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Name: Prof. Dr. } {Font 12, Time New Roman, Italic}

(Member)

Date: / /2020

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Name: Prof. Dr.

(Member)

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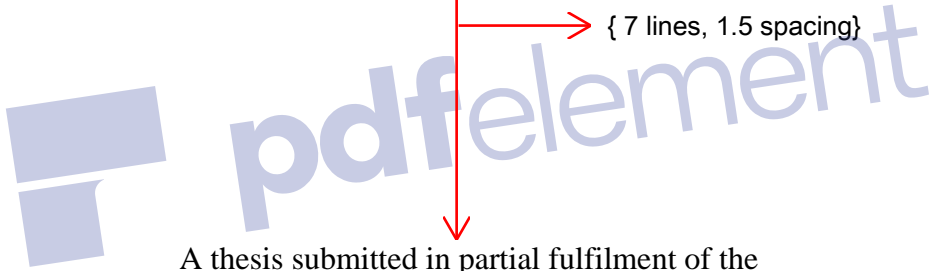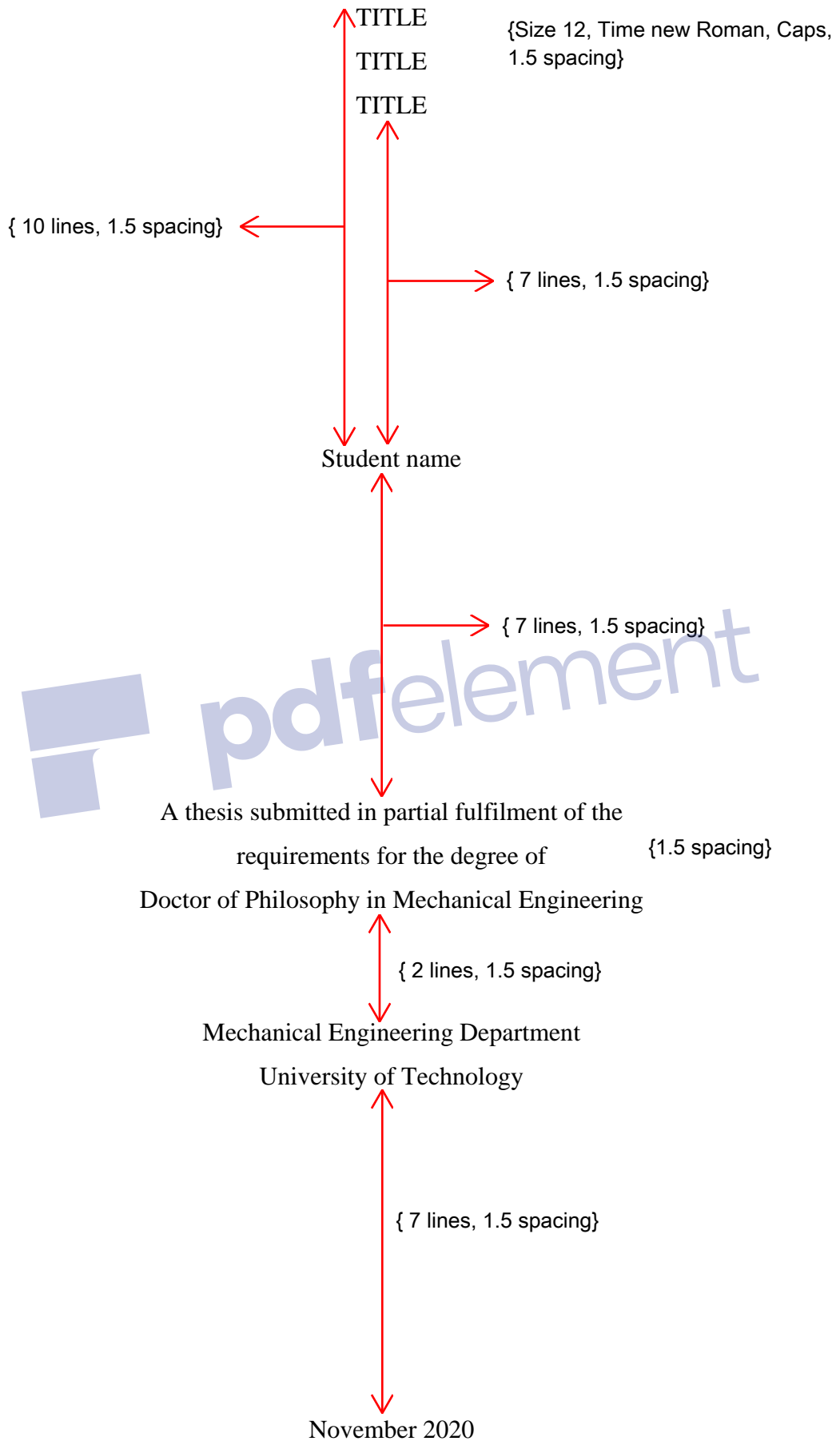Signature: Data:

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ON-LINE RECOGNITION OF DEVELOPING CONTROL CHART PATTERNS

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TITLE

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Student name

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I declare that this thesis entitled *"title of the thesis"* is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.
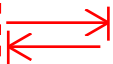
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Name   :

Date   :   00 NOVEMBER 2016

DEDICATION {Bold,Size 12, Time new Roman, Caps, 1.5 spacing}

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This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done

ACKNOWLEDGEMENT

In preparing this thesis, I was in contact with many people, researchers, academicians, and practitioners. They have contributed towards my understanding and thoughts. In particular, I wish to express my sincere appreciation to my main thesis supervisor, Professor Dr. A. A. A for encouragement, guidance, critics and friendship. I am also very thankful to my co-supervisor Professor Dr A. H. A and Associate Professor Dr. H. J for their guidance, advices and motivation. Without their continued support and interest, this thesis would not have been the same as presented here.

I am also indebted to University of Technology (UOT), Applied Science Department for funding/supporting my Ph.D/MS.c study. Librarians at UOT, university of Baghdad, and Universiti Teknologi Malaysia (UTM) also deserve special thanks for their assistance in supplying the relevant literatures.

My fellow postgraduate student should also be recognised for their support. My sincere appreciation also extends to all my colleagues and others who have provided assistance at various occasions. Their views and tips are useful indeed. Unfortunately, it is not possible to list all of them in this limited space. I am grateful to all my family member.

ABSTRACT   {Bold,Size 12, Time new Roman, Caps, 1.5 spacing}

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The purpose of this study is to investigate the application of genetic algorithm (GA) in modelling linear and non-linear dynamic systems and develop an alternative model structure selection algorithm based on GA. Orthogonal least square (OLS), a gradient descent method was used as the benchmark for the proposed algorithm. A model structure selection based on modified genetic algorithm (MGA) has been proposed in this study to reduce problems of premature convergence in simple GA (SGA). The effect of different combinations of MGA operators on the performance of the developed model was studied and the effectiveness and shortcomings of MGA were highlighted. Results were compared between SGA, MGA and benchmark OLS method. It was discovered that with similar number of dynamic terms, in most cases, MGA performs better than SGA in terms of exploring potential solution and outperformed the OLS algorithm in terms of selected number of terms and predictive accuracy. In addition, the use of local search with MGA for fine-tuning the algorithm was also proposed and investigated, named as memetic algorithm (MA). Simulation results demonstrated that in most cases, MA is able to produce an adequate and parsimonious model that can satisfy the model validation tests with significant advantages over OLS, SGA and MGA methods. Furthermore, the case studies on identification of multivariable systems based on real experiment t al data from two systems namely a turbo alternator and a continuous stirred tank reactor showed that the proposed algorithm could be used as an alternative to adequately identify adequate and parsimonious models for those systems. Abstract must be bilingual. For a thesis written in Bahasa Melayu, the abstract must first be written in Bahasa Melayu and followed by the English translation. If the thesis is written in English, the abstract must be in English and followed by the translation in Bahasa Melayu. The abstract should be brief, written in one paragraph and not exceed one (1) page. An abstract is different from synopsis or summary of a thesis. It should states the field of study, problem definition, methodology adopted, research process, results obtained and conclusion of the research. The abstract can be written using single or one and a half spacing..

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TABLE OF CONTENTS

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LIST OF TABLES

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LIST OF FIGURES

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LIST OF ABBREVIATIONS

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ANN   -   Artificial Neural Network

GA   -   Genetic Algorithm

PSO   -   Particle Swarm Optimization

MTS   -   Mahalanobis Taguchi System

MD   -   Mahalanobis Distance

TM   -   Taguchi Method

UTM   -   Universiti Teknologi Malaysia

XML   -   Extensible Markup Language

ANN   -   Artificial Neural Network

GA   -   Genetic Algorithm

PSO   -   Particle Swarm Optimization

LIST OF SYMBOLS

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δ	-	Minimal error
D, d	-	Diameter
F	-	Force
v	-	Velocity
p	-	Pressure
I	-	Moment of Inersia
r	-	Radius
Re	-	Reynold Number

LIST OF SYMBOLS

LIST OF APPENDICES

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CHAPTER 1

INTRODUCTION

1.1   Problem Background

Video provides a powerful way to help you prove your point. When you click Online Video, you can paste in the embed code for the video you want to add. You can also type a keyword to search online for the video that best fits your document. To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each other. For example, you can add a matching cover page, header, and sidebar. *"For the thesis paragraphs, use 'Para 1.5 lines' style"*

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1.2   Problem Background

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need them. To change the way a picture fits in your document, click it and a button for layout options appears next to it. When you work on a table, click where you want to add a row or a column, and then click the plus sign.

1.3   **Problem Statement**

1.4   **Research Goal**

1.4.1   **Research Objectives**

         The objectives of the research are :

(a)   To estimate the parameters

(b)   Item 1

(c)   Item 2

(d)   To define the best parameter estimate.

1.5   **Captions**
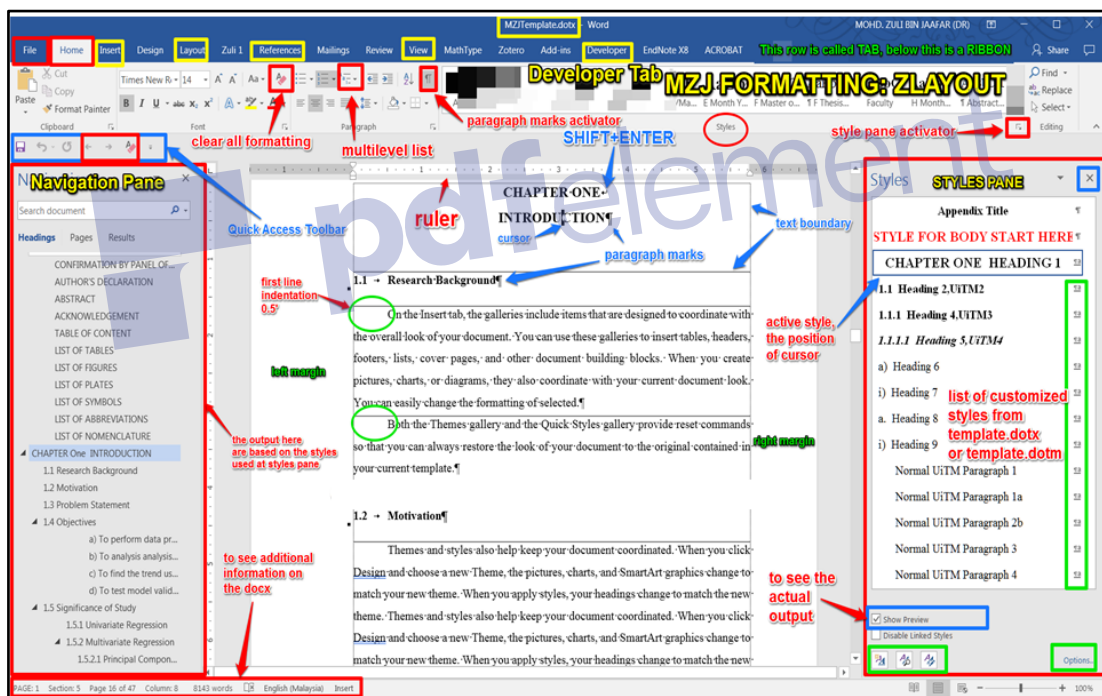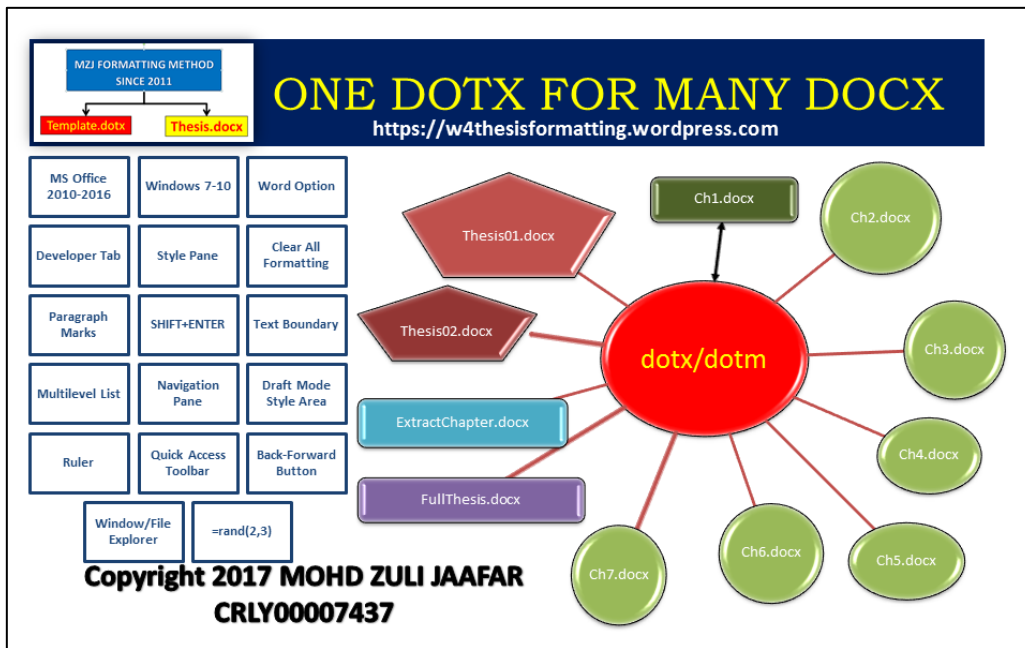

Figure 1.1 Trends leading to the problem using MZJ Formatting Method.

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Figure 1.2 Design and development phases of the proposed scheme [1]

(If the caption is written more than one line, use 1.5 line)

Table 1.1   The role of statistical quality engineering tools and methodologies

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Table 1.2   Basic ANN models used for control chart pattern recognition

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1.6 Quotation

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After deliberating on doctoral education in Australia in the 1990s, one observer I Australia writes:

The lack of any significant formal course work within our Ph.D. and master degrees by research has continued for three decades. The focus of our Ph.D. research type degrees continues to be the research project, and this is almost the only medium by which education is accomplished.

1.7 Equation

Spacing

$$y = mx + c \quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad (1.1)$$

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add a matching cover page, header, and sidebar. Click Insert and then choose the elements you want from the different galleries. Themes and styles also help keep your document coordinated. When you click Design and choose a new Theme, the pictures, charts, and SmartArt graphics change to match your new theme. When you apply styles, your headings change to match the new theme. Save time in Word with new buttons that show up where you need them.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

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Figure 2.1   Continuous variability reduction using SPC chart (Revelle and Harrington, 1992)

Figure 2.2   Typical fully developed patterns on Shewhart control chart (Cheng, 1989)

Table 2.1   Regression analysis for the results of preliminary feature screening

Table 2.2   Estimated effects and regression coefficients for the recogniser's performance (reduced model)

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2.1.1 State-of-the-Arts

2.2 Limitation

2.3 Research Gap

(a)   Video provides a powerful way to help you prove your point.

(b)   When you click Online Video, you can paste in the embed code for the video you want to add.

(c)   You can also type a keyword to search online for the video that best fits your document.

(d)   To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each other.

(e)   For example, you can add a matching cover page, header, and sidebar.

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CHAPTER 3

RESEARCH METHODOLOGY

3.1   Introduction

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3.1.1   Proposed Method

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3.1.1.1 Research Activities

On the Insert tab, the galleries include items that are designed to coordinate with the overall look of your document [1]. You can use these galleries to insert tables, headers, footers, lists, cover pages, and other document building blocks. When you create pictures, charts, or diagrams, they also coordinate with your current document look. You can easily change the formatting of selected text in the document text by choosing a look for the selected text from the Quick Styles gallery on the Home tab.

3.2   Tools and Platforms
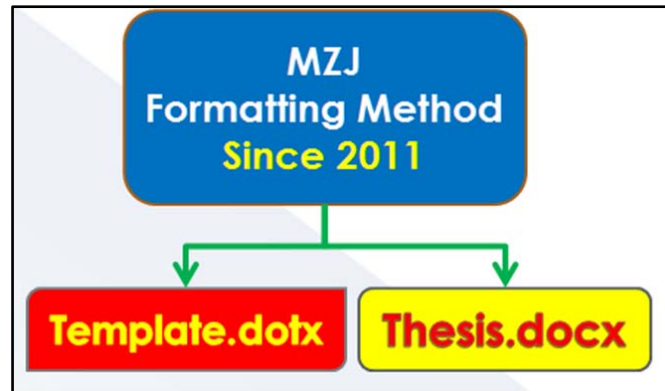
Figure 3.1   Example of Formatting Method.

3.3   Chapter Summary

(a)   Video provides a powerful way to help you prove your point.

(b)   When you click Online Video, you can paste in the embed code for the video you want to add.

(c)   You can also type a keyword to search online for the video that best fits your document.

(d)   To make your document look professionally produced, Word provides header, footer, cover page, and text box designs that complement each other.

(e)   For example, you can add a matching cover page, header, and sidebar.

CHAPTER 4

PROPOSED WORK

4.1   The Big Picture
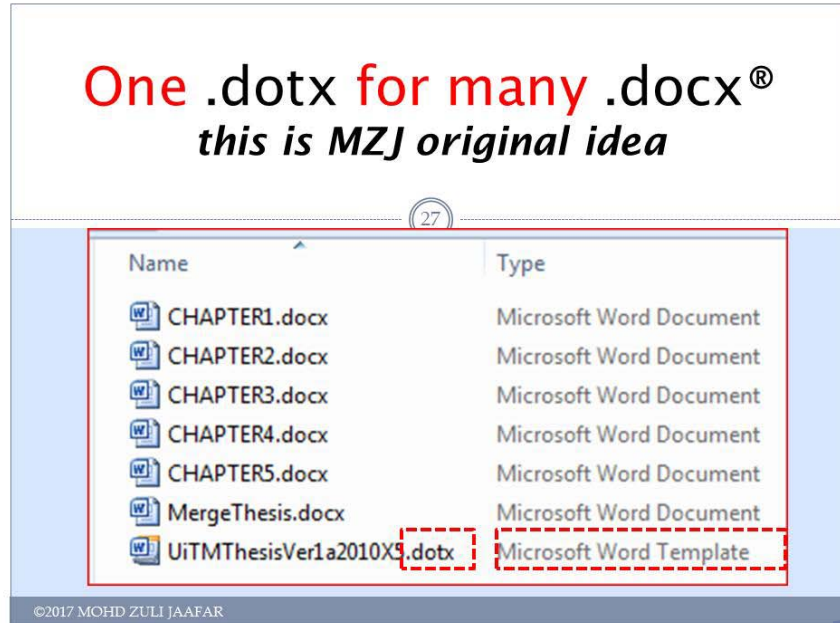
Figure 4.1   This is MZJ original idea.

4.2   Analytical Proofs

(a)   Video provides a powerful way to help you prove your point.

(b)   When you click Online Video, you can paste in the embed code for the video
       you want to add.

(c)   You can also type a keyword to search online for the video that best fits your
       document.

(d)   To make your document look professionally produced, Word provides
       header, footer, cover page, and text box designs that complement each other.

(e)   For example, you can add a matching cover page, header, and sidebar.

4.3 Result and Discussion

Figure 4.2   The method for high performance formatting.

4.4 Chapter Summary

Title	Title	Title	Title	Title	Title	Title

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Orientation

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Pages

Multiple pages: Mirror margins

Preview

Apply to: Selected sections

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CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1   **Research Outcomes**

5.2   **Contributions to Knowledge**

5.3   **Future Works**

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Table 5.1   Example Repeated Header Table. }1.5 line spacing

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References writing style

1- *Book*

Author. *Title of the book*. Edition (if not the first). Place published: Publisher. Year

Example:

Theusen, G. J. and Fabrycky, W. J. *Engineering Economy*. 6th ed. Englewood Cliffs, N. J.: Prentice-Hall. 1984

2- *Article in a book*

Author. Title of the article. In: Author of the book. *Title of the book.* Place published: Publisher. page; year.

Example:

Hussein, S. B., Jamaluddin, H., Mailah, M. and Zalzala, A. M. S. An Evolutionary Neural Network Controller for Intelligent Active Force Control. In: Parmee, I. C. ed. *Evolutionary Design and Manufacturing*. London: Springer-Verlag. 351-362; 2000

3- *Conference articles*

Author. Title of the article. *Name of the conference*. Date of the conference. Place published: Publisher. Year. page.

Example:

Sheta, A. F. and De Jong, K. Parameter Estimation of Nonlinear Systems in Noisy Environments Using Genetic Algorithms. *Proceedings of the 1996 IEEE International Symposium on Intelligent Control*. September 15-18,1996. Dearborn, Michigan: IEEE. 1996. 360-365.

4- *Standards*

Name of the Institution. *Title of the standard*. Place published, Standard number. Year

Example:

British Standards Institution. *Tongued and Grooved Software Flooring*. London, BS 1297. 1987

5- *Patent*

Owner's name. *Title of the patent*. Patent number. Year.

Example:

Lindgren, E. A. *Screen Room Air Inlet and Wave Guard.* V.S. Patent 2, 925,457. 1960.

6- *Thesis*

Author. *Title of the thesis*. Thesis award. Name of Institution; Year

Example:

Ahmed Mohammed. On-line Recognition of Developing Control

Chart Patterns. Ph.D. Thesis. University of Technology - Iraq; 2002

.

7- *Newspaper article*

Print Format

a. No Author   Gearing up to meet new challenges. (2000, February 22) *The Star*. 2.

b. With author   Izatun Shari (2000, April 18) K-economy: draft out in October. *New Straits Times.* 2-4.

8- Magazine

Author. (Year) Title of article. *Name of magazine*, Volume/Issue no., page

Example:

Smith, B. L. 1994). Biofeedback. *Science,* 62, 673 – 675.

9- Journal Articles
The students have to follow IEEE style using EndNote software or other software.

REFERENCES

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Appendix A   Time-series Results Long Long Long Long Long Long Long Long Long Long

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LIST OF PUBLICATIONS

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Journal with Impact Factor

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Indexed Journal

Non-indexed Journal

Indexed Conference Proceedings

Non-Indexed Conference Proceedings