ADDIS ABABA UNIVERSITY
COLLEGE OF NATURAL SCIENCE
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Evaluation of the Usability of Point-Based Traffic Penalty Management System: The Case of Federal Transport Authority (FTA)

By

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EVALUATION OF THE USABILITY OF POINT BASED TRAFFIC PENALTY MANAGEMENT SYSTEM: THE CASE OF FEDERAL TRANSPORT AUTHORITY(FTA)

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A RESEARCH THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY SCHOOL OF GRADUATE STADIES IN PARTIAL FULFILLMENT OF THE REQUIRMENTS FOR THE AWARD OF MASTER OF SCIENCE IN INFORMATION SYSTEMS

ADVISOR

RAHEL BEKELE(PHD)

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Statement of Declaration

I, Nblle Yohannes, hereby declare that the thesis entitled on: “Evaluation of the Usability of Point Based Traffic Penalty Management System: The Case of Federal Transport Authority” has been conducted by me under the guidance and supervision of Rahel Bekele (PHD). I also declare that all materials and sources used for this project research have been accredited appropriately. I am also declaring that this work had not been submitted for the award of any academic Degree or Diploma program in this or any other institution.

Nblle Yohannes

Signature: _____

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Statement of Certification

This is to certify that **Nblle Yohannes** has carried out this research thesis work on the topic entitled Evaluation of the Usability of Point Based Traffic Penalty Management System: The Case of Federal transport Authority (FTA) under my supervision. This work is original in nature and it is sufficient for submission for the partial fulfillment for the requirements of the award of Masters of Science in Information Systems.

Rahel Bekele (PHD)

Signature: _____

Date: _____

Approval Sheet

Evaluation of the Usability of Point Based Traffic Penalty Management System: The case of Federal Transport Authority (FTA)

By

Nblle Yohannes

Approved By the Board of Examiners

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Abstract

System usability is the effectiveness, efficiency and subjective satisfaction when a particular user using a particular product with a specific task to complete in certain circumstances (International Standard ISO9241-11, 2010). Many researchers have used the aspects of usability in their system usability evaluation for some application software. According to literatures, among the prominent researchers in the field of system usability evaluation Nielsen (2003) defines usability as a quality attribute that assesses how easy user interfaces are to use. And many more scholars have forwarded different measuring frameworks/models. This study was employed to perform system usability evaluation for a specified product named 'Point-based traffic penalty management system'. The researcher applied mixed methods approach. Both qualitative and quantitative data from primary and secondary sources were applied. The research design used in this study was descriptive research design which statistically explains what it is transparently. In this research design method, the researcher has gathered data in two ways: firstly, data collected from experts of the system and secondly ordinary day-to-day actual users of the system. Henceforth, the study was conducted based on expert-based system usability evaluation and user-based evaluation. The expert-based evaluation implemented the heuristic evaluation model while the user-based evaluation extracted three independent variables (i.e. learnability, efficiency and satisfaction) from the five system usability quality components (Nielsen, 2012) defined. Though, the research results from the two models were far from perfect, they both indicated the specified system scored higher concerning the measuring threshold. The study forwards a kind recommendation that system usability evaluation shall be incorporated in all parts of software (system) development life cycle (SDLC), since this study was conducted on the implemented system. This research was articulated based on a case-study (a system that was operational) which by default was effective. But, since such kind of study can be operated in any stage, the results of similar studies that can include all five quality components would be an entrance point to wider study area. In the end, this study implemented frameworks that can be easily applied into any kind of system usability evaluation considering its advantage in aggregating system utilization, avoiding possible system failure and unnecessary system related costs.

***Keywords**: Point-based traffic penalty management system, usability evaluation and usability gaps*

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Lists of acronym / Abbreviations

AATMA	Addis Ababa Traffic Management Agency
FTA	Federal Transport Authority
ICT	Information and Communication Technology
IS	Information Systems
QE	Question of Efficiency
QS	Question of Satisfaction
QL	Question of learnability
SPSS	Statistical Package for the Social Sciences
UWIS	Usability of Web-based Information Systems
WAMMI	Website Analysis and Measurement Inventory

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Information Systems (IS) has become crucial for organizations to survive. McKinsey (2008) stated the way of carrying out business in the world today is changing very rapidly with new technologies taking center stage. This improving change brings the issue of how much those systems give improvement to the business or to the organization.

The Traditional IS was closed system within which only staff running the IS had access to the system (Taniar and Rahayu, 2004). With the emergence of Internet and information technologies, many IS systems turned into web-based information systems, enabling everyone to access it through multiple channels which transferred them into open systems. Naturally, this new dynamic environment has generated the necessity to look into the IS assessment topic through a new understanding called IS usability (TOKDEMĐR, 2009).

System usability is the effectiveness, efficiency and subjective satisfaction when a particular user using a particular product with a specific task to complete in certain circumstances is defined by (International Standard ISO9241-11, 2010).

For usability criteria, Chrisna(2014) confirms the importance of efficiency, effectiveness, learnability, helpfulness and control but he adds another criterion, namely: information architecture, learnability and operability which relates to reporting format, data quality, accessibility and processing speed as required in the mining context.

Shafinah et al (2010), claims Eight usability factors (efficiency, understandability, operability, attractiveness, error prevention, learnability, accuracy and effectiveness) have been identified for the evaluation process for the usability of Decision Support Systems (DSSs). In his study the result of the research was presented the usability level for each factor and indicated the tested DDS model is in the excellent level.

For web-based systems which is considered one component of Information System, usability refers to whether the users are easy to understand how to interact with the system, whether they can more easily find the information they need or complete the task they want to do and get pleasurable experience from the system.

1.2 Back ground of the Study Area

The Ethiopian Road Transport Authority (RTA) is a public transport authority responsible for the use of all roads within Ethiopia, vehicles using these roads, and all matters relating to road transport activities. The Road Transport Administration (established in 1967, restructured and replaced by Proclamation No. 14/92.) states that its mission is "to ensure the provision of a modern, integrated and safe Road transport services to meet the needs of all the communities for strong and unitary economic and political system in Ethiopia." In doing so, they attempt to promote an efficient road service, to coordinate and strengthen the road traffic safety and to develop the transport data base system to enhance research for the development of the sector.

In 2005, the Ethiopian government reorganized the transport sector and although the previously independent Urban Transport Authority, the Railway Regulatory Authority, the Aviation Authority, the Airport Administration Authority and the Maritime Regulatory Authority merged into the Ethiopian Transport Authority, the Road Transport Authority remained independent.

Federal Transport Authority which leads the road transport authority is located in Addis Ababa, Ethiopia and is part of the Government Industry. Federal Transport Authority has 155 total employees across all of its locations.

In addition, Addis Ababa Traffic Management Agency one branch of federal transport authority is a governmental organization under Addis Ababa city Administration responsible for traffic management and road safety. It envisages the prevalence of safe and acceptable traffic movement in the city of Addis Ababa. This office has implemented one-point based traffic management system which has recorded hundred-thousand drivers' details every year. The researcher evaluated the usability of this system in terms of efficiency, learnability and satisfaction.

1.3 Statement of the Problem

Systems are becoming part of the critical business processes across the globe. These systems that we are using in our day-to-day activities affect us and how we do things. The basic task of applications which are displayed in our gadgets is to answer our needs in the best way possible. As a result, monitoring the user experience of systems have become part of the new development in software engineering. Information science experts understood that it is not only software development that leads us to efficiency but also the follow-up how systems are utilized (system usability) once they are deployed. In parallel to the swift emergence of new technologies and dynamism in software development the notion system usability evaluation come to exist. Different authors have defined the phrase 'System Usability' in varying ways.

At national level the experience of evaluating system usability didn't mature and requires more intensive application. A study conducted on usability evaluation on Ethiopia Software Organizations showed that the percentage of organizations some form of usability evaluation is low in percentage compared to organizations in Italy or Denmark (Teka, 2017). The researcher's ten years' experience in the software development profession has also helped to identify the gap in the application of evaluation of system usability. As important as the software development, system usability evaluation is found invaluable in the information technology era.

Many researchers have used the aspects of usability in their assessing for some application software. Among these researches Nielsen (2003) defines usability as a quality attribute that assesses how easy user interfaces are to use.

According to Yoseph (2018), the studies of Web services usability are mainly about web-based systems. In this study he confirmed that Ethiopian E-Government systems have usability and accessibility gaps.

Shuangyuan Shi et al (2011), compares the old desktop applications and the new business model requires companies to have distributed information systems. The closed system has difficulty to support enterprises and cannot meet the need of information sharing between upstream and downstream enterprises. The Web services-based information system can achieve low-cost real-time collection to process and share distributed information. However, they confirm this a big gap in current usability between the Web services and old desktop applications.

Ebitisam K. Elberkawi et al (2016), shows a method for evaluation of a web-based system usability. The method was divided into two phases. In the first phase, a system usability evaluated

in accordance to a test plan, while the second phase explains the data received in the test phase and they explore the places where the weaknesses and gaps.

Genet (2009) discussed the hundred- thousands of people who are being killed and injured on the roads every day. One of the solutions set to alleviate transport problems causing such damaging accident is specified to be implementing coordinated traffic management system. The author intended to assess the usability of a web system developed for traffic management. The study intended to assess the usability of the expert system application using tasks as interface media.

From every walk of life, people are affected by the way they transport, and it is found essential to study transport management systems as they are veins to accelerate development and growth. One of the challenges of Ethiopian federal authority is lack of smooth traffic flow.

Beginning from the definition the researcher of this study depicted from the beginning it focus only on these three which are part of the definition of system usability in ISO standard. In addition, Jacob Nielsen's five quality attributes of system usability evaluation has more two components that were part of the ISO standard. Hence, the author refined the survey questions and assigned those thought be part of the scope to the above three dimensions namely: learnability, satisfaction and efficiency (For details look into Appendix A).

The rationality of this study is the evaluation of the usability of Information Management System particularly on 'Point-based Traffic Penalty Management System' of (Ethiopian) Federal Transport Authority. Three usability factors identified for the assessment process, namely: learnability, efficiency, and satisfaction.

This assessment focuses on learnability of users were able to complete specified tasks successfully, the efficiency to complete specified tasks and determining while users were satisfying with this system of Addis Ababa Traffic Management Agency and Federal Transport Authority in the operational environment. Hence, since the system was in use for the past years, it has evolved to be error-free across the time refinement. In addition, the business process that was during the conception phase and all the change of requests included are done correctly.

These inputs for the decision to focus only on the three usability testing quality components are based on the internal documents of User-Acceptance-Testing checklists. Feedbacks forwarded on the errors and tasks set to respond request are aligned on the business process which left the researcher empty of vagueness on the possible survey questionnaire set to be part of effectiveness and error-prone factors.

1.4. Research Questions

In this study three research questions were formulated to evaluate system usability.as the following;

1. Is Point-Based Traffic Penalty Management System easily learnable for new users?
2. How efficient is the system to use by users to perform their tasks?
3. Is the system satisfying to use?

1.5 General Objective

This research aims to evaluate the usability of Point-Based Traffic Penalty Management System while users operate the system to perform their tasks in Addis Ababa Traffic Management Agency and Federal Transport Authority.

1.5.1 Specific objectives

The general objective is categorized into the following specific objectives-:

(i) To identify the learnability of Point-Based Traffic Penalty Management System.

(ii) To assess the extent of the system's efficiency.

(iii) To find out whether users are satisfied by the system.

1.6 Significance of the study

The finding of the study helps the organizational management system at different managerial levels and in particular those who are looking after the Traffic Management departments in the Addis Ababa Traffic Management Agency and Federal Transport Authority. The study will enhance the capacity to look for possible alternative solutions (giving training to users, upgrading the system and preparing user manual documents) for Point-Based Traffic Penalty Management System usability of users in collaboration with other stakeholders of the organization to facilitate fast public services to the customers. It contributes to increase the knowledge and awareness of the gap of usability of the system by concerning bodies including the subordinates and mangers of the organizational staffs. In addition, in this document the hybrid model may be useful to other researchers as a reference material while conducting further studies on similar problem area.

1.7 Scope of the study

The study was limited to Evaluation of the Usability of point-based traffic management system of FTA and AATMA. The data gathered was limited to the source from FTA and AATMA. Henceforth, the generalizability of this study may contain to FTA and AATMA.

1.8 Operational Definition of Terms

Terms	Definition of Terms
Employees (users)	Refers to those employees of the Addis Ababa Traffic Management Agency and Federal Transport Authority ICT Directorate department (Source: user manual of Point-Based Traffic Penalty System, 2017).
web-based information system	Refers to an information system that uses Internet web technologies to deliver information and services, to users or other information systems/applications. It is a software system whose main purpose is to publish and maintain data by using hypertext-based principles (Source: ISSN: 1204-5357, Journal of Internet Banking and Commerce).
Point-Based traffic penalty management system	Refers to a system developed by external private company to manage traffic offense related tasks based on the proclamation published on August 26, 2011 and modified on January 2017 for Federal Transport Authority. This system consists of tasks: ✓ New Traffic Penalty Registration Process ✓ Creating Temporary driver records ✓ Traffic information Registration ✓ Payment collection ✓ lifting suspensions by authorized supervisors ✓ Penalty Follow-up, generating reports related to the assignment and Administrative Tasks.
Usability	Usability is a measure of how well a specific user in a specific context can use a product/design to achieve a defined goal effectively, efficiently and satisfactorily. Designers usually measure a design's usability throughout the development process—from wireframes to the final deliverable—to ensure maximum usability. The researcher rewrites the definition of usability.

Table 1: terms definitions

1.9 Organization of the Document

This thesis is organized in to five chapters. The first chapter discussed the background of the study, back ground of the Study Area, statement of the problem, research questions, objective of the study both general and specific objectives, significance of the study, scope of the study, definitions of terms included. In chapter two, this research reviewed of conceptual and related work literatures included to support the study. In chapter three; Research methodology was briefly stated including the research approach, research design, population of the study, data sources, data collection tools and data analysis included. In chapter four analyses, interpretation and discussion of data were presented. Under chapter five final Major Findings, conclusion and possible recommendation, Research Limitation. Future work of the study was discussed. References and Annexes were also part of this study put at the end.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter different literatures related to the system usability study are reviewed. Those similar works who have been applied in similar usability evaluation and transport traffic system automation are also empirically quantified and brush up. The literature gap for this study is also presented.

2.2 System Usability

The term usability has been used in different ways that lead to a confusing meaning in the research world. The researcher inclines to the general definition of usability by (Usability.gov, n.d., 2011) as customer - system quality measure. Pressman (2001) got a more elaborative definition to usability of software as an attempt to quantify user-friendliness yielding quantifiable attributes of the users.

There is no doubt that the use of information System in organization is increasing, in the past number of years the majority of countries have experienced investment in organizations information System facilities. Its importance towards system implementation is mostly seen in terms of financial gain or loss. Bringula and Basa (2011) have presented the proportionate profit and loss from high usability and low usability of website applications during the endured time. Noting the difference among website usability, web portal usability and system usability literatures critical to this study show common purpose within all. Similarly in usability context, Tarafdar & Zhang (2005) learnt, poor website usability entails billions of dollars cost which is cascaded to even bigger economic loss every year in loss of productivity due to insufficient use of engineering methods of system usability. In the other hand, usable website is associated to higher performance, increased sales and dynamic features specified to business process (Pearson & Pearson, 2008).

According to Ertmer et al (2012), the investment in information System has been broadly welcomed by officers but this delivery of resources has led many researchers to investigate how information System is being integrated into the office and to assess the usability of information System use by employees. Ertmer et al (2012), further categorized information system users based on their perspectives as employees use of information System has been simplified into two

categories those that view information System as a motivation or those that view information System as an interruption. Researchers differ in their methods for measuring information System use with many reporting figures based on the actual number of employees using computers in their offices whilst other studies report on the amount of time spent on computers and the number of different computer applications used. The lacks of continuity between different studies make it difficult to make direct comparisons between researches but they do help in identifying information System usability.

2.3 Usability and the user interface

Ankita Madan et al (2012), states the usability models are conceptual view which lays down the focus areas to demonstrate the usability of the existing software. These criteria are helpful in the usability evaluation of the software system.

According to Xavier Ferré and Natalia Juristo uploaded on (2014), Usability Basics for Software Developers, they distinguish between the visible part of the UI (buttons, pull-down menus, checkboxes, background color, and so forth) and the interaction part of the system to understand the depth and scope of a system's usability. It's important to carefully consider the interaction not just when designing the visible part of the UI, but also when designing, implementing and operating the rest of the system.

2.3.1 Web-based Information Systems Assessment Studies

Web based applications are more complex and powerful for accident data access and sharing than desktop applications. Web based applications are developed on top of national road accident database and make accessible through the woreda nets.

In recent time, with the advent of new technologies Internet and information technologies, numerous information systems shift into web-based information systems, allowing everybody to get access it through various networks which shifted these into open systems. the new dynamic environment obviously created the demand to find the information system valuation theme via a modern consideration.

According to Torkzadeh and Dhillon (2002), the innovation of the information technologies, the means of acting business has also reformed directly. The best use of Internet technologies able to deliver modest advantage in market share, innovation, technology transfer and even management competency.

2.4 Usability Evaluation Methods

Based on Joel & Titus (2015), the aim of usability evaluation methods is mainly to evaluate the application functionality, to verify the effect of its interface on user, also to identity any specific problem with the system such as aspects which show unexpected effects when used in their intended context. Also evaluating applications in particular consists of verifying if the application design allows users to easily retrieve and browse content and invoke available service and application they need. This therefore implies not only having appropriate contents and service available into the application but also making them easily reachable by users.

According to Verkijika & De Wet (2016), usability evaluation methods generally refer to the dissimilar techniques, or set of systematically designed activities, for collecting and analyzing data regarding user interaction with a system, or how given attributes of a system help to attain a given level of usability.

Maristella et al (2013), explored evaluating web applications in particular consists in verifying if the application design allows users to easily retrieve and browse contents and invoke available services and operations.

2.4.1 Heuristic Evaluation

Heuristic evaluation (HE) is an inspection method based on evaluation over real system or prototype, conducted by experts (professionals to the expertise field opposed to users). This method of evaluation does not need to master the usability knowledge and skill rather to assess and value accomplishment of heuristic check list.

Similar to other techniques, HE, usability is subjective in nature that is essentially attached to individual emotions and personal interpretations of the expert in charge of doing the evaluation. In addition, such inspection methods are criticized for detecting few numbers of problems from the ocean of errors that may encounter to the expert.

HE presents many benefits over other techniques which mainly is bold in its implementation suitable for each software life-cycle that is agile. It is also credited for its easy, fast and affordable approach. More fascinating, HE doesn't require the evaluators be usability experts which open the door for software engineers and other core customers with basic usability knowledge to engage in the evaluation.

Looking into the pros and cons of Heuristic Evaluation, the researcher gained a component of usability evaluation technique in the study of system usability assessment.

2.4.2 Nielson 5 quality components for usability evaluation

Nielson identified 5 quality components for usability evaluation namely:

1. Learnability: How easy is it for users to accomplish basic tasks the first time they encounter the design?
2. Efficiency: Once users have learned the design, how quickly can they perform tasks?
3. Memorability: When users return to the design after a period of not using it, how easily can they reestablish proficiency?
4. Errors: How many errors do users make, how severe are these errors, and how easily can they recover from the errors?
5. Satisfaction: How pleasant is it to use the design?

One more advantage, Nielson (2008) empirically demonstrated even between 3-5 experts should be sufficient. The main steps of system usability evaluation (using Nielsen 5 components to be followed) are getting representative users, instructing them to operate the task provided and evaluate the users while they do the talking.

Nielsen (2017) has also explained severity rating for usability problems so that decision of system release should be made. Usually, severity rating of system usability problems is made after the actual evaluation of system usability evaluation. Nielsen advised the severity of system problems evaluators should not spend more than 30 minutes.

The usability evaluation in this technique is both a combination of qualitative and quantitative testing. In qualitative testing, the researcher observed how the users react to the system document and what they perform or say. This qualitative assessment is done in focus group or protocol analysis. In using a focus group – set up a list of questions about the document (its content, organization, style, design, etc.) and let users discuss what they like or don't like, what works or doesn't, and what they find easy or hard to understand. Listen to their suggestions for improvements and take notes. In the other hand, protocol analysis takes place in a one-to-one interview, the user looks at and reads specific parts of the document and then explains what that part means.

In quantitative analysis it is numeric analysis that is used to compare success rate on specified tasks with people using different versions of the document. Then researcher is supposed to measure the efficacy of each quality component for system usability evaluation. and combine with the qualitative descriptions for better result.

2.4.3 Usability and accessibility tools for web

The tradition of considering the primary purpose of web as retrieval of information changed when the use of web in more interactive way. This favored in advent emerged in online shopping and similar development in growing diversity of devices for web accessing. Factors influencing how users perceive these websites' usability are many. Different approaches are imaginable to achieve acceptable usability:

A website is supposed to be designed for and tested using as many users as possible. In practice, this is not feasible – the cost of large-scale usability tests is prohibitive, important types of users may still be missed and it is almost impossible to test on all past and present combinations of hardware and software. ISO standard has listed seven principles indicating a well-designed user-interface namely: sustainability for the task, self-descriptiveness, controllability, conformity with user expectations, error tolerance, sustainability for individualization, and sustainability for learning. Well-designed user interface is expressed in its good usability and accessibility. Usability and accessibility are not same but related concepts. Perhaps, a system can be usable but inaccessible for visually/hearing impaired people.

W3G WCAG

W3C has developed a usability and accessibility guidelines. Hence, it is clear that these guidelines are not evaluation methods, but guidelines, recommendations and principles can be used as an input for usability evaluation methods. In its version 1.0 [W3C-WCAG1] reached the status of a W3C recommendation in May 1999. WCAG 1.0 has 14 rules (look in Appendix A). The rules mainly fit into one of the following three contexts: the content itself and how it is organized (1,2,7,9,11,13,14), on annotating the text with abstract information (3,4,5,12), and compatibility/technical issues (6,8,10). WCAG 1.0 rules are attached to three priority recommendations. Priority 1 (must be satisfied), priority 2 (should be satisfied) and priority 3 (may be satisfied). The conformance level are derivate of the priority. Conformance level A (priority 1 must be satisfied), Conformance level AA (priority 1 &2 must be satisfied) and Conformance level AAA (must be satisfied).

Together with advances in many of the technologies used on the web, and practical difficulties when working with WCAG 1.0, it was soon felt that an effort should be started to update the guidelines and to adapt them to current best practices – WCAG 2.0 [W3C-WCAG2]. Feedback collected for WCAG 1.0 had ultimately supported the Working Group specify six additional requirements for version 2.0. WCAG 2.0 guidelines concluded with the publication of a W3C "Proposed Recommendation" in late 2008 which is centered into 4 design principles. According to WCAG 2.0 web imply a perceivable, operable, understandable, and robust principles.

These guidelines and principles are an input for good usable web application but can be extended to system be it mobile or desktop based.

WAMMI

Muylle et al, (2004) described WAMMI (*Website Analysis and Measurement Inventory*) as a Web analysis service that measures and analyzes the experience of real Web site users to help them achieve the digital goal. This measurement is a research website developed based on international software standards. WAMMI requires 40 to 200 respondents which require few minutes to complete. The final report received from WAMMI is all about assessment of global usability with five sub-scales identified as: attractiveness, controllability, efficiency, helpfulness and learnability. The researcher concluded, the report classifies result average score is 50; below 30 or above 70 means the site is remarkable on this scale, while a perfect score is 100.

UWIS

UWIS (Usability of Web-based Information Systems) is explained by (Oztekin et al, 2009 as a methodology for assessing the usability and design of Web-based information systems that combines the size and quality of Web services and the usability of information systems. Đorđević,(2017) explained the appropriate lists UWIS integrated were extracted (with certain modification) from ServQual, WebQual (designed to assess whether the user will visit the site again) and Nielsen Heuristics.

In accordance with the definition of usability in ISO 9241-11 (ISO, 1998), Đorđević, (2017) illustrated that effectiveness, efficiency and satisfaction are dimensions with objective measures of usability and cannot be changed directly and consciously by the user interface designer. The main limitation of the UWIS methodology is that it does not provide a solution to measure the usability of Web-based information systems if the lists of dimensions are not linearly associated with the usability index (Đorđević, 2017).

The theme of this study was to formulate new model that is hybrid of heuristic evaluation and Jacob Nielsen Model which is extracted to map both user-based and expert-based system usability evaluation. The research questions and survey questionnaires are developed and advanced in the way to answer the problem statement.

2.5 Empirical review of related works

The application of information system in transportation has been under study in different ways. The literature search via keywords including: transport information system, road traffic, transport automation has brought tens research thesis listed in the AAU research catalogue. A clear understanding of the level of usability of web app system in transport bureau have been discussed in different versions. Among them, Getaneh (2010) in his research study titled 'A Web Based Road Traffic Accident Reporting System for Ethiopia 'described the system was made to work in Amharic to maximize its usability. The system had also more interesting Google-map API to further intensify its necessity for users (Getaneh, 2010). In another study by Fekadu (2010) under the title of "Load-Aware Traffic Light Controlling System" that explains an information system implemented to detect whether traffic load on a given direction exceeds a certain limit and temporarily allow traffic on that direction to pass for a longer period of time. Fekadu (2010) stated the system improve the city's traffic control system efficiency and saves time and fuel of drivers.

According to Noe (2017), the Usability, Accessibility and Web Security Assessment of eGovernment Websites in Tanzania. Using several automatic diagnostic (evaluation) tools such as pingdom, google speed insight, wave, w3c checker and acunetix, in his study assesses the usability, accessibility and web security vulnerabilities of 79 selected e-government websites in Tanzania. The results reveal several there is high number of usability problems of websites were found to have broken links and websites have loading time of more than five (5) seconds for their main page. The accessibility results show that all 79 selected websites have accessibility errors and violate w3c WCAG 1.0. The results on web security vulnerabilities indicate that 50.6% assessed websites have one or more high-severity vulnerability. Based on these results, this study provides some recommendations for improving the usability, accessibility and web security vulnerabilities of public institutions in Tanzania.

According to Verkijika S. F. (2017) website usability has also been a problem for e-Government development. Likewise, many developing countries e-Government systems are mostly characterized by poor usability. Consequently, advancing e-Government in Sub-Saharan Africa

including Ethiopia necessitates advancing the usability of current e-Government systems in the region, as usability has been shown to be a vital precondition for e-Government progress. As such, this study had as focus objective to develop a model for improving the usability and accessibility of eGovernment websites in Ethiopia.

In traffic-system related articles, Gebremichael (2017) underlined the essentiality of transport system to economic and the security of the nations. He further stated problems related to traffic are increasingly important where researchers are trying hard to solve them. Another study records about 'GIS Based Road Traffic Accident Black Spot Sites Assessment: A Case Study of Kirkos Sub-city, Addis Ababa, Ethiopia' by (Efrem, 2017) explained how to utilize the GIS to work-out on spatial analyst to record the traffic related data. Another thesis by Elizabet (2020) was to comprehend the SMS distribution and develop a spatiotemporal model of SMS traffic using city of Addis Ababa, Ethiopia as a case study. With the help of a mathematical model Elizabet (2020) developed a system that captures the SMS traffic variation of any location in the city at any time of the day. The system is expected to understand the behaviors of its customers thereby saving cost and reducing resource wastage, and plan its marketing strategy accordingly. But, to what extent system is applied on ground is not known yet.

Having numerous information systems proven their implementation would create a positive outcome in our day-to-day activities, there is a knowledge gap in assessing the usability of such systems and user effort to acquire the full usability of these systems in hand. So, with regard to the practices in identifying the challenges users faced and the strategies devised by respective department were not explicitly explained in any of the studies the researcher assessed.

All in All, an important component of software usability is evaluation. To ensure the required quality, it is necessary to measure many usability characteristics that allow the determination of software quality, where software quality metrics plays a significant role. It is necessary to define a model with a set of usability characteristics of software quality to be assessed. Then, the right choice of an adequate method can significantly improve the efficiency of the evaluation process and usability of the software product. Hence, the attempt by the researcher to review the literature knowledge of this field of study and fill the gap in identifying an inclusive system usability evaluation method that can be used in wide range of systems.

Summary of Literature

Authors and year	Researches /Studies title	Approaches/ Methodologies	Objective	Key Findings
Yoseph (2018)	Usability and Accessibility Model for E-Government Websites in Ethiopia	This study applies mixed methods of data collection and analysis, that integrating quantitative and qualitative data, using questionnaires and interviews to identify the key usability and accessibility issues of Ethiopia e-Government websites services	The objective of this study is to propose Ethiopia e-Government Websites Usability and Accessibility Model (WUAM) for improving the usability and accessibility of the eGovernment websites	The findings of the study confirm that, Ethiopia e-Government websites have many usability and accessibility gaps
Noe Elisa (2017)	Usability, Accessibility and Web Security Assessment of E-government Websites in Tanzania	Using several automatic diagnostic (evaluation) tools such as Pingdom, google speed insight, wave, w3c checker and acunetix, this study assesses the usability, accessibility and web security vulnerabilities of 79 selected e-government websites in Tanzania	The main objective of this study is to assess the usability, accessibility and web security vulnerabilities of selected Tanzania e-government websites.	The results reveal several issues on usability, accessibility and security of Tanzania e-government websites
Verkijika Silas Formunyu (2017)	Evaluating and Improving the Usability of E Government Websites in	The study objective is to develop and test a model for improving the usability of E Government websites	Adopted a combination of design science research and mixed method of evaluations. The study applied heuristics	Using a six-dimensional framework for assessing the usability of e-Government websites in SSA, the

	Sub Saharan Africa for Enhancing Citizen Adoption and Usage.	in Sub-Saharan Africa (SSA).	evaluation, automated testing methods and cross-sectional analysis of national indicators. Evaluating 279 e Government websites usability from 31 SSA countries.	study concluded that, SSA e Government websites were currently characterized by poor usability. The average usability score for the websites was 36.2%
Wan Abdul Rahim Wan Mohd Isa, Muhammad Rashideen Suhami, (2011)	Assessing the Usability and Accessibility of Malaysia E Government Website	The main objective of this study is to investigate the usability and accessibility of Malaysia E Government websites.	155 Malaysia e Government websites were selected, and analysis using Nielson usability guideline and automatic evaluation tools such as Website optimization, Axandra and Eval Access 2.0 tools.	The findings make aware web developer and other stakeholder to give more emphasis on specific accessibility and usability features

Table 2: summary of literature

Geczy et al., (2011) explained, it was commonly observed that web services implementing business processes have low usability. Unfortunately, the assessment of system (including web services) usability has no wealthy literature nation-wide. And this research was to fill the gap of system usability assessment.

Many of the usability tests the researcher reviewed showed usability for Mining, DSS, e-Gov systems, Distributed System, Expert System, etc. The intent of the researcher was to look into different applications of system usability evaluation and secure where the application of this study stands by. Accordingly, this study is more familiar with the expert-system.

2.6 Conceptual Framework

The researcher tried to review in the above Methods of evaluation matrices for the evaluation of usability of point-based traffic penalty management system in the case of Federal Transport Authority. Therefore, the researcher framed (Nielson) evaluation matrices by minimizing the five quality components [Learnability, Efficiency, Memorability, Errors and Satisfaction] of usability in to three components [Learnability, Efficiency and Satisfaction].

Based on the literature review on the Nielson framework the researcher minimizes the five quality components [Learnability, Efficiency, Memorability, Errors and Satisfaction] of usability in to three components [Learnability, Efficiency and Satisfaction].

Because of the system was functioning for almost five years by users as a routine task and during the observation time errors tolerance and Memorability were omitted from the Nielson's model

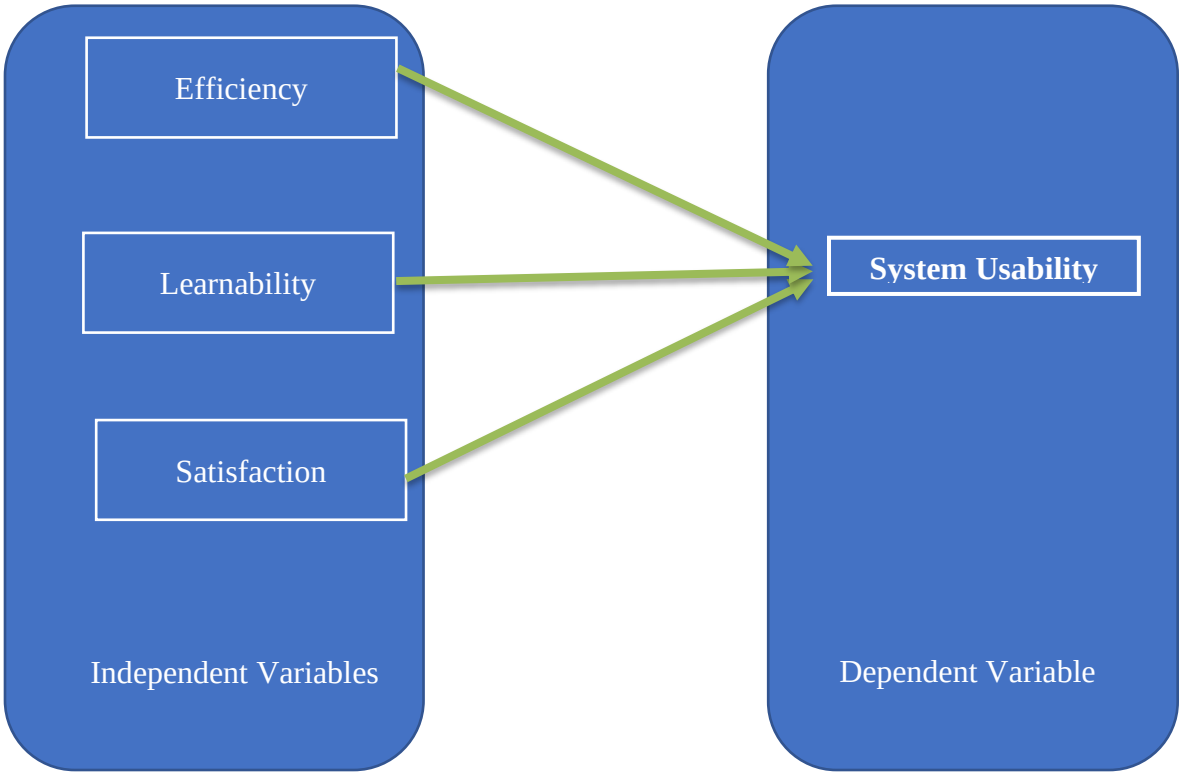

Figure 1: conceptual framework diagram extracted from (Nielsen, 2012)

The outcomes of this study are not dependent only on the evaluation results of a particular case study but also on contributing a hybrid model which can be applicable across the study field.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter includes research approach, research design, procedures used in conducting the study, population and sampling technique, research instruments, and data collection, analysis procedures.

3.2 Study Setting

The proposed framework aims to fill this gap by assessing the usability of Point-Based Traffic Penalty Management System to perform and manage traffic offense related tasks effectively and efficiently and sufficiently to different users in Addis Ababa Traffic Management Agency and Federal Transport Authority.

The approach of the researcher is specific to the particular point-based traffic penalty management. It is a name of the system/application under-study. The 'point-based' refers to the centralized data-center users on site tend to access instantly.

The work is not only limited to only payment collection system. This system consists of tasks:

- ✓ New Traffic Penalty Registration Process
- ✓ Creating Temporary driver records
- ✓ Traffic information Registration
- ✓ Payment collection
- ✓ lifting suspensions by authorized supervisors
- ✓ Penalty Follow-up
- ✓ generating reports related to the assignment and Administrative Tasks.

The Addis Ababa Traffic Management Agency and Federal Transport Authority find driver data records from other regions in order to penalize who traversed traffic rules. Drivers are complaining the service provided by the employees of Addis Ababa Traffic Management Agency and Federal Transport Authority.

The Point-Based Traffic Penalty Management System consists of the following major components:

1. A National Drivers Database that is accessible to all eligible users
2. A central web-based traffic penalty management system, which is currently used by users from Addis Ababa Traffic Management Agency and Federal Transport Authority.

The central database and application are currently deployed at the Ministry of Innovation and Technology's national data center.

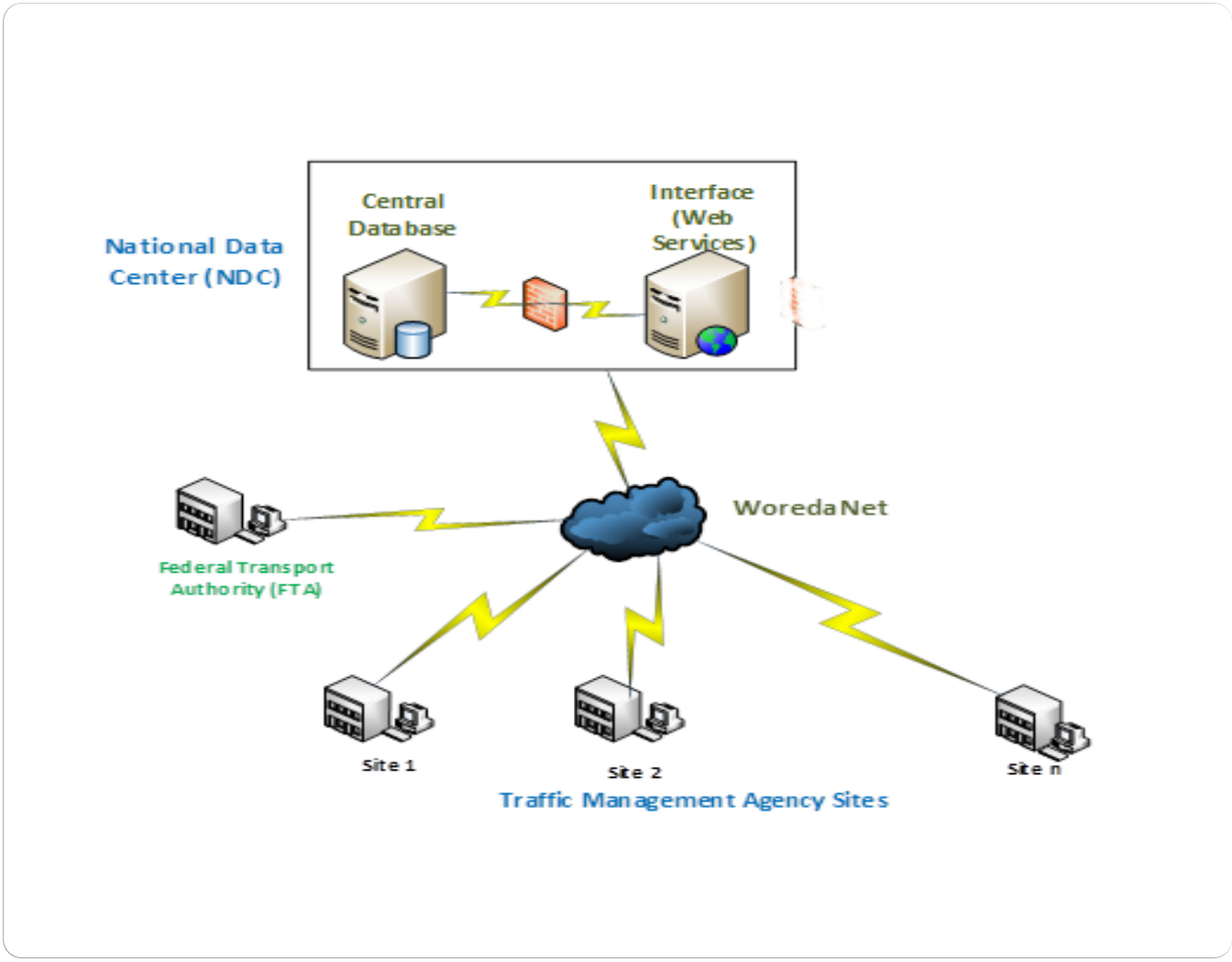

Figure 2: central database and application deployed (Source: user manual of Point-Based Traffic Penalty System, 2017)

Figure 1 shows us the central database and application are currently deployed at the Ministry of Innovation and Technology's national data center and Addis Ababa Traffic Management Agency

and Federal Transport Authority currently use Point-Based Traffic Penalty Management System from different sites of Addis Ababa Traffic Management Agency.

Just as there are a lot of different approaches and definitions of system usability, there are numerous methods for its evaluation. The methods can be qualitative or quantitative, automatic, semi-automatic and manual, ranging from easy to difficult to use, etc. Most of the available methods originated from Human-Computer Interaction (HCI) and are primarily intended to evaluate the quality of traditional software products. Although they are used to identify usability problems of traditional graphic user interfaces, today they can be equally successfully applied to a variety of Web applications. There are plenty of general quality models tailored specifically for Web applications, but the efforts of researchers over the past decade have given a number of models of software quality Web applications, oriented to a specific domain (Đorđević, 2017).

According to Nielsen (2012) five attributes of system usability evaluation are used in present study namely: learnability, efficiency, memorability, effectiveness, and satisfaction. Meanwhile, in this study learnability encompasses the completion time of each task while using the system for the first time as well as the other memorability attribute the completion time of a task when using a system after a week. In addition, efficiency attribute has also implicitly considered the effectiveness attribute. This implies the accurate and timely completion of a task while familiar with the system is measured under this stage. The third independent variable extracted from the five quality attributes is satisfaction which usually measured by the 'After-Scenario Questionnaire' after the end of the task.

Beginning from the definition the researcher of this study depicted to efficiency, satisfaction and learnability which are part of the definition of system usability in ISO standard. In addition, Jacob Nielsen's five quality attributes of system usability evaluation has more two components that were part of the ISO standard. Hence, the author refined the survey questions and assigned those thought be part of the scope to the above three dimensions namely: learnability, satisfaction and efficiency (For details look into Appendix A). Henceforth, from through literature review and arrangements made by the researcher to fit this study three system usability factors (quality components) are identified for the assessment process, namely: learnability, efficiency, and satisfaction.

I. Learnability: This factor determines the time and effort spent in order to reach the level of efficiency ordinary users of the application usually consume for certain activities

defined within the system. It further defines the tasks that are not easily grasped by incoming users and give an input to what improvements shall be made on the implemented system.

II. Efficiency: This factor clarifies the measurement of ordinary user's productivity compared to experts who deeply understand on how the system can execute a task in the shortest way possible without hinderance.

III. Satisfaction: the ultimate reason for a system is to compute the tasks given and prove the necessity of the deliverables by satisfying the stakeholders. And, measuring the satisfaction level of a system applied basically to be evaluated as a pillar of usability is essential.

Therefore, in order to assess the system usability, the researcher combines most common used evaluation methods from the last decade. i.e., Heuristic Evaluation and system usability quality components (learnability, efficiency and satisfaction) coined by Nielsen.

3.3. Research Approach

Goundar (2012) explained qualitative research as a research approach that offers the opportunity to carefully communicate with and capture the experience of the interviewed participants. On the other hand, quantitative research is a distinctive research paradigm that emphasizes to understand, explain, explore, discover and clarify situations, feelings, perceptions, attitudes, values, beliefs and experiences of a group of people (Bryman and Bell, 2007). System usability evaluation requires both qualitative and quantitative data, mixing the two forms of data, and using separate designs that may involve philosophical assumptions and theoretical frameworks. Most importantly, the combination of quantitative and qualitative approaches provides a more complete understanding of a research problem rather than individually implemented.

In this study, the researcher used mixed methods research approach. The quantitative research approach was used to collect numerical data came from questionnaires and secondary data from books, articles and office documents will analyze according to statistical procedures. In Addition to this, detail interviews with selected individuals were a great of help to the researcher to gather enough qualitative data for analysis of the research results. therefore, the achievement of this study was Based on the literature review on the Nielson both qualitative and quantitative research approaches, one approach supporting another.

3.4 Research Design

The main intent of the researcher is aimed at describing phenomena and is very useful for setting out baselines for the population, and characteristics of what rather than how the reality of this particular system usability evaluation is presented.

Descriptive survey research design used in this survey for gathering varying subjects specially to describe the extent to which different conditions obtained about the required information of the research subject.

3.5 Population of the Study

The Population of the study were users of the System selected 15 (fifteen) in number of ICT directorate from the database who have user accounts in the system of Federal Transport Authority, 18(eighteen) from total of employees from the database who have user accounts in the system of Addis Ababa Traffic Management Agency including the subordinates, mangers and system administrators and 3(three) Custor computing plc System Developers (Experts). The information gained from the central database of Federal Transport Authority. The selected respondents were users who have accounts in the system of Point-Based Traffic Penalty Management System Federal Transport Authority and Addis Ababa Traffic Management Agency.

No	Position	Respondents
1	Federal Transport Authority 2 Managers	2
2	Federal Transport Authority ICT 3 Team Leader	3
3	Federal Transport Authority ICT 10 Staff (Expert/support)	10
4	Addis Ababa Traffic Management Agency System users	18
5	Custor computing plc (Experts)	3
Total		36

Table 3: Number of respondents' source (Central Database)

3.6 Sampling techniques

First, the researcher selects 33 number of respondents from the database who have user accounts in the system using census sampling and have asked them the questionnaire. Second, the researcher used purposive sampling to select the three experts knowingly from the software development team and have asked them Expert Based Survey Questions.

3.7 Data sources

The researcher used both primary and secondary sources. Primary data sources are system users and System developers(experts) of the Point-Based Traffic Penalty Management System Federal Transport Authority and Addis Ababa Traffic Management Agency. It helped for generating and collecting original data from the intended operation for an organization and determines precisely and accurately what information is needed and from whom it is needed. Secondary data sources are books, researches, reports, published and unpublished documents.

Secondary data used for this study comes from the documents organized for system user manual, articles done on related field, and policy manual of Federal Transport Authority.

3.8 Data Collection Tools

The researcher employed web survey, focus-group discussion, one to one interview. The one-to-one interview is done to selected users via purposive sampling. The collected data from respondents' questionnaire contains both closed and open-ended questions. While the closed-ended questions are used to generate quantified data for analysis, the responses obtained from the open-ended questions opened a discussion point to where the interview and focus-group discussions based on.

3.9 Data analysis

Data analysis incorporated validity, reliability, frequencies and means. The research used Descriptive statistics to describe the data collected from the respondents. The collected data were analyzed using statical package social sciences (SPSS) new version for windows, after extracted and recorded on Microsoft Excel. The data was analyzed by their means, standard deviations and percentages. Errors and duplicated data were cleaned. From the total number of 33 distributed questionaries to the ICT directorate employees and Ababa traffic management Agency users of the system, 27 response questionaries were collected. And also, three experts were selected in the system development and have asked them survey questionnaire of Custor Computing plc. Software developers and three of them were replied their views and opinions.

3.9.1 Expert-based evaluation

In this method, the researcher has selected 3 experts who were engaged in the system development and have asked them survey questionnaire which have 11 principles extracted from15 principles usability evaluation research studied on heuristic evaluation (Toni Granollers, 2018). The survey

questions from heuristic evaluation were mapped to the three independent variables the researcher selected. The expert-based evaluation is more realistic estimate of usability and it gives clear record of important problems by assuring that it is the system or software product, not the participant which was assessed. Accordingly, the survey questionnaire was piloted to test these interview questions.

3.9.2 User-based evaluation

In this study, User-based Evaluation method was conducted and data gathered by asking users for their views and opinions, such as interviews, surveys, and focus groups. Field observation was also used by going to the offices where this Point-Based traffic penalty management system is configured and working. This field observation was used to provide contextual understanding on system usability evaluation techniques and their attributes. Why this user-based evaluation is incorporated since expert-based affects outcome by overestimating true number of problems.

System usability evaluation was best represented by combination of these both evaluation methods. Since usability evaluators are supposed to estimate the extent to which real users can employ an application learnability, efficiency and subject of satisfaction, if properly executed user-based methods were almost to estimate. However, the usability evaluator does not always have the necessary resources to perform such evaluations and therefore other methods like expert-based evaluation should be used as supportive data.

3.10 Validity and Reliability

3.10.1 Validity

In this research, validity helped as an instrument to measure in quantitative study. For example, the survey about learnability of the system shouldn't measure the capacity of the learner. The development of sound evidence to prove the test interpretation is really measuring the purposed figure is critical in quantitative studies. For this purpose, the research questions and some survey questionnaires for user-based evaluation are derived from literature by (Toni Granollers, 2018) titled "Usability Evaluation with Heuristics, Beyond Nielsen's List". The research questions are modified in a way that would work this thesis. Accordingly, the survey questionnaire is also validated with pilot test to guarantee the measures results are inline to the logic.

3.10.2 Reliability

The type of reliability the researcher checked on this research is the internal consistency of people's response across the items on a multiple items measure that demonstrates to reflect

underlying construct. This is done by cross-checking data from similar questions with pilot interviewees. To check the reliability, the survey questions were categorized into three sections to mention learnability, effectiveness and subject of satisfaction. The study value was above 0.55 for all these three sections and that is satisfactory. Cronbach (1946) stated the fact that people are more likely to agree with a statement than disagree with it. In order to, avoid this 'acquiescence bias's the researcher included negatively narrated questions to balance the positively phrased questions.

Reliability Statistics for satisfaction	
Cronbach's Alpha	N of Items
.894	10

Table 4: Reliability for satisfaction

Reliability Statistics for Efficiency	
Cronbach's Alpha	N of Items
.819	10

Table 5: Reliability for Efficiency

Reliability Statistics for learnability	
Cronbach's Alpha	N of Items
.881	10

Table 6: Reliability for learnability

3.11 Ethical Issue

The researcher's sole interest is to contribute to the academic field and recommend good practices to the stakeholders of the case-study. There is no conflict of interest that can in any form alter the rational of interviewees' response and survey results. In addition, it is with full permission of the system's development organization, owner client and user's privacy that this study is held. As it is put in the survey's disclaim, the interview is conducted, and questionnaires are distributed with full knowledge of the management and the privacy of the respondents' is maintained its confidentiality.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS, AND INTERPRETATION

4.1 Introduction

Employees are the life blood of the organization as they are considered inputs for the decision to focus only on the three usability testing quality components are based on the internal documents of User-Acceptance-Testing checklists. Feedbacks forwarded on the errors and tasks set to respond request are aligned on the business process which left the researcher empty of vagueness on the possible survey questionnaire set to be part of effectiveness and error-prone factors. This is because it is very difficult to think about an organization without employees since it must serve a product or service to public.

This study accordingly has its focus on the Evaluation of the usability of Point-Based traffic penalty management system in Federal Transport Authority (FTA). As many of its employees have a lot of challenges and problems in working their tasks using Web based applications. Thus, in this chapter the researcher tries to present, analyze and interpret the information gathered from the respondents depending on the following factors.

4.2 General Background Evaluation of system usability of Respondents

Questionnaires and interviews were distributed for 33 users and 3 experts in Addis Ababa Traffic Management Agency and Federal Transport Authority and Custor Computing PLC system developer experts respectively. Among the 33 questionnaires, 27 of them were filled and returned 20 of them on google forms and 7 of them on paper and the 3 experts were interviewed and documented their responses.

4.2.1 User Perspective Evaluation

The questionnaire has two parts. The first part provides and questions to gather general information about the respondents whereas the second part presents questions directly related to the statement of the problems. The data pertaining to the distribution of the respondents by age for demographics analysis, and computer basic skill, expertise with Evaluation of the usability of Point-Based traffic penalty management system characteristics for pre-test questionnaires analysis.

Age range	Frequency	Percent
25 – 34	18	66.7
35 – 45	9	33.33
Total	27	100

Table 7: Age range

As shown in table 7 from the total participant of the study aged between 25 to 34 years were the majority (66.7%) and the rest aged between 35 to 45 years 33.3% of this study participant. This shows that age range between 25 to 34 years of participation was high.

Gender	Frequency	Percent
Female	10	37.0
Male	17	63.0
Total	27	100.0

Table 8: Gender

As shown in Table 8, the study participants were majority (63%) of the participants were male, the other 33% were female. This shows that male participation was high.

Work Experience on FTA System	Frequency	Percent
> 5 years	4	14.8
1-2 years	3	11.1
3-4 years	13	48.1
less than a year	7	25.9
Total	27	100.0

Table 9: Work Experience on FTA System

Table 9 as indicated above, out of the total 27 respondents, on this specific System at FTA or AATMA services year of experience four (14.8%) of respondents were more than five years, three (11.1%) of respondents 1-2years, and 48.1% of respondents 3-4 years, 25.9% of respondents less than one years. This shows the majority of users were matured and experienced to offer good response to the researcher.

Level of expertise in computer use	Frequency	Percent
Good	8	29.6
Very good	19	70.4
Total	27	100.0

Table 10: Level of expertise in computer use

Table 10 as indicated above, out of the total 27 respondents,70.4% of were very good Level of expertise in computer use and the rest of 29.6% were good Level of expertise in computer use. This shows the majority of users were good and very good to offer good response to the researcher's questionaries on the usability of the system.

In this portion the researcher aim was to show the Level of expertise in computer use of respondents from the perspective of system usability in this particular system.

The majority of users to Level of expertise in computer use specially focusing on this system were good and very good to offer good response to the researcher's questionaries on the usability of the system. So, there may not be to go farther checking and employing weighted analysis based on the ICT capacity of the users.

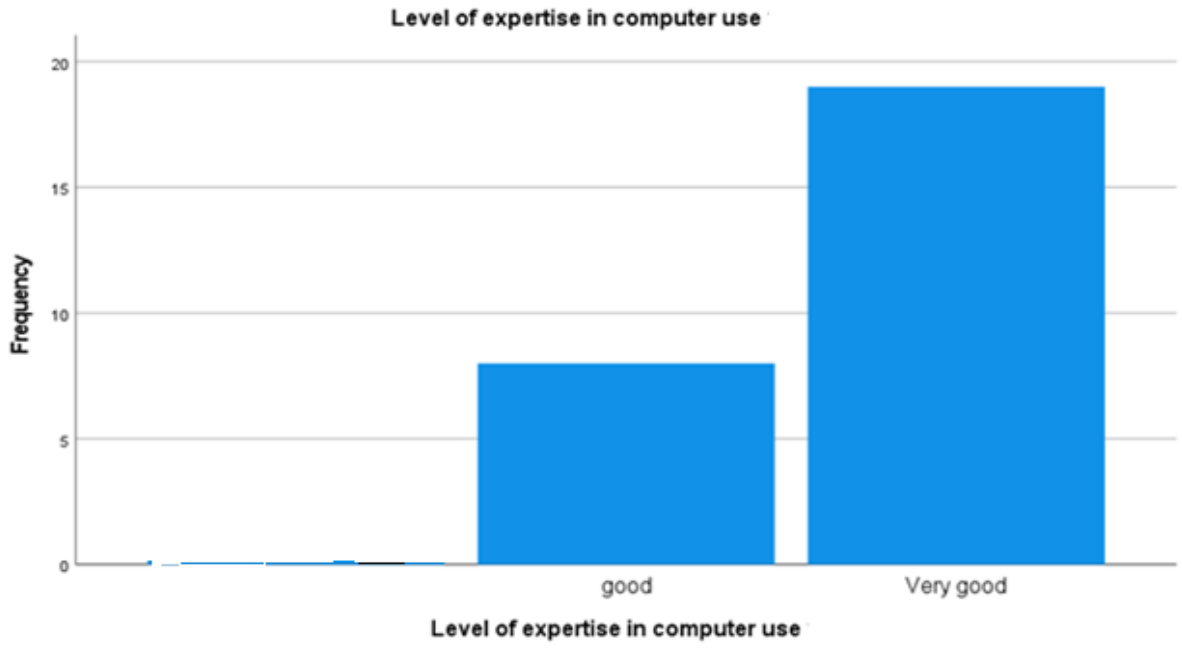

Figure 3:Level of expertise in computer use

4.2.2 Users Perspective Assessment Analysis Result

The researcher reviewed different literatures, one of the most popular one including a mixed of positively and negatively expressed statements in questionnaires, for instance, “It is easy to learn the System do exactly what you want at first” (positive phrase) and “It becomes difficult to learn the System for a user with no experience of computers” (negative phrase). The indicated the purpose of alternating items is to decrease acquiescent bias (users agreeing to many items) and extreme response bias (users providing all 5s or 1s on a 5-point scale).

The researcher, with an all positively worded version of the System Usability Scale (SUS) found little evidence of these biases. In fact, it showed that alternating items causes problems.

In the following section, end-user perspective Evaluation of the usability of Point-Based traffic penalty management system analysis results were presented in the following categories: the results of the survey will help to assess and identify the satisfaction, efficiency and Learnability of the system while operating tasks by the users.

I. Analysis of Satisfaction Scale Measure

Question code		Fully Disagree	Disagree	Do not know	Agree	Fully Agree	Total
QS1	Frequency				9	18	27
	Percent				33.3	66.7	100
QS2	Frequency	10	12	3	2		27
	Percent	37	44.4	11.1	7.4		100
QS3	Frequency		3	2	5	17	27
	Percent		11.1	7.4	18.5	63	100
QS4	Frequency	8	14	2	3		27
	Percent	29.6	51.85	7.4	11.1		100
QS5	Frequency	2	3	2	2	18	27
	Percent	7.4	11.1	7.4	7.4	66.7	100
QS6	Frequency	12	13	2			27

	Percent	44.4	48.1	7.4			100
QS7	Frequency		4		10	13	27
	Percent		14.8		37	48.1	100
QS8	Frequency	11	9	5	2		27
	Percent	40.7	33.3	18.5	7.4		100
QS9	Frequency		4	3	8	12	27
	Percent		14.8	11.1	29.6	44.4	100
QS10	Frequency	4	17	6			27
	Percent	14.8	63	22.2			100

Table 11: Satisfaction scale Measure

In evaluating the usability of Point-Based traffic penalty management system using satisfaction scale measure the investigation of participants' views and responses were discussed above, as shown in the Table 11: -

Regarding to the" I would not like to use this System everyday", 37% of the participants were for "Fully Disagree", 44.4% of the participants were for "Disagree", 11.1% of the participants were for "Do not know", 7.4% of the participants were for "Agree" in the satisfaction scale measure. Most respondents rejected "I would not like to use this System everyday ".

Users reply to" Using the System is frustrating", 29.6% of the participants were respond "Fully Disagree", 51.85% of respondents were for "Disagree", 7.4% of respondents "do not know" and only 11.1% of respondents were Agreed. Many of the participants disagreed to the" Using the System is frustrating".

According to the response of users "The help information given by the System is not very helpful" 44.4% and 48.1% were answered as "Full Disagree" and "Disagree". Most of the participants disagreed to the "The help information given by the System is not very helpful".

Almost half of the total respondents of "Working with the System is mentally stimulating" have fully agreed, 37% of responses were "agreed" ,14.8% were "Disagree". On the other hand, the "I found the System obstacle in my work" phrase the put 40.7% of the participants were "Fully Disagree", 33.3% "Disagree" and 18.5 were "Do not know". Most of the participants disagreed the "I found the System obstacle in my work".

To know when users were safe or not the researcher asked, “I feel safer if I use only a few familiar commands or operations” ,44.4%, 29.6% were “Fully Agree” and “Agree” respectively. The majority of the participants agreed the “I feel safer if I use only a few familiar commands or operations”. At the end the responses to “Messages which appear on the screen are sometimes confusing”, 63% of respondents were “Disagree” and 22.2% were “Do not know”. The majority of the participants rejected to the “Messages which appear on the screen are sometimes confusing”. Therefore, as shown from the above Table 11 and the finding described above the majority of the respondents were satisfied using the system to activate their tasks.

The system has no considerable obstacles and users were satisfied using it, almost two-third of the respondent fully agreed on QS1, QS3, QS5 & QS9, ‘Help statement given by system was not helpful’ is highly refuted statement which implies how useful ‘the information’ is. All of the respondents didn’t hesitate on the way how satisfied they were with the system

Statistics Satisfaction scale Measure mean and Std. Deviation	Satisfaction scale Measure	N		Mean	Std. Error of Mean	Std. Deviation
		Valid	Missing			
	Working with this System is satisfying	27	0	4.67	0.092	0.480
	I would not like to use this System everyday	27	0	1.89	0.172	0.892
	The System is pleasant to use	27	0	4.33	0.200	1.038
	Using the System is frustrating	27	0	2.00	0.177	0.920
	I feel in command of the System when I use it	27	0	4.15	0.265	1.379
	The help information given by the System is not very helpful	27	0	1.63	0.121	0.629
	the System is mentally stimulating	27	0	4.19	0.200	1.039
	I found the System obstacle in my work	27	0	1.93	0.184	0.958
	I feel safer if I use only a few familiar commands or operations	27	0	4.04	0.210	1.091
	Messages which appear on the screen are sometimes confusing	27	0	2.07	0.118	0.616

Table 12: Satisfaction scale Measure

II. Analysis Efficiency measure scale

Question code		Fully Disagree	Disagree	Do not know	Agree	Fully Agree	Total
QE1	Frequency		1	1	10	15	27
	Percent		3.7	3.7	37	55.6	100
QE2	Frequency	6	13	2	5	1	27
	Percent	22.2	48.1	7.4	18	3.7	100
QE3	Frequency	2	4	3	6	12	27
	Percent	7.4	14.8	11.1	22.2	44.4	100
QE4	Frequency	6	13	2	5	1	27
	Percent	22.2	48.1	7.4	18.5	3.7	100
QE5	Frequency	3		2	6	16	27
	Percent	11.1		7.4	22.2	59.3	100
QE6	Frequency	7	17	2		1	27
	Percent	25.9	63	7.4		3.7	100
QE7	Frequency	1		1	5	20	27
	Percent	3.7		3.7	18.5	74.1	100
QE8	Frequency	9	12	3	1	2	27
	Percent	33.3	44.4	11.1	3.7	7.4	100
QE9	Frequency		2	2	9	14	27
	Percent		7.4	7.4	33.9	51.9	100
QE10	Frequency	9	16	1		1	27
	Percent	33.3	59.3	3.7		3.7	100

Table 13:Efficiency measure scale

In evaluating the usability of Point-Based traffic penalty management system using Efficiency measure scale the investigation of participants' views and responses were discussed above, as shown in the Table 13: -

The participants response about "The interface designed helped me to perform my assigned tasks accurately and timely" in the system were more efficient for the users, 55.6% of participants were "Fully Agree" and 37% of the participants were for "Agree.

Almost more than 92% of respondents said the interface designed helped to perform their tasks. The same to the above 48.2% of respondents were "Disagree",22.2% of respondents "Fully Disagree" to the "It is tiring to click multiple buttons to confirm an action" of the system.

the majority of respondents Rejected to the" It is tiring to click multiple buttons to confirm an action".

Regarding to the "After a period of not using the System, I can easily re-establish skill",44.4% of respondents were "fully agree", 22.2% of respondents were "agree".

So, the majority of respondents were easily re-establishing their skill when they were not there.

Concerning to the "The system does not provide me options to recover from mistakes quickly and easily", 22.2% of the participants were for "Fully Disagree", 48.1% of the participants were for "Disagree". The majority of respondents were rejected the system does not provide options to recover from mistake quickly.

The above Table 9: shows that "The system makes me recognize how to perform a task instead of remembering", 59.3% respondents claims that they "fully agree", 22.2% respondents claim agree, 7.4% respondents claim neither "agree" nor "disagree" ,11.1% respondents claim "fully disagree" that they believe.

According to the above response the majority of the respondents claim that they believe the system made them recognize how to perform a task.

The above Table 9: shows that 25.9% of respondents answered that they "Fully Disagree", 63% of respondents were "Disagree" ,7.4% of respondents claimed neither "agree" nor "disagree" ,3.7% of respondents claim "agree "that the "Tasks cannot be performed in easy way using this System" respectively. According to the above response the majority of the respondents were rejected" the Tasks cannot be performed in easy way using this System".

Regarding to the "The System saves me time when I use it" ,74% of respondents were "Fully agree", 3.7% of respondents claims neither agree nor disagree and 18.5% of respondents were "agree ". According to the above response the majority of the respondents were that The System were saved their time. About to the" The reports generated are not often reliable and accurate", 33.3% of the participants were for "Fully Disagree", 44.4% of the participants were for "Disagree", 11.1% of the participants were for "Do not know", 7.4% of the participants were for "Agree" in the efficiency scale measure.as shown in the above majority of the respondents were the reports generated were often reliable and accurate.

The above Table 9: shows that 51.9% of respondents answered that they "Fully agree", 33.9% of respondents were "agree" ,7.4% of respondents claimed neither "Do not know" ,7.4% of

respondents claimed “Disagree “that the “It is relatively easy to move from one part of a task to another” respectively.

According to the above response the majority of the respondents were answered relatively easy to move from one part of a task to another.at the end the respondent’s response to the” The system does not make me fast to finish my tasks”,55.9% of participants were “Disagreed” ,33.3% of participants were “Fully Disagreed”. Hence, the majority of participants were rejected “The system does not make me fast to finish my tasks”.

In General, from the findings the questions concerned to the efficiency of the system usability evaluation of point-based traffic penalty management system was efficient.

Statistics Efficiency measure mean and Std. Deviation		N		Mean	Std. Error of Mean	Std. Deviation
		Valid	Missing			
	The interface designed helped me to perform my assigned tasks accurately and timely	27	0	4.44	0.145	0.751
	It is tiring to click multiple buttons to confirm an action	27	0	1.93	0.118	0.616
	After a period of not using the System, I can easily re-establish skill	27	0	3.81	0.262	1.360
	The system does not provide me options to recover from mistakes quickly and easily	27	0	2.33	0.220	1.144
	The system makes me recognize how to perform a task instead of remembering	27	0	4.19	0.251	1.302
	Tasks cannot be performed in easy way using this System	27	0	1.93	0.159	0.829
	The System saves me time when I use it	27	0	4.59	0.171	0.888
	The reports generated are not often reliable and accurate	27	0	2.07	0.220	1.141
	It is relatively easy to move from one part of a	27	0	4.30	0.176	0.912

	task to another					
	The system does not make me fast to finish my tasks	27	0	1.81	0.160	0.834

Table 14: Efficiency measure scale mean and Std. Deviation

Efficiency measure scale mean and Std. Deviation

III. Statistics for Learnability Scale Measure

Question code		Fully Disagree	Disagree	Do not know	Agree	Fully Agree	Total
	Frequency		2	1	10	14	27
QL1	Percent		7.4	3.7	37	51.9	100
QL2	Frequency	8	10	4	1	4	27
	Percent	29.6	37	14.8	3.7	14.8	100
QL3	Frequency	2	2	1	9	13	27
	Percent	7.4	7.4	3.7	33.3	48.1	100
QL4	Frequency	6	14	4	3		27
	Percent	22.2	51.9	14.8	11.1		100
QL5	Frequency			1	11	15	27
	Percent			3.7	40.7	55.6	100
QL6	Frequency	13	8	6			27
	Percent	48.1	29.6	22.2			100
QL7	Frequency		2	2	8	15	27
	Percent		7.4	7.4	29.6	55.6	100
QL8	Frequency	9	12	4	2		27
	Percent	33.3	44.4	14.4	7.4		100
QL9	Frequency		2	2	8	15	27
	Percent		7.4	7.4	29.6	55.6	100
QL10	Frequency	12	9	4	2		27
	Percent	44.4	33.3	14.8	7.4		100

Table 15: Learnability Scale Measure mean and Std. Deviation

In evaluating the usability of Point-Based traffic penalty management system using Learnability scale measure the investigation of participants' views and responses were discussed above, as shown in the Table 15: -

The participants response about “It is easy to learn the System do exactly what you want at first” in the system were easy to learn the System for the users, 51.9% of participants were “Fully Agree” and 37% of the participants were for “Agree”. The majority of the respondents were put the system were easy to learn the system.

Regarding to the” It becomes difficult to learn the System for a user with no experience of computers”, 29.6% of the participants were for “Fully Disagree”, 37% of the participants were for “Disagree”, 14.8% of the participants were for “Do not know”, 14.8% of the participants were for “Fully Agree” in the learnability scale measure. The majority of the respondents disagreed to the” It becomes difficult to learn the System for a user with no experience of computers” phrases. The above Table 11: shows that 48.1% of respondents claimed “fully agree”, 33.3% of respondents were “agree” to the” The sequence of steps in the interface is similar to the manual task”. The majority of participants agreed to the “The sequence of steps in the interface is similar to the manual task”.

About to the “It takes too long to learn commands/menus to operate the System”, 22.2% of respondents were “fully disagree”, 51.9% of respondents were “Disagree”, 14.8% of respondents were “Do not know”. So, the majority of respondents Disagreed to the phrase for” It takes too long to learn commands/menus to operate the System”. Concerning to the “Tasks are easily done in the interface as compared to the manual task”, 55.6% of participants were “Fully agree”, 40.7% of participants were “agree”, 3.7% of participants were “Do not know”. More than 95% of participants answered positively to “Tasks are easily done in the interface as compared to the manual task”.

According to the “Instructions and prompts are not helpful”, 48.1% of participants were “fully disagree”, 29.6% of respondents were “Disagree”, 22.2% of respondents were “Do not know”.

The majority of the respondents were disagreed to the phrases” Instructions and prompts are not helpful”. The above Table 11: shows that “I have easily learnt the steps needed to accomplish what I want to do.”, 55.9% of respondents claims that they “Fully Agree”, 29.6% of respondents claims “agree”. According to the above response the majority of the respondents claim the “I have easily learnt the steps needed to accomplish what I want to do”.

About to the “Learning to operate this System initially is full of problems”, 33.3% of respondents were “fully disagree”, 44.4% of respondents were “Disagree”, 14.8% of respondents were “Do not

know". So, the majority of respondents Disagreed to the phrase for" Learning to operate this System initially is full of problems".

The researcher described to the as "The commands relevant to a set of tasks are easy to learn", 55.6% of respondents were "fully agree", 29.6% of respondents were "agree" ,7.4% of respondents were "Disagreed", 7.4% of respondents were "Do not know". The majority of respondents agreed to the phrase for" The commands relevant to a set of tasks are easy to learn".

At the end the" I will never learn to use all that is offered in this System", 44.4 % of respondents were "Fully Disagree", 33.3 % of respondents were "Disagree",14.8% of respondents were "Do not know". The majority of respondents agreed to the phrase for I will never learn to use all that is offered in this System".

In General, from the findings the questions concerned to the Learnability of the system usability evaluation of point-based traffic penalty management system was easily learnable.

Statistics Learnability Scale Measure mean and Std. Deviation		N		Mean	Std. Error of Mean	Std. Deviation
	Learnability Scale Measure	Valid	Missing			
	It is easy to learn the System do exactly what you want at first	27	0	4.33	0.169	0.877
	It becomes difficult to learn the System for a user with no experience of computers	27	0	2.37	0.262	1.363
	The sequence of steps in the interface is similar to the manual task	27	0	4.07	0.238	1.238
	It takes too long to learn commands/menus to operate the System	27	0	2.15	0.175	0.907
	Tasks are easily done in the interface as compared to the manual task]	27	0	4.52	0.112	0.580
	Instructions and prompts are not helpful	27	0	1.74	0.156	0.813
	I have easily learnt the steps needed to accomplish what I want to do.	27	0	4.33	0.177	0.920
	Learning to operate this System initially is full of problems	27	0	1.96	0.173	0.898
	The commands relevant to a set of tasks are easy to learn	27	0	4.33	0.177	0.920
	I will never learn to use all that is offered in this System	27	0	1.85	0.183	0.949

Table 16: Learnability Scale Measure mean and Std. Deviation

4.3 Expert-Based System Usability Evaluation

In expert-based system usability evaluation this study employed heuristic evaluation. Heuristic Evaluation (HE) is one of the most widely used methods for evaluating the usability of an interactive system (Toni, 2018). Rusu et al., (2017) in their study titled 'How to develop usability heuristics: A systematic literature review' explained the process followed to develop list of proposal principles of the questionnaire experts were asked. As a result, the researcher derived a total of 11 (heuristic) principles from Nielson's and Tognazzini's lists. The heuristic evaluation principles and their proposed lists for this study are attached in appendix B.

In this study, three system experts were asked to rate the questions into (mainly) strongly agree, agree and disagree (three-point) Likert's scale answers. When quantifying these answers, they were rated: 1 to 'disagree', 2 to 'agree', and 3 for 'strongly agree'. Accordingly, the respondents result is summed, and this result earned out of 9 is converted to out of 5 to get weights in similar measure to the user-based evaluation used above. In parallel, on phone interview with the experts, 'WH' questions were followed for the negative answers or the moderately agreed points for qualitative elaboration based on their required input for the discussion.

No	Heuristic Principles applied	Mean
1	Visibility and system state	3.89
2	Connection about system and real world	4.81
3	Consistency and standards	4.72
4	Recognition rather than memory	5
5	Flexibility and Efficiency	4.44
6	Recognize and recover from errors	4.07
7	Error prevention	4.63
8	Help option	3.70
9	Save the state and protect work	3.89
10	Color and readability	4.44
11	System autonomy	5

Table 17: Heuristic Principles applied

Regarding visibility and system state, respondents agreed on the availability of visible system page, title and or section. The appropriate location of system components, their specified tasks what they describe and correspondingly what they perform, and links clearly defined were able visualized directly. Visibility and system state of the case-study system is averaged to 3.89.

About a connection between the system and the real-world metaphor, the icons were proven they correspond to everyday objects familiar in other systems. In addition, the flow of information in the system kept its logical order and the phrases and concepts the system used were recognizable by the users. This heuristic evaluation principle questions average was rounded to 4.81.

The system proved consistency and standards of link labels and destination's names. Though, there was some wary if the result of similar actions gives similar output; buttons were consistent in their meaning and navigation elements followed the standards suitable for use. The mean for system consistency and standards set to 4.72.

The learnability of this system was based on the learning and anticipation of easy to use the system for the first time. It further studied how easy is to locate the information that has already been searched before. The user can always use the system without remembering previous screens. The content needed for navigation found in the 'current screen' is full and have unimpeded access the information organized according to logic familiar to the end user. According to the survey four questions related to learnability shared to the three experts all of them strongly agreed the system is learnable. The mean for learnability is 5.0.

Flexibility and efficiency of the system is one evaluation component of system usability. The system usability efficiency is more described by keyboard shortcut for common actions. The response illustrated its clarity for how to use it is possible to easily perform an action done earlier. The respondents who are expert for the system were happy that users are always busy without unnecessary delays.

The next point of measurement was how the system helps users recognize and recover from errors. The respondents explained the errors were not shown in real-time and the errors shown were somewhat difficult to understand. The acceptance level by the experts to the questions for the recognition and recover from errors was averaged to a mean of 4.07.

In preventing errors, the system was appreciated by the confirmation message that appears on the screen before taking any action. The search engine has an exceptional capability that introduced a portion of the system that identified phonetic similarities in Geez and display it for clarity. This

differentiated result was elaborated on phone interview with a particular interviewee asked on phone call that gave a full result for this classification. Therefore, some form of typos and spelling errors were tolerated. The mean for error prevention acquired from the respondents was 4.63.

Going further to help option, which is considered the important part of documentation, respondents have fully agreed its availability. But they were not quite satisfied by the information provided on its visibility and easy access and its aim in solving system errors. Experts who participated on phone interview have also indicated the opportunity overseen on help option. Experts rated the help option with a mean of 3.70.

The 'save the state and protect the work' part focused on the capability of continuing work from the previous page or section and or the auto-save implementation from another device where some users have previously working from. The experts tested the system was well validated and the continuation defined here was taken as area of gap the system needs to include. Auto-save state didn't work as expected and the main failure of the system was found to be power cut, intermittent network in the server which usually leads data to corrupt. The respondents rated the mean of this category to 3.89.

The color and readability of the point-based traffic penalty management system was rated high about the font's alternative, size and color with sufficient contrast to its background. However, the background images and patterns allowed the content to be read on were found a little bit fuzzy. The average of the experts concerning this category was around 4.44.

The last topic discussed on the expert used evaluation of point-based traffic penalty management system was system autonomy. It was proven that the system was able to inform users about the system status, update with regular data records and give an information useful for correction when false data are filled. This part of the survey was supported by explanation from the experts on phone interview about the regular expressions handling method that doesn't allow incorrect inputs. The respondents strongly agreed on the system independence or product autonomy. The mean is 5.0. Therefore, expert-based system usability evaluation in this derived heuristic evaluation shows positively answers were responded by the experts of the system.

The usability test components or dimension that investigates Memorability of the user interface results the experts evaluate show it on recognition rather than memory was from the responses of the expert-based evaluation.

Therefore, the derived heuristic evaluation and the three dimensions framework shows positively response of respondents from the interviews and questionaries respectively. so, these two elements or models have similar alignments each other.

CHAPTER FIVE

SUMMARY OF THE MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

So far, we have seen the problem and its approach in chapter one, literature review in chapter two, Research Methodology in chapter three, and data presentation, analysis, and interpretation in chapter Four. Now it is time to present summary of findings, conclusion, and recommendation. Based on this the chapter includes four sections. The first section contains summary of the major findings that are derived from the data analysis. The second section also deals about the general conclusion of this study based on the major findings, and the third section contains the possible solutions recommended by the researcher.

Carefully designed and systematically operated usability of System to have confident and good understanding in the general users of the organization. Therefore, this study is designed to evaluate the usability of point-based traffic penalty management system and suggest solutions specifically answering the study's research questions and achieve objectives of the research. Questionnaires and interview questions were developed using google forms, distributed, and administered to the selected and was conducted with users and experts of the Point-Based Traffic Penalty Management System.

Point-based traffic penalty management system usability (user-based) evaluation was based on Nielson Model by adopting user testing method with descriptive statistic data for interpreting the usability quality evaluation. Then, expert-based system usability evaluation was adopted on the heuristic evaluation principles. Next, to draw comprehensive results, the result of the empirical study is followed up with conclusion of final results in form of recommendations for point-based traffic penalty management system web-based system enhancement in order to facilitate better usability by the users and sustainable development.

5.2 Summary of the Key Findings

Based on the data analysis made in chapter four, the following major findings were made.

The study finds out that most of respondents were experienced and worked on this specific Point-Based Traffic Penalty Management System to offer good response to the questionnaire, interviews.

Concerning to the Level of expertise in computer use, almost all of users were good to offer good response to the researcher on the usability of the system.

Responses related to the Satisfaction of the research questions were results shown as the system has no considerable obstacles and users were satisfied using it, almost two-third of the respondent fully-agreed on QS1, QS3, QS5 & QS9, 'Help statement given by system was not helpful' was highly refuted statement which implies how useful 'the information' is and all of the respondents didn't hesitate on the way how satisfied they were with the system.

Responses related to the Efficiency of the research questions were results displayed as high-rated response of the system efficiency was its importance in timesaving. (has no considerable obstacles and users were efficient using it), recover options were high input for the users efficiency, repetitive buttons were taking some time to click. Responses related to the Learnability of the research questions were results presented tasks are easily done in the interface as compared to the manual task, the commands relevant to a set of tasks were easy to learn, the steps were easy learnt to accomplish tasks, it was easy to learn, the system do exactly what you want first, expert survey questions employed from heuristic evaluation.

In the end-user perspective Evaluation of the usability of Point-Based traffic penalty management system analysis results were presented in the following categories: the results of the survey helped to assess and identify the satisfaction, efficiency and Learnability of the system while operating tasks by the users.

The respondents of both expert based, and user-based evaluators witnessed the interface also helped them to easily re-establish their skill when they were not there.

Results from three system experts' analysis were: system was totally independent (autonomous), the system was really connected with real-world, it met the consistency within and quality standards, it has proven error prevention methods.

The reports generated were reliable and accurate, easy to move from one part of a task to another. Point based traffic penalty system had flaws for it didn't provide options to recover from mistake quickly and had a problem in making users finish tasks quickly with help options. Besides, the overall system efficiency was high.

5.3 Conclusion

The levelheadedness of this study was contributed to the research gap of the usability of Information Management System particularly on 'Point-based Traffic Penalty Management System' of (Ethiopian) Federal Transport Authority by conducting mixed approaches and mixed different sides' exhaustive survey.

To fulfill the evolution of usability of Information Management System, those involved in the implementation and operations of the systems in Addis Ababa Traffic Management Agency and Federal Transport Authority.

As the literature reviewed suggests, were still far behind in implementing system usability and hoped that successful system usability will act as a strong foundation of web-based systems in different organizations.

In this paper, Level of expertise in computer use, work experience of users in this specific system and positive attitude users towards usability of a system in the organization, employees faced different problems.

Users' reaction to the point-based traffic penalty management system main usability issues with end-user feedback to Federal transport Authority were evaluated with the three usability factors identified for the assessment process, namely: learnability, efficiency, and satisfaction.

In addition, expert-based evaluation illustrated similar results to the survey questions which covered the heuristic principles. The experts' response result was affirming the system usability evaluation earned from user-based evaluating.

Henceforth, it can be concluded that, since users in organizations were well experienced and have good computer skill to work their tasks easily learnable, efficiently, and satisfy by the system. In this study having better model for factors components of usability was mandatory to systems in organizations within similar systems. Generally, even if the greater focus of web-based applications systems in Ethiopia, evaluation on more quality components were not conducted in a good manner in the case of in Federal Transport Authority.

5.4 Recommendations

Based on the major findings and conclusion of the study, the researcher forwarded the following recommendations to the evaluation of system usability which were seen in Federal Transport Authority. Organizations, among others, can be effective in achieving organizational goal and can

satisfy their customers using evaluation of system usability in their implemented applications and managed in a good way.

The recommendations are research based and in addition the researcher put the following recommendations on using the hybrid model synthesized in this study.

Researchers' can apply the hybrid model forwarded by the author.

- ✓ For efficient, learnable satisfying system infrastructures are crucial for the organization.
- ✓ Since the findings that for efficiency, learnability, satisfaction system were not measured in the same level, it is better the office should use this model to evaluate system usability of other system to assess system usability.
- ✓ From the study the responses of users and experts in the survey were positive, but this model was target on the implemented system and not included in system design and other stage of software development is necessary to focuses in different stages.
- ✓ The government has to provide a basis on which to analyze and specify international support and cooperation from development partners on evaluation of system usability.
- ✓ Similarly, the organization have to produce guidelines that the organization can use to define needs and agendas with regard to government system usability.

5.5 Research Limitations

As can be observe from the literature review section, the first limitation of the research study was inadequate literature review section about evaluation of web-based system usability of government organizations in Ethiopia. The other limitation of the study lacks comments from software development companies as additional evaluation checklists. However. Some software development companies can design their system testing checklists in the internal companies within the organization outsource the system and it is before implementing the system.

5.6 Future work

This research study evaluates the current point-based traffic penalty management system usability gaps and suggests system usability model. In this model the researcher took three factor components of usability testing technique for the implemented and functioning (live system). However, evaluate the web-based system starting from the first stage of system development to the functioning will be need another study by other scholars.

In addition to this, the scope was limited to the point-based traffic penalty management system in Federal Transport Authority; other systems of in other government organizations services will be in consideration and develop evaluation model and guidelines for other sector study areas will be the future among the professionals of usability testing.

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Appendix

Appendix A: Questionnaire

Evaluation of the usability of Point-Based traffic penalty management system: The Case of Federal Transport Authority (FTA)

Phase I: Evaluation of System Usability Survey

Dear sir/Madam,

Warmest Greetings!

My name is Nblle Yohannes. I am currently doing my M.Sc. Degree in Information Systems in Addis Ababa University. I have finished my course work and now I am doing my M. Sc. Thesis entitled: **Evaluation of the usability of Point-Based traffic penalty management system.**

I believe that your response will greatly contribute to the success of research thesis. So it's with great respect that I ask you to fill this questionnaire. This questionnaire survey is part of a series of steps to assess the system usability of the Point-Based traffic penalty management system. The results of the survey will help to assess and identify the satisfaction, efficiency and Learnability of the users while operating the system. I guarantee that your identity will be kept confidential and the information you provide only be used for academic purposes. Thank you in advance for taking your precious time to fill this questionnaire. Please try to answer all the questions openly, as your answers will have an influence on the outcome of the research. Your 15 minutes or less will greatly contribute to the growth and advancement of knowledge in the system usability assessment. If you have any questions or comments, please don't hesitate to contact me.

You can reach me at; Mobile: 0913383156 or E-mail: nblleyohannes@yahoo.com

With all due respect,

Nblle Yohannes

The first part is of the questionnaire is general information about you. The second part with 56 statements makes Evaluation of the system usability that you are currently using. Please answer every one of them as genuinely as possible.

Please be assured again that the information you provide is kept completely confidential and no information is required that could identify you as a person. Thank you for filling out the questionnaire.

System Usability research group
School of Information Sciences
Addis Ababa University

Name of The System: Point-Based traffic penalty management system

Instruction

1. Tick "√" in the space provided for objective questions;
2. Write your answer on the space provided for the subjective questions;
3. Don't write your name

I. About you

1. Age range

___18 - 24 ___25 - 34 ___35 - 45 ___over 45

2. Gender

___Male ___Female

3. How long have you worked on this specific System at FTA or AATMA?

___ less than a year ___ 1-2 years ___ 3-4 years ___> 5 years

4. Level of expertise in computer use?

____ Very good ____good ____ Satisfactory ____poor

II. Evaluation components of System usability Survey

Scale	No	Items	Fully agree	Agree	Do not know	disagree	Fully disagree
Satisfaction	1.	Working with this System is satisfying					
	2.	I would not like to use this System everyday					
	3.	The System is pleasant to use					
	4.	Using the System is frustrating					
	5.	I feel in command of the System when I use it					
	6.	The help information given by the System is not very helpful					
	7.	Working with the System is mentally stimulating					
	8.	I found the System obstacle in my work					
	9.	I feel safer if I use only a few familiar commands or operations					
	10.	Messages which appear on the screen are sometimes confusing					
Efficiency	11.	The interface designed helped me to perform my assigned tasks accurately and timely					
	12.	It is tiring to click multiple buttons to confirm an action					
	13.	After a period of not using the System, I can easily re-establish skill					
	14.	The system does not provide me options to recover from mistakes quickly and easily					
	15.	The system makes me recognize how to perform a task instead of remembering					
	16.	Tasks cannot be performed in easy way using this System					
	17.	The System saves me time when I use it					
	18.	The reports generated are not often reliable and accurate					

	19.	It is relatively easy to move from one part of a task to another					
	20.	The system does not make me fast to finish my tasks					
Learnability	21.	It is easy to learn the System do exactly what you want at first					
	22.	It becomes difficult to learn the System for a user with no experience of computers					
	23.	The sequence of steps in the interface is similar to the manual task					
	24.	It takes too long to learn commands/menus to operate the System					
	25.	Tasks are easily done in the interface as compared to the manual task					
	26.	Instructions and prompts are not helpful					
	27.	I have easily learnt the steps needed to accomplish what I want to do.					
	28.	Learning to operate this System initially is full of problems					
	29.	The commands relevant to a set of tasks are easy to learn					
	30.	I will never learn to use all that is offered in this System					

III. Open-ended Questions of Evaluation System usability Survey

1. what things you thing to add or to change for more satisfaction of the system?

_____

_____

_____

_____

_____

_____

2. what proportions of functions are described in the user documentation and /or help facility?

3. Describe briefly the sorts of tasks you are required to do using the System

4. Can you recall, if there is any episode that you remember as particularly successful or unsuccessful in using the System?

5. What are your overall impressions of the system?

6. Do you have any other comments?

Appendix B: Expert Based Survey Questions

1.-Visibility and system state

- Does the application include a visible title page, section or site?
- Does the user always know what the system or application is doing?

2.- Connection between the system and the real world, metaphor usage and human objects

- Does information appear in a logical order for the user?
- Does the design of the icons correspond to everyday objects?
- Does every icon do the action that you expect?
- Does the system use phrases and concepts familiar to the user?

3.- Consistency and standards

- Do link labels have the same names as their destinations?
- Do the same actions always have the same results?
- Do the icons have the same meaning everywhere?
- Is the information displayed consistently on every page?
- Do navigation elements follow the standards? (Buttons, check box, ...)

4.- Recognition rather than memory, learning and anticipation

- Is it easy to use the system for the first time?
- Is it easy to locate information that has already been searched for before?
- Can you use the system at all times without remembering previous screens?
- Is all content needed for navigation or task found in the “current screen”?
- Is the information organized according to logic familiar to the end user?

5.- Flexibility and efficiency of use

- If there are, is it clear how to use them?
- Is it possible to easily perform an action done earlier?
- Does the design adapt to the changes of screen resolution?
- Is the use of accelerators visible to the normal user?
- Does it always keep the user busy? (without unnecessary delays)

6.- Help users recognize, diagnose and recover from errors

- Does it display a message before taking irreversible actions?
- Are errors shown in real time?
- Is the error message that appears easily interpretable?

7.- Preventing errors

- Does a confirmation message appear before taking the action?
- Is it clear what information needs to be entered in each box on a form?
- Does the search engine tolerate typos and spelling errors?

8.- Help and documentation

- Is there the "help" option?
- If so, is it visible and easy to access?
- Is the help section aimed at solving problems?
- Is there a section of frequently asked questions (FAQ)?
- Is the help documentation clear, with examples?

9.- Save the state and protect the work

- Can users continue from a previous state (where they had previously been or from another device)?
- Is "Autosave" implemented?
- Does the system have a good response to external failures? (Power cut, internet not working, ...)

10.- Color and readability

- Do the fonts have an adequate size?
- Do the fonts use colors with sufficient contrast with the background?
- Do background images or patterns allow the content to be read?
- Does it consider people with reduced vision?

11.- Autonomy

- Does it keep the user informed of system status?
- Moreover, is the system status visible and updated?
- Can the user take their own decisions? (Personalization)