

FEASIBILITY STUDY ON THE IMPLEMENTATION OF OPTIMIZED PRODUCTION  
TECHNOLOGY IN A MANUFACTURING COMPANY BY SIMULATION MODELLING

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**This thesis is dedicated to my family who have supported me all the way since  
the beginning of my studies**

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## ABSTRACT

Optimized Production Technology, which is later known as Theory of Constraint, as a profit making technique has been reviewed carefully. According to the theory, each system has at least one bottleneck or constraint that controls the whole system's behavior. Based on this theory, this thesis aims to study the method of implementing Optimized Production Technology with the aid of the Arena simulation software to check the feasibility of this method in a manufacturing company. This study provides a simulation model of a manufacturing production line as an initial step of defining the bottleneck of the system. Then a number of scenarios are discussed related to the evaluated bottlenecks that offer the implementation of Optimized Production Technology and in the system to obtain the most optimized improvement in terms of cost and throughput. These improvements will help the company to achieve more benefit as well as improvements in the total throughput number. In order to make a general comparison between the improvements made and the current state of the system of manufacturing production line, the sufficient performance measurements has been proposed as well. The best scenario to improve the system is to reduce all the three bottlenecks at the same time.

## ABSTRACT

Optimized Production Technology, yang kemudiannya dikenali sebagai Theory of Constraints telah dikaji dengan teliti sebagai teknik menjana keuntungan. Menurut Theory of Constraints, setiap sistem mempunyai sekurang-kurangnya satu kekangan yang mengawal tingkah laku keseluruhan sistem. Berdasarkan teori ini tesis ini, bertujuan untuk mengkaji kaedah melaksanakan Optimized Production Technology dengan menggunakan perisian simulasi Arena untuk memeriksa kebolehlaksanaan kaedah ini dalam sebuah syarikat perkilangan. Kajian ini menghasilkan satu model simulasi barisan pengeluaran perkilangan sebagai langkah awal menentukan kesesakan(Bottleneck) pada sistem. Kemudian beberapa senario dibincangkan berkaitan dengan kesesakan yang menawarkan pelaksanaan Optimized Production Technology dalam system yang dinilai untuk mendapatkan peningkatan yang paling optimum darisegi kos dan pengeluaran. Peningkatan ini akan membantu syarikat untuk mencapai manfaat yang lebih serta peningkatan dalam bilangan pemprosesan keseluruhannya. Dalam usaha untuk membuat perbandingan umum antara penambahbaikan yang dibuat dan keadaan semasa sistem pengeluaran pembuatan, pengukuran prestasi yang mencukupi telah dicadangkan juga. Senario yang terbaik bagi sistem ini adalah dengan mengurangkan kesesakan pada semua kesesakan dalam satu masa yang sama.

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

In this chapter a general background of study is discussed. Following that the problem statement is clearly defined. Afterward the scope and objectives have been investigated thoroughly. Then significance of study has been presented. Finally, a brief conclusion has been offered.

#### **1.2 Background of the Study**

In today's challenging world of business, every company's goal is to get the share of market by producing high quality products as well as achieving the maximum profit in shorter throughput times and quicker inventory returns. Reaching these goals later brought the advent of Optimized Production Technology(OPT) which continued the successful standpoints of its previous advances like MRP and JIT with some differences (Shams-ur Rahman, 1998). OPT is a production and inventory control system which has commenced from software and later on turned to

be a production control philosophy. The OPT system is designed for shop floor scheduling based on the concept of bottlenecks as a delineating factor of the system's production potential. The bottlenecks are labelled by OPT as a factor in each organization which has the smallest production potential. Labours, equipments, technologies and many other factors can be considered as the constitutive of the production potentials. Later, OPT became known as the Theory of Constraints (TOC) which is usually applied to improve organizational effectiveness. The fact that each organization has at least one constraint which is very influential for the whole system is the basis of how TOC works. In other words what happens in the TOC system is exactly of the opinion that a chain is as weak as its weakest link. Generally the TOC has two viewpoints: (1) The business system and (2) The ongoing improvement process. In the first viewpoint, the TOC discusses the three dimensions mindset, measurement and methodology. Mindset is about the global goal of the system, measurement has an idea of how to measure the performance of the system, and methodology defines the methods for continuous improvement. In progress improvement process stance of TOC includes three main questions to be asked in order to understand the ways of perfection for the system: The first question which is usually asked is what to change? The next query is what is the altered condition? And ultimately how to bring these changes to our system? (M.Gupta and D.Snyder, 2009)

OPT which originally was a software, now is recognized as a key philosophy in production by the name of theory of constraints. This name is by reason of the main concept that is used for optimizing the process which is anchored in the bottleneck management and scheduling. The software of OPT, is a very expensive software that only giant companies can apply and is hardly ever used by individuals (Yenardee, 1994).

TOC has been transformed a lot from production software to a thoroughly comprehensive philosophy of managing the production, since it's emerge up to the current studies. There are apparent testimonies that show the emergence of new concepts and era in TOC. Nowadays there are many different research transmissions

on the area of TOC and numbers of articles are escalating. These occurrences are as a result of the potential merits of this method that researches confirmed (K. Watson et al., 2007).

Watson et al. (2007) in their study declared that reviews illustrate the advantage of using TOC in general. Furthermore they pointed out some upgrading that can be made by using TOC. Some of these advantages can be mentioned as mean reduction in order-to-delivery lead time, manufacturing cycle time, inventory, Throughputs and revenue as well as mean improvement in due date performance.

Unlike its previous methods, by having a look at bottlenecks as the constraints of the system, TOC makes it possible to deliberate only on the required stations, and not killing time and energy on other areas of work. As a result based on the steps of the TOC, improvement can be obtained faster and easier. Many specialists believe that TOC is a good way of recognizing the features that are preventive and find a technique of achieving the expected objective and improving that constraint and preventive factors in order to make it possible for them not no longer to be a limiting factor. TOC is famous for its technical advances of improvement. Its main concept lies in the theory that each complicated system that contains different processes is consisted of many chain activities that are connected and one among them is always knows as the bottleneck or constraints of the whole organization.

Although there have been many research recently, the need to investigate and search in this topic is still necessary. There is a need of looking further in any angle of this area to ensure the positive effect of this method. This study aims to have a look at the possibility of using TOC in a relatively small company and by conducting simulation model, go through the advantages and disadvantages of using this method for the defined case study company and then generalize it to the other similar situations.

### **1.3 Problem Statements**

Most of the companies in manufacturing areas nowadays are looking for gaining more and more profit in order to win the competitive market and have the biggest share among their competitors. Reaching this desire hence is not that much easy and a systematic method is needed to be taken into consideration in order to give an aid to managers shareholders to attain this goal. Among all methods involved in this issue, for achieving the goal of having more profits, bottleneck reduction in manufacturing system is an adequate approach for enhancing throughputs as well as efficiency.

In this case study, although as the only supplier for the main company, they do not have any problem on achieving the share of market, the managers still have the desire of increasing throughputs and making more profit while large amount of bottlenecks in production lines has made many problems in achieving this goal.

In order to overcome this problem, this study deals with finding a new suitable method and reviewing and testing the feasibility of implementing the TOC method for increasing the profit and making money. The necessity for this research is due to lack of knowledge about this method and a challenge of evaluating its feasibility in the similar companies.

### **1.4 Objective of the Study**

The objectives of this study are:

- To simulate the current situation of the Joker table lamp manufacturing line in the company
- To identify the system's bottlenecks using the simulation model of the production line
- To study the process of implementation and assessing the OPT in the current model and reach the improvement through the OPT and Simulation integration.

### **1.5 Scope of Study**

The scope of the study is:

- This study focuses on Onilux Light designers company located in Johor bahru, Johor, Malaysia
- The study will only consider the Joker table lamp production line system.
- Direct survey will be deployed as the main data collection approach.
- The simulation model will be built by Arena 13.5 simulation software.
- The suggested solution is not necessary to be implemented in the company



## **1.6 Significance of Study**

There have been many different researches on implementation of OPT and TOC and in many different aspects the implementation of this method has been discussed. Many articles and journals have been studied the difference between this method and other comparable methods such as MRP and JIT.

In this study, the process of implementation of OPT and TOC is presented and then by comparing the suggested method with the present method of the case study, the feasibility of this method on similar cases have been tested and evaluated.

Due to significant number of bottlenecks in the company, and based on the fact that this kind of research has not been done in the company, proposing TOC for the companies processes have been seen to be very useful.

In addition, proposing this project as a suggested method can have a great impact on decreasing total numbers of bottlenecks, costs and timing as well as increasing the profit.

## **1.7 Organization of the thesis**

In this thesis; a brief introduction, the topic background, problem statements, the objective and scope as well as significance of study have been discussed in Chapter One.

Chapter Two contains a categorized literature review on OPT and TOC studies in detail. In addition, some related topics and concepts of OPT and TOC methods are explained and compared.

Next, research methodology, its structure and design as well as research flow chart is explained in Chapter Three. A general picture of what is supposed to be done in this research is also depicted.

Later, a brief introduction of case study and the collected information related to the products are presented and the model Simulation has been conducted in Chapter Four.

Chapter Five argues about the result and data analysis which have been assessed by Arena software. Moreover, some discussions for each result have been offered as well.

And finally Chapter Six consists of a summary of whole study, findings of the research and some future research potentials.

## **1.8 Conclusion**

This chapter provided a foundation of study, a brief introduction, the background and scope have been presented and the objectives are defined. Significance of study has been presented and at the end, the general thesis organization was depicted.

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