
CONTENTS

APPROVAL	ii
SELF DECLARATION AGAINST PLAGIARISM	iii
ABSTRACT	iv
ABSTRAK	v
DEDICATION	vi
ACKNOWLEDGMENTS	vii
PREFACE	viii
CONTENTS	ix
LIST OF TABLES	xii
LIST OF FIGURES	xiii
LIST OF TERMS	xiv
LIST OF NOTATIONS	xv
1 INTRODUCTION	1
1.1 Rationale	1
1.2 Theoretical Framework	2
1.3 Statement of the Problem	3
1.4 Objective and Hypotheses	4
1.5 Assumption	4
1.6 Scope and Delimitation	5
1.7 Significance of the Study	5
2 REVIEW OF LITERATURE AND STUDIES	6
2.1 Related Literatures	6
2.2 Related Studies	7
2.2.1 Problem Modeling and Fitness Function	7
2.2.2 Ant Colony System (ACS)	10
2.2.3 Intra-Itinerary Improvement (2-opt)	12
2.2.4 Inter-Itinerary Improvement (2-interchange)	13
2.2.5 Brainstorm Optimization (BSO)	13

2.2.6	Hybrid ACS-BSO	15
3	RESEARCH METHODOLOGY	17
3.1	Research Design	17
3.1.1	System/product/method Implementation	17
3.1.2	Experiment Scenario	18
3.2	The Difference between the TSP Approach and the VRP Approach	20
3.3	Dataset	22
3.4	Tools for Data Analysis	25
3.4.1	Programming Languages	25
3.4.2	Tools	26
3.4.3	Libraries	26
4	PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA	27
4.1	Presentation of Data	27
4.1.1	Parameter Setup	27
4.1.2	General performance	29
4.1.3	Attribute Analysis	30
4.1.4	The Comparison of Hybrid and Standalone Algorithms	34
4.1.5	The Comparison of TSP and VRP Approaches	36
4.2	Analysis of the Data	37
4.2.1	Parameter Setup	37
4.2.2	General Performance	38
4.2.3	Attribute Analysis	39
4.2.4	The Comparison of Hybrid and Standalone Algorithms	40
4.2.5	The Comparison of TSP and VRP Approaches	40
4.3	Summary of Findings	40
5	CONCLUSION AND RECOMMENDATIONS	43
5.1	Conclusions	43
5.2	Recommendations	44
	BIBLIOGRAPHY	45
	Appendices	49
A	RAW EXPERIMENTAL RESULTS	51
A.1	General Performance	51
A.2	Attribute Analysis	57
A.2.1	Travel Duration Attribute	57
A.2.2	Cost Attribute	58

A.2.3	Rating Attribute	64
A.3	The Comparison of Hybrid and Standalone Algorithms	70
A.4	The Comparison of TSP and VRP Approaches	72