UNIVERSITY OF NAIROBI

SCHOOL OF COMPUTING AND INFORMATICS

EVALUATION OF THE IMPLEMETATION OF CASHLESS FARE SYSTEM IN KENYA'S PUBLIC TRANSPORT SYSTEM

BY

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DECLARATION

This project report is my original work and has not been presented for a degree in another University

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This project report has been submitted in partial fulfillment of the requirements of the Master of Science Degree in Information Technology Management of the University of Nairobi with my approval as the University Supervisor

Signature: ....

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DEDICATION

This work is dedicated to my dear wife, loving parents and siblings for always encouraging me to never stop aiming high in life.

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I first thank God for the life He has blessed me with and the far He has brought me; for His unending grace, love, guidance and blessings.

I am grateful to my loving wife, Irene, for walking with me during this journey in my life and always pushing me to reach higher limits in life.

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ABSTRACT

As the technology grows, there is a shift by governments in the developing countries towards integration of ICT in service delivery. Public ICT implementation in developing countries is sometimes faced with challenges especially during the implementation stage. There is a need therefore to evaluate the implementation process and be able to identify the critical success factors of public ICT infrastructure. The aim of this study was to evaluate the implementation of the public fare system and to establish the critical success factors for such an implementation. The research used a quantitative approach through the use of structured questionnaires to gather data. The findings revealed that user participation, compatibility (interoperability) and training were the most critical factors that need to be addressed during the implementation of the cashless fare system.

Keywords: public transport; cashless fare system, critical success factors, implementation.

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1. BACKGROUND INFORMATION

1.1. INTRODUCTION

Public transport system in developing countries is normally provided by small operators. These services are operated in what seems to be ad-hoc manner, but yet again, the commuters in these countries have learnt to rely on them.

The way they are operated is not well understood as they do not have a schedule that they follow. The term 'paratransit' has been used to describe a flexible mode of the operation of public passenger transportation that does not have fixed schedules (Behrens et al 2016).

In developing countries, paratransit services are provided for the general population and are usually weakly regulated or there are illegal operators within the sector. Due to this, it public transport in developing countries is normally referred to as 'informal transport' (Behrens et al 2016).

It should be noted that even in areas where the sector is well developed, it first emerged as an informal sector and through regulation and tax compliance, public transport has developed to be a mainstream business. Governments in developing countries have been making strides in ensuring that the public transport is not only regulated, but also get the business units to have a formal and legal way of taxation.

1.2. BACKGROUND INFORMATION

In developing countries, the passengers neither own the vehicles, nor do they determine the vehicle's route, service times and occupancy. In respect to paratransit regulation and integration, Behrens et al (2016) argue that existing regulations present an obstacle to emergence of innovative services, and that allowing free market entry and fare deregulation would enable a rich mix of new services and that the fare structure would reflect the actual operating costs of the services. They view the reduction of barriers to market entry as a way of increasing the supply of services and increasing the competition between the service providers thereby reducing the fare prices, improving the quality of the service and eliminating the illegal operations.

Sohail et al (2006) noted that there is a need for paratransit to self-regulate in conditions of weak government regulations and enforcement capacity.

While trying to avoid the heavy regulations that increase the negative effects of paratransit, government regulations and legal frameworks would therefore need to reduce on non-compliance and corruption.

In Kenya, regulation on public transport is loosely organized. The National Transport and Safety Authority has spearheaded the transformation of the previously unregulated sector to become a more organized sector. Among the changes they have put forward, in 2013, they published regulations that would form guidelines to the sector. Among the guidelines, all public servicing vehicles, commonly known as *Matatus* in Kenya, must belong to a Savings and Credit Cooperative Organization (SACCO) and they must have a cashless fare system in place.

1.3. STATEMENT OF THE PROBLEM

In public transport, the Kenyan Government, through the National Transport and Safety Authority, NTSA, has published regulations to the stakeholders in the paratransit sector to adopt a cashless fare system. These systems are aimed at collecting and recording the amounts collected in fare. The NTSA was to provide a supervisory role in the implementation of the cashless fare system infrastructure.

This move follows the attempt by the government to organize and streamline the public transport. Consequently, NTSA had published regulations to all *Matatu* owners to form Savings and Credit Cooperatives (SACCOs) to implement and start using cashless fare system by 1st July 2014 (NTSA, 2014).

In June 2014, the NTSA published regulations instructing all Matatus to introduce and implement cashless fare systems (Business Daily, 11 December 2014). According to NTSA, the implementation of the cashless failed due to numerous challenges that they faced. They listed one of the major hindrances to the implementation of the system as the failure of service providers to share infrastructure platform (Business Daily, July 21, 2015).

The system has not been implemented, and the SACCOs that installed the system no longer use the system. To them, installation was just a way to comply with the regulations in order to continue with their business.

1.4. AIM OF THE STUDY

This study aims at evaluating the implementation of cashless fare system in the public sector using an Information System Implementation framework. From the onset, the study will evaluate the system from a 'failed system standpoint'.

This paper seeks to answer to important questions: how the failure happened and why the failure happened.

1.5. SPECIFIC OBJECTIVES

The study is aimed at achieving the following objectives:

1. To investigate the type of the failure of cashless fare system..
2. To identify the critical success factors of successful implementation of cashless fare system.

1.6. SIGNIFICANCE OF THE STUDY

This study aims at answering two important questions in system implementation: how did the failure occur and why did it fail?

The study will help to identify the legal framework within which the public transport operates. It will help in understanding the organization and operation of the public transport thereby identifying the institutional factors and sectorial factors that may have led to the failure of cashless fare system.

1.7. SCOPE OF THE STUDY

After successful study and analysis of the result, the outcome of the study will cover the following areas:

1. The study will analyze the scope of the public transport system and the key players in the sector in an attempt to understand the sector.
2. The study will analyze how the failure of the cashless fare system occurred.
3. The study will identify reasons why the cashless fare system happened.
4. The study will analyze the regulatory framework within which the sector operates and how compliance is enforced.

5. The study will identify the challenges of the cashless fare systems in and some of the possible solutions to these challenges.

1.8. CONCLUSION

In the context of this paper, we commit to explaining the systems failure in developing countries' government spheres in terms of intertwining relationships in the system context. Because of the magnitude of the potential impact the system has on the members of public, cashless fare system is chosen to explain how and why failures occur in information systems implementation.

By choosing NTSA, it does not mean that the Authority is susceptible to failures of their Information systems. It is chosen due to the potential impact of the system and since the system chosen falls directly under the Authority. The same factors could apply to the private sector systems, whether at micro level or macro level.

2. LITERATURE REVIEW

2.1. INTRODUCTION

This chapter starts by reviewing the literature that has been published by the accredited scholars in the area of ICT implementation and system failures. The aim of this literature review is to remove the duplication in projects that may have been presented in the past and to identify the best framework to adopt in reviewing the implementation process of cashless fare system in Kenya.

This chapter will focus on the implementation process of Cashless fare system in Kenya's public transport sector. The issues that will be addressed include the infrastructural framework for successful implementation of the system.

2.2. CASHLESS SYSTEMS

Development in technology has led to changes in a number of things and the way some activities and transactions are carried out. Consequently, some traditional methods like alarm clocks, tape recorders and watches have been faced out. This trend has evolved and is slowly replacing the traditional paper money. Kiwanuka (2016) argues that cash and wallets will soon be replaced by electronic money. The shift towards cashless payments can be partly attributed to the convenient it offers. People are able to pay for services remotely without the need to queue or commute to the paying stations; vices like pickpocketing are minimized; cards are easier to carry around and safer as opposed to paper money; and lastly, electronic money has less counterfeits, if any, as opposed to paper money.

Cashless fare systems have been introduced in a number of countries globally. Kiwanuka points out United Kingdom, United States of America as some of the countries that have adopted cashless fare systems. Rwanda and Kenya have tried to implement the cashless systems in different sectors, with Rwanda implementing the cashless fare systems in the transport sector. Kenya is still in the process of implementing the system and having the system to be fully operational.

2.3. THEORETICAL BACKGROUND

In order to bridge the gap between the potential use of ICT resources and the actual use of the resource, a good implementation framework must be developed and used.

1.3.1 Implementation affects quality

Successful ICT implementation affects the quality of ICT facilities and information systems quality which in turn affect the perceived benefits. In this regard, therefore, ICT project implementation can be termed successful if it is able to realize the perceived benefits (Gichoya, 2007).

The quality of ICT can be assessed by evaluating the infrastructure and the technical functionality. This involves both the technical evaluation and the user evaluation. The quality of any information system can also be evaluated by looking at the quality of information that it generates. A quality system is the one perceived to generate quality information that supports decision making.

The end products that can be used to judge the success of a system are usually the perceived benefits. Benefits that users expect to see in any implementation of ICT systems may include easier communication; system integration; reduction in operational costs; networking; and timely, relevant, complete information (Gichoya, 2007). If a system is not able to deliver on these perceived end products, it will be considered to have failed.

In order to achieve the desired benefits, proper planning is important. Plans fall into two categories: vision without substance and budget without vision (Gichoya, 2007). Planning can help in reduction of waste by identifying the conditions of a successful implementation of ICT system without having to "rush into a complex government strategy without finalizing the national ICT policy" (Aineruhanga, 2004).

1.3.2 Performance Evaluation

Gichoya identifies skilled project team, politics, management support, available resources, infrastructure and users as the key drivers for the successful implementation of ICT system. These factors affect the quality of ICT facilities and the quality of information derived from the systems. These two will therefore affect the perceived benefits of information systems.

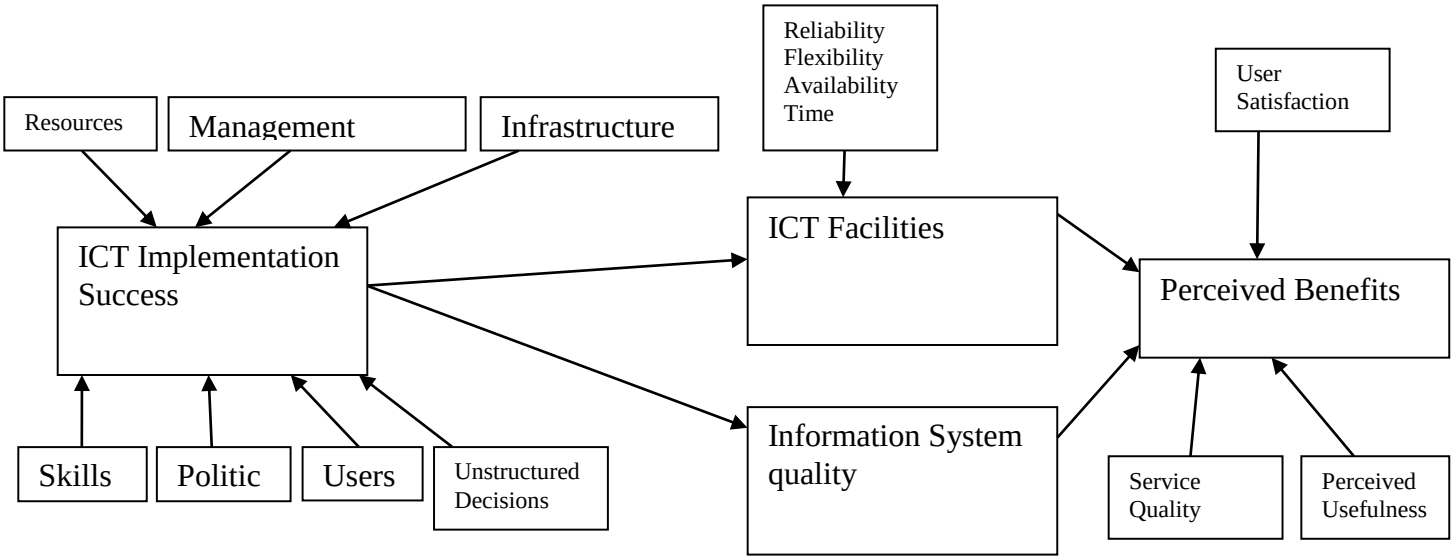


Figure 1: Framework for ICT Implementation evaluation in public sector (Gichoya, 2007)

1.3.3 ICT System Implementation in Government Sectors

ICT evaluation refers to establishing the value of ICT to organizations by the use of qualitative and/or quantitative methods (Khalifa et al 2004). Evaluation means comparing the performance of ICT systems against the goals that have been set. Evaluation should be an ongoing process and should be done while the project is underway so as to determine if the project is meeting its performance goals. This aspect is referred to as formative evaluation (Tina et al, 2005).

According to Doherty and King (2004), evaluation of information systems can be defined as the process of finding the actual worth and importance of information system by the use of qualitative and quantitative methods. This process is mostly done after a new information system has been implemented, so that the effectiveness of the system is analyzed and suggestions are put forward on how to improve the system in order to meet the changing organizational objectives and targets.

Summative evaluation is done when the system has been fully developed, and implemented for its intended users. The guiding principle during summative evaluation is efficieny, how well the system meets the users' needs and the impact it has on the organization. (Rao and Rhee 2008).

Tina et al (2005) identify a five layered approach in evaluating ICT implementation.

1. Pre-project preparation: before project implementation, one is supposed to consider the overall goals that they want to achieve. These goals should be well defined. Moreover, one is supposed

to understand the context, identify the key players and select different implementation approaches.

2. Overall goals and objectives: The goals identified are high level statements that give an overall context for evaluation. For instance, the goal of evaluating the implementation of cashless fare systems in Nairobi would be to gather quantitative data that can be analyzed for decision making process.

3. Context: all projects take place within a context and their implementation is often influenced by the existing national and local policies, political and administrative structures. The risk of implementing a project should therefore be taken into account and issues like stakeholders cooperation and data gathering should be considered beforehand.

4. Key Players: These can be grouped into 3 categories:

a). Stakeholders: this refers to the group that initiated the project. They may include policy makers and local or national authorities, community groups, welfare groups or any other group or individuals who are brought on-board in the course of implementing the project. These people need to be involved actively in order to know their interests in the system and ensure that they system is able to deliver its expectations to these groups.

b). Implementers: these include the vendors who make or manufacture/develop the project and those who are charged with rolling out the project. The implementers could be individuals or group of people or organizations.

c) Beneficiaries: those who are expected to reap the benefits of a system

1.3.4 ICT Application in government

Government administration is complicated and has unique characteristics. The decision making process is usually bureaucratic and politically influenced which at times may not be driven by efficiency (Gichoya, 2007). As opposed to the private sector, where investments in ICT are justified by the expected profits, government institutions have to justify their investments using rationale such as providing better services, and reduction in budget expenses. They are therefore subject to financial constraints, legal/contractual regulatory frameworks which are more strict and binding as compared to the private firms.

Yusof et al (2008) identify 4 phases in evaluation: preliminary, validity, functionality and impact. These also depend on the phase at which the implementation is. Based on this, evaluation

can therefore be formative or summative. Formative evaluation tries to improve the system under development or during implementation. It tries to identify the problems with the system in development as they emerge.

Summative evaluation tries to assess the system while in use, its operations and the overall system effectiveness. It provides information that is useful to determine whether the system will continue to be used or not.

1.3.5 Evaluation challenges in public ICT infrastructure

Most governments in developing world are increasingly adopting ICT as a way to increase efficiency and improve transparency. This calls for a need to have systems that can support e-government services in a wide range and diverse sectors. Due to the high rate of ICT success in private sector, there is a very high expectation of the same success from the government system (Edmiston, 2003).

Due to the complex nature of the citizens, and their varied expectations of ICT systems, the evaluation of ICT systems in government is considered difficult. Due to this complexity, the focus is mainly on ease of use and safety (Sharma & Yucik, 2004).

To overcome the challenges of implementation of the system, DeLone and McLean (1992) Model identifies six components: system quality, information quality, use, user satisfaction, individual impact, and organizational impact.

2.4. EVALUATION FRAMEWORKS

In order to do a thorough evaluation of the implementation of cashless fare system in Kenya, the author reviewed different frameworks that are already in existence. These frameworks were further classified based on their focus.

Generic evaluation frameworks put more emphasis on the methods that are to be used in system development. Friedman et al (1997) evaluation criteria can be grouped into eight steps of subjective and objective evaluation types. They argue that the system should be part of the overall infrastructural technology in an organization as well as social-cultural and functional environment of such an organization.

System development life cycle framework argues that the evaluation methodology should be based on the different stages in system development. The framework proposes a comprehensive

evaluation of the organization and technology spheres. It however leaves out the human aspect and the overall evaluation of the system as a whole.

IT Adoption Model proposes an evaluation of the system from user's perspective. Due to its user-centric view, the model is inadequate to be used for a larger organization and it will be limiting when it comes to evaluating the implementation of a system from a government perspective.

1.4.1 Lucas model

Lucas's most important contention is that systems fail since the organizational behavior problems are ignored in the design and operational of the system. The failure is based on 3 variables: attitudes and the perceptions of the users; system use and performance. Favorable user attitudes and perceptions affect the technical quality of systems which in turn affect the usage of the systems. This notion is in line with what Gichoya presents in his model of government ICT projects implementation.

1.4.2 Lyytinnen and Hiirscheim

They identify four major categories of failures:

Correspondence Failure: it is based on idea that design objectives are documented first and an evaluation is conducted to establish if the objectives are met or not. If the two are not in sync, the system is regarded as failed. This is the most common failure of information systems.

Process Failure: this results from the development process that does not produce a working system. It can also result from systems that are delivered over budget or past the deadlines.

Interaction Failure: This is focused on the use of the system. If a system is heavily used and reliable, the system is considered to be a success. The overall use of the system determines how successful a system is.

Expectation Failure: this is the inability of the system to meet specific expectations of a group of stakeholders. It shows that there is a gap between an existing situation and a desired situation for some specific members of a particular group. From their view, the failure is localized to specific group of stakeholders.

1.4.3 Sauer Model

The model is based on exchange relations. The model presents 3 key components of information system: the project organization, the information system and its supporters.

The information system depends on project organization which in turn depends on supported, and supporters depend on the information system. The project success depends on the expertise and efforts of the project organization and project organization is dependent on the provision of support.

1.4.4 Delone and McLean IS Success Model

The emphasis of this model is to measure the success of information systems. It identifies seven dimensions of success: information quality, system quality, service quality, use, user satisfaction, individual impact and organizational impact.

The model was developed by DeLone and McLean and it has been used in many studies over the years (DeLone and McLean, 2003). The McLean Model was later modified in 2003, and this resulted in the extended model.

The model indicates that the components are interdependent and not independent. The model indicates that the success of an information system does not depend on one factor but rather on the several interrelated factors.

A system exists to serve a user, and the user can be satisfied or not in the course of using the system and this usage has a lot of impact on the users. The total individual impact is what created an organizational impact. The two key characteristics of a system are the system quality and information quality. System quality tries to measure the overall technical success of a system whereas the information quality tries to measure the sematic quality of a system. The effectiveness of a system is measured using the constructs of use, user satisfaction, individual impact and the overall organizational impact (DeLone & McLean 1992, 2003).

After the review of empirical researches, the original model was updated and service quality was introduced while the individual and organizational impact was replaced net benefits. Another key important was that use must occur before user satisfaction. McLean and DeLone explain that positive experience with use will lead to higher user satisfaction and this will lead to higher intention to use and ultimately lead to effective use of the system.

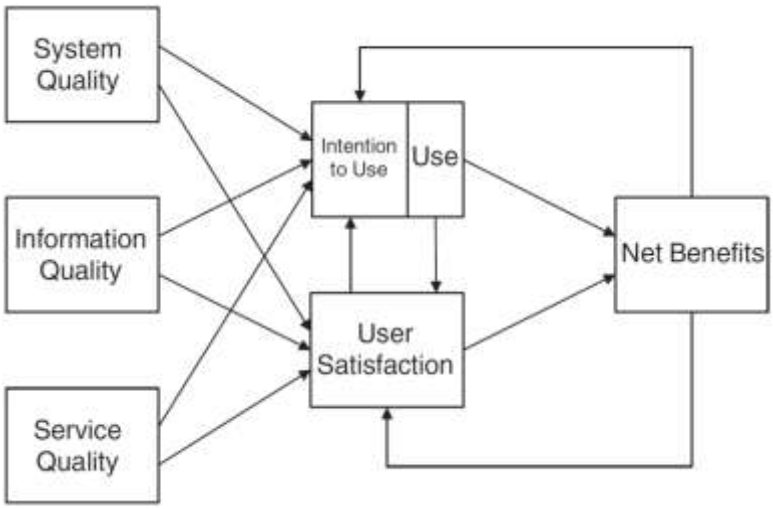


Figure 2: Constructs of DeLone and Mclean Model (Rai et al., 2002)

1.4.4.1 System Quality

The system quality is concerned with how well the system conveys symbols of communication. It is the desired characteristic of the system in regards to the production of information that is to be used by the users. The system quality is therefore viewed from the technical perspective. Some of the issues that are considered include bugs, user interfaces, ease of use, quality and maintainability of program codes and user experience.

The metrics of system quality which have been used in the literature are flexibility, stability, reliability, usefulness, user-friendly interface, ease of use and response time (e.g. Bailey & Pearson, 1983; Doll & Torkzadeh, 1988; Rai et al., 2002; Yusuf, Gunasekaran, & Abthorpe, 2004); usability, availability, reliability, adaptability and response time (DeLone and McLean, 2003), comprehension, turnaround time, ease of access, accuracy of information, completeness of information, relevance of outputs.

1.4.4.2 Information quality

This is the meaning that is attached to the information that is received by the receiver. The information quality is related to the content, accuracy and the format of the information (Rai et al., 2002). The most common measures of information quality include timeliness, consistency, completeness, accuracy and relevance (DeLone and McLean, 2003), reliability, format, user friendly, up-to-date, applicable, sufficient and related.

1.4.4.3 Service Quality

DeLone and McLean define service quality as the overall support delivered by the service provider regardless whether the support is provided in-house or outsourced. Service quality can therefore be thought of as the degree to which the application meets the expectations of the users. The aspects of service quality that can be measured include the service quality include assurance, empathy, responsiveness, efficiency, availability, privacy, contact, perceived value, fulfillment, usability, information quality, service interaction and responsiveness.

1.4.4.4 Use

According to DeLone and McLean, there is no precise definition of what system usage is. For the purpose of this study, use will be taken to mean the actual utilization of information system in everyday work and tasks. This notion is strongly supported by Petter (2008) who argues that use is the actual utilization of capabilities of a system.

Use cab be measured by information retrieval, execution of transaction, frequency of use, time of use, number of access, dependency and usage pattern, time spent using the system, frequency of use and the number of users.

1.4.4.5 User Satisfaction

This is considered as the most common measure of success for information systems (DeLone, 2004). It is the overall satisfaction the users get, and their opinion towards the system (DeLone, 2004). It is the overall feeling and attitude towards a variety of factors affecting a situation (Pearson, 1983).

1.4.4.6 Net Benefits

This is the degree to which a system is helping the organization to succeed. It is the balance between positive and negative impacts of a system. The construct can be measured by productivity, task innovation, improving the work quality.

1.4.5 Critical Success Factors

This model identifies the key factors that are required in implementation of ICT systems. Due to the rapid growth in ICT, there is a lot of emphasis on identifying the key factors that affect the success of ICT projects (Athar et al, 2013). The framework was developed in 1980s due to the

interest in finding out why some organizations were successful than others.

Critical successful factors can be defined as those things that must be done so that an organization can be successful (Ingram, H., et al., 2000). These factors are usually few in quantity, quantifiable and manageable (Selim, H.M., 2007).

Athar et al (2013) identify some critical factors for the success of ICT projects.

1.4.5.1 Management Support

It is important for the management to support, prioritize and understand a project. When a project is supported by the management, and is highly prioritized and the management understands the project, there are higher chances of the system to succeed. (Biehl, 2007).

Top management support is affected by the general state of economy. Management support ensures that the business vision is achieved by ensuring interaction among users and the different departments involved in the project.

1.4.5.2 Leadership

Lack of leadership makes the project implementation to take longer than necessary. Leaders should have strong technical and relational skills and should use their influence to ensure successful implementation of ICT projects (Athar et al, 2013). Leadership calls for a charismatic project manager, and they should use their influence and charisma to mold the project environment.

1.4.5.3 Teamwork

There is a need for cooperation between members of the team. A well-coordinated team usually delivers ICT project on time and with minimal downtime.

1.4.5.4 Clear and precise goals

Well defined goals are identified as another critical success factor (Sudhakar, 2012)(McLeod, 2011)(Fan, 2010). A project must have clear, well defined goals so that plans can be put in place to achieve these plans. The goals should be realistic and these goals should be validated.

1.4.5.5 Team Capability

A well-qualified team is necessary to ensure successful project implantation. A project is more

likely to succeed if the team has the necessary expertise, and proper understanding of the project scope and environment. The team must have diverse capabilities and the knowledge of the functioning of the business unit.

1.4.5.6 Financial support

Financial support is necessary to oversee the project to completion. A project with enough financial support is more likely to succeed as compared to one with little or no financial support. Financial support is closely related to management support since the management is responsible for setting aside resources for the project, and to approve budgets for the project.

1.4.5.7 Effective Communication

Communication is necessary since it helps the stakeholders to understand the objectives of the project and this makes them responsible for their work. Communication should be clear, as direct as possible and should utilize adequate channels.

1.4.5.8 Process Quality

This refers to the monitoring of quality, by setting the acceptable quality standards right from the start of the project.

1.4.5.9 Training

Training facilities should be availed for the managers, staff and the end users. Training users makes them gain more confidence with the IT system and therefore affects their attitude towards the system (McLeod, 2011).

1.4.5.10 User Involvement

According to Lee, S. (2007), when users are not involved in the implementation and development of a system, there is high likelihood of the system to fail. Many IT systems fail since they do not meet the expectations of the users.

Project progress schedule

Software doesn't have physical manifestation and therefore proper tracking of development process is key to success of a software project. The project timelines should be clear and realistic for a project to succeed.

1.4.5.11 Risk Management

For a project to be successful, the user needs during development should be taken care of. Some aspects of development of software require a lot of user input, like design. This enhances the understanding of such a system, which in turn leads to its success.

1.5 CONCEPTUAL FRAMEWORK

A concept is defined as an abstract or general idea that is derived from specific instances or experiences (Kombo and Tromp, 2005). Conceptual framework is therefore a model that has been hypothesized that maps the relationships among the constructs of the model under study (Mugenda, 2003). Its aim is usually to classify and show the relevant concepts that would map the research, identify the gaps in the research and show the relationships among the concepts.

For this research, the researcher adopted the critical success factors. The model was used since it proposes some of the factors that could contribute to the success of a system. The successfulness of a system can be evaluated using McLean model. For this reason, to show the implementation outcome, the enhanced McLean model was used.

In developing countries, politics play a major role in determining the implementation process of ICT systems and other systems in general. If there is no good will from the political class, there will be legal and administrative obstacles which lead to system failures. If the political class is willing to implement a system, they will be ready to create conducive environment for implementation of the system by creating administrative structures and legal framework that will support the system.

Availability of resources, stakeholders' participation, skills, management support and potential users affect the implementation process.

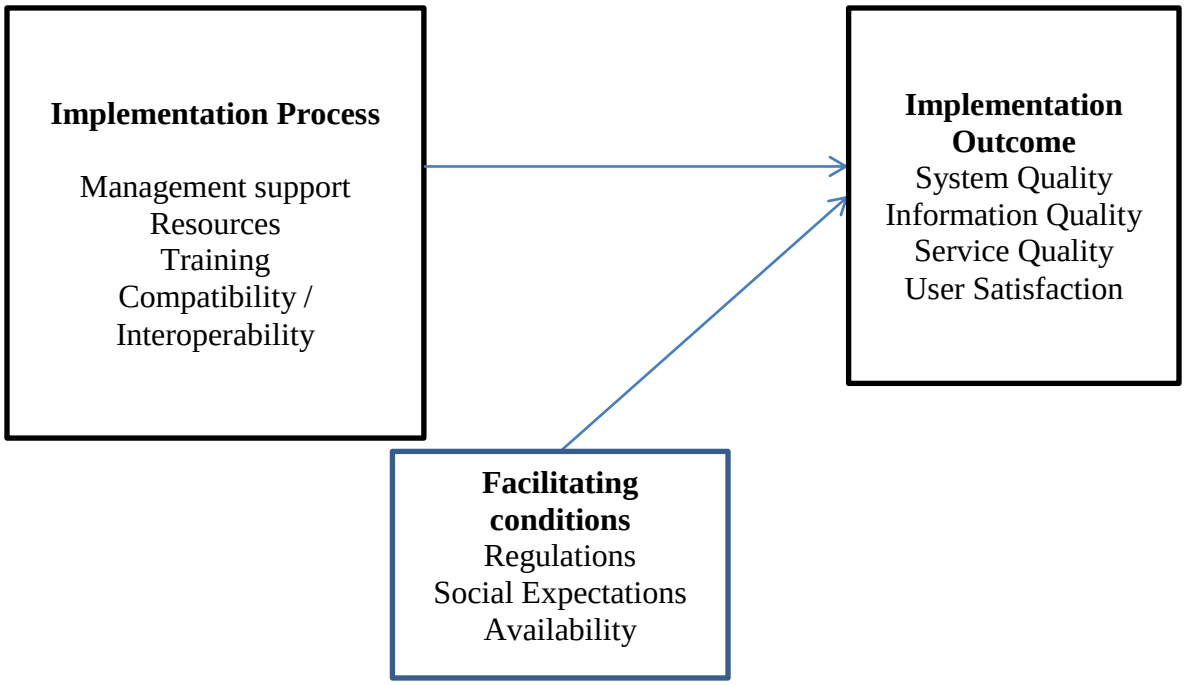


Figure 3: Conceptual Framework

Hypothesis

H1: Implementation process positively affects the implementation outcome

H2: Facilitating conditions positively affects the implementation outcome

1.5.1 Implementation Process

Implementation process is the rolling out of technology to ensure its usability and availability to the users. The implementation of ICT is a process and not a product. It is dependent on a number of factors.

Management Support

Most ICT projects are hindered by lack of management support (Kozma, 2008). Mangement support creates a suitable atmosphere for the system to thrive and get accepted by the users.

Implementation Outcome

System Quality

This is usually concerned with issues like system bugs, user interface, ease of use, and the quality of software code for the system. It refers to the reliability, convenience, functionality and reliability of information system.

Information Quality

This is concerned with the inputs and the outputs of a system. This can be defined as the reliability, completeness of information, accuracy and comprehensiveness of information.

Service Quality

The user service quality assures successful implementation by facilitating their needs and demands. User participation should be encouraged during implementation so that thye can get high quality service from the system (Hsiao, Chang, & Chen, 2011).

The measures of service quality include assurance, empathy, service follow-ups, and most importantly, technical support.

User Satisfaction

This is the most common measure of the success of IS system. The user satisfaction can be measured using the constructs such as reliability, timeliness, relevance and reliability of the information system. Petter et. Al (2008) identify format, content, accuracy, ease of use and

timeliness as the most important factors that can be used to measure the user satisfaction of the system.

Facilitating conditions

This is a subset of conditions that affect the way the information system gets to be accepted by the users. In Kenya, the government usually publishes the regulations that the stakeholders are required to follow. It is hypothesized that these conditions can affect the way the information system becomes acceptable. The facilitating conditions are theorized to include **regulations**, s**ocial expectations** and **availability.**

2.5. CONCLUSION

Whereas different frameworks exist, they complement each other. They evaluate the different areas of system implementation. In order to come up with the best evaluation criteria, it would be best if different aspects of each framework are grouped together to create a framework that can be used to evaluate the implementation of cashless fare system for public transport.

3. RESEARCH METHODOLOGY

3.1. INTRODUCTION

According to Chekland (1981), methodology is a set of principles of methods, which in any particular situation, has to be reduced to a way uniquely suited to that particular situation. This statement is further emphasized by Rowley (1990) who defines methodology as a body of methods, rules and postulates employed by a discipline.

This chapter will describe the techniques and methodologies that were to gather and collect data for the project. The aim of data collection was to comprehensively gather the relevant data that would help in analyzing the implementation process and the success or failure factors for the cashless fare system. The data collected was used to analyze the current challenges of the system leading to the identification of the critical factors that contributed to the failure of the implementation process.

3.2. RESEARCH

The precise knowledge on the present and future user needs of the system is necessary to develop a system that meets the stated objectives. It is also important to evaluate the forms of the working environment that the user needs the system to work in. Therefore, gathering of the relevant data was the key in meeting the stated objectives of the study. In line with this, therefore, a suitable research methodology was adopted in terms of research tools and research strategy.

Research refers to a search for knowledge (Konthari, 2003). The search for knowledge is systematic. Therefore, research is a scientific and systematic search for pertinent information on a specific topic. According to the Advanced Learners' Dictionary of Current English defines research as a "careful investigation or inquiry especially through the search for new facts in any branch of knowledge". This definition is emphasized by the definition of research from the Encyclopedia of Social Sciences which defines research as "the manipulation of things, concepts, or symbols for the purpose of generalizing to extend, correct or verify knowledge, whether that knowledge aids in construction of theory or in the practice of art"'.

According to Khamadi (1993), research methodology is an operational framework within which the facts are placed so that their meaning may be seen more clearly. Research methodology is a harmonious collection of methods for the analysis and design of data processing systems,

coupled with a prescribed order in which these methods are applied (Parkin, 1991). This methodology should provide the general guidelines which are useful for many different types of systems.

Checkland (1981) also defines methodology as a "set of principles of methods, which in any particular situation has to be reduced to a way uniquely suited to that particular situation".

Rowley (1990) defines methodology as a "body of methods, rules and postulates employed by a discipline".

Avison and Fitzgerald (2006) define a methodology as a collection of procedures, techniques, tools and documentation aids which will help the system developers in their efforts to implement a new information system.

Research methodologies are the tools, references, methods, strategies, rules and the principles necessary for carrying out a scientific and systematic data collection process. In evaluating the methods of data collection, decisions were made so as to ensure that the right tools for the right purpose were chosen. Therefore, the researcher had to decide on the best method for a particular purpose and then assign the tools required to do the job.

In the field of information systems, research tools and techniques are necessary for the purpose of evaluation of the implementation process of an information system. The techniques that were chosen for this study were arrived at after evaluating them in terms of their suitability, the objectives of the study, the research questions, the organization and its environment, and the time available for the study.

3.3. RESEARCH PHILOSOPHY

Research philosophy refers to the standpoint of the researcher in relation to the way the data about phenomena will be collected. Information systems research is similar to social sciences research in that, they both deal with the interaction of people (Hirschheim, 1995)

3.2.1 Research Assumptions and Theoretical perspective

The assumptions of the research provide the opinion of the researcher and it is on these assumptions upon which the researcher builds their methodology that will be used in the research. Crotty (1998) argues that it is important for the researcher to explain their philosophical position that is adopted in the research.

Johnson & Duberley (2000) suggests that research assumptions can be shown as a continuum with objectivism on one hand and subjectivism on the other hand. Where the researcher and the phenomena being studied are independent, it is referred to as objectivism. The researcher studies the phenomena independently without influencing the phenomena by the researcher's view and opinion.

Hussey & Hussey (1997) highlight eight features of positivism approach. A quantitative method is used, although some qualitative methods can also be used. Secondly, sample sizes are usually large so as to generalize the findings. Thirdly, hypotheses are tested by statistical methods. Fourth, the data that is used is normally specific and is used to reach conclusions. Fifth, investigation of the problem is not usually conducted in the field. Sixth, reliability, concerned with the repetition of the test – if the study is repeated, the same results and conclusions should be reached. Seventh, validity – the findings should represent real situations. Eighth, generalization is made from the samples.

Interpretative studies have subjective epistemology and usually involve inductive logic. It uses qualitative methods reliant on investigating theories. In interpretive study, the reliability is low and the validity is high in the findings (Collis & Hussey, 2003). The researcher is therefore required to understand that his interpretations of the findings is influenced by his own culture, beliefs and experiences (Creswell, 2009).

In choosing a research philosophy, the researcher tried to avoid **methodological monoism** (whereby the researcher insists on using one single method). It has been observed that there is no single methodology that is intrinsically better than the other (Benbasat et al, 1987). In order to improve the quality of the research, a combination of methods is therefore necessary. The

argument to this is not due to inability to decide between the various merits and demerits of each of the philosophy, but due to that fact that the research can include elements of both approaches.

The **intrepretivism** approach was suitable since the phenomena that were being studied, in addition to them being in their natural form, involved interpretation and intervention in order to fully understand them. In addition, some of the aspects of the conceptual design were hard to observe and come up with conclusion.

The research involved investigation of a failed system implementation. Some of the aspects of the implementation process were either inexistent whereas others were vaguely implemented and enforced. By taking an **intrepretivism** philosophy, these aspects were easily understood from the perspective of the respondents as well as the researcher.

Where the system was being in used, **positivism** philosophy was used whereby the researcher described the phenomena both epistemologically as well as the doxology about the phenomena. In other words, the researcher was trying to transform things from what is believed (**doxa**) to what is known (**episteme**).

Overall, and in line with the research questions in Chapter One, as well as the conceptual framework in Chapter Two, the researcher believed that **pragamatism** philosophy was required for the study. This involved understanding how the information system was implemented, and understanding the role of other stakeholders in the implementation of the information system. Without the involvement of the different stakeholders, it would have been impossible to evaluate the implementation of the information system.

3.3 **RESEARCH DESIGN**

Research design refers is a detailed work plan on what needs to be done in order to complete a project. It ensures that the evidence that will be obtained during data collection helps to answer the research questions as clearly as possible. It helps to remove any ambiguity that was there during the start of the research.

3.3.1 Elements of the Research Process

Research design deals with a logical problem and not logistical problem (Yin, 1989). It is the process that involves overall assumptions of the research to the method of data collection and analysis (Creswell, 2009). The objectives of the research therefore determine the choice of the research design in order to answer the research questions (Crotty, 1998). It is important therefore, for the researcher to describe their research elements, and then describe their philosophical stance.

3.3.2 Qualitative Approach

Qualitative approach involves an interpretative, naturalistic approach to the study phenomena. The researcher study things in their natural setup and tries to interpret the phenomena in terms of the meaning people associate with the phenomena (Newman & Benz 1998). The enquirer makes claims based on primarily constructivist perspective (multiple meaning of experiences) or advocacy/participatory (issue oriented, collaborative) or both. The researcher collects data with the intention of developing themes from the data (Creswel 2003).

It is however difficult to make a decision whether to entirely use qualitative or quantitative approach or even a mixed method approach. The decision is based on the judgment of the researcher since both methods may include different methods (Hanson and Grimmer, 2007).

Qualitative research was used to test an objective theory and it required the researcher to collect numerical data and analyze the data numerically or statistically.

3.3.3 Quantitative Approach

The researcher used post positivist claims for developing knowledge, and employs strategies like experiment and surveys to collect data. This approach involved the study of cause and effect. It required highly controlled conditions and due to this, the richness and depth of meaning to the participants were greatly sacrificed.

The researcher adopted qualitative approach as opposed to the quantitative approach. The information implementation process was highly dependent on people. It was therefore hard to separate their feelings and attitudes towards the implementation process. When reviewing the implementation process, the researcher needed to have the same understanding as the implementers and the regulators. This is the reason why the researcher adopted the qualitative approach.

3.4 SOURCES OF DATA

To acquire the relevant data, the sources were identified and these sources were grouped into the documentary reviews, the regulator, the vendors' and implementers' staff, the owners of the public service vehicles and the operational staff. The documents that were reviewed include the regulations regarding the requirements and the regulations that were to be followed in implementing the system and the published articles in the dailies detailing the views of the respondents.

3.4.1 Documentary Review

The documents that were reviewed include the NTSA regulations and newspaper articles. These documents were considered due to their nature and the relevance to the study. The newspaper articles document first-hand information on the expected benefits of the system. The NTSA regulations were reviewed in order to establish if there were any specific requirements that the system or vendors had to fulfill during the implementation.

3.4.2 Operational Staff

The operational staff included the drivers and conductors of the vehicles. Due to the nature of their work and their daily chores, these people were targeted due the vast information they collect in the course of discharging their duties. These people are also familiar with the work procedures in the relevant areas under study. The information that was collected included the expected impact of the proposed system, and their suggestions of what made the system to fail. The feedback from the information collected from this group was used to establish the perception they had to the system and their level of participation towards the failure of the system.

3.4.3 The regulator

The regulation information that was sought from this group includes the evaluation of the current system and their expectation of the new system. The researcher also collected the information that would be helpful to establish the strategic planning of the implementation of the system.

The other kind of information that was sought after from this group included the specific motivation of implementing the system, vendor cooperation and stakeholder involvement in the implementation of the system.

3.5 STUDY POPULATION

To get the relevant information necessary for the project, the study population will include the personnel of National Transport and Safety Authority, *Matatus* Owners Association, operational staff (drivers and conductors), vendors and implementers.

As outlined earlier, the study population will be divided into the three major categories which include the regulator; the vendor and implementers; and the owners and operational staff.

The operational staff will be involvement since they are the people who were/are directly responsible for the daily running of the system. These people have a direct link to the operations of the system and the success of the implementation of the system highly depends on them.

On the other hand, the regulator will be involved because their support and the full backing of the system will ensure the successful implementation of the system. Further, the regulator will be involved since they are the ones to set the necessary procedures that the vendors and the implementers will adhere to. As the project owners and the regulators, the study will establish the necessary motivations of the project; expected benefits and outcomes of the project; and the project management structures that the regulator had put in place.

There are over 20,000 registered *matatus* in Kenya as of December 2014 (BBC, 2014). The *matatu* owners have formed a welfare association known as *Matatu* Owners Welfare Association.

In Kenya, NTSA requires that for a *Matatu* to be allowed to offer services to the end user, it must obtain a license from NTSA. The *Matatu* must also belong to a SACCO. The SACCOs are the managers of the *matatus*, and they make the collective decisions of the *matatus* that they manage. There are currently 130 registered matatu SACCOs in Kenya, and these belong to Matatu Owners Welfare Association.

In order to obtain a confidence level of 95%, and the confidence interval of 2%, a total of 123 SACCOs were selected for the study.

Vendors

The following are the vendors, who are currently offering cashless fare system in Kenya,

- KCB – Abiria Cards
- Tangaza Pesa – mPOS
- Equity Bank – BebaPay
- Family Bank – yet to introduce
- Diamond Trust Bank – given special attention due to the choice by Matatu Owners to implement the next generation cross-platform for all Matatus

All the vendors were considered for the study.

3.5.1 Sample population

The sample population will be picked after a careful sampling method. The sample population for the survey will consist of the following;

Table 1: Sample population

Category	Number	Percentage of the total sample population
NTSA Staff/ Regulators	1	0.5
Matatu Sacco's/Owners	123	37
Vendors/Implementers	5	1.5
Drivers and conductors	201	61
Total	330	100

3.6 SAMPLING METHOD

3.6.1 Sampling Method

In order to select the study population, the researcher considered the population distribution. In order to come up a representative sample, the researcher considered the distribution of the *matatus* across the 47 counties, and from these, 37% of *matatus* were considered for the study.

From the number obtained from the representative sample, the researcher used random sampling to establish the actual Saccos that were considered in the study. To give each Sacco a chance in the survey, the researcher obtained a list of registered sacco from NTSA (NTSA, 2016) including the regions that they operate. The SACCOs were grouped into regions and from each region, all SACCOs were randomly selected (**using simple random)** by putting each SACCO's name on a piece of paper and randomly selecting the names till the required numbers are obtained.

To obtain an in-depth view of the vendors and the regulator with a high level of reliability of the information collected, the researcher chose to use the **purposive sampling.**

This purposive sampling led to a careful selection of persons from the regulator and the vendors based on the roles and responsibilities they have in different dockets. In addition, there was an additional data collection from the regulator in order to establish the challenges that they identified in the implementation process.

3.7 DATA COLLECTION TECHNIQUES AND THE RESEARCH INSTRUMENTS

These are the actual methods and tools that were used by the researcher to carry out the research and to collect the data that was used in the operationalization of the results.

According to Stone (1994), the techniques used for data collection must:

1. Be suitable for studying the problem,
2. Be within the available resources,
3. Be within the competence of both the surveyor (researcher) and the respondent
4. Produce the data required for the survey

3.7.1 Questionnaires

These are written questions which may be structured or unstructured and which are supplied to the respondents. The respondents were expected to answer the questions and return the questionnaires to the researcher who would then analyze the responses. This tool was used to gather data from a majority of the respondents. The questionnaires were very useful since they allowed equal representation of the views from the entire population.

To ensure that all those that would be affected by the system fully participated in the study, the questionnaires were administered to the concerned people who had been identified as part of the sample population. The questionnaire had both the close ended and the open ended questions. In answering the close-ended questions, the respondents were presented with a multiple choice from which they were to pick the answer. The open ended questions required the respondents to give a brief answer in the spaces provided. This was considered because there were incidences where the users were expected to expound on their answers and to give unguided answers for fair and reliable information.

This tool was found to be the best for the researcher since it allowed the researcher to reach out many respondents as possible within the shortest time available. This made the study to be completed within the scheduled time.

3.7.2 Interviews

This is a planned meeting in which the researcher met the respondent at a stipulated time and place and discusses the information being sought after. Interviews were done through face-to-face meeting while others were done through telephone calls. The researcher chose to use the face-to-face interviews as well as phone calls, in order to reach as many people as possible. This

decision was arrived at after considering the physical proximity of the respondents as well as the overhead costs of calling the respondents and traveling.

In carrying out the study, the semi-structured and open-ended questions were used. These helped to articulate the responses from the respondents and to exhaustively express their needs.

The interviews were considered since they were found to be the best tools to obtain information on goals, feelings, emotions and the expectations of the user over certain issues, which are difficult to get from hard data.

To ensure that the interview drawbacks like irrelevant details, loss of directional control and time wastage were eliminated or minimized, the guide questions were used. Further, precautions were taken to ensure that the chances of these drawbacks occurring were minimized. Interview schedules were prepared in advance. The responses were recorded on a notebook as the interview proceeds.

3.8 OPERATIONALIZATION OF THE CONCEPTUAL FRAMEWORK

3.8.1 Implementation Process determinants

Table 2: Implementation Process determinants

Construct	**Code**
1. During implementation, enough resources were committed to ensure the process is successful.	I1
2. The Authority supported the implementation.	I2
3. Training facilities were provided during the implementation.	I3
4. The system implemented was compatible to other similar systems	I4

3.8.2 Perceived usefulness and ease of use

Table 3: Perceived usefulness and ease of use

Construct	**Code**
1. Using the cashless fare system enables me to accomplish tasks more quickly.	PU1
2. Using the cashless fare system enhances the quality of my work.	PU2
3. I find the cashless fare system useful in my work.	PU3
PERCEIVED EASE OF USE	
4. I find the cashless fare system easy to use.	PU4

3.8.3 Facilitating conditions

Table 4: Facilitating conditions

Construct	**Code**
1. The management and employers expect me to be using the cashless fare system.	FC1
2. The authorities (government agencies) expect me to use the cashless fare system.	FC2
3. I can use the cashless fare across all public transport providers regardless of my card provider	FC3

3.8.4 Use

Table 5: Determinants for use

Construct	Code
1. I use cashless fare system every time I board public transport.	U1
2. I depend on the cashless fare system whenever paying for the fare.	U2

3.8.5 User Satisfaction

Table 6: Determinants for User Satisfaction

Construct	Code
1. I am satisfied with the cashless fare system.	US1
2. Cashless fare system has met my expectations	US2
3. Cashless fare system is exactly what I need	US3

4. DATA ANALYSIS, PRESENTATION AND INTERPRETATION

This chapter presents the findings on the data that was collected, the presentation of the data and the interpretation of the findings. The data that is presented in this chapter include the response rate, background information (demographics), and presentation of data for each objective of the study. The data analyzed and presented was based on the responses to the items in the questionnaires and interview schedules. Descriptive statistics are also used in analyzing the findings of this research project

4.1 QUALITATIVE ANALYSIS

4.1.1 RESPONSE RATE

In the study, 245 questionnaires were administered to the study population. Out of the 245, 217 questionnaires were filled and returned back. The sample response rate was 88%.

4.1.2 DEMOGRAPHICS

The researcher analyzed some demographic data of the respondents using the age, gender and the level of education.

4.1.2.1 Gender

Different gender has different opinions about various issues. The researcher wanted to find out the views of different gender interviewed. The findings are as indicated in table 4.1

Table 7: Respondents' Gender

	Frequency	**Cumulative Frequency**	**Percentage**
Male	209	209	96
Female	8	217	4
Totals	217	217	100

The finding shows that 96% of the respondents were male and only 4% of the respondents were female. This implies that more males were interviewed during the research.

4.1.2.2 Level of Education

Education level has an impact on how people respondent to different opinions. The researcher sought to establish the education level of the respondent. The findings are indicated in table 4.2.

Table 8: Education Levels

Level of Education	Frequency	Cumulative Frequency	Percentage
Primary Level	71	71	34
Secondary Level	132	203	61
Diploma	7	210	3
Degree	4	214	2
Postgraduate	3	217	1
Total	217	217	100

The findings show that majority of the respondents had a secondary education (61%). The respondents with the primary level education constituted 34% of the respondents; diploma level was 3% and the degree level was 2%. There was no respondent with postgraduate education level.

4.1.2.3 Age of the Respondent

The age of the respondent is important in research as people who are old in age may have different opinion than young people due to experience they have gained in the course of their duties. Also people of different age may have varying ideas about certain issues. The researcher wanted to determine age of the respondent and the results are as indicated in table 4.3.

Table 9: Age of the respondents

Age	Frequency	Cumulative Frequency	Percentage
18-30	45	45	21
31 – 40	54	99	25
41 -50	56	155	26
51 – 60	40	195	18
Over 60	22	217	10
Total	217	217	100

The findings indicate that there is almost equal age distribution within the bands that were used. The age bracket between 41-50 years had the highest number of respondents with 26%, 31-40 had 25%, 18-30 years had 21%, 51-60 had 18% and over 60 years were 10%.

4.1.3 IMPLEMENTATION

4.1.3.1 Resources

The researcher wanted to find out if there were enough personnel to oversee the implementation of cashless fare system. The findings are summarized below.

Table 10: Resources

	Frequency	Percentage
Yes	197	91
No	20	9
Total	217	100

The findings indicate that 91% of the respondents think that the authority had enough personnel to oversee the implementation of cashless fare system. This shows that the majority of the respondents have the opinion that the authority had enough resources to oversee the implementation process.

4.1.3.2 Stakeholder involvement

The researcher wanted to find out if there was stakeholder's involvement during the implementation of the cashless fare system. The respondents were asked if there was any stakeholder participation. The following table summarizes the responses obtained.

Table 11: Stakeholders involvement

	Frequency	**Percentage**
Yes	26	12
No	191	88
Total	217	100

The findings indicate that 12% of the respondents believed that *matatu* owners were involved in coming up with the cashless fare system. Majority (88%) of the respondents felt that there was no participation from the stakeholders.

4.1.4 Skills

The system implementation depends on the skills of the persons who are involved in implementing the system. The researcher wanted to find out if the implementers had the necessary skills to manage the implementation process.

Table 12: Skills

	Frequency	**Percentage**
Yes	169	78
No	48	22
Total	217	100

The findings show that 78% of the respondents believed that the implementers of the system had enough skills to ensure smooth implementation of the system. However, 22% felt that the implementers lacked the skills to implement the system.

4.1.5 Perceived Benefits

The researcher asked the respondents to list down the expected benefits of the cashless fare system. The respondents were required to write down what they expected from the cashless fare system. The table below gives a summary of all the responses from different respondents.

Table 13: Perceived benefits

	Frequency	**Percentage of the responses**
Ease of use (easy to use)	211	97%
Accountability and transparency in amounts collected – reduce theft	187	86%
Convenient (easily accessible)	45	21%
Cheaper fares	2	1%
Standardized fares	23	11%
Security (one cannot pickpocket)	3	1%
Easy to get change	203	94%
Reduces confrontation with *matatu* crew	162	75%
Help in budgeting and follow-ups of expenditure	44	20%

There were varied expectations of the cashless fare system, and the expectations varied from the standpoint of the respondent.

4.1.6 Actual Benefits

The researcher wanted to establish whether the system met the expected benefits or not. The respondents were asked whether the system met their expected benefits or not. The table below shows the responses obtained from the respondents.

Table 14: Actual Benefits

	Frequency	Percentage
Strongly Agree	3	2
Agree	20	9
Neutral	7	3
Disagree	96	44
Strongly Disagree	91	42
Total	217	100

From the findings above, most people disagreed with the statement that the system achieved its intended benefits. 44% disagreed with the statement while 42% strongly disagreed with the statement. Only 9% agreed with the statement while 2 percent strongly agreed with the statement.

4.1.7 Challenges

What do you think are the challenges of implementing the cashless fare system?

Table 15: Challenges

Challenge	**Frequency**	**Percentage**
Use of different cards for each vehicle	205	95
Job insecurity and uncertainty	101	46
Reduction in income levels	113	47
Accountability of money in cards	18	8
Inclusivity	88	40
Corruption	209	96

The researcher wanted to find out the challenges faced in the implementation process. The following were the responses from the vendors and the regulator.

Table 16: Challenges by the vendors

Challenge	Frequency	Percentage
Competition among the vendors	2	100
Differentiation	2	100
Resistance from the service crews	2	100
Fear of job loss	1	50
Security of money	2	100
Lack of common protocol to adhere to	5	100

The respondents were presented with some general questions that would elicit some experiences with the system. The findings of these questions are presented below.

4.1.8 Have you used the cashless fare system?

Table 17: Actual respondents who have used the system

	Frequency	Percentage
Yes	41	19
No	176	81
Total	217	100

4.2 QUANTITATIVE ANALYSIS OF DATA

The survey utilized questionnaires to collect data on the overall implementation of cashless fare system. The data collected was used to for analysis and for testing the model.

Model Validation

The validation of the Model was tested using the Partial Least Square with an objective of analyzing the set of dependent variables from the independent variables.

4.2.1 Distribution Analysis

The answers to the survey were analyzed in order to find out if they are normally distributed. The distribution analysis was performed using the skewness and kurtosis. A summary of the distribution of the responses was plotted on a summated scale. The skewness and kurtosis values for each construct were calculated.

According to Hair et al., (2007), the normal distribution has acceptable range of skewness value from -1 to 1, and Kurtosis value from -1.5 to 1.5.

The kurtosis values show how sharp the curve is. For a normal distribution, the acceptable values should be between -1.5 to 1.5. The kurtosis value shows the relationship of the peak of a curve.

Table 18: Kurtosis and Skewness

Item /Construct	Skewness	Kurtosis
I1	1.200177728	0.800178292
I2	-0.459562061	-0.958554484
I3	-0.644922828	-0.457861707
I4	-1.244140033	0.293306858
PU1	0.783841532	-0.494946948
PU2	-1.319005604	0.914400716
PU3	1.240870397	0.950535834
PU4	1.291168485	0.936488001
FC1	-0.814409538	-0.664727351
FC2	-0.584016878	-0.673514042
FC3	1.456163008	0.918059317
U1	1.312251377	0.756898992
U2	1.445238776	0.857860455
US1	1.36028963	0.972340584
US2	1.000268011	0.079536834
US3	1.097200591	0.873614519

From the skewness and the kurtosis value, the response data is normally distributed, and therefore, statistical analysis can be applied to the data to test the constructs of the model.

The regression analysis can be performed to test to test validity and reliability of the model.

Skewness shows the distribution of the data. A negative skew means that the tail of the curve is fatter and longer on the left as compared to the right side.

This section presents the findings of this study construct by construct, through the questionnaire items.

Table 19: Analysis for Implementation process

Questionnaire item	Mean	Standard Deviation
During implementation, enough resources were committed to ensure the process is successful	2.51	0.97592983
The Authority supported the implementation	3.56	1.00477547
Training facilities were provided during the implementation	3.66	1.07494162
The system implemented was compatible to other similar systems	1.85	0.95620412

The table shows the standard deviation and the mean of the findings. The values in the table suggest that the mean values were above 3 which imply some level of agreement with the statements.

The responses show that there was enough support from the authority and training facilities were availed during the implementation process.

Table 20: Perceived Usefulness

Questionnaire item	Mean	Standard Deviation
Using the cashless fare system enables me to accomplish tasks more quickly.	2.46	1.07465252
Using the cashless fare system enhances the quality of my work	4.19	0.98029363
I find the cashless fare system useful in my work	1.9	0.94352737
I find the cashless fare system easy to use.	1.93	1.08143987

From table 20, the mean for the constructs range from 1.9 to 4.2.

There was some level of agreement that the cashless fare syste, would enable people to accomplish tasks more quickly. This is indicated by a mean of 2.46.

The notion that cashless fare system enhances the quality of work was overwhelmingly supported by most users, with a mean of 4.19.

Table 21: Facilitating conditions

Questionnaire item	Mean	Standard Deviation
The management and employers expect me to be using the cashless fare system	3.53	
The authorities (government agencies) expect me to use the cashless fare system	3.39	
I can use the cashless fare across all public transport providers regardless of my card provider	1.82	

There was a level of agreement that some facilitating conditions enhance the successful implementation of an information system. The social expectations and regulations determine the levels of success of a system. Peer expectations and regulations are some of the drivers of successful IS implementation. Availability (with a mean of 1.82) is not necessarily a driver to a successful IS implementation.

4.2.2 Reliability Analysis

For reliability analysis, a composite reliability measure is used. The composite reliability must not be lower than 0.6. For Cronbach analysis, a score of 0.6 is acceptable, although at times, 0.7 is also acceptable.

Table 22: Reliability Analysis

Construct	Composite Reliability	Cronbach's Alpha
Implementation	0.83343	0.62441
Perceived Use	0.88322	0.66239
Facilitating conditions	0.91023	0.71924
Actual Use	0. 88977	0.67893
User satisfaction	0.87992	0.65933

The reliability analysis indicates that the scores are well above the thresholds. The results indicate that the constructs are well explained by their corresponding indicators, and this implies that the model is robust and reliable. For this research therefore, the results indicate that the model proposed can be used to draw valid conclusions.

4.2.3 Validity Analysis

The model was tested for validity by analyzing the convergent and discriminant validity. Convergent validity indicates that a set of indicators represent the same underlying construct and tends to be adequate when the average variance extracted (AVE) value is at least 0.5. As per the table below, the AVE values range from 0.58 to 0.80. This is above the threshold value of 0.50, meaning that the measurement model passes the convergent validity test.

Table 23: Validity Analysis

Construct	**Average Variance Extracted (AVE)**
Implementation	0.803280
Perceived Use	0.753901
Facilitating conditions	0.688246
Actual User	0.587591
User Satisfaction	0.802713

Inter-correlation of latent constructs with their AVE listed diagonally

Table 24: AVE Values

	Implementation	**Perceived use**	**Facilitating Conditions**	**Actual Usage**	**User satisfaction**
Implementation	**0.896258**	0.686293	0.512634	0.323004	0.758340
Perceived Use		**0.868275**	0.555800	0.276821	0.734196
Facilitating conditions			**0.829606**	0.231098	0.555097
Actual Use				**0.766545**	0.371582
User satisfaction					**0.895943**

The table above shows the matrix for correlation with the correlations between constructs and the square root of AVE listed diagonally. The square roots of the AVE listed in bold in a diagonal

manner have greater values than their correlation with other constructs, thus showing validity of the measurement model.

Discriminant validity can be tested using cross loadings, whereby the appropriateness of the model is determined if an indicator has a higher correlation value with another latent construct than with its respective latent variable.

Factor Loadings and Cross Loadings for Each Latent Construct and Its Items

Table 25: Factor and Cross loading

	Implementation	**Perceived Use**	**Facilitating conditions**	**Perceived Usefulness**	**User Satisfaction**
I1	**0.915896**	0.607993	0.482259	0.271728	0.671988
I2	**0.900667**	0.571669	0.427166	0.306410	0.700562
I3	**0.871649**	0.667747	0.470528	0.289308	0.665060
I4	**0.914833**	0.201109	0.471592	0.209013	0.710027
PU1	0.522986	**0.891997**	0.386352	0.229729	0.616400
PU2	0.558021	**0.833544**	0.594638	0.287666	0.576347
PU3	0.482305	**0.842961**	0.469883	0.201252	0.454035
PU4	0.364591	**0.834075**	0.434805	0.233185	0.442269
FC1	0.428837	0.478215	**0.811463**	0.141024	0.484752
FC2	0.306109	0.266782	**0.998467**	0.224965	0.363248
FC3	-0.132193	-0.040561	**0. 932931**	0.422194	0.029727
U1	0.771251	0.648250	0.564220	0.387551	**0.907880**
U2	0.682123	0.660826	0.488030	0.246149	**0.917952**
US1	0.567109	0.667778	0.427106	0.356754	**0.860963**
US2	0.496538	0.416232	0.523789	0.190997	**0.596843**
US3	0.422066	0.470278	0.313817	0.369844	**0.500098**

From the table above, there is a good correlation between the constructs. The load values are higher on their own latent constructs as compared to other latent constructs.

Cross loadings are used to indicate how strongly each item loads on other non-target factors.

I1: Availability of Resources

The analysis indicates that availability of resources is strongly related to the implementation. The cross loading for resources was calculated as 0.915896. This indicates that availability of

resources strongly influences the implementation process. This is when it is compared to Authority support (I2) and Training (I3).

I2: Authority Support

From the data analysis, the Authority support influences the implementation process. It was found out that there was a strong relationship between implementation process and the authority support. The cross loading for authority

I3: Training

Training strongly affects the implementation process. The cross loading for training against implementation were calculated as 0.871649. Whereas it was the least in that category, it was higher as compared to the cross loadings for training against other factors like perceived use, facilitating conditions, perceived usefulness and user satisfaction.

I4: Compatibility / Interoperability

The cross loading for interoperability were calculated as 0.914833, the second highest after the resources. This means that there is a very high relationship between interoperability and implementation. As compared to other factors, it was found out there was trivial relationship between interoperability and other factors.

PU1: Speed

In terms of speed, the respondents were asked whether the system speeds up their work. The cross loading for speed were 0.522986, 0.891997, 0.386352, 0.229729 and 0.616400 for implementation, perceived use, facilitating conditions, perceived usefulness and user satisfaction respectively. This cross loadings indicate that the relationship is strongest with perceived usefulness. This means that there is a very strong relationship between perceived usefulness and speed of work.

PU2: Quality

In terms of quality, the respondents were asked whether the system improves the quality of their work. The cross loading for speed were 0.558021, 0.833544, 0.594638, 0.287666 and 0.576347 for implementation, perceived use, facilitating conditions, perceived usefulness and user satisfaction respectively. This cross loadings indicate that the relationship is strongest with perceived usefulness. This means that there is a very strong relationship between perceived usefulness and the quality of work.

PU3: Usefulness

The cross loading for system usefulness were calculated as 0.914833, the second highest after the resources. This means that there is a very high relationship between interoperability and implementation. As compared to other factors, it was found out there was trivial relationship between interoperability and other factors.

PU4: Ease of Use

The analysis indicates that ease of use is strongly related to the perceived usefulness. The cross loading for ease of use was calculated as 0.834075. From this study, the ease of use strongly influences the implementation process outcome.

FC1: Management and employer expectations

The study sought to establish if there are any conditions that facilitate the implementation outcome. The social management expectation was theorized as one of the conditions that influence the implementation outcome.

According to this study, the cross loading for management expectations were found out to be 0.428837 against implementation, 0.478215 against perceived use, 0.811463 against facilitating conditions, 0.141024 against perceived usefulness and 0.484752 against user satisfaction. The relationship is strongest between management expectation and facilitating conditions.

FC2: Authority / Government expectations

Governments can facilitate the outcome of implementation process by publishing regulations, rules and laws that make it almost mandatory to use a system.

From the study, the cross loadings for government expectations were 0.306109 against implementation; 0.266782 against perceived use; 0.998467 against facilitating conditions; 0.224965 against perceived usefulness and 0.363248 against user satisfaction. From these cross loadings, the relationship is strongest at facilitating conditions.

FC3: Availability

The ease of availability of a system facilitates the implementation outcome of a system. From the study, there was a strong relationship between the availability of a system and the facilitating conditions. The cross loading for availability against facilitating conditions was highest at 0.932931.

U1: Frequency of Use

	Implementation	Perceived Use	Facilitating conditions	Perceived Usefulness	User Satisfaction
U1	0.771251	0.648250	0.564220	**0.907880**	0.387551
U2	0.682123	0.660826	0.488030	**0.917952**	0.246149
US1	0.567109	0.667778	0.427106	**0.860963**	0.356754
US2	0.496538	0.416232	0.523789	0.190997	0.596843
US3	0.422066	0.470278	0.313817	0.369844	0.500098

From the study, the cross loading for frequency was greatest when compared against perceived usefulness. This implies that there is a strong relationship between the frequency of use and the perceived usefulness.

U2: Dependability

The analysis indicates that system dependability is strongly related to the perceived usefulness. The cross loading dependability was calculated as 0.917952. From this study, the system dependability influences the implementation process outcome.

US1: Satisfaction

The cross loading for satisfaction were calculated as 0.860963 against user satisfaction. This shows that there is a strong relationship between user satisfaction and the actual satisfaction that the users get from the system.

US2: Expectations

From the study, there is a strong relationship between the actual user satisfaction and the user satisfaction. The system must meet the user expectation so that the implementation process can be successful. The cross loading for expectation against user satisfaction was calculated as 0.56843.

US3: Exactly what one needs?

In order to determine how successful a system is, the users are expected to have a feeling that the system is exactly what they needed. The feeling that the system fulfills their needs is a clear indication of the outcome of implementation.

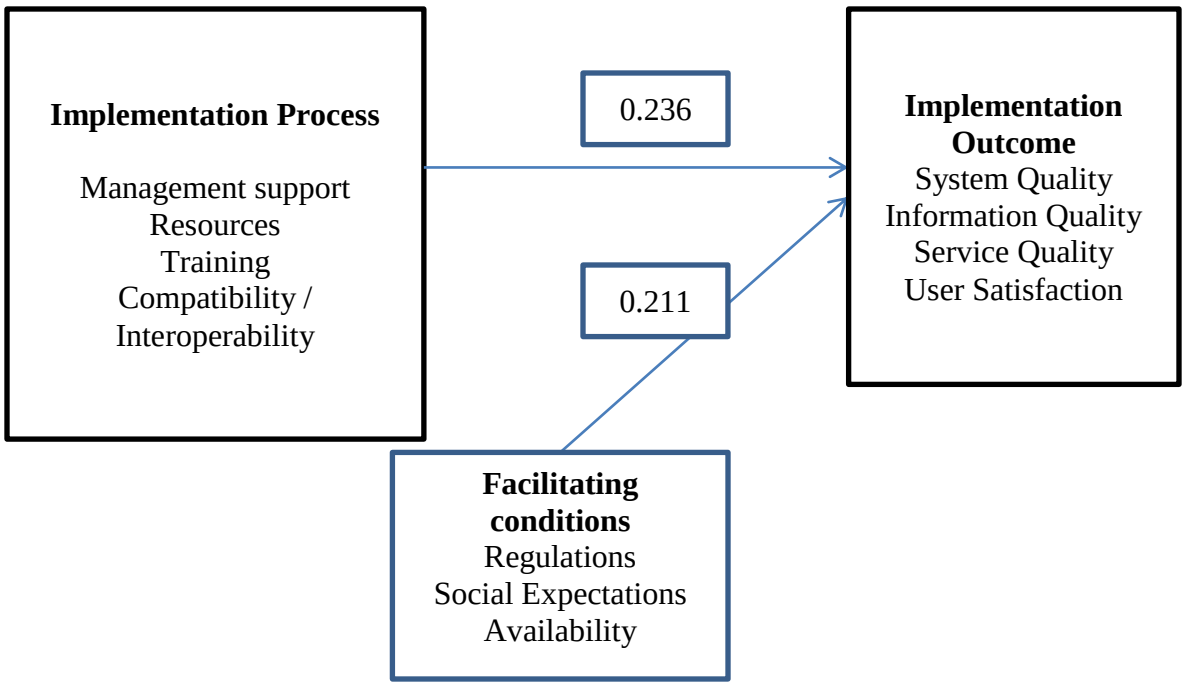
From this study, the cross loadings for the fulfillment of user needs against user satisfaction were calculated as 0.500098 indicating that the relationship is strongest with user satisfaction.

4.2.4 Structural Model: Hypothesis testing

The test of the structural model includes the estimation of the path coefficients and their determinants i.e. R2 values. The path coefficients indicate how strong the relationship between the variables is. The R2 values show the amount of variance explained by the variables.

In order to test the hypothesis, only the respondents who had used the system were considered. Those who had not used the system were not considered. This sample population was considered due to the experience that they have with the system.

To determine the significance of the paths within the model, bootstrap sampling method was used. The structural model was tested by determining the estimates of the path coefficients and coefficients of determinants.



As per the model, the implementation process (whose constructs include management support, interoperability/compatibility, resources and training) had a very strong influence on implementation outcome (System quality, information quality and service quality ($ß_1$=0.192, $ß_2$=0.236 and $ß_3$=0.211 respectively).

5 CONCLUSION AND RECOMMENDATIONS

5.1 Achievements and conclusion of the study

5.1.1 Objective 1: To investigate the type of the failure of cashless fare system

5.1.1.1 Correspondence Failure

Correspondence failure occurs when the design and development of a system not met. The actual deliverables of a system should be well spelt out before the design, development and implementation of a system. From a managerial perspective, the cost-benefit analysis of implementing a system must be measured accurately. To make it easy to measure the achievements of implementing a system, the goals of a system must be defined before the implementation of the system.

Correspondence failure does not recognize the role of users in acceptance of a system.

The analysis of the data that is presented in this study reveals that the implementation process of the cashless fare system indeed had some gaps. The data reveals that all the systems that were implemented did not meet the objectives. According to the literature review, the system can be regarded as to have correspondence failure.

5.1.1.2 Process Failure

Process failure occurs when the system is not delivered within the stipulated time and budget. Sometimes, due to this failure, a workable system is not produced. In other words, the implementation process does not produce a workable system. At times, the implementation process may end up delivering a product that is out of budget, and mostly, the system is quite expensive, usually characterized by overspending in both time and cost. This makes the system to negate the net benefits that were expected by the system. This failure is usually attributed to unsound project management regime and project progress tracking.

The system implementation had characteristics of process failure. The system implementation has taken too long to implement and make it operational. The system has been in implementation from 2013 to 2015.

5.1.1.3 Expectation Failure

Expectation failure occurs when the system that has been delivered does not meet the requirements, values or expectations of the stakeholders. The expectation failure is not only the

failure of the system to meet technical specifications. It is the difference between the desired situation and the actual situation that is achieved after the implementation of a system. The failure is also localized to a set of stakeholders and they explain the failure from their point of view.

The analysis of data shows that the system had expectation failure. The government authority had expectations of the system, and it is clear that the system implemented did not meet the expected goals. In the same way, the implementers, operational staff and the owners did not get their expectations met after the system implementation.

5.1.2 To identify the critical success factors of successful implementation of cashless fare system.

Majority of the respondents agreed with all the five constructs of the model. From the data that was collected, compatibility /interoperability was cited as the most critical factor.

This in in line with the research done by Ugwu (2007) who identifies ease of use, training facilities and facilitating conditions (government ordinances and policies) and perception of users.

Based on the analysis of our results, the cashless fare system failed from the point of view of the operational staff.

5.2 Recommendations

5.2.1.1 Resources

From the study, it was found out that, for a successful implementation of cashless fare system, enough resources must be allocated for the implementation process. Yeo (2002) identify resources as one of the critical factors for a successful implementation. Yeo argues that resources are availed if there is management support.

5.2.1.2 Authority support

Every project requires some leadership in order for it to succeed. Authority support is reflected in areas that require interaction, commitment and direction form top managers, interdepartmental coordination, organization support, individual support and overall project management in terms of timeframes and scheduling.

The ability for interdepartmental coordination is important is crucial as pointed out by Artit (2012). This demonstrates the ability for the authority to oversee the implementation process. The findings indicate that there are some problems with the coordination between the vendors, operational staff and the authority.

5.2.1.3 Training

Stakeholder training is important in implementation process. The main reason for stakeholder training is to get the stakeholders to own the implementation process (Siddiqui et al 2004). Training is meant to make the stakeholders to get to understand and accept the change. Application specific training is aimed at making the stakeholders get to know how to use the system.

The effect of stakeholder training on system acceptance and implementation success is affected by two parameters: complexity of system and the interdependence of tasks.

For this study, therefore, it was necessary to conduct training to the stakeholders in order to promote user acceptance of the system. Training was also found as a driver towards change management.

5.2.1.4 Compatibility / Interoperability

From this analysis, it emerged that end users are required to use different cards for the different operators of the system implemented. It emerged that there was a need for standardization of the cards. The implemented systems ought to have a standardized protocol so that the end users do not have to have different cards for different providers.

5.2.1.5 Availability

Availability of system refers to the ease of finding the system when a user wants to use the system. Availability of the system is closely related to compatibility, such that the available system is always compatible to the method of payment that is available to the user A system will therefore be considered available if there are more avenues to use the system and is compatible to the methods of payments that are available to the users.

5.3 Contribution

This research contributes to the efforts of empirically validating the model in a developing country context. Of most significance, the study proposes better insights into how the government can implement the cashless fare that is useful to the users. Successful

implementation may be achieved through user training, user participation, enhancing the system quality, information quality, availability and interoperability among others. There is also need for the government to create awareness about their products.

According to the analysis of this study, operational compatibility (interoperability) and training were identified as some of the challenges of the implementation process. There is need to involve users (both operational staff and the owners) before implementing the system. According to this research, regulations were not identified as critical factors in implementing cashless fare system. Vendors therefore need to ensure that users own the system through training (McLeod, 2011) as pointed out in the literature review.

5.4 **Limitations of the study**

This study was limited to the cashless fare system. Its results may not be used to generalize the critical success factors for all other systems that are implemented for public use. In order to identify the critical success factors for all public sectors ICT implementations, further study that encompasses all other public information systems may need to be carried out.

5.5 **Further study**

This study was based on quantitative evaluation of the implementation process. It would be interesting to do further study to investigate the issues that have been faced by the vendors and the authority in implementing the cashless fare system. This would go a long way to improve the implementation process.

6 REFERENCES

1. Aineruhanga, M. (2004). *Focus on the 'Kenya ICT Week'. Chakula Newsletter, (9)*
2. Avison, D. E. & Fitzgerald, G. (2006). Information systems development: Methodologies, techniques & tools. Boston, MA: McGrawHill.
3. Behrens R., McCormic D., Mfinanga D., 2016. An Introduction to paratransit on Sub-Saharan African Cities. Routledge.
4. Biehl, M., Success factors for implementing global information systems. Communications of the ACM, 2007. 50(1): p. 52-58.
5. Christophe Bezes.(2009). E-Commerce Website Evaluation: A Critical Review.<hal-00611008>
6. Collis, J. and Hussey, R. (2003), Business Research: A Practical Guide for Undergraduate and Postgraduate Students, Palgrave Macmillan, Houndmills, Basingstoke, Hampshire.
7. Creswell, John W. (2013). Research design: Qualitative, quantitative, and mixed method .4th Edition. Sage Publications.
8. Fan, D. Analysis of critical success factors in IT project management. in Industrial and Information Systems (IIS), 2010 2nd International Conference on. 2010. IEEE.
9. Gichoya, D. (2007). Government Infomatics: towards the successful implementation of ICT projects in Kenya. Loughborough University Institutional Repository. Retrieved Feb, 2016, https://dspace.lboro.ac.uk/2134/7991
10. Hallikainen P and Chen L (2005) "A Holistic Framework on Information Systems Evaluation with a Case Analysis" in The Electronic Journal Information Systems Evaluation Volume 9 Issue 2, pp 57 - 64, available online at www.ejise.com
11. I., Athar, Al-Mudhary S., Roslina I, Taha M. (2013). Critical Success Factors of Information Technology Projects. World Acadamy of Science, Engineering and Technology, Vol:7, No:12, 2013.

12. Ingram, H., et al., Internalizing action learning: a company perspective. Establishing critical success factors for action learning courses. International Journal of Contemporary Hospitality Management, 2000. 12(2): p. 107-114.

13. Kennisnet (2015). Four in Balance Monitor 2009: ICT at Dutch schools. Zoetermeer (Neth): Kennisnet. Retrieved Feb, 2016, from url: http://archief.kennisnet.nl/onderzoek/alle-onderzoeken/bronbestanden-vier-in-balans-monitor-2015/.

14. Khalfan, A., and Gough, T. G., (2000). IS/IT Outsourcing Practices in the Public Sector : A Case Study of a Developing Country. University of Leeds

15. Khalifa, G., Irani, Z., Baldwin, L.P. and Jones, S. (2004). Evaluating Information Technology with You in Mind. http://www.ejise.com/volume-4/volume4-issue1/issue1-art5.htm#_ftn1 edn. Reading, England: Academic Conferences Limited.

16. Kiwanuka O (2016). *Why we need cashless bus-fare system, New York Times,* http://www.newtimes.co.rw/section/article/2016-02-26/197431/

17. Kothari, C.R. Research Methodology: Methods And Techniques, New Delhi: Wiley Eastern, 1990.

18. Lee, S. and K.-j. Kim, Factors affecting the implementation success of Internet-based information systems. Computers in Human Behavior, 2007. 23(4): p. 1853-1880.

19. McLeod, L. and S.G. MacDonell, Factors that affect software systems development project outcomes: A survey of research. ACM Computing Surveys (CSUR), 2011. 43(4): p. 24

20. Moturi C. and Ondego O (2016). Evaluation of the Implementation of the e-Citizen in Kenya in International Journal of Applied Information Systems. ISSN : 2249-0868

21. National Transport and Safety Authority Operation of Public Service Vehicles) Regulations, 2014 , http://kenyalaw.org/kl/fileadmin/pdfdownloads/LegalNotices/23-National_Transport_and_Safety_Authority__Operation_of_Public_Service_Vehicles__Regulations__2014.doc

22. NTSA (2016). Overview of Kenya's Public Transport available http://www.unep.org/transport/new/pcfv/pdf/ken_sootfree_OverviewKenyaPublic.pdf

23. NTSA(2016). List of Registered SACCOS available http://www.ntsa.go.ke/2015/saccolist/registeredsaccos.pdf

24. Plomp, T. (2006). Preparing for Teaching in an Information Society: Various Perspectives. In Crawford et al. (Eds.), Proceedings of Society for Information Technology & Teacher Education International Conference 2006 (pp. 4334-4349). Chesapeake, VA: AACE

25. Selim, H.M., Critical success factors for e-learning acceptance: Confirmatory factor models. Computers & Education, 2007. 49(2): p. 396-413.

26. Sudhakar, G.P., A model of critical success factors for software projects. Journal of Enterprise Information Management, 2012. 25(6): p. 537-558.

27. Tina, J., Miller, J., 2005. Developing a Monitoring and Evaluation Plan for ICT for Education. http://www.infodev.org/infodev-files/resource/InfodevDocuments_287.pdf

28. Warui, M.N., (2011). A Framework for a Sustainable ICT Implementation Solution for Public Primary Schools: Case of Nairobi West District. Strathmore University

29. Yusof M. M., Papazafeiropoulou, A., Paul, R.J, Stergioulas L.K., (2008). Investigating evaluation frameworks for health information systems. International Journal of Medical Informatics.