six Sigma projects comprise aspects of Lean's waste elimination and the Six Sigma focus on reducing defects, based on critical to quality characteristics [2]. Lean defined as systematic approach to identifying and eliminating non value add (wastes) through continuous improvement, flowing the product at the pull of the customer in pursuit of perfection [3]. Although several researchers have provided empirical evidences of the importance of lean on performance, some might have overlooked that the length of lean production adoption would be a catalyst in enhancing this linkage [4]. The research by Bhanpukar *et. al* [6] was to establish the connection between Lean Manufacturing and Six Sigma, the two powerful pillars of the modern industrial revolution. The strong data based approach ensures the objectivity of the whole process and eliminates the traditional mistakes of experience based or gut-feeling based decision making.

### 2.2 Lean Six Sigma in Non-Manufacturing Environment

Muthukumar *et. al.* [7] concluded that this  $L6\sigma$  concept can be implemented to any kind of industry, for better performance,  $L6\sigma$  is a continuous improvement tool for betterment. The study by Ainuddin Omar *et. al.* [9] suggested that there are still many non-manufacturing companies those have come to the conclusion that Six Sigma will not work for them. This is because Six Sigma was originally developed for helping the manufacturing industry. Organizations such as health care systems, financial service providers and educational systems all doubt the usefulness of Six Sigma.

The study by Cliff Ladd [11] described that the implementation of TQM and Lean Six Sigma is a substantial change that mandates a major commitment to transforming the organization in the following key areas: culture, process, and strategic objectives. The paper by Doug Penner [12] has demonstrated the impact of these tools on project identification, patient access, wait times, billing, and several other important facets of medical practice operations. Biniam Gebre [13] suggested that Lean Management helps public sector organizations streamline processes by addressing the causes of organizational inefficiency, building the management systems and capabilities to sustain new ways of working, and engaging everyone in making continuous improvement a part of daily work.

There are many of the impacts reported and noted in organisations identified presented in terms of reduction of (processing or waiting) time, increase in quality through a reduction of errors or 'failure demand', reduction in costs (through less resource), increased employee motivation and satisfaction (particularly related to RIEs) and increased customer satisfaction [14]. Lean Six Sigma is a large undertaking within any organization, and requires the support of upper management to be implemented successfully. One of the hardest things any organization will face when trying to implement Lean Six Sigma is the resistance to change [15].

## 3. Problem Statement

The electricity distribution company under study used to generate steady annual profit of between RM7 million to RM10 million previously until April 2015. However, beginning from May 2015, the tariff for bulk electricity purchase was revised and increased by approximately 20% from the previous rate, while the approved electricity tariff sold to consumers remained the same. The

increase in the tariff for the purchase of bulk electricity has directly impacted the overall operating cost of the company. [16] As the result, for year 2016, the company only recorded Profit Before Tax of RM600 thousand, compared to more than RM7 million in the year before. The company managed to achieve very small profit in 2016 after drastic cost reduction initiatives. If no further actions are taken, the company is expected to suffer loss of up to RM2.4million in the year 2017 [17].

While the root cause of the company’s reduced in profit is obviously due to the increase in the tariff for the incoming bulk supply electricity, it is not straightforward to negotiate for the tariff to be revised. The authority to revise the tariff liaise is under the Energy Commission of Malaysia as well as Tenaga Nasional Berhad. Nonetheless, the management decided to apply Lean Six Sigma approach to uncover any process areas those potentially can be improved and make the internal process more efficient, or to uncover any waste or inaccuracies those might not be realized before.

#### 4. Methodology

Project selection has been based on the data gathered over a period of twenty four months. For the purpose of this study and to analyse the problem, the six sigma (DMAIC) methodology was used [18]. In the Define Phase, the scope of the study was defined and the boundary was established. The second phase was Measure Phase whereby data were taken from various internally generated reports as well as interviews with personnel in the organization under study [16].

##### 4.1 Data Collection

Quantitative data were collected in the form of customer complaint reports, plans and schedules, archival records of financial data, quality performance reports, purchase orders, operational data, performance measurements (such as annual sales and responsiveness) [18]. The first step after obtaining data was to construct “Drill Down Trees”. These are shown by Figure 1 and Figure 2.

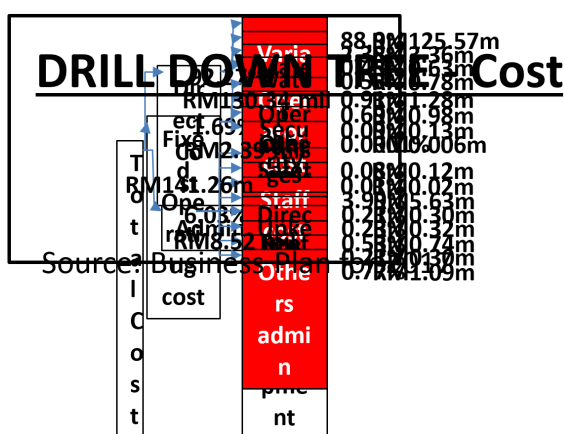


Fig. 1. Drill Down Tree – Cost

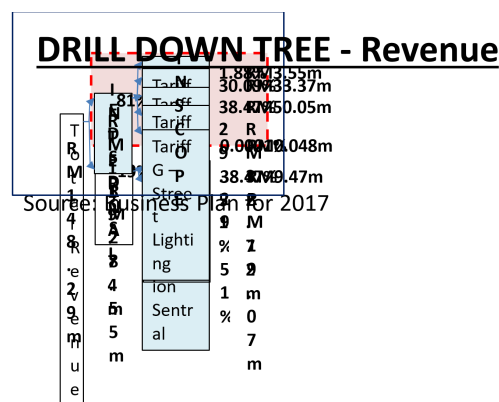


Fig. 2. Drill Down Tree - Revenue

These indicated the need for further study of the process to reach to the vital few Xs affecting the Y of our project those are revenue constraints and cost escalations. During the study the researcher kept a research log that documented each problem encountered during the implementation, in addition to the thoughts and insights gained during the process.

## 5. Findings and Discussion

On analysis of the data using the Pareto chart, it was found that the biggest cost is the payment for bulk supply of electricity. Payments for incoming supply electricity contributed 89% of the total cost borne by the company.

The first stage was Define Phase whereby the problem was identified and the Project Charter was established to determine the scope as well as other parameters relevant to the project. Pareto Chart and Pie Chart were prepared. From the Pareto Chart, 89% of operating cost is the payment for the imported bulk electricity. This is as described in Figure 3. For the source of revenue, as shown in Figure 4, the biggest source of revenue is the distribution of electricity.

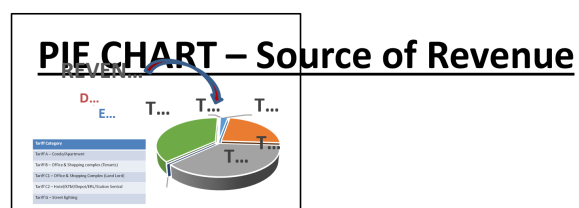
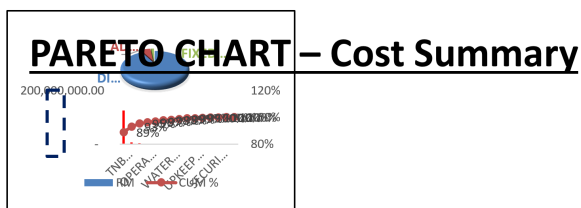


Fig. 3. Pareto Chart – Cost Summary

Fig. 4. Pie Chart – Source of Revenue

From the data collected and initial analysis conducted, the first priority was to analyse the imported electricity as well as the electricity distributed. The objective of this stage is to identify if there were any areas within the scope of electricity distributions those can be improved.

At this stage, the research is still at Measure Phase and just about to enter into Analyse Phase. The researcher will report the next findings when sufficient data, information as well as the result of analysis are available.

## 6. Conclusion

For the organization under study, it is recognized that the main reason for declined in its Profit Before Tax was due to the increased of electricity tariff for the imported electricity. However, there might be other reasons those yet to be explored through the application of Lean Sigma. The decision to apply Lean Six Sigma methodology is to uncover any process areas those potentially can be improved and make the internal process more efficient, or to uncover any waste or inaccuracies those might not be realized before.

At this stage, the research has reached Measure Phase and has yet to enter into Analyse Phase. The next stages of the research are Improve and Control Phases and the researcher will continue to report the findings once the stages complete.

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