

TABLE OF CONTENTS

THESIS ADVISOR APPROVAL.....	I
LEGITIMATION.....	II
PLAGIARISM-FREE STATEMENT.....	III
PREFACE.....	IV
ACKNOWLEDGEMENT.....	V
TABLE OF CONTENTS.....	VI
LIST OF FIGURES	VIII
LIST OF TABLES	X
LIST OF APPENDICES	XI
INTISARI	XII
ABSTRACT	XIII
CHAPTER I INTRODUCTION.....	1
1.1. Research Background.....	1
1.1.1. Robotic Mobile Fulfillment System in E-commerce	1
1.1.2. Storage Assignment Problem.....	3
1.1.3. Replenishment Operations	6
1.1.4. Energy Consumption in RMFS.....	8
1.2. Research Questions and Objectives	9
1.3. Assumptions and Limitations.....	10
1.4. Research Contributions	11
1.5. Organizations of Thesis.....	12
CHAPTER II LITERATURE REVIEW	13
2.1. Robotic Mobile Fulfillment System.....	13
2.2. Storage Assignment Strategies in RMFS.....	16
2.3. Replenishment Operation and Energy Consumption in RMFS	18
CHAPTER III THEORETICAL BACKGROUND	23
3.1. Robotic Mobile Fulfillment System (RMFS)	23
3.2. Agent Based Modelling.....	27

3.3.	Design of Experiment	28
3.4.	Statistical Analysis	30
CHAPTER IV METHODOLOGY.....		33
4.1.	Problem Description and Methodological Framework	33
4.1.1.	Research Workflow	33
4.1.2.	Products-to-Pod (PTP) Assignment Conceptual Framework	36
4.1.3.	Inventory Control Logic in RMFS	40
4.2.	RMFS Process Flow and Assumptions	42
4.3.	Products-to-Pod Assignment Design	46
4.3.1.	Products-to-Pod Mathematical Formulation	52
4.3.2.	Products-to-Pod Solution Approach	61
4.4.	Replenishment Policies	71
	Warehouse Inventory - SKU in Pod	72
4.5.	RMFS Energy Efficiency Formulation	75
4.6.	Simulation Experiment.....	79
4.6.1.	Design of Experiments and Performance Metrics	80
4.6.2.	Agent-Based Simulation Modeling Settings.....	82
CHAPTER V RESULTS AND DISCUSSIONS.....		87
5.1.	Data Preparation and Preprocessing Procedures.....	87
5.1.1.	Product Classification Results.....	87
5.1.2.	Item-Slot Configuration	90
5.1.3.	Products Proportion Class-Sampling	90
5.2.	Products-to-Pod Assignment Results and Analysis	92
5.3.	Simulation-based Experiment Results	98
CHAPTER VI CONCLUSION AND FUTURE RESEARCH		115
6.1.	Conclusion	115
6.2.	Future Research.....	117
REFERENCES.....		119
APPENDIX.....		125