

**APPLICATION OF SPARE PARTS DISTRIBUTION
USING DIJKSTRA'S ALGORITHM
(A CASE STUDY IN PT. TRAKTOR NUSANTARA)**

by

STEPHANUS ALDO

11211077

BACHELOR'S DEGREE
in
INDUSTRIAL ENGINEERING

FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

SWISS GERMAN UNIVERSITY



SWISS GERMAN UNIVERSITY

EduTown BSD City

Tangerang 15339

Indonesia

August 2015

Revision after Thesis Defense on August 4th 2015

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains neither material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Stephanus Aldo

Student

Date

Approved by:

Aditya Tirta Pratama S.Si, M.T.

Thesis Advisor

Date

Dr. Tanika D. Sofianti S.T., M.T.

Thesis Co-Advisor

Date

Dr. Ir. Gembong Baskoro, M.Sc.

Dean

Date

Stephanus Aldo

ABSTRACT

APPLICATION OF SPARE PART DISTRIBUTION USING
DIJKSTRA'S ALGORITHM
(A CASE STUDY IN PT. TRAKTOR NUSANTARA)

by

Stephanus Aldo

Aditya Pratama S.Si, M.T., Advisor

Dr. Tanika D. Sofianti S.T., M.T., Co-Advisor

SWISS GERMAN UNIVERSITY

Spare parts needs distribution system to be delivered to its maintenance point. Most of company use third party as their logistic service. The problem in logistic caused by the archipelago of Indonesia, it makes the transportation system more complex because to reach every point in Indonesia need more than one transportation mode. This research is made to support logistic division to choose logistic vendor for delivery. Rapid Application Development used as a methodology to develop the tools by iterative development. In result, spoilage of shipping is reduced, distribution route and specific vendor are determined faster.

Keywords: Dijkstra's algorithm, Maintenance, Outsourcing, Distribution, Spare Parts, Logistic



DEDICATION

I dedicate this thesis to God, my parents, and this country: Indonesia



ACKNOWLEDGEMENTS

First of all the author would like to express gratitude to Jesus Christ for His blessings through the completion of this research. Secondly to my family members, father who also give me an input and support in the hard time

The author owes deep gratitude and appreciation to Mr. Aditya Tirta Pratama as the advisor and Mrs. Tanika D. Sofianti as Co-advisor of this research. Thank you for the guidance, support and time in completing this thesis.

To my friends in "Invanos's Class" on Thursday, Kevin Aurey, Hoki Michael, Ryan Saputra, to my friends, the resident of "Studento L11 and L10", Industrial Engineering 2011 in FB 302 who always give supportive behavior of laughter, Andrew Japar for the patience guidance, to my fellow Andreas Pratama and Tiffani Balqis Boediartha who gave constant support to finish this thesis.

SWISS GERMAN UNIVERSITY

TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR	2
ABSTRACT	3
DEDICATION	5
ACKNOWLEDGEMENTS	6
TABLE OF CONTENTS.....	7
LIST OF FIGURES	11
LIST OF TABLES.....	13
CHAPTER 1 – INTRODUCTION.....	14
1.1. Background.....	14
1.2. Objectives	15
1.3. Problem Statement.....	15
1.4. Expected Result.....	16
1.5. Thesis Scope.....	16
1.6. Thesis Limitation.....	16
1.7. Significance of Study.....	17
CHAPTER 2 – LITERATURE REVIEW	18
2.1. Supply Chain.....	20
2.1.1. Supply Chain Principles	20
2.2. Maintenance	22
2.2.1. Maintenance Organization.....	22
2.2.2. Outsourcing Maintenance	23
2.2.3. Budgeting and Costing Planned for Maintenance.....	23
2.2.4. Forecasting and Capacity Planning	24
2.2.5. Planning and Scheduling	25
2.3. Logistic	26
2.3.1. Logistic System.....	26
2.3.2. Logistic Cycle	27
2.4. Transport Modes.....	29

2.4.1.	Truck Transport.....	29
2.4.2.	Railway Transport	30
2.4.3.	Sea Transport	30
2.5.	Outsourcing	31
2.6.	Network Model	32
2.6.1.	Shortest Path Model: Node Selection and Sequencing	33
2.6.2.	Spanning Tree Model: Arc Selection	34
2.6.3.	Maximum Flow Model: Arc Selection and Flow Assignment	34
2.7.	Dijkstra's Algorithm.....	35
2.7.1.	Initialization	39
2.7.2.	Distance Value Update and Current Node Designation Update	41
2.7.3.	Termination Criterion	44
2.8.	Linear Programming.....	45
2.9.	Java Programming Language.....	45
2.9.1.	Java Shortest Path Algorithm.....	47
2.10.	Rapid Application Development	54
CHAPTER 3 – RESEARCH METHODOLOGY		56
3.1.	Thesis Methodology	56
3.2.	Data Acquisition & Analysis	58
3.3.	Shortest Path Solving using Dijkstra's Algorithm	59
3.4.	Application Methodology.....	59
3.4.1.	Data Requirement.....	61
3.4.2.	Design Phase	62
3.4.3.	Development Phase	71
3.4.4.	Implementation	71
3.5.	Gantt Chart	72
CHAPTER 4 – RESULTS AND DISCUSSIONS		73
4.1.	Overview of PT. Traktor Nusantara	73
4.2.	Data Acquisition.....	74
4.2.1.	Primary Data	74
4.2.2.	Secondary Data	76
4.3.	Dijkstra's algorithm.....	76

4.3.1. West Region.....	78
4.3.2. South Region.....	80
4.3.3. Mid Region	82
4.3.4. East Region	84
4.4. Application Deployment.....	86
4.5. Result of Dijkstra's Algorithm.....	89
4.6. Cost Calculation	89
CHAPTER 5 – CONCLUSIONS and recommendations	92
5.1. Conclusions.....	92
5.1.1. Dijkstra's algorithm performance is determining distribution route.....	92
5.1.2. Dijkstra's algorithm cannot determine continuous route.....	92
5.1.3. Developed application is able to reduce the expenses in logistic division 92	
5.1.4. Developed application is not flexible if there is a turnover of logistic vendor 93	
5.2. Recommendations	93
5.3. Future Works.....	93
GLOSSARY.....	94
REFERENCES.....	95
APPENDIX A.....	97
Dijkstra's Algorithm.....	97
1. Branch Location.....	100
2. Region	101
3. West Region	102
4. South Region	113
5. Mid Region.....	118
6. East Region.....	124
APPENDIX B	128
Java Programming	128
APPENDIX C	134
Program Flow Chart	134
APPENDIX D	136

