DEVELOPMENT OF CAVITE PUV FARE AND NAVIGATION SYSTEM USING COGNITIVE ERGONOMICS

THESIS

JOHN GLENDLE A. ANGUE
JOELA C. GANCIOSO
RICA MAE A. RAÑADA
BRYAN ALLEN I. ROLL

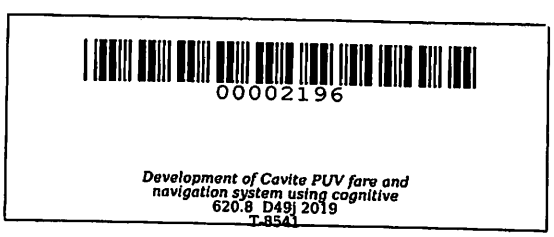
College of Engineering and Information Technology
CAVITE STATE UNIVERSITY
Indang, Cavite

June 2019

DEVELOPMENT OF CAVITE PUV FARE AND NAVIGATION SYSTEM USING COGNITIVE ERGONOMICS

Undergraduate Thesis
Submitted to the Faculty of the
College of Engineering and Information Technology
Cavite State University
Indang, Cavite

In partial fulfilment
of the requirements for the degree
Bachelor of Science in Industrial Engineering


00002196

Development of Cavite PUV fare and navigation system using cognitive
620.8 D49j 2019
T-8541

JOHN GLENDLE A. ANGUE
JOELA C. GANCIOSO
RICA MAE A. RAÑADA
BRYAN ALLEN I. ROLL
June 2019

ABSTRACT

ANGUE, JOHN GLENDLE A., GANCIOSO, JOELA C., RANADA, RICA MAE A., and ROLL, BRYAN ALLEN I. Development of Cavite PUV Fare and Navigation System using Cognitive Ergonomics. Undergraduate Thesis. Bachelor of Science in Industrial Engineering. Cavite State University, Indang, Cavite. June 2019. Adviser: Engr. Gerry M. Castillo.

This study was conducted from August 2018 to April 2019 in all municipalities/cities of Cavite which aimed to develop a PUV fare and navigation mobile application using cognitive ergonomics. Specifically, the study aimed to: 1.) determine the current situation of fare system in Cavite; 2.) determine the problems encountered in the fare system; 3.) design and develop a fare and navigation application using cognitive ergonomic criteria and industrial engineering tools; 4.) test and evaluate the developed Cavite PUV fare and navigation mobile application; and 5.) provide possible recommendations that can improve the fare system in Cavite.

Descriptive and developmental research were used in the study and Define, Measure, Analyze, Design and Verify (DMADV) method was followed as its research methodology. The primary sources of data were the data coming from the fare matrix issued by the Land Transportation Franchising Regulatory Board (LTFRB), tariff from all municipalities/cities in the province and survey questionnaires while the secondary sources were the data coming from some books, journals and articles as well as the data coming from the internet that supports the findings of the study that were related in cognitive ergonomics, transportation, fare and mobile application design. Slovins formula and Stratified random sampling technique were used to determine the number of participants in the study. A total of 400 respondents in different municipalities and cities were the participants of the study.

The identified problems in the study using survey questionnaire were insufficient fare matrix posted in every Public Utility Vehicles (PUVs), unreliable and incomplete fare information at Cavite, unavailability of fare information when searching online, lack of awareness on the current situation of the fare system in the province, experience paying an overpriced fare and difficulty in seeking information about fares. These problems were categorized in information management, communication problems and time consuming.

After identifying the problems that were encountered by the respondents, the researchers designed and developed a mobile application using the gathered problems and ergonomic criteria. In terms of the ergonomic quality and usability of the application, it yields a level of excellence from the respondents, and achieved the effectiveness, and efficiency of the website. This also gives a satisfaction level to the users.

The result of the system evaluation was excellent because the system met the intended function in different aspects. For further improvement of Cavite PUV fare system, the researchers recommend that: (1) the mobile application must be promoted and advertised by the authorities such as the Land Transportation Franchising and Regulatory Board (LTFRB) to make sure that the mobile application will be used for awareness and safety purpose; (2) for the developed system, it is recommended to add or provide more interesting features for the convenience of the users such as lighter background color to be pleasing to the eyes of the user and some trivia or information regarding on the place the user wants to visit; (3) upgrade the mobile application into an offline based information system to be accessible to the commuters of the province without accessing to the internet; and (4) make the mobile application available not only for the android phone but also to all kinds of operating systems such as iOS and others.

TABLE OF CONTENTS

Page

BIOGRAPHICAL DATA iii

ACKNOWLEDGEMENT vii

ABSTRACT ix

LIST OF TABLES xiii

LIST OF FIGURES xvi

LIST OF APPENDICES xviii

INTRODUCTION 1

Statement of the Problem 3

Objectives of the Study 3

Significance of the Study 4

Time and Place of the Study 5

Scope and Limitation of the Study 5

Definition of Terms 5

Conceptual Framework 7

REVIEW OF RELATED LITERATURE 8

METHODOLOGY 21

Research design 21

Research method 21

Sources of data 24

Participants of the study 24

Sampling technique 24

Data gathering procedure 27

Research instrument 27

Data analysis 27

RESULTS AND DISCUSSION 29

Define phase 29

Measure phase 34

Analyze phase 35

Design phase 39

Verify phase 49

SUMMARY, CONCLUSION AND RECOMMENDATIONS 80

Summary 80

Conclusion 81

Recommendations 83

REFERENCES 84

APPENDICES 87

LIST OF TABLES

Table		Page
1	Distribution of participants per cities/municipalities of Cavite	26
2	Identified problems of the study	31
3	Pareto analysis	34
4	Matrix data analysis	37
5	Likert scale for rating the respondents' statements	49
6	Descriptive level of mean	50
7	Guiding principles of the system in making specific actions	51
8	Guiding principles of the system does what is appropriate	51
9	Guiding principles of the system responses to user's actions	52
10	Workload of the system does not overload displays with excessive data	53
11	Workload of the system limiting the reading and shows concise items	54
12	Workload of the system limiting the reading and shows concise items	54
13	Workload of the system does not require item translations	55
14	Explicit control of the system processes only those actions requested by the users	56
15	Explicit control of the system is easy for the users to recover data in event of failure	57
16	Explicit control the user has the chance to review the content of the system	58
17	Adaptability of the system was designed to match the needs of different users	59
18	Adaptability of the system can adapt to any devices	59
19	Error management of the system helps to prevent or reduce errors	60

20 Error management of the system allows the users to make corrections when needed 61

21 Error management of the system facilitates the user retrieval of data 62

22 Error management of the system by suggesting the reasons for their errors and showing them ways to avoid or solve the errors 62

23 Error management of the system do not occur without cause 63

24 Error messages in the system describe what action is needed 64

25 Error messages in the system can understand easily 65

26 Consistency of the display format of the system is consistent 66

27 Consistency of the label format in the system 66

28 The system is compatible to the needs of the user 67

29 The system has a good design and response compatibility between controls/actions. 68

30 The design of the system is compatible to some factors such as screen resolution, background, color, use of frames 69

31 The system is effective in finishing the desired task 70

32 The information needed in the system is easy to find 70

33 The system is free from unpredicted errors 71

34 The information in the system is clear and informative to the users. 72

35 The system does correctly what was proposed 73

36 The user can easily start and finish the program 74

37 The system has all the functions required for its execution 74

38 The system helps user to meet its intended goals in efficient time 75

39 The system was designed for various users 76

40 The system can accomplish the tasks more quickly 76

41 The system promotes good user experience 77

42 Overall, the system is very satisfying and easy to use 78

43 Summary of the tabulated data 79

LIST OF FIGURES

Figure		Page
1	Conceptual framework of the study	7
2	Current situation of commuting in Cavite	30
3	Affinity diagram of the problems	33
4	Pareto analysis of the study	35
5	Interrelationship diagraph of the problem categories	36
6	Tree diagram in solving problems in terms of information management	38
7	Tree diagram in solving communication problems	39
8	Google Maps	41
9	Source location search box	42
10	Destination location search box	43
11	Home button	44
12	Home display	45
13	Navigation map	46
14	Poor internet connection	48

LIST OF APPENDIX FIGURES

Appendix Figure		Page
1	Bacoor City Hall	99
2	Municipal Government of General Mariano Alvarez	99
3	Noveleta Town Hall	99
4	Municipal Government of Kawit	99
5	Municipal Government of Imus	100
6	Municipal Government of Indang	100
7	Staff on Cavite City Municipal Government	100
8	Municipal Government of Cavite City	100
9	Mendez Municipal Building	101
10	Municipal Hall of Amadeo	101
11	Municipal Government of Silang	101
12	Municipal Government of Alfonso	101
13	Municipal Hall of General Emilio Aguinaldo	102
14	Provincial office of Land Transportation Franchising and Regulatory Board	102

LIST OF APPENDICES

Appendix		Page
1	Preliminary survey questionnaire	89
2	Evaluation form	92
3	Tricycle request letter	96
4	LTFRB request letter	97

DEVELOPMENT OF CAVITE PUV FARE AND NAVIGATION SYSTEM USING COGNITIVE ERGONOMICS

John Glendle A. Angue
Joela C. Gancioso
Rica Mae A. Rañada
Bryan Allen I. Roll

An undergraduate thesis presented to the faculty of the Department of Industrial Engineering and Technology, College of Engineering and Information Technology, Cavite State University, Indang, Cavite. In partial fulfillment of the requirements for the degree of Bachelor of Science in Industrial Engineering with Contribution No. CEIT 2018-19-2-017. Prepared under the supervision of Engr. Gerry M. Castillo.

INTRODUCTION

Cavite is a province in the Philippines located on the CALABARZON region in Luzon Island. According to Philippine Statistics Authority (2015), the total population of the province was 3,678,301 and classified as one of the most industrialized and fastest growing provinces.

According to the National Statistics Office (2013), Cavite is an area most often visited by local and foreign visitors. It is the second most frequently visited place after National Capital Region (NCR). The number of visitors in the area continued to increase, particularly during summer months when both domestic travel and foreign tourist arrival are at peak.

As studied by Adrian (2017), whether commuters or the public transport operators like it or not, change is upon the transportation scene in the Philippines. The awful traffic