



REGULATORY ECONOMY AND COMPETITION POLICY THESIS



**EFFECTIVENESS OF ELECTRONIC TICKETING SYSTEM IN IMPROVING FARE
REVENUE COLLECTION OF PUBLIC TRANSPORT COMPANIES IN KIGALI CITY.
CASE STUDY: KIGALI BUS SERVICES LTD**

THE THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
MASTER'S DEGREE OF SCIENCE IN REGULATORY ECONOMICS AND COMPETITION
POLICY.

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DECLARATION

I, Melchior NZAKIZWANIMANA, hereby declare that the work presented in this master thesis is my original work and has not been presented for a master's degree at the University of Rwanda or any other universities. All sources of material that have been used are fully acknowledged.

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ABSTRACT

Electronic ticketing system is critical factor in public transport fare collection. KBS Ltd started using Tap and Go card in 2016, replacing the old method of cash payment which much of liquid cash used to get lost. The aim objective of the study is to assess whether e-ticketing system brings any improving in fare collection of KBS Ltd. This study is primarily based on both primary and secondary data. Primary data was mainly collected from 392 surveyed KBS commuters through close-ended multiple questionnaire and three interviews of KBS directors. The secondary data obtained from financial reports of KBS Ltd submitted to RURA. Inferential and descriptive statistics were used; The responses have been analyzed using SPSS and the findings were presented thereof using frequencies, corresponding percentages, tables, charts and diagrams.

To justify the sensitivity of e-ticketing system to fare revenue collection improvement, the chi-square test was used and the researcher determined that there is a significant relationship between e-ticketing system and fare revenue collection improvement in KBS with an asymptomatic significance which is less than the p-value of 0.05 and this was confirmed by result from reported fare collected analysis which is almost the doubling of overall growth rate at 15.5% in post e-ticketing compared to overall growth rate of 8% in pre e-ticketing system. The managing director of KBS confirmed this during an interview that the fare revenue collected has increased in great extent since they started to use e-system in fare collection. However, persistent long queuing in bus stations and stops during peak hours is still a challenge; Some bus driver's behaviour to take cash in hand, high cost of tap and go card, no refund when erroneously taped on validator machine, lack of POS agents to new roads and there is no interoperability. The researcher recommended KBS and public transport stakeholders to introduce of Dedicated Public Transport Lanes to improve the speed in public transport services during peak hours and eliminating persistent long queue; clear plan of trips. AC group must update tap & go system to become most efficient in service delivery and multipurpose in payment of goods and other services that can become a means of COVID-19 preventive measures, AC group must reduce or remove the cost of tap and go card and having a possibility to refund when erroneously taped; RURA must put a tap & go regulation, increase inspection, enforcement and punitive measures to discourage cash fare payment.

Key words: Electronic ticketing system, improving fare revenue collection, public transport companies

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LIST OF ABBREVIATIONS

- AFC: Automatic Fare Collection
- ATM: Automatic Teller Machine
- BO: Back Office
- CBD: Central Business Development
- CoK: City of Kigali
- E-payment: Electronic payment
- e-ticketing: Electronic ticketing
- GoR: Government of Rwanda
- ICT: Information Communication Technology
- KBS: Kigali Bus Service
- MININFRA: Ministry of Infrastructure
- POA: Point of Access
- POI: Point of Issue
- POS: Point of Sale
- PU: Perceived usefulness
- RTDA: Rwanda Transport Development Agency
- RURA: Rwanda Utilities Regulatory Authority
- TIU: Ticket Inspection Unit

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

The change of business from traditional (need of physical contact) to e-commerce is one of the results of globalisation and emerging technology. Ozkan et al (2010) show that the expansion of e-commerce has increased the importance of transferring money online. The transfer of cash online also called e-payments involves exchange of cash and knowledge online with none any direct engagement with the recipients. These electronic payments systems can be classified usually as direct online credit/debit payments, mediated credit/debit payments, stored-value money and electronic bill payments (Ozkan et al, 2010).

Traditional e-payment systems are noted to possess many limits, which constrain consumers from adopting them. Former research proposes that many of these factors relate to the absence of trust, security, usability, high transaction costs, lack of a perceived advantage and perceived risk. For example, Prabowo (2012) indicates that Indonesian banks bear tens of billions of rupiahs of losses from master card fraud every year.

The Kigali city is confronted by a rise in congestion and pollution on its roads, especially during peak periods. This phenomenon may be direct results of an increasing population related to an exponential increase in privately car ownership. Public transport services, containing bus, mini-bus taxis, and motor cycle taxis are poor, mostly informal and uncoordinated. Roads are generally during a poor condition, and many of which are gravel roads, not suitable for public transport. To resolve these problems, the Government of Rwanda through the Ministry of Infrastructure introduced a project for the design of a public transport system in Kigali City. The project involved between others, travel demand valuation, multi-modal transport analysis and planning of a comprehensive public transport system in Kigali City (Public Transport Policy and Strategy for Rwanda” (Mininfra, 2012).

Public Transportation Policy and plan for Rwanda indicate that fares policy must set comprehensive policy directions addressing, amongst others, the next key aspects: Maximizing of income while preserving a low fare for users, authorizing general access to public transport, permitting the system to cover its own expenses without external subsidy, simplifying understanding of the system by the residents. Matters that will need detailed consideration, various of which are interconnected, comprise whether fares will be distance, zonal, or flat based

(irrespective of distance), fare collection technology, a system of fare verification, how fare payment media will be traded, Avoiding extreme queuing at fare payment or confirmation points. How collected money will reach a bank account, and the part of a fare collection firm, how information will be spread to the public (users), how the result data about system usage will be collected and managed, how fare incorporation with bird feeder services will be established (Mininfra, 2012).

Due to difficulties public transport service provision associated with fare collection, collection of data and obedience with service values, RURA together with other investors started and presented the utilisation of automatic ticketing system. Diverse awareness forums then sensitisation was directed to inspire passenger transport companies to accept the system then start using it in their day-to-day transport actions. This project has the next purposes: to decrease losses suffered by companies throughout the fare collection procedure, to safeguard easy information gathering for planning roles, defend customer rights and computerise public transportation systems (RURA annual report, 2014–2015).

To ensure effective management of fare collection by the public transport operators, fare collection adjustments are unavoidable. This comprises all essential changes whether acceptance or initiation of new system for effective fare collection. Therefore, by the initiation of automatic fare collection, the assessment of public transport regulations and drafting of original regulations is essential to make provisions for business guidelines to put up the system. For the case of Rwanda, the City of Kigali and Rwanda Utilities Regulatory Authority (RURA) are authorized to make public transport regulations over powers granted upon them provided with different laws and ministerial orders; Law No09/2013 of 01/03/2013 creating Rwanda Utilities Regulatory Authority (RURA) is being among those. Thus automatic fare collection (e-tickets, e-cards) has been created by the passenger's road transport regulations N°007/TRANS/RT/RURA/2015 for 01/06/2015 under Articles (47) payment of fares and (49) proof of payment of fares which stated that the Regulatory Authority shall determine when the use of paper tickets shall cease along given route(s) to be replaced by e-tickets, e-cards and other electronic payment systems and considering the need to have a standard alone regulation for each type of public transport services for an effective regulation; having reviewed provisions of passengers' road transport regulation N°007/TRANS/RT/RURA/2015 for 01/06/2015 relating to public transportation services by bus

and minibus in the article 13 general obligations for all licensees stated that a holder of any of the public transport services license must use of E-ticketing.

To attain this objective, it has been urgently needed to modify the existing manual payment using paper-based ticket and Cash based payment and with a view to replacing them with the automatic fare collection. The need to replace it with an automatic fare collection has not only been driven by the need to require public transport operators to write down all operations, nevertheless also it is necessary for the public transport company to rise collection in a low-cost way. It remains the public transport's obligation to deliver good customer services that fulfil commuters' desires and surpass expectations, then to this conclusion, sustained developments of the systems processes and procedures add up very much in the public transport operator's transactions, and between system developments is the initiation of automatic fare collection. The invention of AFC aimed at encouraging all commuters to pay their fare as fixed in tariff. But the broad objectives would only be accomplished by placing a solid foundation on the part of administration and control tools comprehensive of the operations manual.

In developed markets, a greatest effective change to cash free transport schemes has home base public private partnerships, and Rwanda acts as the greatest sample of that. Kigali's transport was affected with several of an equivalent problem same as in Kenya above congestion, delays, and lost revenue of up to 40% due to fraud, fare evasion. However, Rwanda acquired a much dissimilar approach in drawing cash free operation system by undertaking on public-private partnership while the Kenya government's gauche efforts to force private matatu operators the usage of different private firms to process their transactions. Government of Rwanda granted an AC Group, a Rwandan start up tech, with the agreement to plan a cashless transportation payment system. Referring to government, passengers and bus companies permitted the AC Group to adapt the system to altogether or any residents, AC Group CEO Patrick Buchana has told to Hope Magazine. By way of fragment of the Smart Kigali Creativity, 3 bus companies that deliver public transport facilities in Kigali decided for change to the electronic Tap & Go bus fare system invented by AC Group. Tap & Go cards can simply be bought and refilled at bus positions using mobile as well as money and credit (Mondato, 2019).

1.2 Problem Statement

The old manual fare or cash payment used by public transport companies had many challenges like theft of fare collected, fare evasion, fraud and corruption. The fact that there was no electronic fare payment system put in place; There was always disputes in fare payment as money passes on the hands of many persons; It's very difficult to control the revenues generated every day which becomes a loss to those public transport companies.

Due to difficulties in public transportation service provision associated with fare collection, collection of data and obedience with service values, RURA together with other stakeholders started and presented the utilisation of automatic ticketing system. Diverse awareness forums then sensitisation was directed to inspire passenger transport companies to accept the system then start using it in their day-to-day transport actions. This project has the next purposes: to decrease losses suffered by companies throughout the fare collection procedure, to safeguard easy information gathering for planning roles, defend customer rights, ease transport inspection for monitoring compliance of regulation and computerise public transportation systems (RURA annual report, 2014–2015).

In 2016, Automated fare collection system (Tap & Go card) was introduced in Rwanda; Said by Patrick Buchana, the founder and chief executive officer of the AC Group that being a smart card solution provider in Rwanda, they searched for the pain points within the transport system and found that bus operators were losing big part of their revenue due to fraud because of cash handling on buses (Hope Magazine, 2016). Therefore, Kigali Bus Service Ltd (KBS) is one and first in public transport operators in Rwanda that has adopted the automatic fare collection system (Tap & Go system) for handling all those problems raised that broke their targets in fare revenue collection when using the analogue system of collecting fare.

The researcher assessed the improvement in fare revenue collection achieved by KBS because of effective usage of electronic ticketing system.

1.3. Objectives of the research

1.3.1. Main objective

The major objective of the research is to assess whether e-ticketing system introduced in 2016 by AC Group brings any improving in fare revenue collection of KBS Ltd.

1.3.2. Specific Objective

- To assess the effect of e-ticketing system in public transport services (KBS Ltd);
- To assess its contribution to KBS fare revenue collection;
- To assess the level of satisfaction to the usefulness of e-ticketing users at KBS;

1.3.3. Research questions

- ✓ Does e-ticketing system become effective in fare collection of KBS?
- ✓ Has the e-ticketing system introduced in 2016 significantly improved KBS amount of fare revenue collected compared to prior period?
- ✓ Do e-ticketing system users satisfied on its usefulness and what can be done to improve it?

1.3.4. Hypothesis

According to Baron and Robert (2010), a project research hypothesis is a statement or a set of assumptions about the subject of study or official declaration that presents the probable connection among an independent and dependent variable. It is a notional statement of relative amongst two or further variables. Then, the supposition for this research stands as follow:

1. Ho: There is no relationship between the effectiveness of e-ticketing system and fare revenue collection improvement in KBS.
2. Ha: There is a relationship between the effectiveness of e-ticketing system and fare revenue collection improvement in KBS.

1.4. Research significance

The study is important to the researcher, Kigali Bus Service Ltd and policymaker. This study focuses on the e-ticketing system looking possible contribution to the organisation fare revenue collection improvement. To Kigali bus services ltd if they adopt the recommendation, it will improve on the fare revenue collection, hence effective and efficient service delivery in Kigali City public transport. This research will benefit city of Kigali and RURA in such a way that the management will be able to access the material that will help to understand well the impact of e-

ticketing system to public transport companies on fare revenue collection and challenges which will guide them on how they can improve the system through developing new rules and regulations of fare collections or updating the existing ones so that they can match with what is needed on the market in both user's public transport companies and commuters side as well as promoting cashless economy as it is in line of Government of Rwanda. The study provides researcher with knowledge of e-ticketing system and its effects on fare revenue collection for public transport companies

1.5. Scope of the research

The study was aimed at evaluating the impact of e-ticketing system in improving of fare revenue collection, especially in KBS Ltd; It has been carried out at KBS headquarter premises located in Kigali city, Gasabo District at Mulindi and it has covered a period nine years (2011-2019). The period was chosen since it is sufficient for the verification of the relationship between variables (Dependent and independent). All these variables have been investigated in 2 months (December 2020- January 2021) at Nyabugogo main public bus stations) according to KBS zone and routes. The targeted persons are commuters, the managing director and key directors in KBS Ltd.

1.6. Organisation of the research

The research project was organized in five episodes. The 1st episode entails the contextual of the research, the problem statement followed by research objectives, research questions, and research significance, scope of research then finally organisation study. While episode two highlights different theories related to the area of the study and related evidence from the empirical studies, episode three, which indicates the methodology that involves; study plan, population target, size of the sample, techniques and collection data approaches then tools to be used under this study. Whereas episode four entails findings interpretation then lastly episode five contains the resume drawn from the findings paying particular attention to those factors under which the data was analyzed, in the previous chapter, therefore, summary, conclusions and recommendation.

CHAPTER TWO: LITERATURE REVIEW

2.0. Introduction

Second chapter involves the analysis of the related literature to the research. It explores different lessons conducted on the evaluation of the effect of e-ticketing system in public transportation, which will be out-sourced from books, reports, policy papers, electronic sources with information regarding the objectives of the study.

2.1. Meaning of Basic Theory

2.1.1. The payment system

A payment system is indicated by the connections between diverse subjects and is made of many components that comprise the system's members, its structure and the tools that permit the transmission of financial value among monetary agents (Merlonghi, 2010). Therefore, payment scheme's oversight and supervisory roles have as an objective of the graceful operative of the system.

2.2. Modes of payment

Making payment may be an everyday activity of each commerce. One side must form payment toward different party on the usage of its services and goods. Here are diverse methods of payment by means of which the payment can be done (Hitesh, 2019). Traditionally payments models have been batter trade, cash, and cheques in modern business people wants to save time and escaping risks including security risk associated with holding cash. The invention of electronic payment tools helps people to perform transaction without a requirement of holding cash, or writing a cheque. These electronic payment tools are such as credit cards (Smart cards, Visa cards) and debit cards (Sanga, 2015).

2.2.1. Cash Payment

It is the easiest and normally used method of payment everywhere the world (Sanga, 2015). This method of compensation has been hired by the sellers since previous times, and this means of payment is remains selected by adulthood or fewer digital savvy persons. The purchaser forms the decided sum of payment by means of money notes or coins to the vendor to obtain goods and services formed by the vendor then by way of an acknowledgement vender delivers an effective receipt of the bill. People in everyday businesses regularly use this method of payment (Hitesh, 2019). By means of cash in any service transaction announces a security danger. It is too high

expensive to store and transportation. Using cashless scratches together security and cash treatment costs intensely, that explain why card compensation or automated money systems are moving fast into internal catering facility administration (Coyle-Camp, 1994). However, a cash system still popular and useful to many transactions both in developed and developing countries. For customers, the important attraction of money is its universality. It is often extended and is accepted wherever, every time, by everybody. As a customer or a reseller, you are doing not necessity for checking account to also use or receive cash (Worthington, 2006). However, there are in fact costs related to the acceptance of money. Such cost is like retail crime costs; costs related to security, collection, count and transporting, wholly of which mean time and energy; insurance similarly costs cash and banks in adding charge retail businesses for payment of money on their accounts (Worthington, 2006). Worthington (2006) has argued that money has been and can persist for the predictable future, in bulk terms, the first way of payment for customers at the role of service. Not until the reception of the automated reward is as universal because the reception of money are we probable to discover a change within situation.

2.2.2. Check Payment

The check can be explained as an instruction to a bank to pay the expressed sum of cash on the check from a person's account to the individual whose name is stated on the check. The check is considered as one of the most secure modes of payment as one does not need to carry a huge sum of cash all around. A check book is given to an individual when he opens an account in a bank (Hitesh, 2019). Paper check operation volumes are as of now in long-term decrease as both customers and retailers ended up more aware with the usage and taking of many plastics' payment cards (Sanga, 2015). Worthington (2006) argued that the usage of checks in volume terms has been declining since 1990 and is anticipated to proceed to decrease as plastic card and electronic payments proceed to develop. Furthermore, Worthington argued that at the moment most UK monetary organizations permit current account holders to utilize checks as regularly as they like, with no costs to the account so long as the account remains in credit.

2.2.3. Telegraphic Transfer or Mail Transfer

This mode of payment is well known among dealers and vendors who do the commerce of thousands a day. This implies of payment in case fairly quick as compared to the prior strategy of

payment. In this implies of payment, the payer stores the take advantage the bank, which highlights a division interior the payee's town, once money is stored by the payer the payee's bank is educated telegraphically and inquired to create payment within the payee's account (Hitesh, 2019).

2.2.4. Electronic payment

This mode of payment become well known due to the progress of innovation and entrance of web in each field. There are a few sorts of computerized mode of payment, like payment utilizing keeping money cards sorts of an open-end credit and MasterCard, Web keeping money, portable managing an account, online payment utilizing apps like PayPal, etc. Computerized Modes of payment are as often as possible utilized by individuals to create little and huge exchanges. These strategies of payment have different preferences as payment can be made inside many seconds (Hitesh, 2019).

2.3. Automated revenue collection system

According to Plouffe et al (2000) displays that in the late 1990s, newspaper and journal titles say volumes about the absence of achievement of numerous electronic card-based payment system trials accepted. In their research when smart card was compared to other payment systems, the findings show that cash payment was favored by 80% (non- participating respondents) and by 50% (participating respondents) compared to other four options of payment namely credit cards, cheque, debit or automatic teller machine cards, and therefore the precise card. However, many organizations are protecting their business utilizing technology, it is important that all steps of revenue collection have been coordinated. Duffy and Dale (2008) argued that it's vital to certify that each one credits, installment, transfers and MasterCard clearance are checked and in a perfect world controlled by one financial framework.

According to Abdul-Muhmin (2010), recommended that development in technology, expanded competition and changes in trade performance have encouraged the improvement of options to cash payment in retail outlets. In financially progressed nations and developing parts of the creating world, customers presently have more alternatives for consummating retail installments, as buys are often acquired by cash, cheque, charge or credit cards. Variables affecting these payment mode choices are of intrigued to monetary teach, retailers and approach creators, afterward elective payment strategies have related benefits and costs to customers, monetary

industry players and society (Abdul-Muhmin, 2010) the literature proposes numerous possible effects, counting, customer demographics, cost features of another payment tools, situation-specific operation features, venders' payment method receipt strategies and retail business size (Duffy & Dale, 2008).

Walker and Johnson (2001) said that, the cash collection system must support different payment approaches like electronic funds transmission, wire transmission and lockbox frameworks similarly as ancient check store framework. Listfield and Montes Negret (2000) have debated proficiency in payment systems, explained that payment rapidity, payment certainty, reliability, safety and security, credit risk control, privacy record maintenance, convenience and costs are factors in defining the proficiency of payment system.

Prideaux (2009) said that when the operation is finalised, persons likewise want a simplest managed, detailed record of their expenditure. Fresh technology is wanted, cantered on an original age of cards, which combine payment applications with advance applications. When these applications work together, they strip out time-wasting stages at the ideas of burden and thus add value by saving consumer time.

In adding, Worthington (2006) displays that for numerous global travelers and meeting attendees, lifetime would be very difficult without the capability to pay by plastic card for products and consumed services. One of the most concerns with reference to electronic payments is noted to be security. It is because cash and data are exchanged online without any straight engagement with the recipients (Puri, 2006). Perceived risk is the additional critical figure that impacts client certainty in electronic payments. The chance of losing individual data and master card getting to the hands of hackers are still a genuine to the clients. Furthermore, according Hoffman et al (2005), 95% of web clients have rejected to supply their individual information to websites and 40% have asked that they would make their lost data. Believe in electronic commerce operations is additional vital component for online applications (Abrazhevich, 2004). The perceived benefit stands also more demonstrated by PEOU and PU on electronic trade buyer choice to accept the electronic payment scheme (Davis, 1989). A significant benefit of the electronic installments that contributes towards perceived usefulness and perceived ease of use is that the comfort they supply via permitting operations to be done with negligable period and cash (Leong et al., 2003). Additionally, usability feature permits customers to get to user-friendly system with simple route.

2.4. Smart card

Usage of innovative technologies in public transportation improves both higher client satisfaction and level movement of commuters and raise the effective fare collection compared to the manual payment way (Sanga, 2015).

Smart card an itself-programmable one chip computer was born at the beginning of 1980s (Urien, 2003). Payment cards are round in prolonged time presently and with them the comfort of taking plastic cards has been exposed and appreciated (Puri, 2006). The silicon chip realizes five operations types: data input and output, reading and writing in a non-volatile memory, and cryptographic calculations computation (Urine, 2003). Smart cards are a means of providing secure payment over the web by separating authentication from the method that gives the communication links. One can charge up money from the card or proprietary bank network and then be able to make payment over the internet. Several firms are exploring open-end credit technology as Puri 2006 put as “Now subsequent generation of the operation card is being taken in by “smart cards”. The numerous probable profits from a sensible card application of automatic cash might be briefed as follows.

2.4.1. Benefits to customer:

Accessibility, simple access to services, many load points; Adaptability, high or low esteem payments, speeder transactions; Control, the smart card cardholder knows precisely where he or she stands; Bigger security; The cardholder perceives the system and his or her funds are secure.

2.4.2. Benefits to operators:

Minor processing costs; Fast, certain cash flow; Operative suitability; Fraud, security, theft risks reduced; Lower insurance prices;

2.5. Smart Cards Against Existing Payment Possibilities

Plouffe et al. (2000) show one interesting issue with reference to the open-end credit smart card acceptance is to what degree customers and dealers just like the novel technology, mostly with reference to recent payment choices and practices. Worthington and Edwards (2000) show that there moves taking lay within the payment’s markets and the expected future of more card-based payments and less paper- check- and cash-based payments. Although there will at that point be a few switches and substitution of cash by put away stored cards, coins and notes will continue to be most payment instrument, in volume terms, for the probable future. According to Worthington

and Edwards (2000) study the accretion and occurrence of the usage of ATMs will still raise in both states (The UK and Australia), as the usage of cash back for the Purpose of Sale, for which each Electronic Fund Transfer at the purpose of Sale fatal in result becomes a money machine, as fine as a means of accepting card-based payments. The universality of admission to the ATM and Electronic Fund Transfer at the purpose of Sale systems for entirely cardholders and the prices related to such a service have silent to be determined among the monetary services providers, but the issuing of a plastic card to customers which permits them to access their cash, at any moment, anywhere and anyway can once more frame the thought of a relationship between the cardboard guarantor and so the cardholder, a relationship that's kept up and improved by the persistent usage of the cardboard, both for access to cash and to make payments at the purpose of sale (Worthington & Edwards, 2000). The improved usability of the plastic payment card is one of the clarifications for its success as a way of payment in Australia and UK and can be a source of its continual popularity progress in future (Worthington & Edwards, 2000).

2.6. Mobile Banking

Agreeing to Tobbin (2012), the creation of portable mobile communications innovation has made portable phones progressively collective and exposed for clients indeed inside the farthest portion of the planet. Tobbin (2012) said that the presentation of pre-paid tariffs, fast distribution and cheap handsets from China has donated meaningfully to the spread of portable mobile innovation in developing nations. Numerous rural individuals within the developed world who are dispossessed of essential services such as keeping money, pipe-borne water and power, have admission to portable phones. The number of portable mobile clients has long surpassed the number of people with bank accounts over the planet (Medhi and Ratan, 2009). The term portable mobile banking is explained as banking operation utilizing portable devices such as cell phones personal digital assistants, smartphones and other devices “(Lee and Chung, 2009).

2.7. Revenue collection improvement

The revenue collection normally states to an agency invoicing overall public or associate of the public for penalties, taxes or the other payment. In any case, income collection is additionally in general collection of income for arrears owed or owed income by people or companies. The idea of income administration is vigorous to organisation want the increase in income collection to maintain commerce operations. Numerous lessons highlighted a role of income administration in

increasing income and proposed techniques for doing so. Gilliam (2014) requested revenue grades next to profit and income may be a number those users of financial statements utilize to measure financially related position and execution of trade companies.

2.8. Effect of Electronic revenue collection

Oyster card could be a stored-value electronic smart card, which can have sole permits, dated permits as well as travel documents, that can be additional via cardboard earlier travel. Commuters trace it to the automated reader during inflowing then exit the transportation system to confirm it or abstract reserves. Postcards could also be loaded by frequent payment official, by electronic acquisition, at recognition master card stations or by money, the final two approaches at stations or ticket workplaces. The postcard is implied toward scale back the number of operations at ticket workplaces and thus the number of paper permits. Utilization is stimulated by contributing considerably inexpensive prices than with money however the receipt of money is being chased out. In London buses, cash is not accepted.

Inaugurated in 2003, an Oyster card system is a method of electronic ticketing used on public transportation in Larger London. It is supported by Transport for London and is effective on travel methods across London plus London Underground, London Buses, Docklands Light Railway, London Overground, trams, boat services, highest National Rail services interior the London price zones. The use of Oyster cards within the train system took numerous years barter (2006–2009) then was launched in January 2010 on nine London train operating companies. This has caused in increased TOC revenues of 6% in London (GBP 100 million annually) (Interoperability final report, 2016).

The report of UK Department for Transport and Detica (2009), the net present value of a national electronic ticketing construction done 10 years was valued at \$36.8 billion by full take-up. Level with a negligible rollout of smart card, net present value was estimated at \$2.8 billion, corresponding to a Benefit Cost Ratio of 1.8, which is near to the level designed as a high value for currency (2.0). The Department for Transport decided that the connection of open-end credit construction in United Kingdom public transport has big one-off charges but fairly low operating prices. The profits are large and are available from features like as modal changes, charge savings, revenue increased, fraud decrease, better service, and access improved and interconnection with further services.

Lastly, well planned automated systems can decrease corruption by falling face to face contacts (Jayakumar and Nagalakshmi, 2006). To confirm that taxes are collected professionally and decrease chances for corruption, a commonly recognized principle is that tax officials couldn't handle cash directly. Preferably, tax authorities must have small direct interaction to taxpayers and fewer option in decision of how to deal them (Geetha and Sekar, 2012). Usage of novel technologies in public transportation donates mutually advanced client satisfaction and easy drive to commuters then likewise rises competence of fare collection compared to the recent payment system produces probabilities for further flexible fares, donation, for example, chances to convert a zone-based fare structure into a distance based one. Extra chance is the formation of flexible membership rates, example: middle rates amongst weekly based and monthly based season tickets (Jasper Dekkers & Piet Rietveld, 2007).

Sanga (2015) concluded that system (My Park) is effective and efficient and has improved revenue collections to a great extent. It is expected that the system will be very effective when full deployed as it will reduce cash lockup associated with paper system and the trend towards control of revenue shows significant improvements. The efficient of my park was that initial costs are high but when fully implemented it will be very efficient as revenue will be improved. Generally, findings show that my park is efficient and more preferable than other system used before.

2.9. Operations of Tap & Go card

Tap and Go Card is a local cashless electronic payment system designed by the AC Group in a bid to promote the country's cashless economy and regional expansion with the aim of building a regional ICT hub. The AC Group is a Rwandan tech start-up, which is a leading provider of interactive and intelligent public transportation solutions to the country. System stands built with chip that is read by a machine installed at the entrance of the bus. When boarding the bus, passengers tap the card on the machine that deducts an amount of money equivalent to their trips. The machine at the entrance of the bus allows not only a cashless payment of the bus fare but also shows the card holder his or her account balance. Tap and Go cards can easily be bought at bus stations and recharged either using point of sale devices operated by AC group agents at bus terminals or via personal mobile money accounts. The e-payment system came with a promise of tapping a stop to long hours and queues, and harassing out with bus conductors for variation, amongst others. AC Group officials claim that the system allowed transport operators to reduce

costs and increase service transfer. Revenue loss straight to cash passing over many fingers, specifically, conductors, bus conductors and accountants, is the main challenge for operators that the system succeeded to address. Additionally, the system improves sanitation of buses by eliminating of paper voucher and to help handle several challenges, counting disputes that might generally occur between customers and drivers on fares. Furthermore, some bus operators stated that the system helped eliminate the challenge of counterfeit money, which was another source of revenue loss in the public transport business. For the part of passengers, there are claims that the system facilitated decrease the inconvenience of holding a change (in relations of coins) for the car fare and improved efficiency in terms of paying the fare.

The effective revenue collection using e-ticketing is facilitated by KBS management through their internal control system by checking that no passenger can enter into bus without paying using Tap & Go card.

2.9.1. Advantages of using e-ticketing

E-purse security: E-purse is the amount of money available in the card. After topping up a card and performing the transactions with that card all information are stored in the system. Minimise fraud and System security: Payments, top-ups are validated only after PIN entry by the cardholder and can be read only by devices belonging to the system components offline system: There is a main server at HQ connected to mini servers installed at remote sites, these mini servers allow the system to operate even if there is no relation connection to the key server till the link is re-established.

2.9.2. Benefits of e-ticketing system to public transport companies

Avoids theft and fraud, rise revenue, decrease operating charges, direct collection of payment, rise service efficacy and complete operation records and full traffic examination.

2.9.3. Benefits of e-ticketing system to passengers

Shorten operation periods, decrease cash treatment; Rise staying competence, automatic transmission refunds and reductions over loyalty plans. The Tap and Go structure be able for rising income by more than 30 percent then speediness up every day commutes and here are over a million Tap and Go users in Rwanda.

2.10. Features influencing e-ticketing system to be effective in fare collection

Strong Internet; a robust internet is a key factor to a new system or software to be effective and efficient. The technology involved in automatic fare collection system must rely on high-bandwidth, reliable mobile communications for online automatic fare collection systems (usually 4G).

Service Provider (KBS); Kigali bus service ltd must ensure that all users possess Tap &Go cards as it is a requirement to buy it at 500 frw then load money to Point of Sale agents located in different car stations and bus stops or loading using mobile money and using in fare payment by taping to bus validator machine on the entry of bus and do a daily follow up on their usage by the skilled IT technicians who must resolve any technical problem raised. The effectiveness of the Tap & Go card depends on the willingness of users due to perceived usefulness (PU).

System Supplier (AC Group); They must connect, construct and start the e-ticketing system at users' grounds, source spare parts and fittings to end users, train users on the greatest way of management of e-ticketing system, technical provision and preserve the supplied accessories at users' buildings and safeguard sustainable transaction.

Electronic devices; these devices must be of high quality and security in order to be effective for the targeted result to both service provider and users.

ICT innovation; The system to be effective, it needs to be innovated. The technology involved in e-ticketing systems must consider a continual need to be innovated and updated system security and software and integrate changes in fares according to the need of users and new technology on the market. ICT support must ensure that data are directly transmitted to AC Group server which will facilitate in monitoring all transactions and offering reports and over ICT provision, the connection among AC Group, Service suppliers, tap and Go users would be solid then KBS should obtain dependable information to the users through strong internet.

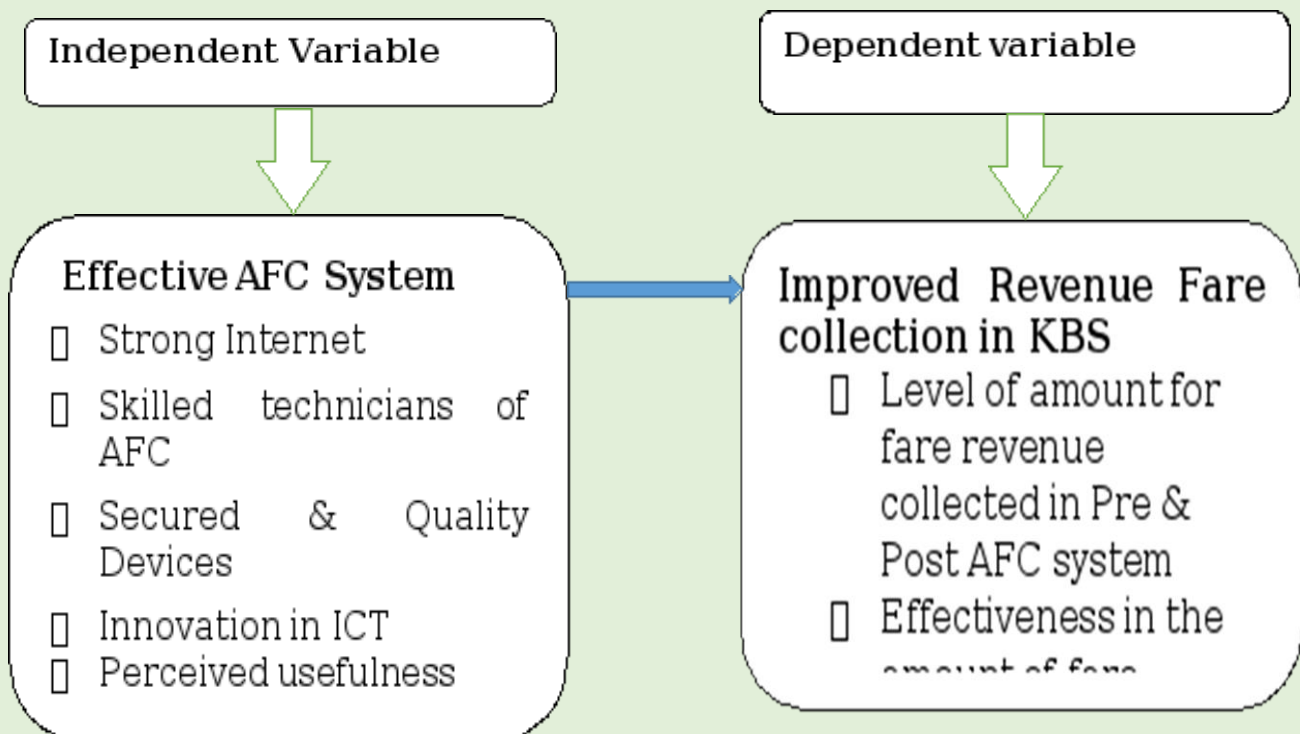
2.11. Conceptual Framework

Agreeing to Adam and Kamuzora (2008) Theoretical/Conceptual system could be a demonstrate of how one hypothesis makes consistent sense of the relationship among a few variables that have been identified as important to the issue. It could be a story layout introduction of factors to be examined and theoretical connections between and among the factors. It points at demonstrating

the preeminent imperative zones to be secured by the think about. As we can't build a house without establishment, investigate work too needs an establishment (Adam & Kamuzora, 2008).

There are two sorts of variables in this conceptual show, the dependent variable and independent variables. The dependent variable of this study is the fare revenue collection improvement, which is measured by level of amount for fare revenue collected due to eliminated theft and fraud of fare caused by cash in hands of persons and disputes in fare payment. In the other side; e-ticketing system with strong internet, skilled technicians, quality, secured devices and ICT innovation in this study are the independent variables. The study evaluated the commuters' behaviour towards e-ticketing system in KBS where perceived usefulness (PU) was assessed. After that, the effectiveness of e-ticketing system will be looked through comparison between level of amount for fare collected in pre and post e-ticketing system periods.

Figure 1: Conceptual Framework



CHAPTER THREE: METHODOLOGY

3.0 Introduction

The section debates on the method that the study should be undertaken. This part starts by discussing the research design appropriate for the study, the Population involving the study and the sample size used by this study. After that, methods used to gather data and the ways they will be treated are debated.

3.1 Study Design

The research specifically applied a descriptive survey plan whereby data collection has been done through administering questionnaires to the sample on population targeted and together qualitative and quantitative information provided. After the collection of the questionnaires, the researcher describes the provided information and referred to the primary and secondary data that was collected.

3.2. Target population

All the items under consideration in any field of analysis constitute a „universe“ or „population“. Sekaran describes a population as the complete group of persons, events or things that investigator needs to examine. Our targeted population is composed of all users that use Tap & Go card in KBS Ltd on daily basis which is estimated to 22,000 commuters according to AC Group report. However, the interview was designed to get also the thoughts of KBS manager, directors and staffs which are equal to 154 employees according to the information that was provided by management of KBS Ltd; The target population was chosen randomly on pro rata basis.

3.3. The sample size and sampling techniques

Sampling defined as the process that contains taking a portion of the population, making opinion on these representative groups then generalizing the findings to the large population (Ary, 1991).

Sampling is a selection of the small number of respondents to characterize the survey population and concerning sample selection. Slovin's formula is very over-all calculation used when you can estimate population but you haven't any idea about how certain population conducts.

Equation 1: Sample size formula

$$S = \frac{N}{1 + N \cdot e^2} \quad \text{Where}$$

S= Sample size; N= Population and e^2 level of precision or sampling error which in this case was taken at 5%

According to AC Group report, an estimated daily average tap of 22,000 which represents the number of populations that use Tap & Go card in KBS Ltd which may be used to calculate the sample size using probabilistic sampling method.

Table 1: Estimated daily average taps

Companies	Daily average taps (all lines)
ROYAL	19,000
RFTC	39,079
KBS	22,000
CITY CENTER	24,543
TOTAL	104,622

$$S = 22,000 / (1 + 22,000(0.05 * 0.05)) = 392.857 \text{ almost } 393 \text{ commuters}$$

Therefore, the random sample size was 393 commuters

The researcher visited KBS head office and obtained information from the director of operations concerning buses stations (CBD, Nyabugogo, Remera and Nyanza) used by KBS buses. The researcher asked the management the key and special bus station, which contains commuters of special characters, different kinds, come from different areas and possess different skills where Nyabugogo bus station were chosen; we used this way to avoid crossing all bus stations which can increase high risk on covid 19 during this period. The researcher followed by a random sampling technique in a way to avoid bias and decrease error chances.

Researcher also asks the management the list of employees, where names was provided to the researcher according to their tasks. Some directors purposively chosen for the interview because they are directly connected to fare collection and e-ticketing system (Tap & Go card) especially director of operation and director of ICT so that they can give us reliable information completing the managing director.

Table 2 below shows the composition of total used.

Table 2: Sample size of the study

Category	Number of respondents	Filed and returned	Not Returned	Percentage
MD and two Directors	3	3	0	100%
Commuters	393	352	41	90%
Total	396	355	41	90%

Source: Researcher's data 2021

3.4. Collection data Methods

Collecting data is a vital portion of any study which is limited by time. However, time should not be taken as an excuse in failure of collecting detailed data to support the study. The case study design allows the use of observations, interviews, past records and audio-visual materials (Leedy & Ormrod 2010). There two sorts of data, secondary data and primary data

3.4.1. Primary data

Those are data which are collected anew and primary time, as the original in character (Kothari, 2004). Primary data were collected over questionnaires and interview. Questionnaires were distributed to a total of 393 respondents and three interviews was conducted as shown in table 2.

The interview technique of data collection was arranged using structured questions. Qualitative data was collected over this technique, the data were used to complement and enrich discussion of the findings from questionnaires. Interview will be conducted on all groups in the sample just to collect opinion on the matter much specifically to managers (Mc Queen R and C. Knussen, 2002).

3.4.2. Secondary data

Those are which have even now been collected by somebody and have previously been passed over the statistical process (Kothari, 2004). The usage of secondary data was to supplement the findings, secondary data example used by researcher are the data analysed from the audited financial reports of KBS Ltd from 2011 to 2019 submitted to Rwanda Utilities Regulatory Authority (RURA) which detailing the turnover and the data from AC Group on estimated daily average tap.

3.5. Validity and Reliability

As far as this research is concerned, the reliability and validity for the information has been based on the nature of the questionnaires and interview guide developed because they were comprised of short and precise close-ended questions that are easy to understand and respond. The researcher considers that an average of 2 years of experience with KBS for employees and 2 years for using Tap & Go card to commuters are enough to rely on the data provided. Different tests such as percentages has been used to check for reliability of data. The analysis for the response rate has been conducted to find if the response was fair, this is expected to be fair at the rate exceeding 55%.

3.6. Data analysis and Procedures

Questionnaires are planned in a way that they can deliver quantitative data, even though chances for additional opinion agreed that can result in qualitative data. Respondents were asked to rank some statements from 1 definitely agree to 5 definitely disagree. Inferential and descriptive statistics were used in this research. Tables, pie chart and diagram were used in the presentation of findings.

The set created was to provide percentages and frequencies of each response possibility by the total number of responses; The multiple responses were tabulated by using SPSS version

Chi square

A test of categorical data with two or more treatment and outcome categories, to determine the outcome of the treatment on the outcome. Assumes five or more subjects projected in to each “cell” of the contingency table. For this particular research, the purpose was to quantify the strength and closeness of the connection among AFC system and fare revenue collection improvement in KBS.

Interpretation of chi-square

Pearson Chi-Square	Interpretations
sig.< 0.05	Reject Ho
sig. > 0.05	Do not reject Ho

Source: James & Jones (2000)

CHAPTER FOUR: RESULTS PRESENTATION AND DISCUSSION

4.1 Introduction

The role of this section is about presentation and discussion for the findings of the research on Effectiveness of e-ticketing system: Does it bring any improvement in revenue collection? A case study of KBS Area transport company – Kigali, the findings are presented and discussed on objectives basis, on the other hand the chapter presents the respondents background and then presentation and discussion on the effectiveness of e-ticketing system. After that, satisfaction level of e-ticketing system to different users at KBS is presented and discussed.

4.2 Respondent's Background

4.2.1 Response rate analysis

The total of 393 questionnaires were distributed for the accomplishment for the intended study. In most cases, the researcher asked the respondents to answer the questionnaire while getting some elaborations on the requirements of the questions especially to commuters. This tendency allowed 352 questionnaires filled and returned back with rate of response of 90% while 41 forms which are 10% were not returned back as shown in Table 2.

The interview was conducted to three senior staffs composed by managing director and two directors. This finding shows that the response rate is enough and fair, it indicates that the findings of the study would be representative.

4.2.2 Respondents' Gender

Table 3: Respondents' Gender

Gender	Frequency	Percent
Male	147	41.76
Female	205	58.24
TOTAL	352	100.0

Source: Researcher's Findings 2021

Respondent 's gender was considered important to discuss the respondents background, the findings show that the majority of the respondent were Female with 58.2% and male represented 41.8%. It is assumed that female are most ones accepted to respond to the questionnaires and

government of Rwanda has promoted female so now today's there are running out there conducting their deals.

4.2.3 Age of Respondents using Tap & Go Card

The researcher found to be important to consider the age of respondents using Tap & Go cards as the more period of usage is assumed to have more information on Tap & Go hence provision of realistic information

Table 4: Respondents' Age

Age	Frequency	Percent
Between 18-30 Years	65	18.47
Between 31-40 Years	146	41.48
Over 41 Years	141	40.06
Total	352	100.0

Source: Researcher's Findings 2021

The findings show that the greater number of the respondents were in the age between 31 and 40 with 41.5%, and 41 and over age with 40%. This means that 80% of respondents have more than 30 years which is considered as the category of commuters with responsibility running out in their daily work.

4.2.4 Education of the Respondents

The researcher put consideration into the educational qualification of respondents and found out that most of participants had bachelor's degree with 35.2% followed by A1 at the extent of 25.9% followed by Secondary level at the extent of 23.6%, primary level with 13.6% and PHD with 1.7% which may assure the researcher to get accurate responses.

Table 5: Education of the Respondents

Education level	Frequency	Percent
Primary	48	13.64
Secondary	83	23.58
Diploma	91	25.85
Bachelor	124	35.23
PHD	6	1.70
Total	352	100.0

Source: Researcher's Findings 2021

It shows that bachelor's degree, diploma and secondary holder are most category using public transport services accumulation of 84.7% as they are many outside finding jobs and working in different areas in Kigali. Most of PHD holders have their own private cars used in their daily work.

4.2.5. Tap &Go usage period by respondent

The researcher found to be of important to discuss the experience of respondents in using Tap &Go, the question posed was that "How long have you been using Tap & Go? Due to the loss of cash comes from theft or fraud of fare and other challenges; KBS become firstly started to use Tap & Go card in 2016 as solution of that loss and was said by its managing director in the interview held in December 2020. As more experience in using tap & go card is assumed to have more information on the system.

Table 6: Experience of the respondent

Usage period	Frequency	Percent
Between 1&12month	30	8.52
Between 1 & 2yeras	93	26.42
between 2 & 3 years	185	52.56
Between 3 & 4 years	24	6.82
Above 4 years	20	5.68
Total	352	100.0

Source: Researcher’s Findings 2021

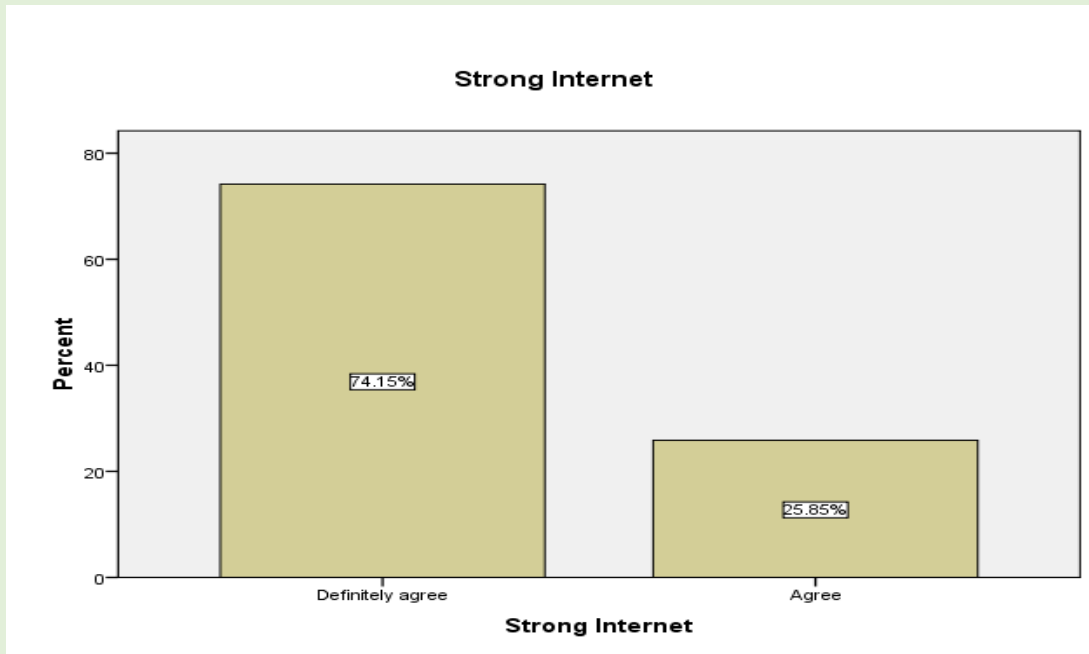
The finding on this question shows that 8.52% of the respondents are between one month and 12 months, 26.42% are between one year and 2 years, 52.56% are 2 years and 3 years, 6.82% between 3 years and 4 years and 5.68% above 4 years. The researcher found that 65.06% of the respondents are experienced in using Tap & Go cards for more than 2 years hence provision of realistic information.

4. 3. Applicability of e-ticketing system

4.3.1. Strong Internet

In general, a robust internet is a key factor to a new system or software to be effective and efficient. The technology involved in automatic fare collection system must rely on high-bandwidth, reliable mobile communications for online automatic fare collection systems (usually 4G). It is the reason why the researcher wanted to know the strongest of e-ticketing system internet; This will help to identify if there is no technological problem Example: Miss working sometimes due to internet problem. The question asked to the respondents is that: as system user do you use strong internet to carry out your operations like loading Tap & Go card and payment of fare?

Figure 2: Strong Internet



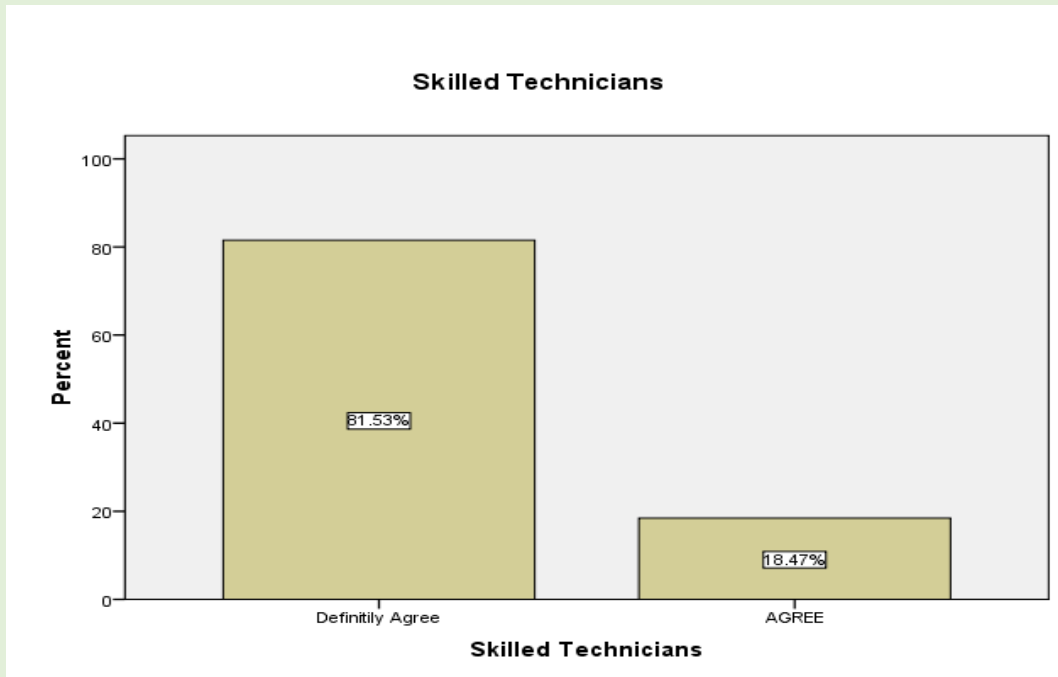
Source: Researcher's Findings 2021

The findings showed that 25.85% of respondent agreed that e-ticketing system has a strong internet and 74.15% are definitely agree; Almost 100% of users agreed that e-ticketing system maintained robust internet; These reflect that the fare revenue collection is effective through faster internet and there is no miss working problem, internet cutting, lower internet bandwidth, no delay in fare payment. It was explained by KBS technical director during the interview argued that AC Group management as Tap & Go system founder agreed to maintain strongest internet as the key factor which helped the system to be effective in terms of fare collection, eliminations of theft, frauds as well as errors in fare payment, easy data collection and reporting.

4.3.2. Skilled Technicians

As new system to be effective in operational must have skilled technicians. The technology involved in automatic fare collection systems need to consider high skilled and knowledgeable technicians in system development and implementation so that system become friendly usable and trustable by users. The researcher wanted to know the quality support from system technicians regarding the complaints raised. The researcher assessed technician skills based on question asked: as a system user; Does KBS Ltd offer high standard technical assistance through skilled technicians when it is required?

Figure 3: High Standard Technical Assistance by Skilled Technicians



Source: Researcher's Findings 2021

This finding shows that 81.5% of the respondents are definitely agree and 18.5% of the respondents are agree with faster and good assistance from skilled technicians when the problem arises. The outcomes of many respondents shows that they agree that technicians have enough skills to offer any assistance required. Almost new system used to have technical problems where skilled technicians are the key element to resolve them very soon as possible, this reduces the complains born and when resolved, users friendly become motivated to use the system which make it effective. KBS fare revenue collection become effective due to the ease way of resolving technical complaints installed by KBS management through its technical direction who work together with technical team always stayed in all bus stations checking and resolving each technical problem raised and escalating unresolved complaint to AC group technical team for assistance as mentioned by the IT director ok KBS during his interview.

4.3.3. Security and Quality e-ticketing devices

AFC system to be effective must highly consider the security of transactions and possess high quality of e-ticketing devices in order to be trusted by commuter. The technology involved in automatic fare collection systems must consider a need for security transactions, protected of fraud or theft for fare and personal data through quality devices. The researcher wanted to know how

the system users value the transaction security through the e-ticketing quality devices whether they are protected from fraud or theft in the whole process of fare payment. The asked question is: What is your observation on the security and quality of e-ticketing system devices (Tap & go card, POS machine and validator machine) during fare payment process.

Table 7: Security and quality of e-ticketing system devices

Security and quality of e-ticketing system devices	Frequency	Percent
Definitely Good	228	64.8
Good	93	26.4
Not Good	31	8.8
Total	352	100.0

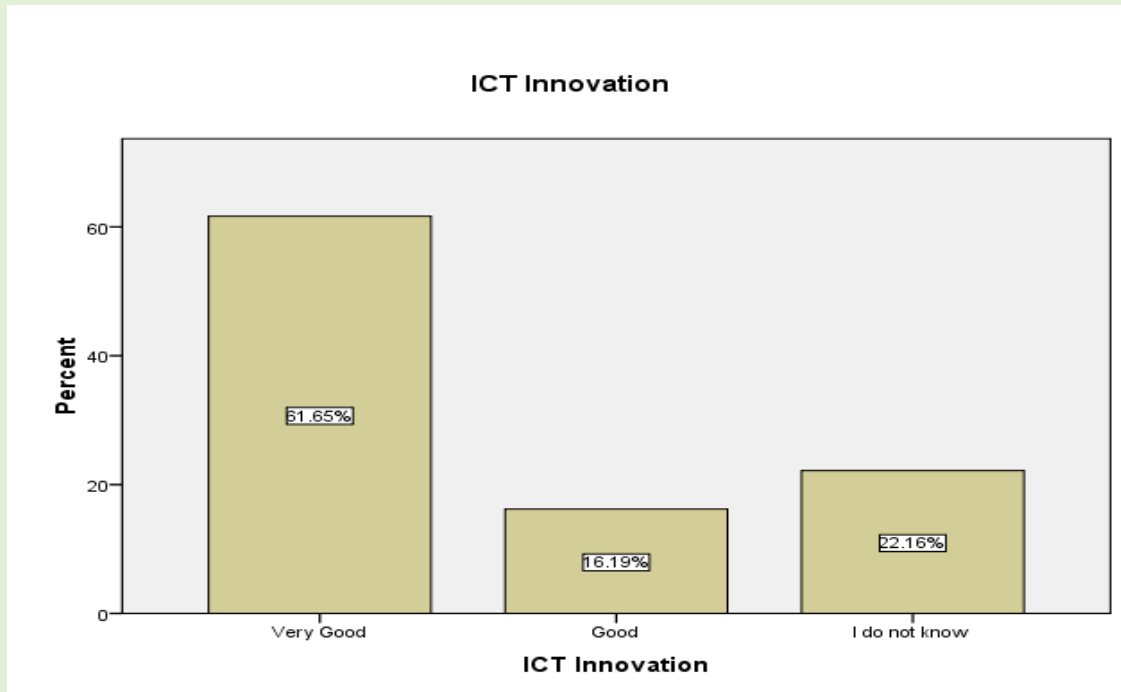
Source: Researcher’s Findings 2021

The finding shows that 64.77% of the respondents agree with security of the transactions in fare payment are definitely good, 26.42% are good and 8.81% not good. This means that approximately 91% of Tap & Go users trust the security of the whole process of the system from card loading up to payment process as well as maintaining the balance on their cards. The management of KBS through the managing director’s interview confirmed that they believe the system security devices offered by AC Group as system supplier, all fare loaded are used accordingly to the cardholder. Theft and fraud of fare was eliminated, no one can touch balances on the cards and the paid fare reach the destination without any deviation. The fact that e-ticketing system transactions are secured, this was increased trust to the users which helped the system to be effective in improving fare payment

4.3.4. ICT Innovation

The system to be effective, it needs to be innovated. The technology involved in automatic fare collection systems must consider a continual need to innovate and update system security and software and integrate changes in fares according to the need of users and new technology on the market. The researcher wanted to know if tap & go system ever innovate their services so that cardholders benefit such innovation to make life very easy in-service utilization as well as benefit to service provider in sufficient fare collection. The asked was that: What is your opinion to the ICT innovation of Tap & go provided by system founder?

Figure 4: Innovation in ICT



Source: Researcher's Findings 2021

This finding shows that 61.65% of respondents are very good and 16.19% of the respondents are good with the ICT innovation while 22.16% don't know about the ICT innovation of Tap & go system. Approximately 77% of the respondents agree there is an innovation of Tap & Go system when you compare the current status and starting periods. System to be successful need to be innovated by inventing new services influencing new user's attention. Tap &Go card has been innovated in different ways but mostly on how commuters load their card; Today the cardholder can load tap & go card using MOMO, Tap & Go App and Transfer from your bank account as better solution to avoid spread and contamination of covid 19, differently to the situation before where only POS agent can load the tap & go card, you can check the balance which differently from the previous years where only POS agent can load and check balance on the card using the POS machine. The installed free Wi-Fi (4G) in public buses encouraged commuters to use public transport services and making life very easy. The innovation of e-ticketing system has a big influence in fare revenue collection improvement as commuters have been motivated to use the system as was explained by KBS IT director that the introduction of different mode of loading Tap & Go card brought significance improvement in fare payment of KBS Ltd.

4.4. Customer behaviour & satisfaction level

4.4.1. Perceived Usefulness (PU).

The researcher wanted to know the most important thing an adoption of any technology before considering e-ticketing effectiveness. This is commuter's behavior towards technology, the question asked was that "When A e-ticketing is used, how do you rank the following statements? Rank by ticking from 1 (Definitely agree) to 5 (Definitely disagree) to show the degree of acceptance on the statement". The commuter 's behavior towards e-ticketing system at KBS was determined by Perceived Usefulness (PU).

Table 8: Using e-ticketing system has enhanced commuters job performance

Perceived usefulness (PU)	Frequency	Percent
Agree	40	11.4
Definitely Agree	261	74.1
Disagree	51	14.5
Total	352	100.0

Source: Researcher's Findings 2021

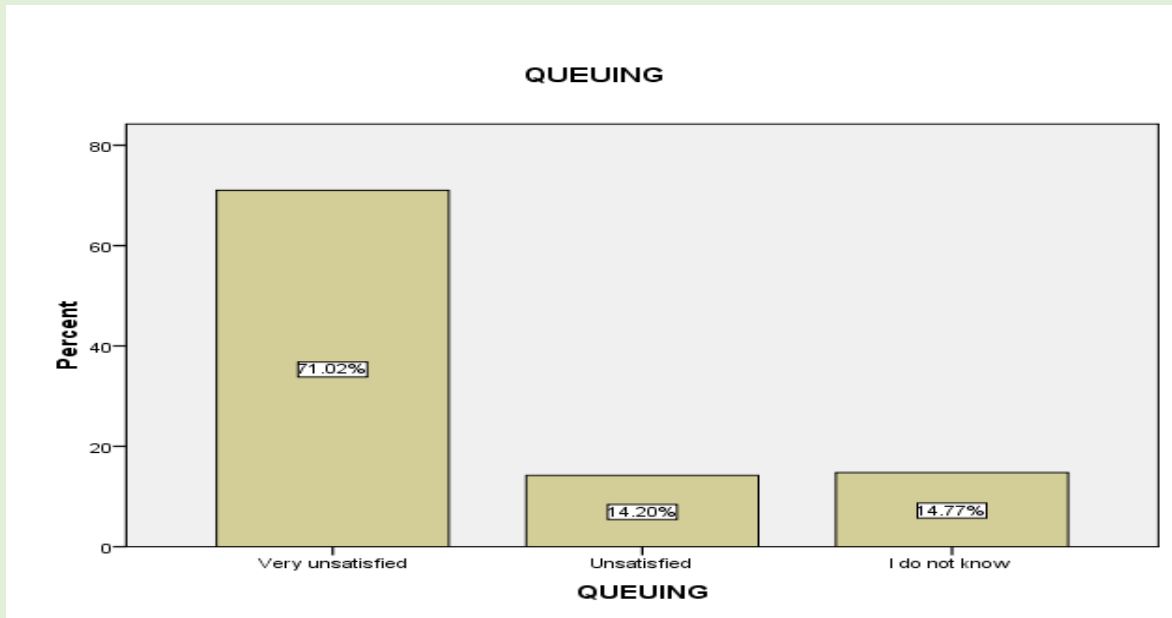
This finding shows that 74.15% of respondent are definitely agree, 11.36% are agree and 14.49% disagree that e-ticketing has enhanced their job performance.

In general, when the descriptive examination was conducted on the findings of perceived usefulness (PU) showed that 85.51.0% of respondents are agree which means that e-ticketing system is a technology accepted and useful to different users as it meets the minimum standard. Cash disputes born between drivers and commuters in the process of fare payment was eliminated, holding cash in pocket was no longer exists, loosing time to find exchanges of payment was eliminated, services of payment become very easy and quick once you have money on the card which saves user's time and avoid him covid 19 contamination.

4.4.2. Queuing problem solving

Most of the times commuters complained about long queue in bus stations of Kigali. The satisfaction of e-ticketing system was measured through many parameters including queuing problem. The question posed to respondents is that "How are you satisfied with the application of e-ticketing system at KBS? Ranking to show your satisfaction level, rank 1 to mean unsatisfied to 5 very satisfied"

Figure 5: Queuing solving problem



Source: Researcher's Findings 2021

The findings on this question above showed that 71.02% are very unsatisfied, 14.20% showed that they are unsatisfied and 14.77% showed that they do not know. In general, 85.22% of commuters disagree on e-ticketing system role in resolving queuing problem in different bus stations. Managing director of KBS also confirmed that long queue is a big challenge to all operators in public transport services in Kigali that could happen mostly during peak hour for the AM period is 7:30-8:30 and the peak hour for the PM period is 17:00-18:00. Unresolved queuing issue will continue to be a challenge of smart public transport services and to fare revenue payment in public transport services; Its resolution requires joint participation of all public transport stakeholders including government.

4.4.3. Quality and Quantity service offered by KBS

Quality of services is a key factor to the satisfaction of commuters. High satisfaction of users indicates that the system become effective. The researcher wanted to know the quality and quantity of the service provided by KBS; The question posed was How do you rank the quality of the services provided by KBS?

Table 9: Quality of services provided

Quality of service	Frequency	Percent
Good	100	28.4
bad	187	53.1
very bad	65	18.5
Total	352	100.0

Source: Researcher's Findings 2021

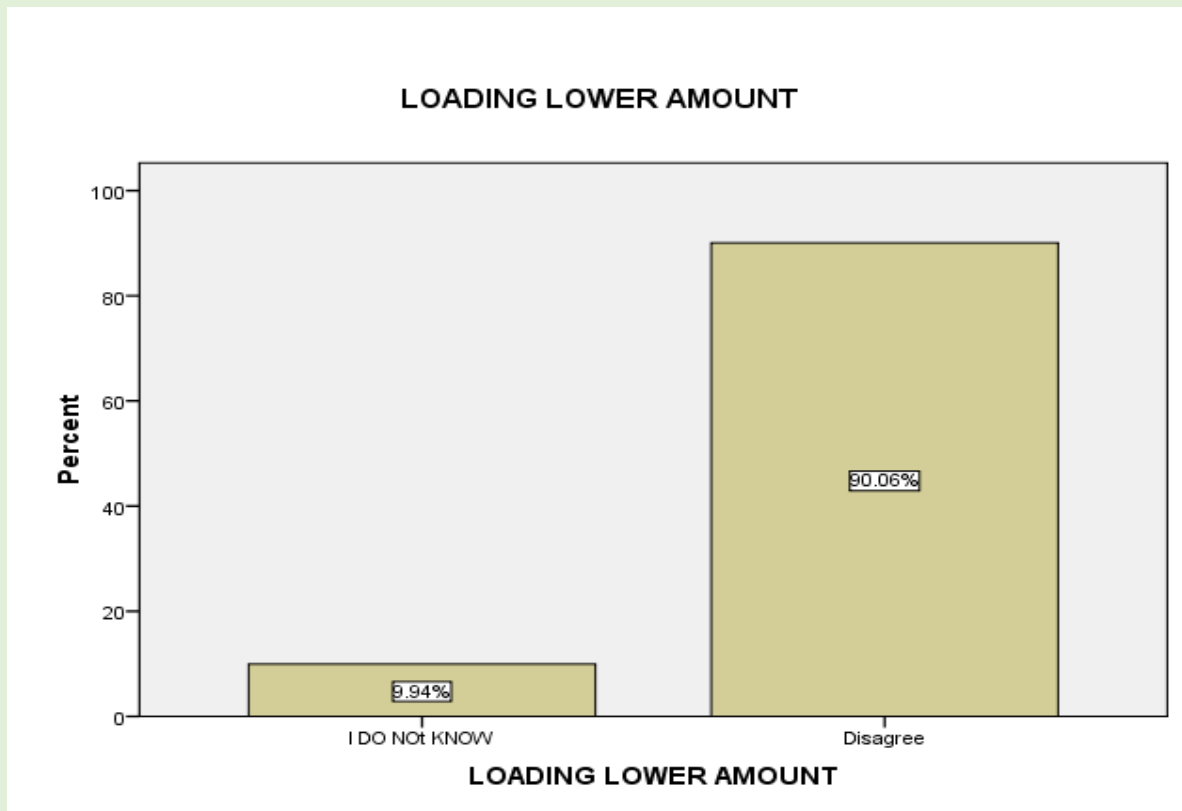
The finding on this question shows that 28.41% of the respondents respond that quality of service is good, 53.12% respond that quality of service is bad and finally 18.47% respond that quality of service is very bad. when the descriptive analysis was conducted on the findings where more than 71% respond that service offered by KBS are bad is because many commuters mostly look public transport services images through long queue wherever in bus stations and routes not only for KBS case but it is for all public transport buses in Kigali; Loading high number of commuters than expected in buses which bring non satisfaction mind of commuters. Queueing problem is a general problem and its resolution will be in general because it requires solidarity of public transport stakeholders as said by managing director and technical director of KBS during their interviews. Lower quality services mean commuters are not satisfied which make the e-ticketing system to be ineffective.

4.5. Challenges faced in usage of tap & go card

4.5.1. POS agent load lower amount than what has been paid

At the beginning of using Tap & Go cards, commuters had only one option to load their cards through POS agent; sometimes an agent may load lower amount that what have been paid by commuter. The researcher wanted to know if AC Group agent load lower amount than what has been paid by commuter. The question asked was what are the most challenges faced since you start to use e-ticketing?

Figure 6: POS agent load lower amount than what you have paid



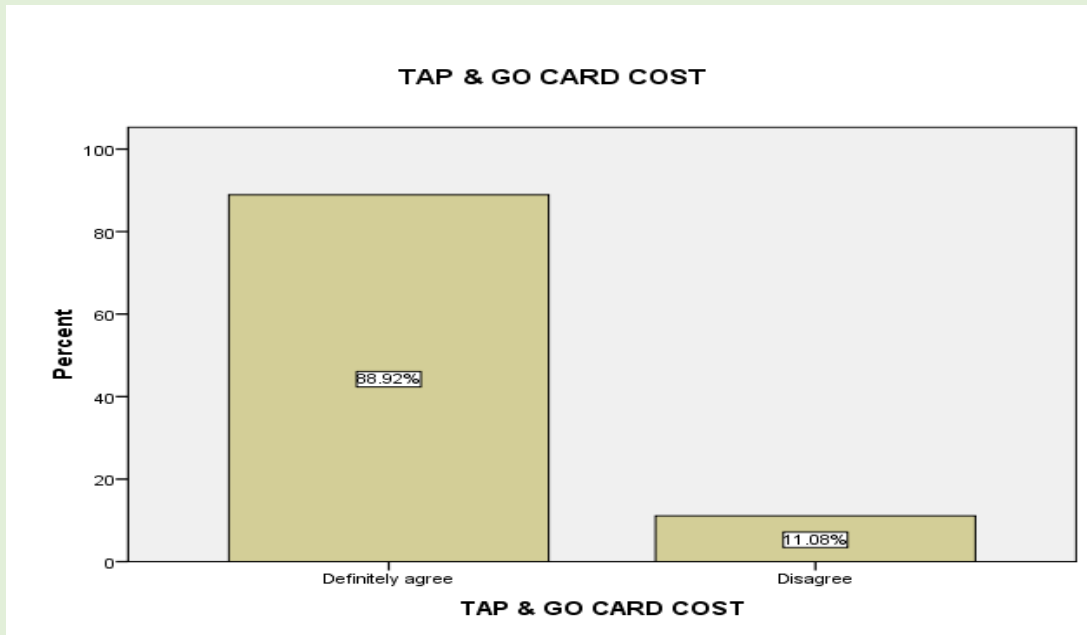
Source: Researcher's Findings 2021

The finding on this question shows that 90.1% of the respondents said that they disagree with loading lower amount, 9.9% of the respondents said that they don't know. This problem used to happen at the beginning of e-ticketing system but it is no longer exist because high punishment given to POS agent condemned with such bad habit as explained by operational director in KBS.

4.5.2. AC Group Tap & Go card cost

Greater number of users in public transport services are those who don't have financial capacity of buying their own private cars which imply the lower income; high cost of Tap & go card may become a challenge to many commuters. Researcher wanted to know if AC Group tap & go card cost become a challenge to commuters; The question asked was what are the most challenges faced since you start to use Tap & Go card? This question was asked considering that the current cost of the Tap & Go card is 500 Rwf

Figure 7: AC Group Tap & Go card cost



Source: Researcher’s Findings 2021

The finding on this question shows that 88.92% of the respondents are definitely agree that the cost of Tap & Go card is challenge to them and 11.08% of the respondents are definitely disagree that AC Group tap & go card cost is not a challenge. As higher number of commuters agree that tap & go card is expensive and their proposal should be to give them for free as material to use for loading their fare and if there is cost it should be lower so that every commuter can afford it in order to help everyone in fare payment easily.

4.5.3. Double Deduction from the card

At the beginning of usage of Tap & Go card, there was many challenges as it is normal to a new system; due to technical problem and internet there was a time where validator machine remove fare twice to tap & go card when a commuter passed near to that machine. The researcher wanted to know if POS validator make double deduction from the card; the question posed was what are the most challenges faced since you start to use e-ticketing? Considering that it was the main issues for commuters at the beginning of using e-ticketing system.

Table 10: Double deduction from the card

Quality of service	Frequency	Percent
Good	100	28.4
bad	187	53.1
very bad	65	18.5
Total	352	100.0

Source: Researcher’s Findings 2021

The finding on this question shows that 21.6% of the respondents said that they do not know, 78.4% of the respondents said that they disagree of double deduction which means that the problem has been resolved. This was an effort made by AC group and public transport operators in Kigali and RURA as said by managing director of KBS. This was motivated commuters and increased their trust to pay using Tap & go card.

4.5.4. Checking Balance

Checking balance on the card was the general problem to commuters from the starting of the system, once you want to know the balance on your card you had to request POS agent to check for you. It was a challenge that was supposed to be resolved in order to allow commuter each commuter to check balance on its own for better planning of fare usage. The researcher wanted to know if checking balance on Tap & Go card is a problem to commuters; The question posed was: what are the most challenges faced since you start to use e-ticketing system? This question was asked considering that this was the big complaints to the users at of using AFC system.

Table 11: Checking balance

Checking balance	Frequency	Percent
Agree	250	71.0
Do not know	24	6.8
Disagree	78	22.2
Total	352	100.0

Source: Researcher’s Findings 2021

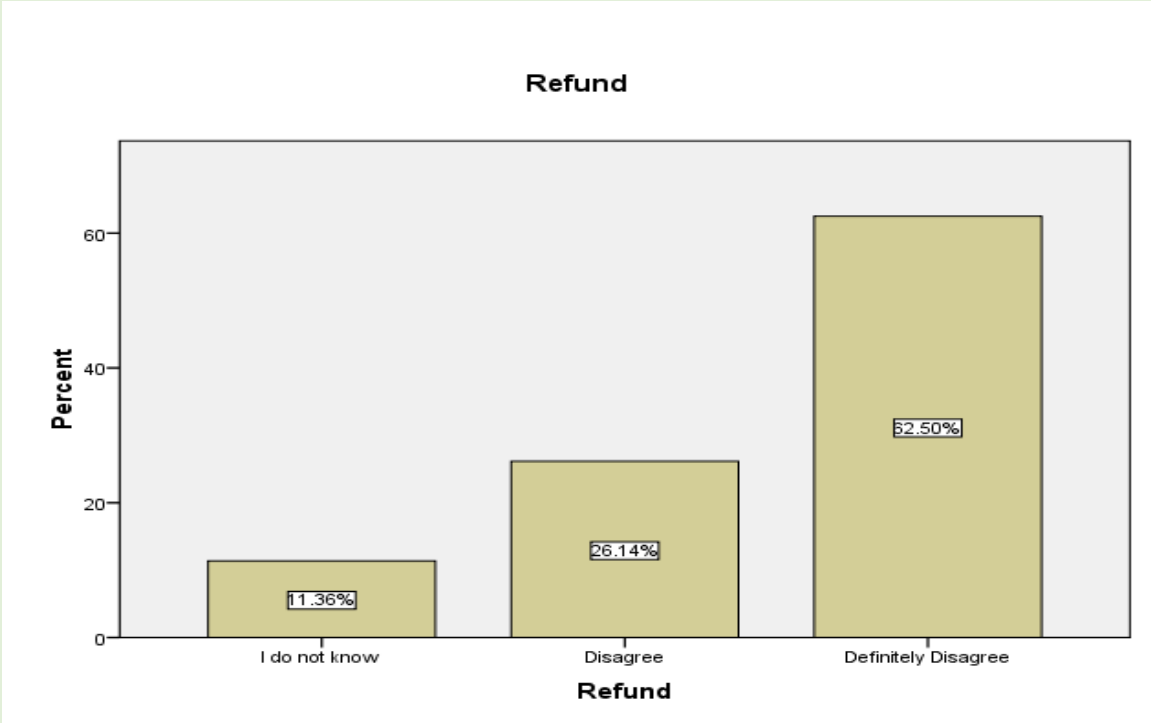
The finding on this question shows that 71.02% of the respondents said that they agree that checking balance is a problem to them, 22.16% of the respondents said that they disagree and 6.82% of the respondents said that they do not know.

In 2020, AC Group has launched Tap & Go App used by commuters in Rwanda traveling within and outside Kigali. In Kigali, a commuter is able to load using Tap & Go App, check balance and Transfer fare to friends and family but the challenge is that someone who do not use smart phone can't benefit these services and those who have them complained that the system is not working well as published. This can be one of the reasons why more than 70% commuters consider checking balance on the tap & go cards is still problem. Without an easy way of checking balance may affect commuters in planning of fare payment loaded for their trips.

4.5.5. Refund when erroneously taped

In the process of a trip, a commuter may erroneously tap to wrong bus he was not supposed to tap; that is why KBS must refund fare to the commuter. The researcher wanted to know if commuters are refunded when erroneously taped their cards; The question posed was that: what are the most challenges faced since you start to use AFC?

Figure 8: Refund when erroneously taped



Source: Researcher's Findings 2021

The finding on this question shows that 62.50% of the respondents are definitely disagree, 26.14% of the respondents are disagree and 11.36% dot not know. This problem occurs when a commuter erroneously enters to bus, he is not supposed to use and tap to bus terminal he is not supposed to use in his or her trips. The time company is not able to refund the commuters, it is considered as a loss to commuter because they can pay twice to one trip; which is not fair to tap & go system user as it can demotivate them.

4.6. Chi-Square

Table 13 establish the Pearson Chi-Square analysis that evaluate the relationship between AFC system (independent variable) and level of fare revenue collection improvement (dependent variable).

In chapter one, the following hypothesis- “there is relationship between e-ticketing system and improved fare revenue collection in KBS”- was suggested and the basing on the findings, the conclusions have been made.

Table 12: Chi-square result analysis

No	Variables	Value	Degree of freedom	P-value
1	Strong internet	8.848	2	0.012
2	Skilled technicians	8.848	2	0.012
3	ICT innovation	20.373	4	0.000
4	Security and quality of AFC system devices	49.993	4	0.000
5	PU	45.502	4	0.000

Source: Researcher’s Findings 2021

The above table provides a Pearson Chi-Square of coefficient between e-ticketing system and fare revenue collection improvement, total population were 352 and the significant level is 0.05, the statistical evidence confirmed that e-ticketing system had a significant relationship on fare revenue collection improvement in KBS basing on the fact that he Pearson Chi-Square in the table 13 were 8.848, 8.848, 20.373, 49.993, 45.502, and the asymptomatic significance of 0.012, 0.012, 0.000, 0.000, 0.000 respectively which is less that the p-value of 0.05. Then, the null hypothesis is rejected

and the researcher confirms that there is a significant relationship between e-ticketing system and fare revenue collection improvement in KBS Ltd.

4.7. Effectiveness of e-ticketing system

4.7.1. Demonstration of e-ticketing system impact on fare revenue Collection

The researcher wanted to demonstrate the effectiveness of e-ticketing system by analyzing collected fare revenue amount in pre and post e-ticketing system through audited financial reports of KBS Ltd from 2011-2019. The effectiveness of e-ticketing was measured by comparing the overall growth rate of revenue collected before the introduction of e-ticketing (2011-2015) versus actual revenue collected after introduction of e-ticketing system (2016-2019).

Table 13: Pre and Post e-ticketing system revenue amount collected 2011-2015 & 2016-2019

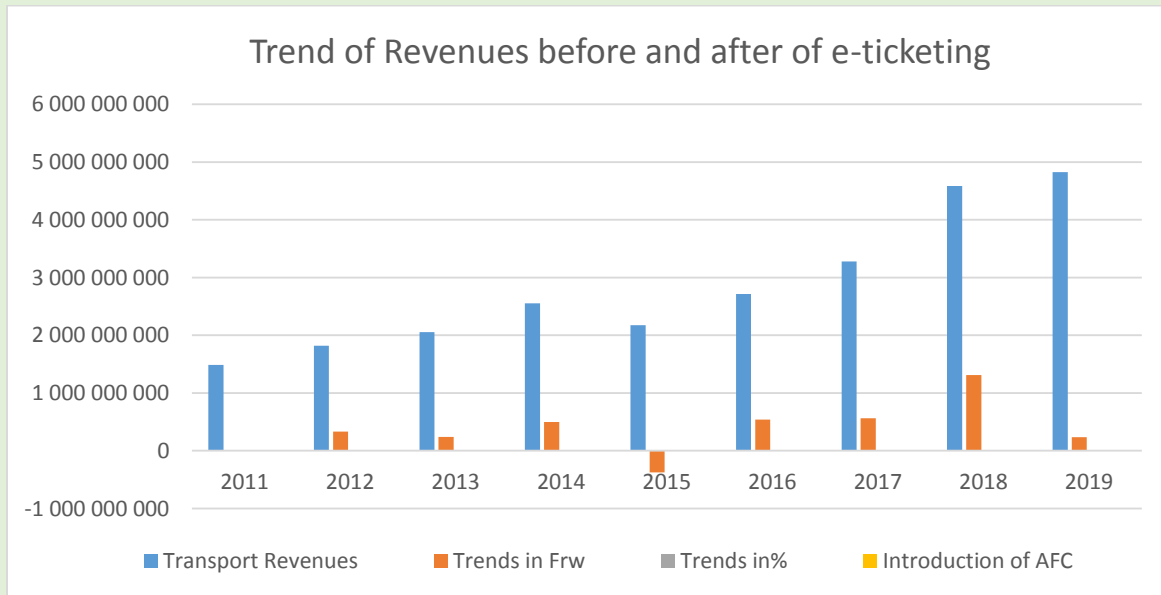
Year	Transport Revenues	Variance Trends in amount	Trends in%	Pre & Post AFC
2011	1,487,753,723	0	0	0
2012	1,818,173,106	330,419,383	18%	0
2013	2,056,824,960	238,651,854	12%	0
2014	2,552,707,368	495,882,408	19%	0
2015	2,176,391,743	-376,315,625	-17%	0
2016	2,713,707,000	537,315,257	20%	1
2017	3,277,073,000	563,366,000	17%	1
2018	4,587,881,000	1,310,808,000	29%	1
2019	4,823,996,000	236,115,000	5%	1

Source: Researcher's Findings 2021

0= stands pre-e-ticketing system periods 2011-2015

1= Stands post e-ticketing system periods 2016-2019

Figure 9: Trend of revenues collection in Pre and Post e-ticketing system



Source: Researcher’s Findings 2021 using excel

Equation 2: Formula of overall revenue growth rate (Wiki How)

$$\frac{(ending R)^{1/n}}{starting R} - 1$$

R= Revenue

n= Number of Years

The overall growth rate of pre e-ticketing system and post e-ticketing system collected revenues.

$(Ending R / Starting R)^{1/n} - 1$

Overall growth rate of Pre e-ticketing (2011-2015) = $(2,176.4 / 1,487.8)^{1/5} - 1 = 8\%$

Overall growth rate of Post e-ticketing (2016-2019) = $(4,824 / 2,713.7)^{1/4} - 1 = 15.5\%$

The findings showed that there is an improvement achieved by using e-ticketing system revealed by almost the doubling overall average growth rate at 15.5% comparing overall average growth rate of pre e-ticketing system revenues collected 8%. The improvement has been done extremely well in 2018 where KBS collected revenue has increased up to 29% compared to the decrease of 17% in 2015 before the system introduction. It is linked with the interviews of managing director in KBS Ltd who confirmed that Since KBS Ltd started to use Tap & Go system the revenue collected has increased effectively due to elimination of fraud of fares.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

The Section introduces the summary, conclusion of the main findings from the research and suggested recommendations on the relationship of automatic fare collection system and revenue collection improvement; Then the chapter includes policy implications

5.2. Findings' summary

The research analysed e-ticketing system to discovery if the system brought any improvement to revenue collection in KBS Ltd. The findings of the study were presented and interpreted basing on the problem statement, the objective of the research and directed by research questions. A number of 393 questionnaires were dispersed in order to accomplish the intended study and three (3) interviews were conducted. Only 352 questionnaires filled and returned back with 90% as response rate while 41 questionnaires are not returned back with 10% as response rate. Interviews were conducted to managing director as well as two (2) directors (ICT & Operations).

The analysis and interpretations were focused on the data collection from the total surveyed people; Then the researcher came up with the findings to fulfil the objectives and were presented within the tables, diagrams, charts and pie charts.

The findings showed clearly that almost all respondents confirmed that e-ticketing system had maintained a strong internet; The findings showed that 81% of the respondent agreed that e-ticketing system had skilled technicians to run the system by giving technical support to the users; The findings showed that 91% of the respondents confirmed that e-ticketing system had a better security and quality devices where fare payment transactions were done in full security; The findings showed that 77% of the respondents confirmed that e-ticketing system had innovated the services of tap & go system which were updated with time focusing to the needs which is making very easy the life of users and the findings showed that 85% of the respondents had a good perception on the usefulness of e-ticketing System which are all above to general decision criterion 55%. These made the tap & go system to be effective and has a positive impact in improving fare revenue collection where actual amount of fare revenue collected were improved in great extent;

In order to find out correlation between e-ticketing system and fare revenue collection improvement, the researcher used Chi square analysis. Findings showed that there is a significant relationship among e-ticketing system and fare revenue collection improvement with the

asymptomatic significance of 0.012, 0.012, 0.000, 0.000 and 0.000 which is less than the p-value of 0.05 and this was confirmed by the doubling overall growth rate at 15.5% in post e-ticketing system compared to overall growth rate of 8% in pre e-ticketing system. The managing director of KBS confirming this during interview that KBS amount of fare revenue collected has increased in great extent since they started to use e-ticketing system in fare collection; This improvement has been done extremely well in 2018 where KBS amount of fare revenue collected has been increased to 29% compared to the decrease of 17% for 2015 before the system.

Despite that e-ticketing is a technology accepted and useful by different users as it meets the minimum standard. The acceptance level is inappropriate as the tabulated of responses' frequencies revealed some weakness like persistent long queue in bus stations and bus stops during peak hours, the cost of Tap & Go card equals to 500Rwf considered as expensive; POS agent and Tap & Go cards are few to some bus stops and routes, checking balance on the Tap & Go card is a challenge to some who don't have and use smart phones, there is no refund given to someone who erroneously taped to validator machine installed in the bus and the card is only useful in transport fare payment.

5.3 Conclusion

The whole research was aimed to be carried out in KBS Ltd. The analysis done was aiming to assess the effect of e-ticketing system on fare collection improvement. As referred on the findings where the surveyed commuters, conducted interviews to the management of KBS and the analysis of reported amount of fare collected in pre and post system expressed the responses of e-ticketing system to the fare collection improvement of KBS, the findings have proven that there is an impact of e-ticketing system on fare revenue collection improvement in KBS.

In general, findings showed that e-ticketing system is extremely effective and more preferable not only in fare revenue collection matters but also in this period of COVID 19 as essential preventive measure to reduce its spread and contamination between commuters in their trips.

5.4. Recommendations

After the analysis of the findings, some problems were discovered and these have led the researcher to come up with the following recommendations:

5.4.1. KBS and public transport stakeholders in city of Kigali

Referring to the persistent long queue in bus stations and bus stops; KBS, public transport stakeholders and government must introduce Dedicated Public Transport Lanes (DBLs) aimed at improving the commercial speed in public transport services and eliminating long queue in pick hours.

KBS ltd and other public transport services operators in city of Kigali must come up with clear plan of public transport trips which provides the real time travel information to public transport users.

5.4.2. AC Group Ltd

KBS and other public transport services stakeholders should request AC Group to reduce the cost of Tap & Go card or offering it for free if necessary to facilitate the usage of tap & go system up to the lower income commuters which are considered as greater number of users;

To put POS agents wherever needed to reduce the complaints for commuters using some new routes, more than one POS agent where seems necessary due to greater number of commuters.

AC Group should update tap & go card by including owner's personal details that give the possibility for refund when the incident of mistakenly tapping occurs;

AC Group has to find easy way of checking balance to each category of commuters as Tap & Go app are one's for smart phones user;

AC Group has to update Tap & Go card so that it can be a multipurpose not only in fare payment but also in payment of goods and other services in order to eliminate cash payment and the spread of COVID 19 as preventive measure;

Encourage commuters to load tap & go cards using online transfer as cashless policy.

Improving cybersecurity for the system by securing it from any attacks.

5.4.3. RURA

RURA must set a related regulations and change current scheme of fixed fares tariff into distance fare-based tariff to resolve complaints of tap & go system users who requested to pay full cost of a trip instead of paying equivalently the distance used to travel for short trips in town; For example, a trip from one bus stops to another or from one kilometer to two kilometers;

RURA and public transport operators have to increase punitive measures to discourage bus drivers behaviors to take cash and promote the cashless system; Joint inspection by system stakeholders;

RURA must recommend all public transport services operators in the country to use automatic fare collection system which will bring the whole country on the same stage of having smart public transport services;

RURA has to increase inspections and enforcement in the whole country to make sure for well application of rules and regulations on automatic fare collection system.

5.4.4. Policy implications

To develop an identical fare design agreement to provide a more consistent transport system in a multi-agency environment in order to save time and avoid to take a long distance for fare payment;

To improve public transport fare policy (for all public transport modes including taxis and shared mobility) in Kigali and updated as needed and integration of ticketing system and fare collection policy which would be for all public transport modes;

Develop a public transport automatic fare collection interoperability considered as the capacity of diverse agencies to organise and share information so that commuters should travel in integrated manner or capacity of systems to offer services and receive services from other systems as well as to use the services replaced to permit them to function together effectively.

5.5. Limitation of the research

Challenge of this research is that there is no financial means to carry out a study field visit abroad like US, Europe and Asia where e-ticketing system is more developed long times ago. The researcher has restricted the study in City of Kigali as resolution to financial constraints. It was very hard to get data on time due to corona virus pandemic as many offices were closed. Smart public transport is very wide but for the matter of this study we only focused on the impact of e-ticketing system in improving of fare revenue collection in KBS Ltd.

REFERENCES

- Abdul, M. A. (2010). Transaction Size Effects on Consumers' Retail Payment Mode Choice, *International Journal of Retail & Distribution Management*, Vol. 38. pp. 460 – 478 .
- Bank, T. I. (2016). *Public Transport Automatic Fare Collection Interoperability: Assessing Options for Poland*.
- Bhat, C., Bicka, S., Mondia, J. L., Kapur, A., Guo, J., & Sen, s. (2006). *Measuring Access to Public Transportation Services (pp71) Texas*. center transportation research (CTR) THE UNIVERSITY OF TEXAS AUSTIN.
- Coyle, C. E. (1994). *Savings in the Cards", Facilities* (Vol. 12).
- Dali, S. (2015). *Electronic revenue collection: Does it improve organization performance? A case study of Ngorongoro conservation area authority*.
- Diaz Olvera, L. P. (2008). Household transport expenditure in sub-saharan african cities: measurement and analysis. *Journal of transport geography* ,16(1). 1-13.
- Duffy G, D. B. (2008). *E-commerce processes: A study of criticality, Industrial Management & Data Systems* (Vol. 102).
- Geetha R, S. M. (2012). Awareness and Satisfaction level of individual Tax payers in Coimbatore city, India *Research Journal of Management Sciences*, 1(4),6-11.
- Giorgio, M. (2010). Fighting financial crime in the age of electronic money: opportunities and limitations", *Journal of Money Laundering Control*. Vol. 13, pp. 202 - 214 .
- Glen Weisbrod Economic Development Research Group, I. (2005). *Economic & Transport Trends Affecting Maine's Future* Glen Weisbrod Economic Development Research Group, Inc. 2 Oliver Street, Boston.
- GoR. (2012). *Public Transport Policy and Strategy for Rwanda*. Ministry of Infrastructure.
- Hope, M. (2016, May 11). Kigali public transport to go cashless.
- Hopkins, R. (2005). *Travel Management Faces New Tests*. Euromoney.

- Iseki, H., Demisch, A., Taylor, B. D., & Yoh, A. C. (2008). *Evaluating the costs and benefits of transit smart cards. California PATH Program, Institute of Transportation Studies.* University of California at Berkeley.
- Jasper, D., & Rietveld, P. (2007). *Electronic Ticketing in Public Transport.*
- Jayakumar A, N. C. (2006). *Direct Tax Reforms: An overview, Southern Economist.*
- Kamana, D. (2016). *Influence of electronic tax management system on effectiveness of tax collection in Rwanda a case study of Rwanda revenue authority (RRA).* Kigali.
- Leedy, P. D., & Ormrod, J. E. (2010). *Practical Research: Planning and Design, Ninth edition,* Pearson education Inc. New Jersey.
- Listfield, R., & Montes, N. F. (2000). *Modernizing Payment systems in Emerging Economies.* World Bank policy research working papers 1336.
- Marketing91. (2019). Modes-of-payment.
- Matas, A. (2004). *Demand Revenue Implications of an Integrated Public Transport Policy: The Case of Madrid*”, *Transport Reviews* (Vol. 24). Madrid.
- McQueen, R., & Knussen, C. (2002). *Research methods for social science; An introduction,* Prentice Hall, Harlow.
- Mondato. (2019). CASHLESS TRANSPORTATION: KENYA AND RWANDA AS CASE STUDIES.
- MUWANULA, P. (2013). *Adoption of an Automated Fare Collection System: City of Tshwane Taxi Owner's Perspectives.* JOHANNESBURG.
- Niyonsenga, D. (2012). *Assessing public transport supply for Kigali, Rwanda.* University of Twente, Netherland.
- Olivková, I. (2016). Evaluation of Quality Public Transport Criteria in Terms of Passenger Satisfaction. *Transport and Telecommunication.* 18–27. doi:10.1515/ttj-2016-0003

- Ozkan, O., Bindusara, G., & Hackney, R. (2010). Facilitating the adoption of e-payment systems: theoretical constructs and empirical analysis", *Journal of Enterprise Information Management*. Vol. 23, pp. 305 – 325.
- Plouffe, C. R., Mark, V., & John, H. (2000). Why smart cards have failed: looking to consumer and merchant reactions to a new payment technology", *International Journal of Bank Marketing*. Vol. 18, pp. 112 -123 .
- Prabowo, H. Y. (2012). A Better Credit Card Fraud Prevention Strategy for Indonesia, *Journal of Money Laundering Control*. Vol. 15, pp. 267 – 293.
- Prideaux, J. (2009). *Visa and Digital Money*, *European Business Review*, Vol. 99.
- Puri, V. (2006). Smart cards - the smart way for the banks to go?" *International Journal of Bank Marketing*, Vol. 15.
- RURA. (2014-2015). *Annual report* .
- Sekaran, U. (2003). *Research Methods for Business: a skill- building approach (4th ed. ed.)*. New Dehli.
- The world, B. (2011a). *Rwanda urban infrastructure and city management project*, from <http://go.worldbank.org/HVCZ4YYNK0>.
- The World, B. (2011a). *Sub-Saharan Africa Transport Policy Program*. <http://go.worldbank.org/PB2YAU0LZ0>.
- Tobbin, P. (2012). *Towards a model of adoption in mobile banking by the unbanked: a qualitative study*", *info*, Vol. 14.
- Transport, D. f. (2009). *The benefits and costs of a national smart card ticketing infrastructure*. Department for Transport and Detica Report. HMSO.
- Urien, P. (2003). *Internet Smartcard Benefits for Internet Security Issues"*, *Campus-Wide Information Systems*, Vol. 20.
- Walker, K. B., & Johnson, E. N. (2001). *Planning a revenue stream system in an e-business environment*, *Industrial Management & Data Systems*, Vol. 101.

wikiHow. (2020). How to Calculate Growth Rate.

Wilcox, T. (2011). *Calls for Oyster Card in Scotland to encourage bus and rail travel.*

Worthington, S. (2006). The cashless society, *International Journal of Retail & Distribution Management. Vol. 23*, pp. 31-40.

Worthington, S. (2006). The Development of and the Prospects for Retailer-issued Credit Cards in Japan, *International Journal of Retail & Distribution Management. Vol.22* , pp. 33-38.

Worthington, S., & Edwards, V. (2000). Changes in Payments Markets, Past, Present and Future: a Comparison Between Australia and the UK, *International Journal of Bank Marketing. Vol. 18*, pp. 212-221.

Appendix A: Interview questions

INTERVIEW GUIDE

THE INTERVIEW IS SPECIFIC TO MANAGER AND DIRECTORS OF KBS

Dear sir/Madam,

I'm Melchior NZAKIZWANIMANA, a University of Rwanda' student. The aim of this study is to assess the impact of e-ticketing System in improving fare revenue collection at KBS Ltd, focusing on its impact to fare collection maximization. The study is conducted in partial fulfillment of the requirement for Master's degree of science in regulatory economics and competition policy.

I would be very thankful if you can take a few times to answer my questions. Your responses are really significant and will be kept in strict confidence.

1. Introduce yourself; For example, indicate your position, experience at KBS Ltd.
2. Why KBS decide to introduce TAP & Go system?
3. Does e-ticketing system become effective in fare collection improvement to KBS and how?
4. Do you think that TAP & GO satisfies different users at KBS?
5. What do you consider as the contribution of TAP & Go to KBS operational performance?
6. What are the most challenges of using e-ticketing since its introduction?

Appendix B Questionnaire Type A
QUESTIONNAIRE

TO VARIOUS RESPONDENTS AS SAMPLE SHOWS

Dear sir/Madam,

I'm Melchior NZAKIZWANIMANA, a University of Rwanda' student. The aim of this study is to assess the impact of e-ticketing System in improving fare revenue collection at KBS Ltd, focusing on its impact to fare collection maximization. The study is conducted in partial fulfillment of the requirement for Master's degree of science in regulatory economics and competition policy.

I would be very thankful if you can take a few times to answer my questions. Your responses are really significant and will be kept in strict confidence.

PART ONE. RESPONDENT'S PERSONAL INFORMATIONS (Please fill the gaps)

1. Gender

Male or Female

2. Age

Between 18-25 years

Between 26-35 years

Over 35 years

3. Education: 1. P6 2. S6

3.A1 4. A0

5. PHD

4. How long have you been using Tap & Go card?

- a) Between one months and 12 months
- b) Between one year and two years
- c) Between two years and three years
- d) Between three years and four years
- e) Over four years

Part II. APPLICABILITY OF E-TICKETING SYSTEM

5. As System user, do you use strong internet to carry out your operations like loading Tap & Go card and payment of fare?

Definitely agree	Agree	I don't know	I don't agree	Definitely disagree

6. Does KBS Ltd offer standard technical assistance through skilled technicians when it is required?

Definitely agree	Agree	I don't know	I don't agree	Definitely disagree

7. What is your observation on security and quality of e-ticketing system devices (Tap & go card, POS machine and validator machine) during fare payment process?

Definitely good	Good	I don't know	Not good	Definitely not good

8. What is your opinion to the ICT innovation as user facility of Tap & go provided by system founder?

Factor	Very good	good	I do not know	bad	Very bad
ICT innovation					

9. As Tap & Go user, how do you rank the level of fare collection/payment in KBS?

Statement	Definitely agree	Agree	I don't know	Disagree	Definitely disagree
Improved fare collection/payment					

Part III. CUSTOMER SATISFACTION

10. When e-ticketing system (Tap & Go) is used, how do you rank the following statements? Rank by ticking from 1 (Definitely agree) to 5 (definitely disagree) to show the degree of acceptance on the statement.

Statement	Definitely agree	Agree	I don't know	Disagree	Definitely disagree
Using e-ticketing system has enhanced my job performance					

11. How are you satisfied with the application of e-ticketing system at KBS? Rank this element to show your satisfaction level, rank 1 to mean unsatisfied to 5 very satisfied.

ELEMENT	1	2	3	4	5
Queuing solving problem					

12. How do you rank the quality of the services provided by KBS? Rank 1 as the worst to 5 as the best?

Factor	Very good	good	I do not know	bad	Very bad
Quality					

Part IV. THE CHALLENGES FACED IN USAGE OF TAP & GO CARD.

13. What are the most challenges faced since you start to use e-ticketing system?

Statement	Definitely agree	Agree	I don't know	Disagree	Definitely disagree
The AC Group agent load lower amount than what you have paid					
AC Group smart card cost 500 Rwf					
Double deduction from the card					
Checking balance					
Refund when erroneously taped					

Appendix C: Questionnaire Type B

QUESTIONNAIRE

THIS QUESTIONNAIRE IS ANSWERED FROM THE ANALYSIS MADE BY THE RESEARCHER HIMSELF. SO, THE QUESTIONS WERE USED AS THE GUIDANCE ON THE INFORMATION REQUIRED BY THE RESEARCHER

Demonstration of the effect of e-ticketing on revenue collection at KBS by comparing the amount collected before and after introduction of Tap & Go

1. The following are the Pre and Post period of e-ticketing system amount of fare collected by KBS according to its audited financial statements submitted to Rwanda Utilities and Regulatory Authority (RURA) in the years ended December 2011-2019. Use 2011 as base year in this analysis
2. What was the variance trends (amount & percentage) of fare collection during these periods? Pre & Post e-ticketing system amount of fare collected, variance trends in amount and percentage

Periods	Transport Revenues	Variance Trends in amount	Trends in%	Pre & Post AFC periods
2011				0
2012				0
2013				0
2014				0
2015				0
2016				1
2017				1
2018				1
2019				1

EFFECTIVENESS OF ELECTRONIC TICKETING SYSTEM IN
IMPROVING FARE REVENUE COLLECTION OF PUBLIC
TRANSPORT COMPANIES IN KIGALI CITY. CASE STUDY: KIGALI
BUS SERVICES LTD

ORIGINALITY REPORT

12%

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