UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AN INVESTIGATION OF HUMAN FACTOR ENGINEERING AND HUMAN BEHAVIOR ON PRODUCTIVITY

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Management) with Honours.

By

ADIYANA BINTI SUKOR

B050810019

FACULTY OF MANUFACTURING ENGINEERING

2011

© Universiti Teknikal Malaysia Melaka

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS TESIS*

JUDUL: **An Investigation of Human Factor Engineering and Human Behavior on Productivity**

SESI PENGAJIAN: 2010-2011

Saya **ADIYANA BINTI SUKOR**
mengaku membenarkan tesis (PSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Tesis adalah hak milik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (√)

☐	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☐	TIDAK TERHAD	

Disahkan oleh:

(TANDATANGAN PENULIS) (TANDATANGAN PENYELIA)

Alamat Tetap:
No. 18, Jalan Laksamana 9, Taman
Ungku Tun Aminah, 81300 Skudai,
Johor Darul Takzim

Cop Rasmi:

Tarikh: _____ Tarikh: _____

* Tesis dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah dan Sarjana secara penyelidikan, atau disertasi bagi pengajian secara kerja kursus dan penyelidikan, atau Laporan Projek Sarjana Muda (PSM).
** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis ini perlu dikelaskan sebagai SULIT atau TERHAD.

© Universiti Teknikal Malaysia Melaka

ABSTRACT

The purpose from this research is to investigate the two categories factor can be influence to productivity achievement. This research would be done in the automotive industry at area pasir gudang johor bahru. From this research human facto and human behavior is two main factor influences on the productivity achievement. Then to make the experiment start, DOE method use for help to analyze the data analysis the result by use the DOE model and interpreting graphing. The experiment start from to provide the questionnaires to analyze for human behavior, after the data will be taken, the next step is to make the analysis then choose the higher effect based on result. Then combine the human behavior and human factor to make the experiment and find the factor can be most influence on the productivity. Through the DOE model analysis, will have find the factor was significant and higher impact to productivity achievement based on analysis and result have been taken. Then from the research after find the influence factor, the problem cabn be solving based on the result analysis, the next step it's to give and choose the potential alternatives to solving the problem and the same time the productivity can be increase the achievement.

© Universiti Teknikal Malaysia Melaka

ABSTRAK

Pada kajian kali ini adalah mengenai dua faktor yang sangat berpengaruhi dalam meningkatkan produktiviti. Kajian ini di lakukan di kawasan perindustrian automotif di pasir gudang johor bahru. Dalam kajian ini terbahagi kepada dua faktor yang sangat berpengaru dalam meningatkan produktiviti, faktor-faktor tersebut adalah human behavior dan human factor. Untuk melakukan kajian ini kami menggunakan keadah DOE model untuk mengenalpasti faktor yg berpengaruh. Dalam kaedah DOE, terdapat cara-cara untuk mereka bentuk analisa data, menganalisis data dengan terperinci dan mengeluarkan graph bagi merujuk keputusan data yang telah di analisakan. Eksperimen ini kami lakukan bermula dari menyediakan questionnaires untuk human behavior dan seterusnya menganalisa data dari keputusan tersebut seterusnya memilih faktor human behavior yang sangat berpengaruh ke kajian yang seterunya untuk di kombinasikan bersama human factor. Langkah seterusnya adalah eksperiment yang dilakukan adalah menkondisikan sesuatu bilik mengikut data yang telah terhasil daripada menggunakan kaedah DOE, daripada kajian tersebut penganalisa keputusan di buat dari menggunakan kaedah DOE untuk mengeluarkan graf yang sesuai dengan faktor yang terlibat. Berdasarkan kajian dan graf yang terhasil itu, keputusan dan penganalisis telah di lakukan dan menentukan faktor apakah yang sangat mempengaruhi pencapaian produktivty di industry terbabit. Daripada keputusan itulah langkah atau cadangan telah di berikan kepada pihak kilang untuk memastikan produktiviti terus mendapat peningkatan yang positif.

© Universiti Teknikal Malaysia Melaka

DECLARATION

I hereby, declared this report entitled An Investigation of Human Factor Engineering and Human Behavior on Productivity is the results of my own research except as cited in references.

Signature : …….

Author's Name : ADIYANA BINTI SUKOR

Date : ……

© Universiti Teknikal Malaysia Melaka

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process) with Honours. The member of the supervisory committee is as follow:

(Signature of Supervisor)

……

(Official Stamp of Supervisor)

© Universiti Teknikal Malaysia Melaka

APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Process) with Honours. The members of the supervisory committee are as follow:

(Signature of Principal Supervisor)

……

(Official Stamp of Principal Supervisor)

(Signature of Co-Supervisor)

……

(Official Stamp of Co-Supervisor)

© Universiti Teknikal Malaysia Melaka

DEDICATION

To my beloved mother, father and friends, thank you for the support and encouragement.

© Universiti Teknikal Malaysia Melaka

ACKNOWLEDGEMENT

First and foremost, I thank the almighty god for being my side throughout. I wish to extend my sincere thanks Mr Hj Abd Rahman bin Mahmood as my supervisor for helping and always guiding me throughout the development of the research. I would like to thank to Mr. Hairulanuar bin Suli and Ms. Juliana binti Sentol for helping me with outstanding information to conduct my experiment and research development in the factory. I am grateful to thank my colleagues Mr Mohammad Atiq and Mr. Zharif Anuar, as many creative thoughts and valuable discussion about the research have had a significant influence throughout my project development. Also not to forget the Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka management for allowing me to be a part of the network and thus giving me a chance to gain useful knowledge and experiences. In addition, I am especially indebted to my parents, Mr Shahril bin Sukor and my fiancé Mr. Farid bin Daud for their love, encouragement and support me throughout the development of this research.

© Universiti Teknikal Malaysia Melaka

TABLE OF CONTENT

ABSTRACT i

DECLARATION iii

APPROVAL iv

DEDICATION vi

ACKNOWLEDGEMENT v

LIST OF FIGURE vii

LIST OF TABLE viii

1. INTRODUCTION

1.0 Introduction 1

1.1 Problem Statement 4

1.2 Objective 5

1.3 Importance of the Study 5

1.4 Scope of the study 6

© Universiti Teknikal Malaysia Melaka

2. LITERATURE REVIEW

2.0 Theory and concept of Productivity 9

2.1 Productivity Concept and Measure 14

2.1.1 Factor affecting in Productivity 16

2.1.2 Improving Productivity 17

2.1.3 Productivity at the National Level 18

2.2 Human Factor 21

2.2.1 Illuminance 22

2.2.2 Relationship between illuminance and irradiance. 23

2.2.3 How to Calculate Illuminance 24

2.3 Noise 24

2.3.1 Measuring Noise 26

2.3.2 Calculation to measuring the noise 26

2.4 Thermal Comfort 27

2.4.1 Factors determining thermal comfort 30

2.4.2 Explanation about factor affecting in thermal comfort 30

© Universiti Teknikal Malaysia Melaka

2.4.3 Measuring thermal comfort 36

2.5 Human Behavior 39

2.5.1 Element of Organizational Behavior 39

2.5.2 Model of Organizational Behavior 39

2.5.3 Social systems, culture and individualizations 41

2.5.4 Organizational Development 42

2.5.5 Quality of Work 43

2.5.6 Introduction to work attitude value Enhancement 46

2.5.7 The Four-Factor model of Personality in the workplace 47

2.5.8 Personality can be influence of job Performance. 51

2.5.9 Herzberg's Motivation-Hygiene Theory (Two Factory Theory) 53

2.5.1.1 Self-concept 55

2.6 D.O.E (Design of Experiment) 58

2.6.1 Principles of Experimental design, following Ronals A. Fisher 59

2.6.2 Step-by-step procedure in the effective design of an experiment 61

© Universiti Teknikal Malaysia Melaka

3. METHODOLOGY

3.0 Introduction 68

3.1 Product of Flow 71

3.2 Design Of Experiment 72

3.3 Mehanism of Full Factorial design 72

3.4 Full Factorial design 74

3.4.1 Specification to measurement cut of human factor 75

3.4.2 Specification to measurement human behavior 76

3.5 Experimental equipment 77

4. RESULT AND DISCUSSION

4.1 Company Background 79

4.2 Procedure of an experiment 80

4.2.1 Human Behavior 80

4.2.1.1 Questionnaires 80

\

4.2.2 Human Factor 82

© Universiti Teknikal Malaysia Melaka

4.2.2.1 Instrumentation of tool to measure 82

4.2.2.2 Instrumentation of tool to measure the part or work piece 88

4.2.2.3 Interpret the condition using Minitab 89

4.2.2.4 Design the table following the generator from Minitab Data 93

4.2.2.5 Procedure of the experiment 94

4.3 Analysis of the experiment 97

4.3.1 Human Behavior 97

4.3.2 Human Factor and Human Behavior analysis 111

4.4 Analysis of the experiment 125

5. ANALYSIS PART II AND RECOMMENDATION

5.0 Overview 126

5.1 Validation Data 127

5.2 Analysis Part II 128

5.3 Analysis from the experiment 137

5.4 Recommendation 140

© Universiti Teknikal Malaysia Melaka

5.4.1 Performance approach 140

5.4.2 Purpose of conducting performance assessment 140

5.4.3 Ensuring effectiveness of performance appraisal 141

5.4.4 Performance 142

6. CONCLUSION 143

REFERENCES xii

APPENDIX xiii

© Universiti Teknikal Malaysia Melaka

LIST OF FIGURES

2. Literature Review

2.10 Meter Lux 21

2.11 Distance of Lighting 24

2.12 Diagram of ears 25

2.13 Equipment to measure the thermal comfort 37

2.20 Human Behavior 40

2.21 Quality of Work 43

2.30 Factorial Design 60

2.31 Randomized flow chart 66

3. Methodology

3.1 Research of Methodology 70

3.2 Procedure flow diagram 71

3.3 Mechanism of Full Factorial Design Method 72

3.4 Two factor and three factor 73

© Universiti Teknikal Malaysia Melaka

4. Result and Discussion

4.1 Sample of Questionnaires 81

4.2 Thermal Anemometer 84

4.3 Light Meter 85

4.4 Sound Meter 87

4.5 Icon of Minitab 90

4.6 Click icon DOE 90

4.7 Icon create factorial design 90

4.8 Change the setting of factor 91

4.9 Determine the design 91

4.11 Factors 92

4.12 Data generators DOE 92

4.13 Dimension part to measuring 93

4.14 (a) Generate data from Minitab 104

4.14 (b) Remark from result in DOE from Minitab 105

4.15 (a) Setting the alpha 106

4.15 (b) Normal plot of the effect 106

4.15 (c) Half normal plot of the effect 107

4.15 (d) Pareto Chart of the effect 107

© Universiti Teknikal Malaysia Melaka

4.16 (a) Half normal plot of the effect 118

4.16 (b) Normal plot of the effect 118

4.16 (c) Pareto Chart of the effect 119

4.17 (a) Interaction plot for productivity 122

4.17 (b) Main Effect plot for productivity 123

4.17 (c) Cube plot for productivity 124

5. Analysis Part II and Recommendation

5.1 (a) Pareto Chart of the effect 130

5.1 (b) Half Normal Plot of the effect 131

5.1 (c) Normal plot of the effect 132

5.2 (a) Interaction plot for productivity 133

5.2 (a.i) Personnel attitudes versus Light 134

5.2 (b) Main effect plot productivity 134

5.2 (c) Cube plot for productivity 136

© Universiti Teknikal Malaysia Melaka

LIST OF TABLES

2. Literature Review

2.2 Factor in Job Attitude 53

3. Methodology

3.1 Five factor affected in productivity 75

3.2 Specification of Factor 76

4. Result and Discussion

4.1 Specification of Factor 88

4.2 Design of Experiment 93-94

4.3 DOE analysis 94

4.4 Specification of Factor 95

4.5 Instrumentation Tool 95

4.6 Table of data 96

4.7 Example result of questionnaires 98

4.8 Specification of human behavior 98

© Universiti Teknikal Malaysia Melaka

4.9 Result of human behavior 99 – 103

4.10 Combination of data refer the productivity value 105

4.11 Human factor and human behavior experiment 111

4.12 Result of experiment 112-115

4.13 Value of productivity 116

5. Analysis Part II and Recommendation

5.1 Generate data from MINITAB 129

© Universiti Teknikal Malaysia Melaka

CHAPTER 1

INTRODUCTION

In this section, this chapter will provides and explain the background, scope, problem statement and the importance of the study. Besides, this section will briefly touch the concept of productivity and analyze the factor can influence increase or decrease the performance. The human factor and human behavior which factor can be influence the productivity and which one can giving more impact for productivity.

The concept of productivity is a measure of output from a production process, per unit of input. For example, labor productivity is typically measured as a ratio of output per labor-hour, an input. Productivity may be conceived of as a metric of the technical or engineering efficiency of production. As such, the emphasis is on quantitative metrics of input, and sometimes output. Productivity is distinct from metrics of allocatives efficiency, which take into account both the monetary value (price) of what is produced and the cost of inputs used, and also distinct from metrics of profitability, which address the difference between the revenues obtained from output and the expense associated with consumption of inputs.

Productivity is the ratio of output to the input of labour. Where possible, hours worked, rather than the numbers of employees, is used as the measure of labour input.

© Universiti Teknikal Malaysia Melaka

With an increase in part-time employment, hours worked provides the more accurate measure of input. Productivity should be interpreted very carefully if used as a measure of efficiency. In particular, it reflects more than just the efficiency or productivity of workers. Productivity is the ratio of output to labours input; and output is influenced by many factors that are outside of workers' influence, including the nature and amount of capital equipment that is available, the introduction of new technologies, and management practices.

From the multifactor productivity is the ratio of the real value of output to the combined input of labour and capital. Sometimes this measure is referred to as total factor productivity. In principle, multifactor productivity is a better indicator of efficiency. It measures how efficiently and effectively the main factors of production - labour and capital - combine to generate output. However, in some circumstances, robust measures of capital input can be hard to find. Productivity and multifactor productivity both increase over the long term. Usually, the growth in productivity exceeds the growth in multifactor productivity, reflecting the influence of relatively rapid growth of capital on productivity.

Productivity studies analyze technical processes and engineering relationships such as how much of an output can be produced in a specified period of time. It is related to the concept of efficiency. While productivity is the amount of output produced relative to the amount of resources (time and money) that go into the production, efficiency is the value of output relative to the cost of inputs used. Productivity improves when the quantity of output increases relative to the quantity of input. Efficiency improves, when the cost of inputs used is reduced relative the value of output. A change in the price of inputs might lead a firm to change the mix of inputs used, in order to reduce the cost of inputs used, and improve efficiency, without actually increasing the quantity of output relative the quantity of inputs. A change in technology, however, might allow a firm to increase output with a given quantity of inputs; such an increase in productivity would be more technically efficient, but might not reflect any change in allocative efficiency. Many factors affect productivity. Some general categories for these factors are product, process, labor force, capacity, external influences, and quality.

© Universiti Teknikal Malaysia Melaka

In this research must to understand the human factor issue and how the factor can influence to the organization, as well as assisting an organization in developing better systems of work that maximize performance and benefit of bottom line for productivity and safety. They have many element from human factor, Personal Factors, among the Personal Factors that influence a worker's productivity are responsibility, the worker's commitment to the task at hand and learning capacity the ability to learn, which is tied to the worker's education level and the willingness to learn and satisfaction a complex factor that motivates the worker's display of responsibility and learning capacity.

The work Group Factors. Leadership is important. Appropriate leadership helps create a satisfying work environment and conducive to high productivity. Good relationships and organization within the work team provide a balance of effort and no one member shoulders an unfair load and motivate team members to excel and organizational Factors. Incentives, both qualitative and quantitative, go a long way toward motivating workers to be more productive, and they increase job satisfaction. Measuring productivity and communicating with the employee about his or her performance are critical elements in achieving optimal productivity. Both productivity models focus on the same factors for motivation, training, communication, tools, techniques, and rewards. Assuming the employee is fit for the job, much of the responsibility for worker productivity rests with the employer. Organizations must look closely at the workplace culture for ways to incentivize and help workers, and ultimately the company, achieve optimal productivity.

From the human behavior is the study and application of knowledge about how people, individuals, and groups act in organizations. It does this by taking a system approach. That is, it interprets people-organization relationships in terms of the whole person, whole group, whole organization, and whole social system. Its purpose is to build better relationships by achieving human objectives, organizational objectives, and social objectives. As you can see from the definition above, human behavior encompasses a wide range of topics, such as human behavior, change, leadership, teams, etc. Since many of these topics are covered elsewhere in the leadership guide, this paper

© Universiti Teknikal Malaysia Melaka

will focus on a few parts of human behavior elements, models, social systems, OD, work life, action learning, and change.

Every organization experiences issues and look for ways to increase productivity, and maintain a viable workplace environment. There are many factors which affect the productivity of an organization. Those factors can include material quality, people skills, system & procedures, equipment & tools, knowledge of worker and management skill. Placing all this aside, one of the key crucial factors is the attitude of supervision/leadership. The right attitude within leadership can create viable work environment conducive to high productivity. Negative behavior of a management can turn the best job into a desolate one causing subordinates to loose their productivity and creativity and at time loose their workplace engagement. Negative behavior of management can create an atmosphere of mistrust and fear. This in turn creates a negative impact on productivity and can increases the operational cost. It is important to know employee potential, appreciate their good work.

1.1 Problem statement

Company INNO Precision Sdn Bhd is an automotive component manufacturer at Pasir Gudang. As usually happen to other company the productivity of this company is very crucial in determining the company profit. A little improvement measures in productivity can give significant effect to the company profit margin. In other word any reworks, or reject if happen caused by workers' working attitude (WWI) or due to human factor engineering (HFE) are the examples of factors which will decrease the level of productivity. The company is busy with production in order to meet the production schedule as required by customer and there is no concerted effort was made to address this particular issue of productivity. From initial research observation in the company it was found that there are some rooms for improvement to the productivity.

© Universiti Teknikal Malaysia Melaka