# UNIVERSITI TEKNOLOGI MARA

# TECHNICAL REPORT

# OPTIMIZATION OF SUPPLIER SELECTION BY USING ZERO-ONE GOAL PROGRAMMING

**P51S18**

**NUR AIN SYUHADA BINTI AZMALI (2016571977)**
**NOR ATIKAH ANATASYA BINTI ALIAS (2016338611)**
**FATIN AINAA AZNI BINTI MARZUKI (2016340609)**

**Report submitted in partial fulfilment of the requirement for the degree of Bachelor of Science (Hons.) Mathematics Faculty of Computer and Mathematical Sciences**

**DECEMBER 2018**

## ACKNOWLEDGEMENTS

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

Firstly, we are grateful to Allah S.W.T for giving me the strength to complete this project successfully.

We would like to express my gratitude to our research supervisor Nur Rasyida Binti Mohd Rashid. This paper would have never been completed without her assistance and dedicated involvement in every step throughout the process. We also want to thank Dr. Mat Salim Bin Selamat, our MSP660 lecturer who gave guidance and supporting us in doing this research.

Getting through our dissertation required more than academic support and we want to express our sincerest gratitude to our classmates who are always helping us in getting information to finish this project successfully. We will never forget your kindness.

Most importantly, none of this could have happened without our family especially our parents, who offered their encouragement and has been supportive to us over the last several years. This dissertation stands as a testament to their unconditional love and encouragement.

# TABLE OF CONTENTS

ACKNOWLEDGEMENTS ..... i
LIST OF TABLES ..... v
LIST OF FIGURES ..... vi
ABSTRACT ..... vii
NOMENCLATURE ..... viii
1. INTRODUCTION ..... 1
1.1 Problem Statement ..... 3
1.2 Objective ..... 3
1.3 Significance and Benefit of the Study ..... 3
1.3.1 Significance of the Project ..... 3
1.3.2 Benefit of the Project ..... 4
1.4 Scope and Limitation of the Project ..... 4
1.5 Definition of Term and Abbreviation ..... 4
2. BACKGROUND THEORY AND LITERATURE REVIEW ..... 6
2.1 Supplier Selection ..... 6
2.2 Zero-One Goal Programming ..... 6
2.2.1 Application of Goal Programming ..... 7
2.2.2 Application of Zero-One Goal Programming ..... 8
2.2.3 Integrated of Zero-One Goal Programming ..... 9
2.2.4 Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) ..... 9
3. METHODOLOGY AND IMPLEMENTATION ..... 11
3.1 Zero-One Goal Programming method ..... 11
3.1.1 Zero-One Goal Programming Approach in Supplier Selection ..... 13
3.1.2 Objective Function ..... 14
3.1.3 Models of the Constraints ..... 14
3.1.4 Details of Data ..... 17
3.1.5 Assignation of Variables ..... 18
3.1.6 Deviation variable ..... 18
3.2 Implementation of Zero-One Goal programming Model ..... 19
3.2.1 Hard Constraints ..... 19
3.2.2 Soft Constraints ..... 19
3.2.3 Goals and Priority of the Constraints ..... 21

3.2.4 Objective Function for This Model ..... 22
3.3 Summarization of Model ..... 22
3.4 Verify using TOPSIS method ..... 24
3.4.1 Step to Verify using TOPSIS method ..... 25
4. RESULTS AND DISCUSSION ..... 28
4.1 Result of the Zero-One Goal Programming ..... 28
4.2 Validation of the result ..... 30
4.2.1 Step to verify TOPSIS result ..... 31
5. CONCLUSION AND RECOMMENDATION ..... 36
REFERENCES ..... 37
APPENDIX A ..... 41

## ABSTRACT

Supplier selection process is an important issue in business as well as supply chain system as most of the companies work with several suppliers in running the business. Nowadays, the suppliers need to compete with each other to gain trust from the company. However, the company also needs to choose the right supplier based on their qualitative and quantitative aspects. The task of choosing the right supplier is a tedious decision making process as it involves multiple objectives to be achieved. In this study, Zero-One Goal Programming (ZOGP) method was used to choose the best supplier for Az-Zain Mart which is situated in Shah Alam. ZOGP method was an approach to assist decision makers to solve multiple objective problems regarding this optimization problem of supplier selection. This study had helped Az-Zain Mart, Shah Alam in choosing the best supplier out of four suppliers, which were Nur Izam, R Razy Enterprise, Flytechnobiz or Ikhwan Food Industries in supplying fish ball by using ZOGP model. Then the model was tested using LINGO software by considering multiple constraints such as demand, purchasing cost, maximum supply delay time, transportation cost, defect ratio, delivery time and percentages of discount of the product. In the light of this result, the model was verified by using TOPSIS method where the best supplier for the company is R Razy Enterprise which achieved the objectives that had been set by the company. Thus, this showed that ZOGP was a useful tool that can be used to solve supplier selection problem as well as other multi-objectives problem.