PERFORMANCE EVALUATION, MANAGEMENT AND PUBLIC SATISFACTION OF HIGHWAY MAINTENANCE BY CONTRACTS IN JORDAN

By
Abdulraouf M. Al Ahdab

Supervisor
Dr. Majed Msallam

Thesis Submitted in Partial Fulfillment of the Requirements for the Master’s Degree of Science in Engineering Projects Management

Faculty of Graduate Studies
ISRA UNIVERSITY

August 2018
I, Abdulraouf M. Al Ahdab, authorize the Isra University to supply copies of my thesis to libraries or establishments or individuals on request, according to Isra University regulations.

Signature:

Date:
COMMITTEE DECISION

This thesis (Performance Evaluation, Management and Public Satisfaction of Highway Maintenance by Contracts in Jordan) was successfully Defended and Approved on ...............
DEDICATIONS

There are a number of people without whom this thesis might not have been done, and to whom I am greatly indebted.

This thesis is dedicated to my parents, for their endless support and encouragement.

Loving thanks to my friends / learning partners, who played such important roles along the journey, as we mutually engaged in making sense of the various challenges we faced and in providing encouragement to each other at those times when it seemed impossible to continue.
ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor Dr. Majed Msallam for the continuous support of my research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me in all the time of research. I could not have imagined having a better supervisor and mentor for my Master’s study.

Besides my supervisor, I would like to thank the rest of my thesis committee: Prof. Dr. Subhi Bazlamit and Dr. Walid Hasan for their encouragement and insightful comments.

In Addition, I want to thank Prof. Dr. Basem Jrew, Eng. Waleed Ushroqlaban and Eng. Aktham Altarawneh for their support.

Last, but by no means least, I would like to thank my brothers and sisters for their support and encouragement.
TABLE OF CONTENTS

AUTHORIZATION FORM ........................................................................................................II

COMMITTEE DECISION .....................................................................................................III

DEDICATIONS .................................................................................................................... IV

ACKNOWLEDGEMENTS ...................................................................................................... V

TABLE OF CONTENTS ....................................................................................................... VI

LIST OF TABLES ................................................................................................................ IX

LIST OF FIGURES ............................................................................................................... XI

ABSTRACT ........................................................................................................................ XII

CHAPTER ONE: INTRODUCTION .........................................................................................1

1.1 BACKGROUND ............................................................................................................ 1

1.2 MAINTENANCE BY CONTRACTS IN JORDAN ...............................................................1

1.3 RESEARCH OBJECTIVES ............................................................................................ 2

1.4 RESEARCH HYPOTHESIS ............................................................................................ 3

1.5 THESIS ORGANIZATION .............................................................................................. 3

CHAPTER TWO: LITERATURE REVIEW .............................................................................4

2.1 INTRODUCTION ............................................................................................................ 4

2.2 EVALUATING HIGHWAY MAINTENANCE ................................................................... 5

2.3 HIGHWAY MAINTENANCE MANAGEMENT ................................................................10

CHAPTER THREE: DATA COLLECTION METHODOLOGY .............................................14

3.1 INTRODUCTION ............................................................................................................ 14

3.2 PREPARING AND FORMULATION OF THE STUDY QUESTIONNAIRE ..................14

3.3 ARBITRATION OF THE QUESTIONNAIRE ..................................................................15

3.4 FINALIZATION OF THE QUESTIONNAIRE ..................................................................15
CHARTER FOUR: DATA ANALYSIS AND RESULTS ............................................. 18

4.1 RESPONDENTS’ DETAILS ................................................................. 18
   4.1.1 Field of Work ........................................................................... 18
   4.1.2 Work Position .......................................................................... 18
   4.1.3 Academic Qualification ............................................................ 19
   4.1.4 Years of Experience ................................................................. 20

4.2 STATISTICAL ANALYSIS TOOLS .................................................... 20

4.3 RELIABILITY STATISTICS ............................................................. 21

4.4 RELATIONSHIP BETWEEN THE DEPENDENT AND INDEPENDENT VARIABLES .... 21
   4.4.1 Specifications Related Questions ............................................... 23
   4.4.2 Project Owner Related Questions ............................................. 25
   4.4.3 Consultant Related Questions .................................................. 28
   4.4.4 Contractor Related Questions .................................................. 31
   4.4.5 Safety Related Questions ........................................................ 34
   4.4.6 Fund Related Questions ........................................................... 36
   4.4.7 Materials and Equipment Related Questions ............................ 38
   4.4.8 Public Related Questions ......................................................... 41
   4.4.9 Maintenance Projects’ Overall Performance and Satisfaction ....... 44

CHAPTER FIVE: DISCUSSION OF RESULTS ............................................. 47

5.1 INTRODUCTION .................................................................................. 47

5.2 DISCUSSION OF RESULTS .............................................................. 47
   5.2.1 Specifications Related ................................................................. 47
5.2.2 Projects Owner Related .................................................................49
5.2.3 Consultant Related.................................................................51
5.2.4 Contractor Related.................................................................52
5.2.5 Safety Related .................................................................54
5.2.6 Fund Related .................................................................55
5.2.7 Materials and Equipment Related ........................................57
5.2.8 Public Related .................................................................58

5.3 Analysis of Overall Performance and Satisfaction ..........................60

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS .............63

6.1 Conclusions ..............................................................................63

6.2 Recommendations ......................................................................65

6.3 Future Work ............................................................................66

REFERENCES ..................................................................................67

APPENDIX A .................................................................................68

APPENDIX B .................................................................................69

APPENDIX C ................................................................................76

APPENDIX D ................................................................................83

ABSTRACT IN ARABIC ..................................................................90
LIST OF TABLES

Table 2.1: Comparison between the MBO construction method and traditional methods ........................................................................................................................................... 11
Table 2.2: Different examples of actual KPI’s described using its title, Definition, measurement and target .......................................................................................................................... 13
Table 4.1: Cronbach’s Alpha values for dependent and independent variables ........21
Table 4.2: Pearson Correlation Coefficient between variables .................................. 22
Table 4.3: Ranking of Specifications Related Satisfaction Variables ....................... 23
Table 4.4: Validation and Correlation of mathematical models for specification related variables ........................................................................................................................................... 24
Table 4.5: Multiple Regression Analysis between the Independent and Dependent variables of specification related satisfaction ................................................................. 25
Table 4.6: ANOVA analysis of specifications related mathematical model ............... 25
Table 4.7: Ranking of Project Owner Related Satisfaction Variables ....................... 26
Table 4.8: Validation and Correlation of mathematical models for project owner related variables ........................................................................................................................................... 27
Table 4.9: Multiple Regression Analysis between the Independent and Dependent variables of project owner related satisfaction ................................................................. 28
Table 4.10: ANOVA analysis of projects owner related mathematical model ............. 28
Table 4.11: Ranking of Consultant Related Satisfaction Variables ............................ 29
Table 4.12: Validation and Correlation of mathematical models for consultant related variables ........................................................................................................................................... 30
Table 4.13: Multiple Regression Analysis between the Independent and Dependent variables of consultant related satisfaction ................................................................. 31
Table 4.14: ANOVA analysis of consultant related mathematical model ..................... 31
Table 4.15: Ranking of Contractor Related Satisfaction Variables ........................... 32
Table 4.16: Validation and Correlation of mathematical models for contractor related variables ........................................................................................................................................... 32
Table 4.17: Multiple Regression Analysis between the Independent and Dependent variables of contractor related satisfaction ................................................................. 33
Table 4.18: ANOVA analysis of contractor related mathematical model ..................... 33
Table 4.19: Ranking of Safety Related Satisfaction Variables .................................... 34
Table 4.20: Validation and Correlation of mathematical models for safety related variables ................................................................. 35
Table 4.21: Multiple Regression Analysis between the Independent and Dependent variables of safety related satisfaction ................................................................. 36
Table 4.22: ANOVA analysis of safety related mathematical model ................................................................. 36
Table 4.23: Ranking of Fund Related Satisfaction Variables ................................................................. 37
Table 4.24: Validation and Correlation of mathematical models for Fund related variables ................................................................. 38
Table 4.25: Multiple Regression Analysis between the Independent and Dependent variables of Fund related satisfaction ................................................................. 38
Table 4.26: ANOVA analysis of Fund related mathematical model ................................................................. 38
Table 4.27: Ranking of Materials and Equipment Related Satisfaction Variables ........ 39
Table 4.28: Validation and Correlation of mathematical models for materials and equipment related variables ................................................................. 40
Table 4.29: Multiple Regression Analysis between the Independent and Dependent variables of materials and equipment related satisfaction ................................................................. 41
Table 4.30: ANOVA analysis of materials and equipment related mathematical model ................................................................. 41
Table 4.31: Ranking of Public Related Satisfaction Variables ................................................................. 42
Table 4.32: Validation and Correlation of mathematical models for public related variables ................................................................. 43
Table 4.33: Multiple Regression Analysis between the Independent and Dependent variables of public related satisfaction ................................................................. 43
Table 4.34: ANOVA analysis of public related mathematical model ................................................................. 44
Table 4.35: Ranking of Projects’ Performance and Satisfaction Variables ........ 44
Table 4.36: Validation and Correlation of mathematical models for public related variables ................................................................. 45
Table 4.37: Multiple Regression Analysis between the Independent and Dependent variables of projects’ performance and satisfaction ................................................................. 46
Table 4.38: ANOVA analysis of projects’ performance and satisfaction mathematical model ................................................................. 46
LIST OF FIGURES

Figure 2.1: Steps of index system in the management of highway maintenance ..........12
Figure 3.1: Working Field of Respondents Percentages......................................... 18
Figure 3.2: Working Position of Respondents Percentages.................................... 19
Figure 3.3: Academic Qualification of Respondents Percentages............................ 19
Figure 3.4: Years of Experience of Respondents Percentages ............................... 20
Figure 3.5: Specifications Related Questions Ranking ............................................ 24
Figure 3.6: Project Owner Related Questions Ranking ............................................. 27
Figure 3.7: Consultant Related Questions Ranking ................................................ 30
Figure 3.8: Contractor Related Questions Ranking .................................................. 32
Figure 3.9: Safety Related Questions Ranking ....................................................... 35
Figure 3.10: Fund Related Questions Ranking ...................................................... 37
Figure 3.11: Materials and Equipment Related Questions Ranking ......................... 40
Figure 3.12: Public Related Questions Ranking .................................................... 42
Figure 3.13: Projects’ Performance and satisfaction Factors Ranking ....................... 45
Figure 4.1: Mean Scores of Specifications Related Factors .................................... 48
Figure 4.2: Mean Scores of projects’ owner Related Factors ................................ 50
Figure 4.3: Mean Scores of Consultant Related Factors ........................................ 51
Figure 4.4: Mean Scores of Contractor Related Factors ........................................ 53
Figure 4.5: Mean Scores of Safety Related Factors .............................................. 54
Figure 4.6: Mean Scores of Fund Related Factors ................................................ 56
Figure 4.7: Mean Scores of Materials and Equipment Related Factors .................. 57
Figure 4.8: Mean Scores of Public Related Factors .............................................. 59
Figure 4.9: Mean Scores of Performance and Satisfaction Factors .......................... 61
PERFORMANCE MANAGEMENT AND PUBLIC SATISFACTION OF HIGHWAY MAINTENANCE BY CONTRACTS IN JORDAN

By
Abdulraouf M. Al Ahdab

Supervisor
Dr. Majed Msallam

ABSTRACT

Due to important rule of highways in economic growth and where highways’ maintenance is one of significant factors to improve highways’ durability; this thesis discussed the main factors (specifications, owner, consultant, contractor, safety, fund, materials and equipment, and public) that affect the performance and satisfaction of highways maintenance process, also, sub factors of each main factor are studied. Research questionnaire is prepared to assess performance and satisfaction factors, and based on the statistical analysis of study results, the following conclusions can be drawn.

The following points are considered positive points for previously mentioned factors; existence of specifications in maintenance process, projects’ owner has his own specifications, consultants’ offices and staff are qualified and classified to supervise maintenance projects, contractors are qualified and classified to execute maintenance projects, providing warning signs at suitable distances before project area, enough Fund for maintenance projects, maintenance cost decrement due to premature maintenance, existence of specifications for materials and instrument, and highways become safer after maintenance.

On the contrary, the following points are considered negative points, and it is needed to overcome these problems; shortage in users feedback to improve specifications for future projects, shortage in using of up to date technologies for projects assessment, shortage in consultants’ clear vision of projects demands and their suitability, shortage in contractor using of up to date technologies for project assessment, shortage in existing of premature highway maintenance, shortage in existence of periodic materials testing, and shortage in taking complaints and notes in account by official organizations.