METHOD OF PRODUCTIVITY IMPROVEMENT THROUGH INTEGRATION OF ANALYTICAL HIERARCHY PROCESS INTO THEORY OF INVENTIVE PROBLEM SOLVING

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To my beloved mother, father and sisters who have filled my heart with the best during my life

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ABSTRACT

Human productivity in manufacturing and industrial organizations has been a challenge since ages. Making effective decisions for the improvement of productivity needs generation of efficient methods and decision making starts with this fact that always there are many criterions to be considered simultaneously. Current business environments due to rapid development, are asking industrial companies to make the multi criteria effective decisions. In this thesis, during decision making regarding human productivity, Analytical Hierarchy Process (AHP) and theory of inventive problem solving (TRIZ) areapplied to propose suitable productivity improvement methods with respect to cost, production and time simultaneously. The method isinvestigated on a real-world example which isa manufacturing company. At first, TRIZ concept isused to match human resource into the procedure extracted from many solved problems to omit the errors of the decision-making. Then, the criterions areconsidered and the problem is structured into hierarchies to make the final decision. To this end, the ideas of a group of experts areaggregated and the decision selection is made using AHP. The robustness and stability of the method areexamined by conducting sensitivity analysis. The results of analysis show that the constructed methods are reliable and the ranking of AHP can be used for the purpose of productivity improvement.

ABSTRAK

Produktiviti kemanusiaan dalam sektor pembuatan dan perindustrian organisasi telah menjadi semakin pesat kebelakangan ini. Membuat keputusan yang efektif bagi meningkatkan produktiviti memerlukan kaedah yang cekap. Untuk menghasilkan keputusan iniia bermula dengan fakta yang mempunyai banyak kriteria yang sama perlu dipertimbangkan secara bersama. Suasana perniagaan semasa disebabkan olehpembangunan yang pesat, memaksa syarikat-syarikat industri untuk membuat pelbagai keputusan secara efektif. Dalam tesis ini, semasa membuat keputusan mengenai produktiviti manusia , Proses Hierarki Analisis (AHP) dan teori penyelesaian masalah berdaya cipta (TRIZ) telah digunakan untuk mencadangkan kaedah peningkatan produktiviti yang sesuai berkaitan dengan kos, pengeluaran dan masa secara serentak. Kaedah ini telah dikaji pada sebuah syarikat pembuatan. Pada mulanya , konsep TRIZ telah digunakan untuk memadankan sumber manusia ke dalam prosedur yang diekstrak daripada banyak penyelesaian masalah untuk menghasilkan ralat-ralat yang membuat keputusan. Kemudian, kriteria ini dipertimbangkan dan masalah itu dibahagikan kepada hierarki untuk membuat keputusan muktamad. Untuk tujuan ini , idea-idea pakar telah disatukan dan keputusan pemilihan itu dibuat menggunakan AHP. Kemantapan dan kestabilan bagi kaedah ini telah diuji dengan menjalankan analisis sensitiviti. Keputusan analisis menunjukkan bahawa kaedah yang digunakan boleh dipercayai dan ranking AHP boleh digunakan untuk tujuan peningkatan produktiviti

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CHAPTER1

INTRODUCTION

1.1 Introduction

This chapter consists of an overview for the whole project. It contains the background of the problem, problem statement, research questions, objective and scope. Lastly is the significance of study and thesis structure.

1.2 Background of study

Theory of inventive problem solving (Teoriya Resheniya Izobreatatelskikh Zadatch - TRIZ) has shown that it is possible to achieve performance improvement in conducting business. Over the last decade, a great deal of research concerning the TRIZ has been conducted to examine and improve the cost savings. This enormously impacts the field of engineering by revolutionizing the way in which engineers think about their approach using the procedures of TRIZ. The idea behind the TRIZ begins with the recognition of innovation follows a certain trend (Lou et al., 2012).

Due to rapid development of markets, current business environment depicts diversity and uncertainty. However, industrial companies demand optimal decisions for their product development. It is well known that there is a high uncertainty in

making decisions. In fact, there are often significant delays in the decision making processes. One of the most frequent reasons is a decision-making error, which leads to rework and time-consuming data collection activities. This causes not only delays, but also increase the cost. TRIZ can be used to minimize errors of decision-making in the optimization of existing products, processes or technologies, or the development of a new creative product, process or technologyand it helps increase innovation during the process (Ilevbare et al., 2013).

Sometimes, just using TRIZ methodology could be inefficient and/or insufficient for complex problems and for finding appropriate innovative solutions in a short time period. Analytical hierarchy process (AHP) which is a multi-criteria decision making tool, can be used to enhance this methodology thus making it capable of achieving performance improvement.

1.3 Problem Statement

Most activities done to suggest methods for enhancing human productivity usually consider one criterion regarding the problem involved. When only one criterion is in consideration, improvement of human productivity is not possible. Other problems are also likely to emerge when facing other criterions. Therefore, using unsuitable methods for solving the problem will cause losses in terms of cost, production and time.

1.3.1 Research Questions

The research question of the study is defined as following:

How AHP can be integrated into TRIZ conceptin order to be used for proposing improvement activities for human productivity?

1.4 Objectives

The objective of this project is to integrate AHP into TRIZ concept and use of TRIZs' 40 principles related to the alternatives and criterions of AHP which are cost, production and time to propose methods for human productivity improvement.

1.5 Scope

The scope of the study is specified as:

- Study is done at a manufacturing company.
- Only selected the department is analyzed.
- AHP and TRIZ concept is integrated for a better decision making.

1.6 Significance of Study

In most of studies done regarding TRIZ, the terms being considered are only principles of TRIZ. These are done without a decision making procedure to decide in regards to the generated ideas. In this study, during decision making regarding the human resource, AHP and TRIZ concept is integrated to propose suitable productivity improvement activities and help the company to be able to consider the cost, production and time simultaneously.

1.7 Thesis Structure

The thesis encompasses 5 chapters. Chapter 1 is the introduction of the project which consists of the background of study, statement of problem, project questions, objective, scope and significance of study. Chapter 2 presents literature review of TRIZ, AHP and human resources. Chapter 3 explains about the methodology used inside the project. Chapter 4 concentrates on data collection and the analysis of result in which all the data gathered, consisting of qualitative and quantitative data, is presented. And finally, chapter 5 brings about the discussion, conclusion and recommendations for future researches.

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