



UNIVERSITY of  
RWANDA

**ASSESSING PERCEPTIONS OF PASSENGERS' SAFETY AND  
SECURITY IN PUBLIC TRANSPORT IN RWANDA. THE CASE  
OF CITY OF KIGALI**

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DATE: June, 2021

## DECLARATION

I, **Pacifique HIRWA** declare that this research project entitled “Assessing perceptions of passengers’ safety and security in public transport in Rwanda. The case of City of Kigali” is my own work and is not produced for a degree in other college or university or for any other award. All sources used or quoted have been shown and acknowledged by the means of referencing.

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A handwritten signature in blue ink that reads "Mut. Fidèle". The signature is stylized with a large, sweeping flourish at the end.

Signature:

Date: 08 /09/ 2021

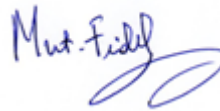
# Approval Sheet

This thesis entitled **Assessing perceptions of passengers' safety and security in public transport in Rwanda. The case of City of Kigali**, written and submitted by **HIRWA Pacifique** in partial fulfilment of the requirements for the degree of Master of Science in **Regulatory Economics and Competition Policy (REC 6131)**, is hereby accepted and approved.

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Supervisor

23.08.2021



The thesis is accepted in partial fulfilment of the requirements for the degree of Master of MSc Economics

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## **DEDICATION**

Above all, I dedicate this master's thesis to the almighty God, the creator and source of all knowledge and wisdom.

I also dedicate this work to my wife BYUKUSENGE Annualithe who is the most encouraging person in my life.

## **ACKNOWLEDGMENT**

I extend my gratitude to my supervisor Dr. MUTEMBEREZI Fidèle without his intellectual guidance and support; it would have been difficult to complete this work.

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The almighty God bless you all.

## **ABSTRACT**

The City of Kigali is experiencing rapid population growth, public transport bus service does not automatically solve all problems especially safety and security issues and risks for passengers.

The aim of this research was to assess safety and security of passengers using public transport bus service. From the general objective specific objective were derived as to determine the level of safety and security and protection provided to passengers in the City of Kigali, to identify the safety and security risk associated to public transport use in the City of Kigali and to estimate safety and security parameters in public transport in the City of Kigali bus service. Public transport safety and security data were obtained through questionnaires and interviews at bus terminals, bus stop, and taxi parks throughout the City of Kigali. Factor analysis categorized safety and security items into loading factors and structural equation model was estimated in purpose of generating a model on the factors predicting perceived safety and security of bus passengers.

Results of the research findings revealed that bus passengers in the City of Kigali are overall safe and secure; and safety and security risk and problems associated to using public transport bus are low; the perceived level and effectiveness of measures and stakeholders interventions in improving passenger safety and security is highly appreciated. It concluded that perceived safety and security of passengers is mainly affected by safety parameters mostly risk of bus accident happening caused by vehicle mechanical problems, risk of bus accident happening caused by driver behaviour and risk of bus accident and security parameters mostly nights time hours risk to sense of security, security risk in desolated places and a combination of variables where the most influencing are effectiveness of usage of technology in safety and effectiveness of communication tools for safe and secure travel.

Basing on findings different recommendations for safety and security future improvement in the City of Kigali were proposed which include putting in place a good regulatory environment to combat safety and security incidences.

Key word: Public transport, Safety, Security, Perception on safety and security

## **LIST OF ACRONYMS AND ABBREVIATIONS:**

<b>AMOS</b>	Analysis of a Moment Structures
<b>CCTV</b>	Closed-Circuit Television
<b>CDC</b>	Center for Disease Control and Prevention
<b>CFA</b>	Confirmatory Factor Analysis
<b>CFI</b>	Comparative fit index
<b>CoK</b>	City of Kigali
<b>GoR</b>	Government of Rwanda
<b>JICA</b>	Japan International Cooperation Agency
<b>KBS</b>	Kigali Bus Service
<b>NISR</b>	National Institute of Statistics of Rwanda
<b>NFI</b>	Normed Fit index
<b>PCA</b>	Principal Component Analysis
<b>PT</b>	Public Transport
<b>PTAs</b>	Public Transport Agreements
<b>RIB</b>	Rwanda Investigation Bureau
<b>RFTC</b>	Rwandan Federation of Transport Cooperatives
<b>RMR</b>	Root Mean Square Residual
<b>RNP</b>	Rwanda National Police
<b>RTCs</b>	Road Traffic Crashes
<b>RTI</b>	Road Traffic Injuries
<b>RTDA</b>	Rwanda Transport Development Authority
<b>RURA</b>	Rwanda Utilities Regulatory Authority
<b>SEM</b>	Structural Equation Model
<b>STATA</b>	Software for Statistics and Data Science
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>SRMR</b>	Standardized Root Mean Square Residual
<b>UN Habitat</b>	United Nations Human Settlements Programme
<b>USA</b>	United States of America
<b>WB</b>	World Bank
<b>WHO</b>	World Health Organization

## **Table of Contents**

DECLARATION .....	i
DEDICATION .....	iii
ACKNOWLEDGMENT.....	iv
ABSTRACT.....	v
LIST OF ACRONYMS AND ABBREVIATIONS: .....	vi
CHAPTER 1.INTRODUCTION .....	1
1.1 Background of the study.....	1
1.2 Problem Statement .....	3
1.3 General objective of the research .....	4
1.4 Specific objectives.....	4
1.5 Research questions .....	4
1.6 Significance of the research.....	4
1.7 Scope of the study.....	4
1.8 Study organization.....	5
CHAPTER TWO: LITERATURE REVIEW .....	6
2.1 Introduction .....	6
2.2 Definition of key terms.....	6
2.2.1 Public transport .....	6
2.2.2 Security in public transport .....	6
2.2.3 Safety in public transport .....	7
2.3 Urban Public transport.....	7
2.4 Urban Public transport in the city of Kigali .....	7
2.5 Urban public transport safety .....	9
2.6 Urban public transport security .....	11
2.7 Theorizing safety and security in transit settings and infrastructure .....	13
2.8 Perception of safety and security in public transport .....	14
2.9 Conceptual Framework.....	17
2.10 Research gap.....	19
CHAPTER THREE: RESEARCH METHODOLOGY .....	21
3.1. Introduction .....	21
3.2 Research Design .....	21
3.2.1 Target population and Group .....	21
3.2.2 Sample size.....	22
3.2.3 Validity and Reliability .....	24



3.2.4. Data collection process.....	24
3.3. Data Analysis Procedures .....	25
3.3.1 Descriptive Analysis .....	25
3.3.2 Factor analysis.....	25
3.3.3 Structural equation model .....	26
3.4. Ethical Considerations.....	27
3.5 Study limitations.....	27
CHAPTER FOUR: DATA ANALYSIS AND RESULTS.....	28
4.1 DESCRIPTIVE ANALYSIS OF BUS PASSENGERS.....	28
4.1.1 General Characteristics .....	28
4.1.2 Public transport bus safety and security overall perception by interviewed passengers.....	30
4.2 Passengers’ perceptions on risk associated with using public transport bus service in the City of Kigali.....	35
4.2.1 Safety risk in public transport bus service by passengers’ perception.....	35
4.2.2 Security risk in public transport bus service by passengers’ perception.....	40
4.3 The level of safety and security and protection provided to public transport bus passengers.....	44
4.4 Views of city of Kigali bus operators on safety and security of passengers .....	49
4.5 Views of RURA on safety and security of passengers.....	50
4.6 Views of City of Kigali on safety and security of passengers.....	51
4.7 Factor analysis .....	52
4.8 Validity of the structural model.....	58
4.9 Validation of the proposed model .....	58
4.10 Structural Equation Modeling predicting perception of safety and security ....	59
CHAPTER FIVE: DISCUSSION AND CONCLUSION .....	63
5.1 Introduction .....	63
5.2 Summary of findings .....	63
5.3 Conclusion.....	64
5.4 Recommendations .....	65
REFERENCES .....	67
ANNEXES.....	70

## LIST OF FIGURES

Figure 1. Pyramid of travelers' needs (van Hagen and Sauren, 2014) .....	15
Figure 2. Conceptual framework .....	18
Figure 3: Public transport bus passenger's overall safety and security perception ....	30
Figure 4: Bus passenger's safety and security perception while the bus delay .....	31
Figure 5: Bus passengers' perceptions on including safety and security cost in public transport tariff model .....	31
Figure 6: Gender characteristics of public transport bus passengers in the city of Kigali.....	32
Figure 7: Passengers perception on experienced bus accidents.....	35
Figure 8: Severity level trend of accidents .....	36
Figure 9: Model with standardized regression coefficients .....	60

## LIST OF TABLES

Table 1: Public Transport zones and buses in the City of Kigali.....	9
Table 2: Average number of daily passengers .....	22
Table 3: Probability Proportion to Size .....	23
Table 4: Interviewed stakeholders and government officials .....	24
Table 5: Characteristics of interviewed bus passengers .....	29
Table 6: Gender and overall safety and security perceptions by bus passengers .....	33
Table 7: Cross tabulation between gender, feeling secure at night, in desolated places and poor environment condition .....	34
Table 8: Passengers perception on Level of seriousness of accidents experienced in public transport bus.....	36
Table: 9: Passengers perception on safety risk .....	37
Table: 10: Passengers perception on safety risk .....	38
Table 11: Time of the day factor on safety .....	40
Table 12: Passengers perceptions on security risk.....	42
Table 13: Passengers' perceptions and feeling on security risk .....	43
Table 14: Perceived safety intervention initiatives by public transport stakeholders..	47
Table 15: Perceived security intervention initiatives by public transport stakeholders .....	48

Table 16: KMO and Bartlett's Test .....	52
Table 17: Communalities .....	54
Table 18: Rotated component matrix .....	56
Table 19: Reliability analysis .....	57
Table 20: Values of standardized regression coefficients in the structural model. ....	58
Table 21: Performance metrics indices for the estimated model. ....	59
Table 22: Values of standardised regression coefficients in the measurement model	62

## **CHAPTER 1. INTRODUCTION**

This chapter introduces the historical background of the problem by clearly describing the public transport in the context of safety and security. It explains the problem statement of the study, objectives of the study, research questions, and other important aspects of the study on assessing perceptions of safety and security in public transport bus service in the City of Kigali.

### **1.1 Background of the study**

Transportation is the backbone of our urban society. It is the mechanism by which all movement occurs. The rise and development of all civilizations have relied on mobility for social and economic commerce. Depending upon its historical point in time, land travel has utilized either non-motorized (i.e., walking, bicycles, carriages, animals, etc.) or motorized (i.e., automobiles, trucks, motorcycles, buses, aircraft, etc.) movement.

Transport stimulates economic and social development and ensures accessibility to opportunities. It is not only a matter of developing transport infrastructure and services, but rather the ease of reaching destinations in terms of proximity, convenience and safety.

In most developing countries, the ownership of private cars is very low hence most people depend on public transportation, which is not well developed (Kumar, 2011).

Unfortunately, public transportation in itself poses a higher safety and security risk as it conveys a larger number of commuters at a time (Joewono & Kubota 2006).

In October 2012, the government of Rwanda has approved the Public Transport Policy and Strategy for Rwanda, among the key principles for Public Transport survives in Rwanda is to promote safety and security for passengers (Transport Sector Strategic Plan, 2013).

Kigali is the economic, and transport hub of Rwanda ever since it became the capital upon independence in 1962. It has a population of over 1.5 million. The rapidly growing city, Kigali is the country's most important commercial center and main port of entry.

Road transport is main mode of transport in the city, especially in the movements of people from their places of residence to where they must go to pursue all the activities of life, such as work, education, business, shopping and leisure activities (Byamukama, 2012);

The urbanized areas of Kigali City experience higher accidents numbers; in general, approximately 79% of annual accidents occur in the city (Kigali development plan,2020). This can be due to being a higher number of motorized vehicles on roads in the city as compared to the rural areas.

The number of accidents in public transport bus service has reduced in the past four years from 2018 to 2019 there were a slightly decrease of 72% due to measures and initiatives taken by all stakeholders in public transport bus service in the City of Kigali. where in 2016 there were 129 accidents, in 2017 there were 119 accidents, in 2018 there were 43 accidents and lastly in 2019 there were 25 accidents. Among the leading causes of accidents most accidents in the city of Kigali are caused by unbecoming human behaviors, speeding, drink-driving, using the phone while driving, and drugs, fatigue, dangerous maneuvers and violating traffic control lights (Rwanda National Police, 2021);

As domestic and international public transportation venues experience crime, terrorism, health issues concern for public transportation safety and security is growing across public transport providers, government institutions and general public (Laura Minns, 2019).

The leading offenses in the City of Kigali in 2020 were theft (Not aggravated theft) and Assault with 4,744 cases, assault and battery with 3,291 and fraud with 957 cases (Refer to annex Table A1).

This research assesses the perception of passengers in public transport on safety and security in the City of Kigali. A long the research conducted, the question on how passengers in public transport perceive in regards to their safety and security was provided.

## **1.2 Problem Statement**

Public transport is an integral part of community infrastructure, providing access to mobility for both business and social purposes. Media has created negative perception of facilities and operations which cumulated into fears in the hearts of the users; there is over exaggeration of incidence of crimes against users and belongings. As a result of these people tend to make less use of public transport, and in extreme cases have to cancel journeys they might have made or often arrange for more expensive and less convenient modes of transport (Easteal and Wilson, 1991; World Bank, 2002).

Despite the number of studies on perceived quality of public transportation services, infrastructures and vehicles, the assessment of perceived safety and security presents still some gaps in knowledge.

In facts, many studies (Karlaftis et al., 2001; Eboli & Mazzulla, 2007; Irfan et al., 2012; Abenoza et al., 2017; Allen et al., 2019) have included safety and/or security assessment within the overall quality perception, and have compared them to other factors such as reliability, frequency, cleanliness, comfort, staff courtesy.

Only few studies have focused specifically on safety and security either using qualitative surveys to investigate which factors could influence travelers' perceptions (Fyhri et al., 2010; Amir et al., 2015; Currie et al., 2010; Park & Garcia, 2019), or assessing quantitatively what are the factors that directly may affect safety and security perception.

Public transport buses in the City of Kigali also are sometimes involved in crime affecting the security of passengers, including kidnapping, rape, murder, death, armed robbery, removal of personal belongings (telephones, money and bags), also it is involved in the accidents affecting the safety of passengers, Few studies were conducted on safety and security using traveler's perception although overall public transportation is extremely safe and secure, and the research examined the extent to which the safety and security of passengers is perceived and ensured through different public transport stakeholders.

### **1.3 General objective of the research**

This research aims to assess the perceptions of passengers on security and safety of public transport in the City of Kigali.

### **1.4 Specific objectives**

In addition to the main objective, specific objectives were formulated as follows:

- To determine the level of safety and security and protection provided to passengers in the City of Kigali;
- To identify the safety and security risk associated to public transport use in the City of Kigali;
- To estimate safety and security parameters in public transport in the City of Kigali bus service.

### **1.5 Research questions**

- What is the level of safety and security and protection provided to passengers?
- Which safety and security risks associated to public transport bus usage?
- What is the adequate structural equation model to estimate safety and security parameters in public transport in the city of Kigali? Which is the best tool to estimate safety and security parameters?

### **1.6 Significance of the research**

The research will:

- Address gap of knowledge by providing a treasure trove of information regarding safety and security in public transport using buses in the City of Kigali;
- Set a foundation for future in-depth studies on safety and security in public transport buses in the City of Kigali;
- Policy recommendation on safety and security improvement in public transport bus service.

### **1.7 Scope of the study**

This study focuses on public transport system with special attention to Kigali city public transport bus service. It is limited in scope and geographic and analyses the city

transport safety and security of passengers for the period of past four years trends and past experience using City of Kigali bus passenger perception survey.

### **1.8 Study organization**

The study is organized into five chapters as follows:

Chapter one provides a general introduction of overview of the safety and security of public transport in Rwanda, the problem statement, significance of the study, research questions and objectives of the study;

Chapter two highlights some keys literature reviews in relation to public transport safety and security as per passengers' perceptions;

Chapter three explains the used methodology and sampling methods, data collection tools, data interpretation and analysis tools that are being used;

Chapter four present results and discusses findings; and

Chapter five closes with Summary of findings, conclusions and recommendations for further research.



## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter discusses the literature reviews related to public transport bus services safety and security factors that influences the level of security and safety and different attributes to evaluate passengers' perceived safety and security in general.

### **2.2 Definition of key terms**

#### **2.2.1 Public transport**

Public transportation by definition connotes the act or the means of conveying large number of people “en masse” as opposed to conveyance in individual vehicles carrying very few people at a time. In other words, public transport or mass transit is a system in which a greater number of people are moved at a time along principal corridors (Ogbazi, 1992, Wikipedia, 2009). Public transport or mass transit comprises mainly of the rail system, light rail system, tram ways and monorails, bus system and where possible water transportation (Wikipedia, 2009). Public transport is an integral part of community infrastructure, providing access to mobility for both business and social purposes;

Public transport (also known as public transportation, public transit, mass transit, or simply transit) is a system of transport, in contrast to private transport, for passengers by group travel systems available for use by the general public, typically managed on a schedule, operated on established routes, and that charge a posted fee for each trip (Wikipedia,2021)

#### **2.2.2 Security in public transport**

Security can be defined as the product of human action and behaviour something that has to be produced and ensured. In general discussions about national security or internal security, all efforts come down to security measures (Nagenborg 2011);

Public transport security refers to measures taken by a mass transit system to keep its passengers and employees safe, to protect the carrier's equipment, and to make sure other violations do not occur. This includes the enforcement of various rules and regulations, human and video surveillance, the deployment of a transit police force, and other techniques (Wikipedia 2021).

### **2.2.3 Safety in public transport**

Safety is the state of being "safe", the condition of being protected from harm or other non-desirable outcomes. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk (Wikipedia,2021).

Passenger safety is defined as vulnerability to accident and/or injury involving a public transport vehicle (Sam and Abane, 2017).

### **2.3 Urban Public transport**

Transport is a critical means by which people are able to reach opportunities provided by a city (Hamilton and Jenkins, 2000; Levy, 2013);

As an essential service in urban centers, transport enables people, firms and other organizations to carry out their activities at sites selected for these purposes in separate locations in the cities. Transport provides a key to the understanding and operation of many other systems at many different scales and is an epitome of the complex relationships between social and political activities and the level of economic development (Buchanan, 1969; Hoyle and Smith, 1992).

Public transportation systems provide the most efficient means of moving large number of people especially in density populated urban centers. In addition to the wellbeing of its users, public transport plays a vital role in the productivity of cities which in turn has a direct bearing on the national economies (World Bank, 2001; Lyndon and Todd, 2006).

In most developing countries, the ownership of private cars is very low hence most people depend on public transportation, which is not well developed (Kumar, 2011).

### **2.4 Urban Public transport in the city of Kigali**

One of the key factors that play a pivotal role in a region's economic growth is the presence of a reliable and efficient transportation system, this is mainly due to the fact that a well-developed transportation system provides adequate access to the region which in turn is a necessary condition for the efficient operation of manufacturing, tourism, retail, labor and housing markets (Daniel NSENGIYERA; Marie Chantal MUSABYEMARIYA and BOBITA Mohajan, 2018);

Kigali is the economic, and transport hub of Rwanda ever since it became the capital upon independence in 1962. The current (2018) population of Kigali is approximately 1.5 million and is forecasted to grow to approximately 3.8 million in 2050 (Kigali master plan 2020).

According to recent study published by Rwanda Transport Development Authority (RTDA), The current road network in Kigali City consists of 732 km of roads, of which only 14% is paved. The remainder are dirt roads with quality varying from smooth hard surfaces with drainage to rutted, extremely uneven tracks passable only with a four-wheel drive vehicle (RTDA, 2019).

Public transport provision in Kigali City has undergone several changes over decades and every change comes with its own challenges through decades (Mugabe & et al., 2020).

Kigali public transport arrangement based on franchise agreement is operated by three companies arranged in form of cooperatives and companies which operate different types of public transport vehicles, the major market shares of vehicles come from individual operators (RTDA, 2019). In terms of total available seat capacity, the three individual operators provide 70% of the supply and they use mainly large buses, medium buses and minibuses. There is also taxi cabs and motorcycle taxis provide 3% and 13% of the passenger capacity respectively (RTDA, 2019).

Kigali City was divided into four public transport zones as shown in Table 1 below Kigali Bus Service (KBS) operates Zone I, Royal Express operates Zone II, And Zone III and Zone IV are operated by Jali Transport Limited. Three bus companies were awarded with a contract with five years license to operate in their respective zones (JICA Rwanda 2019).

As per RURA Annual Report 2019-2020 in table 1, there were only four zones and three operators providing public transport services using 509 buses, in 56 bus routes in the city of Kigali.

**Table 1: Public Transport zones and buses in the City of Kigali**

<b>Operators</b>	<b>Number of Buses</b>	<b>Number of bus routes</b>
Remera Transport Cooperatives (Zone I)	142	20
Kigali Bus Service Ltd (Zone II)	91	15
Royal Express Ltd (Zone III)	80	12
City Center Transport Cooperatives (Zone IV)	196	9
<b>Total</b>	<b>509</b>	<b>56</b>

Source: RURA Annual Report 2019-2020

## **2.5 Urban public transport safety**

Transport stimulates economic and social development and ensures accessibility to opportunities. It is not only a matter of developing transport infrastructure and services, but rather the ease of reaching destinations in terms of proximity, convenience and safety. The principle of good access include safety (Olowosegun and Okoko, 2012), and safety is a urban necessity not a luxury.

Three primary dimensions to traffic safety are well grounded in literature: exposure to risk, risk of having a crash given a certain amount of exposure, and consequences of injury given a crash, for example (Wegman, Zhang, & Dijkstra, 2012). Risk associated with transport includes that faced in access trip, often as pedestrians, risk to the occupants inside the vehicle, and risk that vehicle poses to the other road users. Risks are considered internal if imposed on modes users, and external if imposed on other people (Litman, 2014).

Traffic accident statistics can be measured based on collisions, casualties, or fatalities and may include passengers, vehicle occupants, all crash victims (including other road users hit by a transit vehicle), as well as non collision injuries such as falls in transit stations, and employee workplace injuries (Litman, 2014).

The Queensland Road Safety Action Plan, developed by the Queensland Department of Transport in 1999, identified four major contributing factors to road crashes. These factors have been referred to as the fatal four: speeding, drunk driving, fatigue, and

failure to use seatbelts (Lewis, 2008). In the same vein, Wegman, Aarts, and Bax (2008) identified such risk increasing factors as lack of driving experience, psychoactive substances (alcohol and drugs), illnesses and ailments, emotion and aggression, fatigue, and distraction. Backer-Grondahl and Sagberg (2011) also identified the use of mobile phone while driving as a leading cause of distraction.

The Rwandan government made vast improvements to infrastructure and began implementing road safety programs following the genocide in the 90s. The most significant changes included seatbelt laws, vehicle inspections, and speed limits in addition to overhauling law enforcement by cracking down on police corruption and increasing police resources (Anjni Patel, 2016).

Studies have shown that public transportation is a safer form of transport as compared to other traffic modes (Chimba et al. 2010). Interest in improving bus safety is not as great as improving safety for other types of vehicles (Cafiso et al. 2013; Kelvin et al. 2014). Nonetheless, bus safety plays an important role in public transportation services.

Globally, road traffic crashes (RTCs) cause 1.35 million deaths and many other non-fatal road traffic injuries (RTIs) (World Health Organization, 2018). Road Traffic Injuries create a significant health and economic burden in low- and middle-income countries (LMICs). African countries have a particularly disproportionate burden of road traffic crashes and road traffic injuries (RTCs). According to the World Health Organization (WHO), the countries in the African region have the highest per capita rate of road deaths in the world despite having a small fraction of the world's vehicles (World Health Organization, 2018). 90% of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately 54% of the world's vehicles (WHO Africa, 2018). Road traffic injuries cause considerable economic losses to individuals, their families, and to nations as a whole. These losses arise from the cost of treatment as well as lost productivity for those killed or disabled by their injuries, and for family members who need to take time off work or school to care for the injured. Road traffic crashes cost most countries 3% of their gross domestic product (WHO, 2018). Crash injuries place a major economic burden on low and middle income countries it is estimated that LMICs will experience approximately \$834 billion dollars (in 2010 USD) in economic losses from 2015-2030 due to fatal and nonfatal crash injuries (CDC, 2020).

Modeled estimates find that Rwanda has the highest road traffic fatality rate at 22 deaths per 100,000 and the highest burden of road traffic injuries (RTIs) at 1,173 disability-adjusted life years per 100,000 population compared to other East African countries (Institute for Health Metrics and Evaluation (IHME), 2015). The Rwandan National Police (RNP) reported 2,270 road traffic injuries (RTIs) including 270 (11.9%) deaths in 2010. While total road traffic injuries (RTIs) in 2010 were grossly the same as 2015 (2,187), fatalities rose to 351 (16.0%). (NISR, 2017).

In efforts to control the unsafe high speeds in Kigali, the city introduced speed governors in 2016. These are set to a maximum of 60 km/h in public service vehicles and vehicles transporting goods (Kigali master plan report 2020).

The project continues to face difficulties in implementation as some of the fleet have yet to install the governors and in others they are tampered with or removed. Vehicles that do not comply are stopped, suspended and face penalties. Speed governors have also been a part of the reason why public transport costs have risen early 2018 (Kigali master plan report 2020).

The government has continued to implement safer road programs to educate road users on effective and safe usage of the road. In 2017 the government reviewed laws on road safety to toughen penalties against traffic offenders. They have also committed to implementing all possible strategies to enhance road safety measures as evident by a campaign launched by the Rwanda national police and minister of transport in 2017 to curb road accidents and promote road users respect road safety standards (Kigali Transportation plan 2020).

The police have been conducting road safety sessions among motorists, cyclists, members of the public and in schools from 21<sup>st</sup> May to 1<sup>st</sup> June 2018 (Kigali Transportation master plan report 2020).

## **2.6 Urban public transport security**

The security problem is less well quantified or recognized. More often the acts of personal violence or harassment especially sexual harassment in public transport vehicles do not get recorded. The prevalence of such is demonstrated by social surveys in Latin America (Gomez 2000, WB, 2002);

Transport insecurity can be defined as vulnerability to intentional criminal or anti-social acts suffered by those engaged in trip making. This could be property crime,

violence (assault and threat), rape, sexual harassment, insult, murder, kidnapping, and vandalism (Uittenbogaard, 2014). According to Joewono and Kubota (2005), the European Commission proposed a hierarchy of quality determinants in public transportation in Europe. In the hierarchy of quality determinants, security is defined as the actual degree of safety from crime or accidents and the feeling of security resulting from that and other psychological factors. The security class consists of three aspects, namely, safety from crime, safety from accidents, and perceptions of security and safety.

The concern about personal security on transport infrastructure in cities is capable of leading to social exclusion, impeding accessibilities to job, health, education, and social integration and bonding among the residents. In cities across most developing societies the risk to lives and properties are becoming regular features on transport routes and terminals (Ajayi & Ajayi, 2014). According to Litman (2014), crime statistics may include violent crimes, all crimes against passengers and employees, or all transit-related crimes, a major portion of which involve trespassing, transit property vandalism, and fare evasion.

There has been a noticeable upsurge in the incidences of urban crime in most less developed countries particularly in the last two decades, from India Sub-Continent to Sub-Saharan Africa, from Medellin to Mexico City (Ajayi & Ajayi, 2014). According to Uittenbogaard (2014), security is one of the many factors influencing the mobility of individuals in an urban environment. Among factors found to be influencing crime occurrence are socio-economic characteristics such as age, gender, income, car ownership, and household size. Ajayi and Ajayi (2014) revealed in their study that the risks of passengers becoming a crime victim were heightened as a female. The time of the day when a travel is embarked on also goes a long way in determining how secure the trip maker can be.

According to NISR statistical year book (2019) theft and assault are the leading offenses committed in Rwanda in the period of 2018-2019 (Refer to Annex Table A3).

Ultimately, the government's overriding concern with national security issues, combined with its need for legitimacy, has led to sustained efforts to create a city that is tightly controlled through a range of strategies that project it as a 'model' space, both domestically and internationally (Tom Goodfellow and Alyson Smith, 2012).

Article 11 (5) of the Law establishing City of Kigali bestows the Mayor of Kigali with the legal mandate of ensuring the security of people and their property in the City of Kigali. Tipped as one of the safest and friendliest of African capitals, Kigali is blessed with a moderate high altitude climate that belies its tropical location. Security and safety of residents and investors is a pre-requisite for investment. The security enjoyed in the City of Kigali is an attractive factor for foreign investment in the myriad of investment opportunities. This security is being enhanced by the use of modern technology like CCTVs which are being erected in all parts of the City (City of Kigali Report, 2013).

## **2.7 Theorizing safety and security in transit settings and infrastructure**

Road infrastructure design in terms of road networks, mix of types of traffic and types of safety measures determines the likelihood of traffic accidents occurring in urban areas. Road design and facilities influence driver behaviour through amenities such as curves, gradients, road markings and the provision of facilities for vulnerable road users. Initiatives that can readily be used without major re-planning of urban neighbourhoods include the installation of traffic lights, pedestrian-only streets, lighting, bus lanes, pedestrian walkways, video monitoring of traffic and speed bumps. It is important to maintain the goodwill of road users when implementing such road safety measures (UN Habitat 2007).

Rationalizing road space allocation by accommodating commonly used forms of transportation, such as two- and three-wheeled vehicles and non-motorized transport, may help to reduce traffic accidents. (UN Habitat 2007).

The integration of safety concerns within road design and construction is also increasingly evident in developing countries (UN Habitat 2007).

For passenger terminals with the concentration of vehicles and passengers' accumulation the problem of increasing the level of safety and security becomes more significant. Passenger terminals often operate 24-hours a day and are placed where people congregate, especially during peak hours. As node of regional and international transportation networks, terminal generates a number of routes, flow throughputs and attract different activities to its surrounding area. It is an expanded risk landscape for terrorism,



criminal activities and extreme weather (Vaira Gromule, Irina Yatskiv, Juris Pēpulis, 2016).

For passenger terminal it means: to improve passenger terminal resilience to terrorist attacks and safety incidents through technologies and methodologies enabling design to reduce the impact of blast, fire and dispersion of the toxic agents on passengers, staff and infrastructure (Anon, 2016).

Transport infrastructure is directly affected by extreme climate events such as storm surges, floods, droughts and temperature changes due to which recognizing a need for implementing adaptation measures is important. Research on passenger security as mentioned in (Safety and Security, 2014) should lead to more effective and privacy friendly technologies (scanners, detectors of new explosives, smart chips) enabling monitoring of a large number of passengers with minimum inconvenience and intrusion.

Routine activity theory (Cohen and Felson, 1979) is closely tied with crime pattern theory and suggests that the occurrence of a crime requires the convergence of three factors in time and space; a motivated offender, a suitable target, and the absence of a capable guardian. Within a rapidly moving transport system, there is a constant interchange of potential offenders, possible targets (infrastructure, passengers or staff), and potential guardians. These guardians could include ticket inspectors, police or other security, CCTV camera, general peripatetic staff, or even passengers.

A clear finding from the research literature is that a small proportion of all nodes on a public transport system experience a large percentage of all the crimes at stops and stations (Pearlstein and Wachs, 1982; Levine et al, 1986; Loukaitou-Sideris, 1999).

## **2.8 Perception of safety and security in public transport**

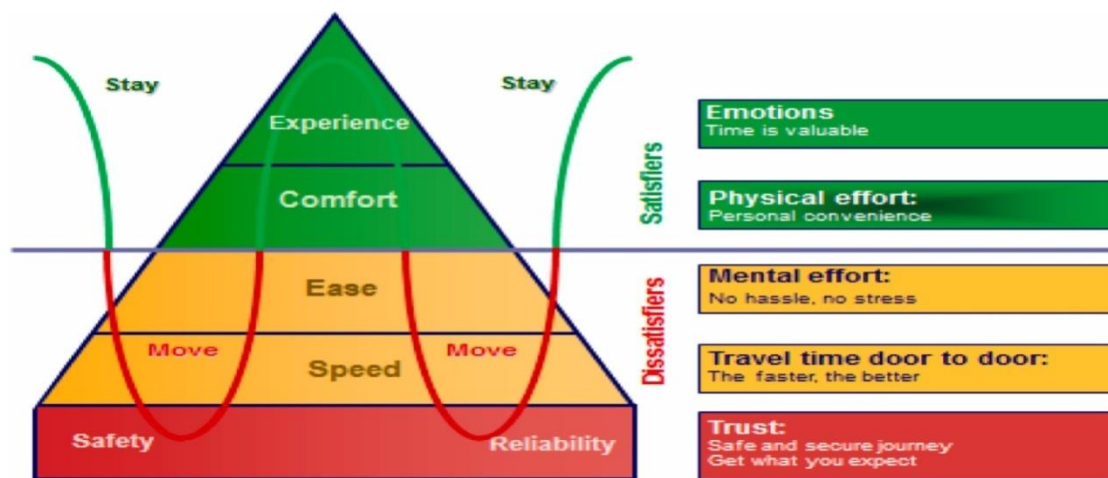
Safety and security may be general terms in our daily life, but the study of these in the transportation sector has been very limited, especially in developing countries. Many people agree that the safety and security aspect in public transportation operation is very important, as public transportation closely relates with human lives on a larger scale or in greater numbers as many passengers happen to be riding in one car.

However, many people and experts agree that congestion in urban areas is worsening, especially in developing countries. They believe that the existence of public

transportation is a key to solve the problems. In addition, the provision of public transportation faces a challenge to maintain the passengers and to attract the potential users. The improvement of public transport performance requires comprehensive planning, where safety and security are two of the important aspects.

Perceptions of personal safety and security are believed to have a significant influence on public transport ridership. Studies in the United Kingdom suggest 10% of the population would reconsider using public transport if their fears were addressed (Crime Concern, 2004);

*Figure 1. Pyramid of travelers' needs (van Hagen and Sauren, 2014)*



Travelers' needs can be represented with a pyramidal structure, analogous to the Maslow's hierarchy of needs (Maslow, 1954).

According to various authors (van Hagen and Sauren, 2014; Ceccato, 2013; Allen et al., 2019), safety and security are essential requirements that find place at the base of this pyramid, meaning that failure to meet these two needs will make it impossible for consumers to appreciate the qualities that are ranked on the highest levels of the pyramid, such as speed, ease of travel and comfort.

This notwithstanding, several researchers have underscored the importance of personal safety and security in determining mode share, operator choices and travel frequency (Sam et al. 2014; Forsblom 2002; Benjamin et al. 1994; Ingalls et al. 1994). Sam et al. (2014) have observed that passengers' perception of safety and security ranked high in their public transport operator choices. Personal safety and security concerns on public

transport results in passengers' poor rating of the service with implications for patronage (Reed et al. 2000).

Given that the way public transport is organized and operated affect passengers' safety and security (Iles, 2005; Lynch & Atkins 1988), there are increasing calls for regular monitoring and evaluation of the safety and security strategies employed by public transport operators (Needle & Cobb 1997);

Transport safety and security are different issues, because safety is associated with risk while security is associated with uncertainty or they focus on very different types of risks. "Safety risks" originate from unintended failures, errors or misfortunes whereas "security risks" originate from deliberate or malicious attempts to disrupt, disable or destroy (Ranger, 2010). The term "security" is the prevention of unlawful interference with passengers and transport infrastructure and must give users confidence in the use of transport, while term "safety" refers to the methods and measures to protect people from the risks directly related to and arising from transport (Safety and Security, 2014). Security – sense of personal protection experienced by customers, derived from the actual measures implemented and from the activity designed to ensure that customers are aware of those measures (European Union, 2002). Safety measures reflect the likelihood that one will be involved in an accident, but security measures- become a victim of a crime.

Women are commonly identified as a group of public transport users who experience unique barriers compared to male commuters. Fear of harassment has been identified as the greatest barrier for women to ride public transport (Smith, 2008).

Women completely avoid the use of public transport, particularly at night. Despite these fears, globally, women have a higher probability of using public transport, for trip purposes other than commuting compared to men (Kuhnimhof et al., 2006).

Unless female riders' needs are addressed, they will continue to be limited in their use of public transport, and be unable to receive the full benefits provided by an integrated system.

The fear of harassment and of becoming a victim can constrain how women travel and be the primary decision-making factor for mode choice, route selection and time of day

of travel (Smith, 2008; Loukaitou-Sideris, 2014; Gardner et al., 2017) Most women are afraid of travelling alone and at night; thereby limiting their access to public spaces (Gardner et al., 2017; Lubitow et al., 2020). Harassment can be classified as non-confrontational (e.g. leering, sexualized slurs, offensive language) and confrontational (e.g. following the victim, aggressive speech, sexual assault) (Gardner et al., 2017; Stark and Meschik, 2018).

Some appropriate interventions may be driver skill and competence development and redevelopment, use of safer vehicles, adherence to strict maintenance and servicing schedules, active surveillance (police and other security patrols, CCTV), baggage identification system, and well-lit terminals. However, in order to fully understand how the public transport system bleeds security concerns, the routine activities theory propounded by Cohen and Felson (1979) was incorporated. As indicated by Newton (2014).

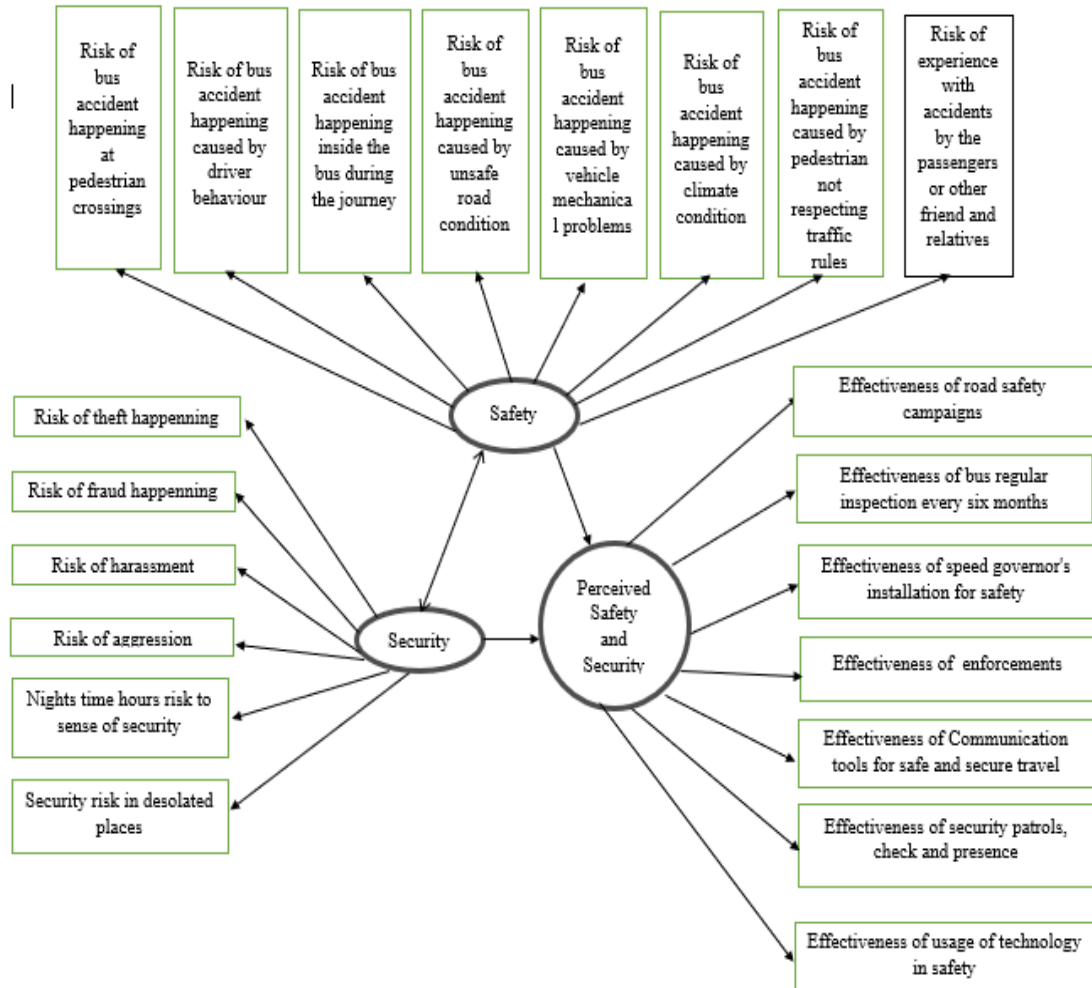
Public transport provides a unique setting, in terms of places and times, for crime and anti-social acts. Connected to this is the notion that public transport, network can act as both attractors and generators of crime and anti-social acts (Smith and Cornish, 2006; Clarke and Eck, 2005), given that it attracts a larger number of both commuters and potential commuters over time and space.

## **2.9 Conceptual Framework**

About the methodologies proposed to quantitatively assess travelers' perception of transportation services, the most used approaches compare the (stated) individual evaluations of specific factors to the evaluation of the overall perceived quality (de Oña& de Oña, 2015; dell'Olio et al., 2017). To this end, data collection strategies mainly involve Revealed Preference/Stated Preference (RP/SP) surveys using closed-ended questions based on Likert scales (Yavuz and Welch, 2010; Tyrinopoulos& Antoniou, 2008; Abdul Hamid et al., 2015; dell'Olio et al., 2010; Abenoza et al., 2018; Allen et al., 2019). In this way, respondents are often asked either to express how much they agree with a statement on an ordinal scale, e.g. from 1 to 5 (where 1 means "Completely disagree" and 5 means "Completely agree"), or are asked to express their satisfaction on an ordinal scale, e.g. from 1 to 5 (where 1 means "Very dissatisfied" and 5 means "Very satisfied"). de Oña and de Oña (2015), dell'Olio et al. (2017) and van Lierop et

al. (2018) have shown that more advanced modeling techniques can be distinguished into two main categories: structural equation models and regression analysis.

**Figure 2. Conceptual framework**



Source: Own conceptualization based on other models

In this study, an integrated structural equation model has been developed in the context of perceived safety and security in the City of Kigali bus services using variables adopted from different researches. Specifically, perceived safety and security as latent endogenous (Dependent variable) is measured by a combination of latent exogenous variable (Independent) which are safety parameters and Security as per conceptual framework and a combination of other variables.

## 2.10 Research gap

Only few studies have focused specifically on safety and security either using qualitative surveys to investigate which factors could influence travelers' perceptions (Fyhri et al., 2010; Amir et al., 2015; Currie et al., 2010; Park & Garcia, 2019), or assessing quantitatively what are the factors that directly may affect safety and security perception.

Some studies find that the more unsafe people feel on public transport the less likely they are to use it, although it is hard to know if fear reduces use or frequent use reduces fear (Lynch and Atkins, 1988).

Furthermore, sophisticated empirical techniques are noticeably lacking from transport literature's analysis of perceptions of safety and security. Conclusions are drawn almost exclusively from focus groups or comparative analyses (Reed et al., 2000, Cozens et al., 2003, Crime Concern, 2004). A few exceptions exist, such as simple regression analyses used in Wallace et al. (1999) and Morse and Benjamin (1997).

This study aims to contribute to this field of research by considering the combined influence of risk of bus accident happening at pedestrian crossings, risk of bus accident happening caused by driver behaviour and risk of bus accident, risk of bus accident happening inside the bus during the journey, risk of bus accident happening caused by unsafe road condition, Risk of bus accident happening caused by vehicle mechanical problems, Risk of bus accident happening caused by climate condition, risk of bus accident happening caused by pedestrian not respecting traffic rules, risk of experience with accidents by the passengers or other friend and relatives, risk of theft happening, risk of fraud happening, risk of harassment happening, risk of aggression happening, nights time hours risk to sense of security, security risk in desolated places, effectiveness of road safety campaigns, effectiveness of bus regular inspection every six months, effectiveness of speed governor's installation for safety, effectiveness of enforcements, effectiveness of communication tools for safe and secure travel, effectiveness of security patrols, check and presence, effectiveness of usage of technology in safety on perceived safety and security of passengers. The use of structural equation modeling (SEM) expands the methodological applied on this issue in the

transport domain. It explored the impact that perceived safety and security have on the use of public transport compared to other known influences

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1. Introduction**

This study used different methodology to answer research questions; being a cross sectional study, it uses the descriptive analysis of the data collected on a sample of public transport bus passengers, later a factor analysis to extract factors and then a structural equation model was derived to estimate safety and security parameters as per bus passenger perceptions.

This chapter presents the research methods that were used to carry out the study which is a cross sectional study. It covers the research design, target population, sample design, sample size, research instrument, and measurement of variables, data collection methods, data analysis and ethical considerations.

### **3.2 Research Design**

This study used the qualitative and quantitative methods for data analysis. Quantitative and qualitative methods were used in examining existing information on safety and security in public transport that are quantified and qualitative. Quantitative research is based more directly on its original plans and its results are more readily analysed and interpreted, Qualitative research is more open and responsive to its subject (Christine, 2006). For practical reasons and for the benefits of this research, a questionnaire with a set of open-ended and close-ended questions were developed and used in line with the objectives of the study and research questions.

The questionnaire was structured in a way that fit the respondent's characteristics and it was targeted to users of public transport in the City of Kigali.

#### **3.2.1 Target population and Group**

Sekaran defines a population as the entire group of people, events or things that researcher wishes to investigate (Sekaran,2003). Our targeted population is composed by all users of public transport bus services; and different stakeholders in public transport buses services with knowledge and active participation in safety and security for public transport in Kigali City. The target population was chosen randomly on pro rata basis.



### 3.2.2 Sample size

Zikmund defines sample size as the number or objects in the sample (Zikmund, 2003). A sample itself is defined as all the people or cases selected to take part in research study. Sampling is the selection of a small number of respondents to represent the survey population and concerning the sample selection.

The sample size was calculated using Yamane (1967) margin errors formula as follows:

$$s = \frac{z^2 * p(1-p) / e^2}{1 + (Z^2 * p(1-p) / e^2 N)}$$

Where:

s is the sample size  
 p is the proportion  
 e is margin error  
 N is Population size  
 Z is Z-score

As per transportation master plan (2020) the current (2018) population for Kigali is approximately 1.5 million.

The population of passengers using public transport in the City of Kigali varies where the researcher used daily averages to come up with the sample size.

Using the data from AC Group Ltd as per table 2, the estimated daily average taps or passengers using public transport buses in the City of Kigali are presented in table 2 below:

**Table 2: Average number of daily passengers**

<b>Zones</b>	<b>Daily average taps or passengers all zones</b>
Zone I	22,000
Zone II	19,000
Zone III	39,079
Zone IV	24,543
<b>Total</b>	<b>104,622</b>

Source: AC Group data

An estimated daily average taps or passengers of 104,622 which represents the population of public transport bus services users at the time of the study which may be used to calculate the sample size using probabilistic sampling method using margin errors formula. Considering the margin of error of 5% and the confidence level of 95%

$$\text{The sample size}(s) = \frac{1.96^2 * 0.5(1-0.5)/0.5^2}{1+(1.96^2 * 0.5(1-0.5)/0.5^2 * 104,622)}$$

s = 382.7 approximately 383 respondents.

Public Transport in the City of Kigali is divided into Four Zones Zone I, Zone II, Zone III and Zone IV each with a different number of routes, bus stops and terminal. After calculating the sample size, according to Chris J. Skinner (2016) Probability proportional to size (PPS) sampling is a method of sampling from a finite population in which a size measure is available for each population unit before sampling and where the probability of selecting a unit is proportional to its size. Probability Proportion to Size (PPS) method was used as per the table 3 below:

**Table 3: Probability Proportion to Size**

Zones	Daily average taps or passengers all zones	proportion	Sample Size
Zone I	22,000	0.2	80
Zone II	19,000	0.2	70
Zone III	39,079	0.4	143
Zone IV	24,543	0.2	90
<b>Total</b>	<b>104,622</b>	<b>1</b>	<b>383</b>

Source: Own compilation

The ability of passengers to travel safely and securely depend on the effort and actions taken by different stakeholders in public transport bus service in the City of Kigali a focus interview was conducted with concerned and knowledgeable stakeholders in public transport as per below table 4:

**Table 4: Interviewed stakeholders and government officials**

No	Names of organization	Position or Department
1	Jali Transport Ltd	Managing Director
2	Royal Express Ltd	Managing Director
3	Kigali Bus Services Ltd	Managing Director
5	Rwanda Utilities Regulatory Authority	Senior Manager, Transport Planning and Development
6	Rwanda Investigation Bureau	Office of the spokesman
7	City of Kigali	City Engineer
8	Rwanda National Police	Traffic and Road Safety

Source: Own compilation

The methods used to gather data, secondary data from published information as explained above are determined to a large extent by the research questions and objectives.

### **3.2.3 Validity and Reliability**

To test the questionnaire a pilot study was conducted on a small number of respondents for the suitability and relevance of the questions.

Validity and reliability test was conducted on the collected data. The Cronbach alpha coefficient which is a measure of internal consistency, that is, how closely related a set of items are as a group was used.

### **3.2.4. Data collection process**

The data was collected using a well-structured questionnaire, it was divided in three parts: (1) General aspect of the respondents; (2) safety aspect and (3) security aspect with much focus on passengers attributes of safety and security in public transport.

Depending of sample frame and sample size 383 personal interviews was conducted to randomly selected respondents using public transport bus services in different inside buses, in bus stop, taxi parks and bus terminals.

According to Mugenda & Mugenda, A.G, 2003 the response rates exceeding 50% and Arora, 2003 who consent that a response rate of 75% is adequate. The response rate was 100% since non respondent passengers were replaced.

The researcher used also secondary data that is generally taken from magazine, newspaper, text books, official documents, published reports, internet, statistics, bulletins and other documents which enabled the researcher to get information that are not covered in primary data methods such as literatures on safety and security in public transport in the city of Kigali that was used in literature review.

### **3.3. Data Analysis Procedures**

Descriptive statistics assist with the process of organizing and summarizing data; they may form the end point in data analysis, as with purely descriptive studies, or they may be the beginning point before testing hypotheses with inferential statistics in experimental research (Schmidt, 1975).

The collected data were analysed using different methods among others descriptive statistics, factor analysis and structural equation modeling in Excel, SPSS AMOS, STATA and SPSS softwares.

#### **3.3.1 Descriptive Analysis**

Descriptive analysis was used to present quantitative description of the collected data on safety and security perceptions of public transport bus service passengers in the City of Kigali where frequency table, bar chart, and others table were used. Also Stakeholders in public transport were interviewed where their views on public transport safety and security in the city of Kigali were described in a qualitative approach.

#### **3.3.2 Factor analysis**

Factor analysis is a collection of methods used to examine how underlying constructs influence the responses on a number of measured variables (Jamie DeCoster, 1998).

Factor analyses are performed by examining the pattern of correlations (or covariances) between the observed measures. Measures that are highly correlated (either positively or negatively) are likely influenced by the same factors, while those that are relatively uncorrelated are likely influenced by different factors ((Jamie DeCoster, 1998).

Factor analysis helped in identifying correlated factors loading for perceived safety and security, factor loadings for safety, factor loading for security used in estimating the structural equation model for the research.

### 3.3.3 Structural equation model

According to (Lee, Ihaka, &Triggs, 2012; Shmueli, 2010; Rawlings et al., 2006 and Granville, 2015), statistical modeling helps to develop and test theories using causal explanation, prediction, and description.

Structural equation modeling ‘is a multivariate statistical analysis technique that is used to analyze structural relationships’ (Anderson & Gerbing, 1988). This technique is the combination of factor analysis and multiple regression analysis, and it was used to analyze the structural relationship between measured variables and latent constructs. This method is preferred by the researcher because it estimates the multiple and interrelated dependence in a single analysis (Anderson & Gerbing, 1988).Modeling using Structural Equation Model was done to test correlation between variable and to identify the contributing factors to safety and security.

In this analysis, two types of variables are used endogenous variables (equivalent to dependent variables) and exogenous variables (equivalent to independent variables).

The Structural Equation Model (SEM) (see (Goldberger and Duncan, 1973; Bentler and Weeks, 1980; Muthén and Muthen, 2010)) in its most general form can be expressed by the following latent variable model:

$$\eta = \alpha\eta + B\eta + \Gamma \xi + \zeta$$

Equation above represents the latent variable model where  $\eta$  is a vector of latent endogenous variables with  $B$  a matrix of regression coefficients for the impact of the latent endogenous variables on each other,  $\xi$  is the vector of latent exogenous variables with  $\Gamma$  a matrix of regression coefficients for the latent exogenous variable’s impact on the latent endogenous variables,  $\alpha\eta$  is a vector of equation intercepts, and  $\zeta$  is the vector of latent disturbances that have a mean of zero and are uncorrelated with  $\xi$ .

In order to validate the proposed model, the comparative fit index (CFI), Normed Fit Index (NFI), and Standardized Root Mean Square Residual (SRMR) were applied in this study.

If the model fits well the data, the CFI value should be greater than 0.90. This index does not vary much with sample size (Kenny,2020);We consider that a model with an NFI lower than 0.9 can be improved (Hooper, Coughlan & Mullen, 2008) and The Standardised RMR resolves this problem and is therefore much more meaningful to

interpret. Values for the SRMR range from zero to 1.0 with well-fitting models obtaining values less than .05 (Byrne, 1998; Diamantopoulos and Sigauw, 2000), however values as high as 0.08 are deemed acceptable (Hu and Bentler, 1999).

### **3.4. Ethical Considerations**

With the authorization letter from University of Rwanda the researcher has provided a signed consent form to respondents so that their can participate in the research freely. The formal written consent of respondents is attached as proof to questionnaires of collected, while ensuring the respondents confidentiality by informing them that the study is purely for academic purpose and all the information that collected is treated with confidentiality.

### **3.5 Study limitations**

There issues related to complexity of safety and security concepts in public transport and there are variant number of attributes that several research judged important. The study used primary data and records from different sources overseas but locally no many researches were conducted on the topic which affected comparability aspect of the generated model, also the availability of data from targeted sources was difficult and took time due to different reasons among others the collection of data during the pandemic of Covid-19.

## **CHAPTER FOUR: DATA ANALYSIS AND RESULTS**

This chapter is concerned with the analysis of responses collected through the passenger's questionnaires and structural equation model estimation. The descriptive analysis is divided into three parts; the results of the public transport bus service passengers in four zones, and public transport bus service stakeholders' views, then the structural equation model estimation was performed for further analysis.

### **4.1 DESCRIPTIVE ANALYSIS OF BUS PASSENGERS**

This part is concerned with description analysis of perceptions of bus passengers in different safety and security aspects.

#### **4.1.1 General Characteristics**

The survey was conducted on 383 bus passengers in four zones, and 6 stakeholders in public transport bus services among others three city of Kigali bus operators.

Table 5 below gives information about general characteristics of interviewed passengers.

The results show that the majority of travellers are in age group of 16-35 years with 42.8% and lastly are certain vulnerable groups of users of public transport bus service in the City of Kigali such as older with age between 65 years and above representing 3.4%

The results show that 37.9% respondents had either attended or completed university level education (Bachelor's degree, master's degree etc), 33.4% had either attended or completed upper secondary level education. The monthly income of bus passenger's respondents most of them 43.9% was between 100,001 – 300,000 Rfw. The purpose of the trip for most bus passengers is business with 42% followed by going to school for students with 21.4%; most of passenger's respondents 56.4% indicated that they use bus services 5-7 times a week; in regards to car ownership the majority of bus passengers 97.1% do not own a car for travel.

**Table 5: Characteristics of interviewed bus passengers**

<b>Variable</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Age of bus passengers	16 - 35	164	42.8
	36 - 54	155	40.5
	55 - 64	51	13.3
	65 and above	13	3.4
Education background of bus passengers	None	10	2.6
	Primary Level	24	6.3
	Lower secondary level	37	9.7
	Upper secondary level	128	33.4
	Polytechnic	39	10.2
	University level	145	37.9
Monthly income of bus passengers	0 - 10,000 Rfw	55	14.4
	10,001 - 50,000 Rfw	72	18.8
	50,001 - 100,000 Rfw	75	19.6
	100,001 - 300,000 Rfw	168	43.9
	300,001 - 500,000 Rfw	11	2.9
	500,000 Rfw and Above	2	.5
Purpose of the trip for bus passengers	Work	72	18.8
	Business	161	42
	Shopping	28	7.3
	Visiting Friends and Relatives	36	9.4
	School	82	21.4
	Other Reasons	4	1
Frequency of passenger bus weekly usage	0 - 2	33	8.6
	3 - 4	120	31.3
	5 - 7	216	56.4
	7 and more	14	3.7
Car ownership for bus passenger	Yes	11	2.9
	No	372	97.1

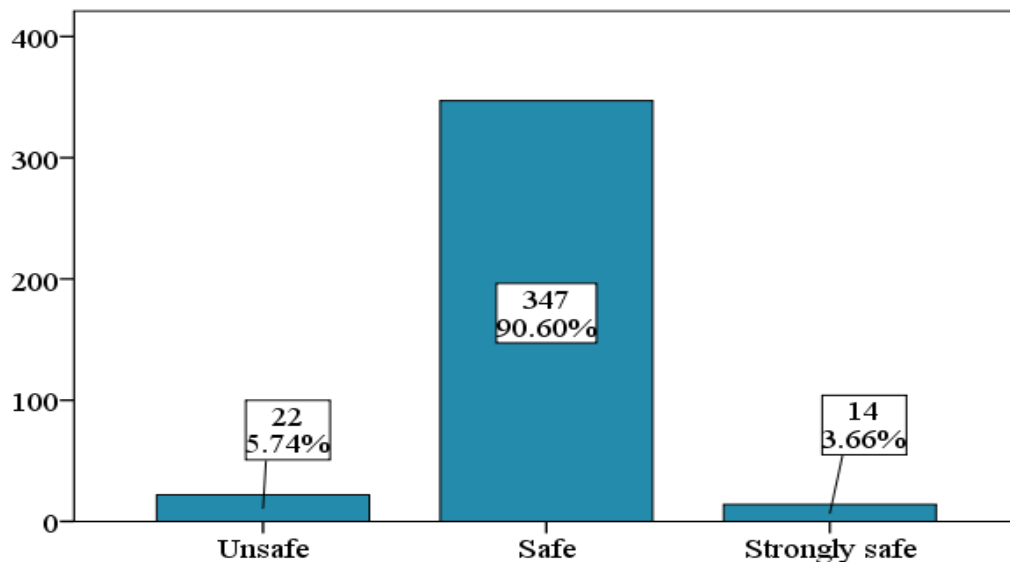
Source: Own visualization



#### 4.1.2 Public transport bus safety and security overall perception by interviewed passengers

Public transport bus service in the City of Kigali is overall safe and secure according to interviewed passengers. As per figure 3 most of bus interviewed passengers feel overall safe and secure either travelling in a public transport bus or while waiting for a bus in a bus stop and bus terminal representing 94.26% satisfaction level on safety and security with 90.6% respondents who said it is safe and 3.66% said strongly safe.

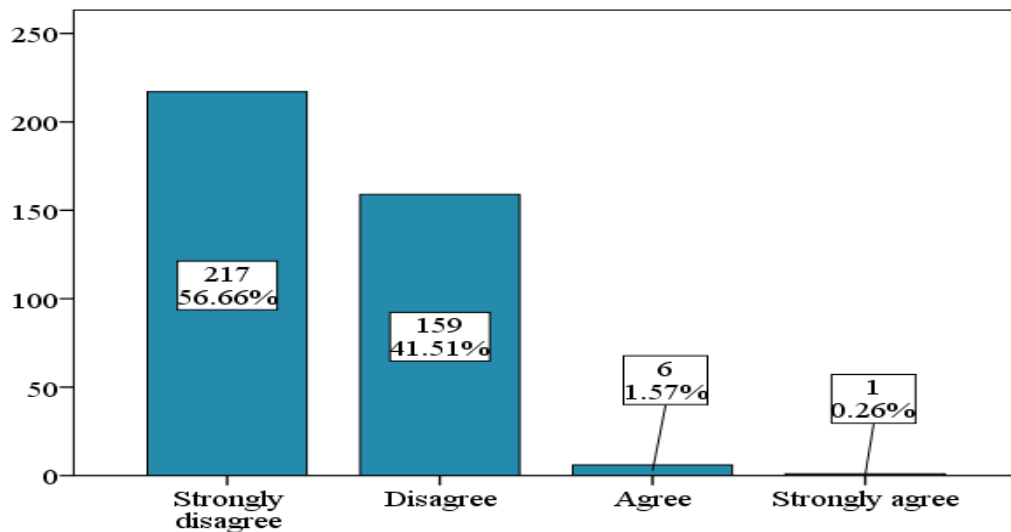
**Figure 3: Public transport bus passenger's overall safety and security perception**



Source: Own visualization

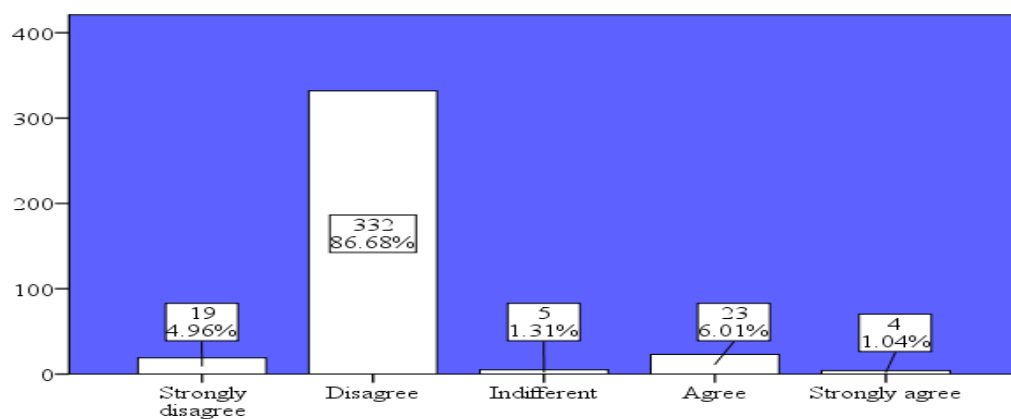
However as per Figure 4 there is need to improve on public transport bus punctuality and schedule because when the bus delay or do not come on time most bus passengers waiting at bus stop or bus terminal feel emotionally unsafe with strongly unsafe representing 56,66% of the respondents and unsafe representing 41.51% of the respondents.

**Figure 4: Bus passenger’s safety and security perception while the bus delay**



Source: Own construct

**Figure 5: Bus passengers’ perceptions on including safety and security cost in public transport tariff model**

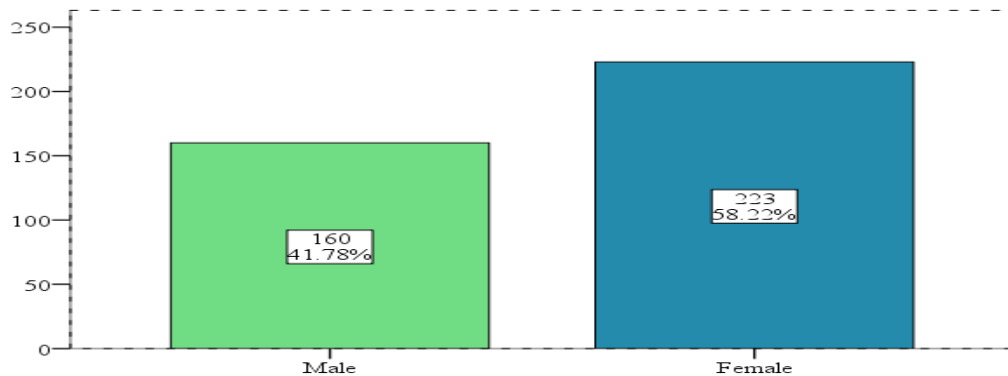


Source: Own compilation

Providing safety and security in public transport in the City of Kigali is costly and one had to pay for the cost associated to this service provision. As per figure 5 bus passenger disagreed 86.68% and 4,96% strongly disagree on whether the regulator should include passenger safety and security cost into the public transport tariff model, of bus passengers in the City of Kigali said that it is costly and had to be financed through

government and stakeholders in public transport by using sector generated revenues such as taxes, insurances, fines, fare, fuel prices, paid services, incentives and other means the government can use to finance the cost for provision of safety and security for public transport bus service.

**Figure 6: Gender characteristics of public transport bus passengers in the city of Kigali**



Source: Own visualisation

Figure 6 indicate that most of the City of Kigali public transport bus users are female with the percentage of 58.22% (223) in comparison to male with 41.78% (160), Safe public transit for women and girls accounts for and accommodates the reality of the travel patterns of women and girls. Women’s movement through the city has been described as trip-chaining. This means that women tend to combine the various activities that they must complete in a day, for example, domestic and care-taking responsibilities as well as wage- earning trips. In public transit, it is very common that women have to get off at multiple destinations, pay multiple fares, and travel during off peak hours (Peters, 2002, 7). Ultimately, “women in urban areas tend to take a greater number of shorter trips to dispersed locations at more varied times. “These trips are more expensive in terms of time and money” (Kunieda and Gauthier, 2003, 6).

**Table 6: Gender and overall safety and security perceptions by bus passengers**

			Overall safety and security perception by public transport bus passengers' respondents			Total
			Unsafe	Safe	Strongly safe	
Gender of public transport bus passengers	Male	Frequency	5	151	4	160
		percentage of total	1.3	39.4	1	41.8
	Female	Frequency	17	196	10	223
		percentage of total	4.4	51.2	2.6	58.2
Total		Frequency	22	347	14	383
		percentage of total	5.7	90.6	3.7	100

Source: Own visualisation

Table 6 indicate that public transport bus service in the City of Kigali also is very secure and safe environment for female with 51.2% safe and 2.6% strongly safe and male with 39.4% safe and 1% strongly safe.

A study by the World Bank in Peru concluded that while personal security is women's number one concern with respect to using public transit, speed is men's first priority. The same study points out that, "in order to cope with lack of personal safety, women develop a series of strategies, ranging from refraining from traveling on certain routes, or at night alone, to carrying pins while traveling on the bus in order to keep molesters away" (Gómez, 2000, 2).

**Table 7: Cross tabulation between gender, feeling secure at night, in desolated places and poor environment condition**

		Gender of public transport bus passengers				Total
		Male		Female		
		Percentage	Frequency	Percentage	Frequency	
Security risk in while in a specific poor environment condition	Strongly disagree	1.57	6	3.66	14	20
	Disagree	28	108	33.94	130	238
	Indifferent	1	4	2.87	11	15
	Agree	10	37	16.97	65	102
	Strongly agree	1	5	0.78	3	8
Security risk in desolated places	Strongly disagree	1.31	5	2.87	14	16
	Disagree	27.68	106	36.55	140	246
	Indifferent	0	0	0.78	3	3
	Agree	12.01	46	16.71	64	110
	Strongly agree	0.78	3	1.31	5	8
Nights time hours risk to sense of security	Strongly disagree	1.57	6	3.66	14	20
	Disagree	25.59	98	33.42	128	226
	Indifferent	1.57	6	2.61	10	16
	Agree	11.75	45	17.75	68	113
	Strongly agree	1.31	5	0.78	3	8

Source: Own computation

Table 7 highlights that in comparison also to man and boy's travellers in the City of Kigali public transport girls and women feel unsafe and unsecure traveling at night hours as 33.42% and 3.66% of women and girls agreed and strongly agreed in comparison to boys and men 25.59% agree and 1.57% strongly agree; 36.55% women and girls disagree and 2.87% strongly disagree of being secure and safe in being in desolated places like being near under construction houses, desolated bus stops, forest and bushes lastly 33.94% women and girls disagree and 3.66% strongly disagree of

being secure and safe being in places with poor environment conditions like being in a polluted air and water places, places with high temperatures, overcrowded places, places with waste disposed, etc in comparison to boys and men.

#### 4.2 Passengers’ perceptions on risk associated with using public transport bus service in the City of Kigali

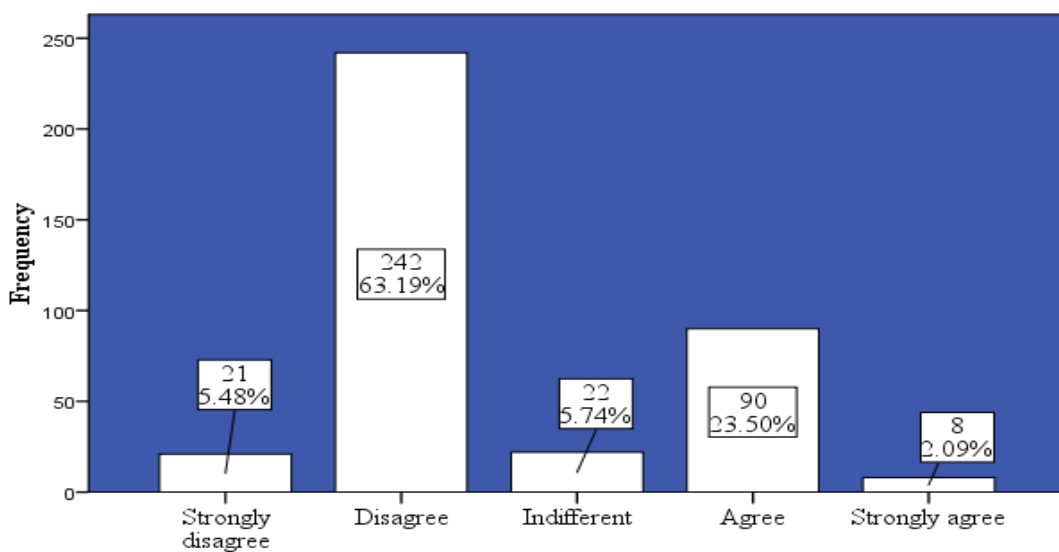
Passengers were asked to rank using likert scale their perceptions on different aspect of safety and security risks associated with using public transport bus service from strongly disagree; disagree; indifferent; agree; strongly agree.

##### 4.2.1 Safety risk in public transport bus service by passengers’ perception

Overall public transport in the City of Kigali bus service is safe from different aspects of accidents happening as per bus passenger perceptions.

Figure 7 indicates that risks of accidents in public transport especially bus service in the City of Kigali is very low according to passenger respondents, 23.5% agreed and 2.09% strongly agreed on experiencing bus accidents or hearing the accidents through friends or relatives and hearing accidents cases on radio, television or on other communication means (twitter, whatsApp, facebook,etc).

**Figure 7: Passengers perception on experienced bus accidents**



Source: Own visualization

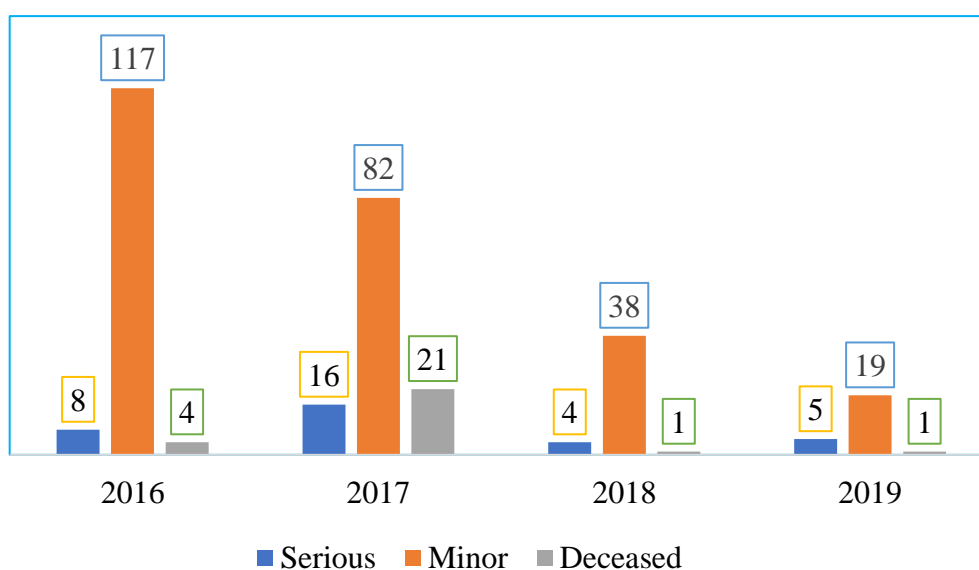
In table 8 among the 23.5% agreed and 2.09% passenger who responded on experiencing, witnessing or hearing about bus accidents in public transport; most of the accidents were minor accidents with 74.2%.

**Table 8: Passengers perception on Level of seriousness of accidents experienced in public transport bus**

Level of seriousness	Frequency	Percentage
Light	4	3.33
Fair/Minor	89	74.2
Serious	22	18.3
Very serious	5	4.2
Total	120	

Source: Own visualisation

**Figure 8: Severity level trend of accidents**



Source: Rwanda National Police

Among the accidents data as per figure 8 there is a slightly decrease in minor injury accidents; serious injury accidents, property damage accidents and deadly accident or fatal accidents in the past four years.

There were a decrease from 2016 to 2019 where serious accidents decreased by 60%, minor decreased by 516% and very serious accidents involving deaths decreased by 300% among those dying on the roads are “vulnerable road users”: pedestrians, cyclists,

motorcyclists, persons with disabilities, children, elderly, road workers’’ also drivers and bus passengers become the victim of the accidents.

**Table: 9: Passengers perception on safety risk**

Variable name	Answer category	Frequency	Percentage
Risk of bus accident happening at pedestrian crossings	Strongly disagree	21	5.5
	Disagree	256	66.8
	Indifferent	16	4.2
	Agree	83	21.7
	Strongly agree	7	1.8
Risk of bus accident happening caused by driver behavior	Strongly disagree	21	5.5
	Disagree	237	61.9
	Indifferent	18	4.7
	Agree	97	25.3
	Strongly agree	10	2.6
Risk of bus accident happening inside the bus during the journey	Strongly disagree	21	5.5
	Disagree	249	65
	Indifferent	20	5.2
	Agree	83	21.7
	Strongly agree	10	2.6

Source: Own visualization

Table 9 indicates that risks of accidents happening in public transport especially bus service are very low in the City of Kigali since the risk of bus accident happening at pedestrian crossings are 21.7% and 1.8% as respondents agreed and strongly agreed; the risk of bus accident happening caused by driver behaviour are 25.3% and 2.6% as respondents agreed and strongly agreed; the risk of bus accident happening inside the bus during the journey is 21.7% and 2.6% as respondents agreed and strongly agreed. These risks come with overcrowded buses with driver bad manoeuvres and there is the lack of basic safety equipment’s on many buses operating in the City of Kigali.



**Table: 10: Passengers perception on safety risk**

<b>Variable name</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Risk of bus accident happening in waiting areas	Strongly disagree	3	.8
	Disagree	256	66.8
	Indifferent	12	3.1
	Agree	95	24.8
	Strongly agree	17	4.4
Risk of bus accident happening while standing in a bus platform	Strongly disagree	7	1.8
	Disagree	261	68.1
	Indifferent	10	2.6
	Agree	85	22.2
	Strongly agree	20	5.2
Risk of bus accident happening caused by unsafe road condition	Strongly disagree	21	5.5
	Disagree	247	64.5
	Indifferent	10	2.6
	Agree	95	24.8
	Strongly agree	10	2.6
Risk of bus accident happening caused by vehicle mechanical problems	Strongly disagree	21	5.5
	Disagree	240	62.7
	Indifferent	21	5.5
	Agree	88	23
	Strongly agree	13	3.4
Risk of bus accident happening caused by climate condition (rain, wind, earthquake,...)	Strongly disagree	21	5.5
	Disagree	255	66.6
	Indifferent	10	2.6
	Agree	87	22.7
	Strongly agree	10	2.6
Risk of bus accident happening caused by pedestrian not respecting traffic rules	Strongly disagree	21	5.5
	Disagree	226	59
	Indifferent	27	7
	Agree	102	26.6
	Strongly agree	7	1.8

Source: Own visualisation

Table 10 indicates that risks of accidents in public transport especially bus service is overall low in different aspect in the City of Kigali.

The risk of risk of bus accident happening in waiting areas like bus stop, bus shelter with or without seating places are 24.8% and 4.4% as respondents agreed and strongly agreed;

The risk of risk of bus accident happening while standing in a bus platform bus terminal bus stations and structure are 22.2% and 5.2 % as respondents agreed and strongly agreed;

The risk of bus accident happening caused by unsafe road condition are 24.8% and 2.6% as respondents agreed and strongly agreed; these attributed to the fact that the number and quality of roads in the City of Kigali has increased, small number of unpaved roads, the road markings and signs are more and clearer.

The risk of bus accident happening caused by vehicle mechanical problems are 23% and 3.4% as respondents agreed and strongly agreed; since some buses used in the city of Kigali have been serving for long time but also the new buses can experience these problems due to not maintaining them on time.

The risk of bus accident happening caused by climate condition (earthquake, cloudy, rain, wind) is low 22.7% and 2.6% as respondents agreed and strongly agreed is low;

The risk of bus accident happening caused by pedestrian not respecting traffic rules are 26.6% and 1.8% as respondents agreed and strongly agreed. There are some pedestrians who do not give way to motorist where it is due and do not observe traffic light signals, cross the road while distracted, leading to otherwise avoidable road accidents.

**Table 11: Time of the day factor on safety**

<b>Variable name</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Risk of bus accident happening in day hours	Strongly disagree	2	.5
	Disagree	30	7.8
	Indifferent	67	17.5
	Agree	258	67.4
	Strongly agree	26	6.8
Risk of bus accident happening in night hours	Strongly disagree	2	.5
	Disagree	37	9.7
	Indifferent	83	21.7
	Agree	235	61.4
	Strongly agree	26	6.8

Source: Own visualization

Table 11 indicate that according to passengers' views public transport bus accidents most of them can happen in day hours 67.4% agreed and 6.8 % strongly agreed in comparison to nights' hour's accidents 61.4% agreed and 6.8% strongly agreed since the movement of vehicles and passengers, pedestrians and other road users are concentrated in days' hours, also there are small movement of buses in night hours most of them close their services early.

#### **4.2.2 Security risk in public transport bus service by passengers' perception**

The City of Kigali public transport passenger respondents' statistics of incidents and offenses reveals that there are minimal incidents of theft, fraud, threat, terrorism attack, harassment and aggression and threats inside buses, in bus stops, bus terminals and taxi parks.

Table 12 indicate that the risk of theft happening are low with 30.8% and 1.8% of respondents agreed and strongly agreed, passengers' property (mobile phones, bags, laptops, pickpocketing.) and money are stolen inside buses, in bus stops, bus terminals and taxi parks but slightly decreased in comparison to past years;

The risk of fraud happening are low with 27.7% and 2.3% of respondents agreed and strongly agreed, passengers sometimes encountered people using different technics in other to persuade them and steal them precious items and money inside buses, in bus

stops, bus terminals and taxi parks but these behaviours are slightly decreased in comparison to past years;

The risk of terrorism attack happening are low with 8.4% and 0.5% of respondents agreed and strongly agreed, reference is made to local newspapers, Rwanda has faced unsuccessful terrors which consisted of grenades attacks thrown to passengers in bus stops, taxi parks and bus terminal but there is a decrease due to security measures undertaken.

The risk of threat happening are low with 18% and 1.3% of respondents agreed and strongly agreed, passengers are threatened, witnessed or heard someone threatened inside buses, in bus stops, bus terminals and taxi parks also these cases has decreased over time.

The risk of harassment happening are low 27.9% and 2.1% of respondents agreed and strongly agreed, passengers are harassed, witnessed or heard someone harassed inside buses, in bus stops, bus terminals and taxi parks also these cases has decreased over time.

The risk of aggression happening are low with 26.6% and 2.1% of respondents agreed and strongly agreed, passengers are harassed, witnessed or heard someone harassed inside buses, in bus stops, bus terminals and taxi parks also these cases has decreased over time.

*Table 12: Passengers perceptions on security risk*

<b>Variable name</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Risk of theft happening	Strongly disagree	20	5.2
	Disagree	221	57.7
	Indifferent	17	4.4
	Agree	118	30.8
	Strongly agree	7	1.8
Risk of fraud happening	Strongly disagree	19	5
	Disagree	231	60.3
	Indifferent	18	4.7
	Agree	106	27.7
	Strongly agree	9	2.3
Risk of threat happening	Strongly disagree	21	5.5
	Disagree	284	74.2
	Indifferent	4	1
	Agree	69	18
	Strongly agree	5	1.3
Risk of terrorism attack happening	Strongly disagree	15	3.9
	Disagree	332	86.7
	Indifferent	2	.5
	Agree	32	8.4
	Strongly agree	2	.5
Risk of harassment happening	Strongly disagree	20	5.2
	Disagree	238	62.1
	Indifferent	10	2.6
	Agree	107	27.9
	Strongly agree	8	2.1
Risk of aggression happening	Strongly disagree	19	5
	Disagree	231	60.3
	Indifferent	23	6
	Agree	102	26.6
	Strongly agree	8	2.1

Source: Own compilation

**Table 13: Passengers' perceptions and feeling on security risk**

<b>Variable name</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Presence of other to affect sense of security	Disagree	42	11
	Indifferent	30	7.8
	Agree	221	57.7
	Strongly agree	90	23.5
Nights time hours to affect sense of security	Strongly disagree	20	5.2
	Disagree	226	59
	Indifferent	16	4.2
	Agree	113	29.5
	Strongly agree	8	2.1
Day time hours to affect sense of security	Strongly disagree	20	5.2
	Disagree	231	60.3
	Indifferent	14	3.7
	Agree	109	28.5
	Strongly agree	9	2.3
Feel secure in desolated places	Strongly disagree	20	5.2
	Disagree	238	62.1
	Indifferent	15	3.9
	Agree	102	26.6
	Strongly agree	8	2.1
Feel secure while in a specific poor environment condition	Strongly disagree	16	4.2
	Disagree	246	64.2
	Indifferent	3	.8
	Agree	110	28.7
	Strongly agree	8	2.1

Source: Own visualisation

Table 13 above highlight feelings of security in different aspect; public transport passengers feel secure in the presence of other people or in crowd condition with 57.7% agreed and 23.5% strongly agreed; they feel not secure being in bus, bus terminal, bus stop during night hours with 59% agreed and 5.2% strongly agreed; they feel also secure being in bus, bus terminal, bus stop during days' hours with 60.3%

disagree and 5.2% strongly agreed; passengers also feel insecure in desolated places with 62.1% disagreed and 5.2% strongly and lastly passengers also feel insecure while in a specific poor environment condition with 64.2% disagreed and 4.2% strongly disagreed.

#### **4.3 The level of safety and security and protection provided to public transport bus passengers**

Safety and Security in Public transport bus service in the City of Kigali is provided via coordination made with different stakeholders among others the bus operators, City of Kigali, Rwanda National Police, Rwanda Utilities Regulatory Authority, Rwanda Investigation Bureau (RIB), , etc, the perceived satisfaction level of passengers with different measures and initiatives taken by these stakeholders in reducing security and safety incidences is high.

Bus passengers as per Table 14 reveals that different road safety awareness campaigns undertaken by Rwanda National Police and stakeholders are effective in improving road safety in public transport bus services since 49.6% agreed and 26.4% strongly agreed these campaigns included the " Gerayo amahoro" campaign, which means 'reach safe', road safety sessions, education and advocacy among motorists, cyclists, bus operators, churches; members of the public and in schools. These road safety campaigns have contributed a lot in the prevention and reduction of road accidents and behavior change of road users.

Results reveals that bus regular inspection every six months' initiative is effective and 50.7% agreed, 27.2% strongly agreed; Rwanda National Police has fixed Motor-vehicle mechanical inspection in different area in the country and this technical control equipment have a combined capacity of inspecting over 700 automobiles per day, this ensures that vehicles moving in Rwanda are road-worthy and less prone to mechanically induced accidents and these services will be expanded to other districts.

The effectiveness level of installed speed governor's for safety according to passengers perception is high with 49.9% agreed and 24.8% strongly agreed, These initiative was undertaken by RNP and RURA following February 2015 Presidential Order relating to installation of speed governors into public service and other commercial vehicles to

control the speed of business vehicles, the hi-tech device limits vehicles to the maximum speed of 60 kilometers, all public transport buses in the City of Kigali are installed with speed governors monitored online via Rwanda National Police and Rwanda Utilities Rwanda Authority tracking platform, these device has contributed a lot in reduced fatal bus accidents in the City of Kigali. In collaboration with RURA, Rwanda National Police Traffic has conducted inspection for preventing bus drivers for tampering with speed governor's and some drivers were fined.

The effectiveness of enforcements as per passenger's perceptions is high in reducing traffic accidents, 51.2% agreed and 24.3% strongly agreed, in enforcing traffic rules and regulations, there is zero tolerance to corruption, different means are used by Rwanda National Police, traffic police conduct regular inspections, road safety audits, fining non-compliant with traffic rules and regulations these sanctions include prison and fines for drivers (Drunk drivers, etc).

RURA ensures that public transport operators comply with the regulations, license obligations and other applicable laws. In this context, RURA inspectors work hand in hand with police and conduct field inspections to encourage compliance and non-compliant operators are sanctioned.

The effectiveness level of usage of communication tools in safety the perception of passengers on this initiative undertaken by stakeholders is very high 52.7% agreed, 25.1%, Rwanda National Police and its stakeholders conduct several radio and TV talk-shows on road safety and other sort of sensitization using online, print media platforms and social media platform like twitter, facebook, instagram, whatsapp and telephone messages are sent to communicate.

The effectiveness level of usage of technology in safety the perception of passengers on this initiative undertaken by stakeholders is very high 52.2% agreed, 25.1% strongly agreed, the art of using technology in ensuring safety of passengers in public transport bus has started with RNP deployment of more CCTV cameras on Rwandan roads to detect and prevent traffic violation and they are effective in controlling traffic flow and reducing accidents , breathalyzers for alcohol detection in drivers, hand held terminals cashless system for fining traffic offenders using smart card (Visa,..), Automatic Number Plate Recognition system machine to check the status of vehicles (vehicle inspection, insurance, and traffic offender records). Also the introduction of a device



called on-body camera which is an electronic device attached on a police personnel body like a chest or arm, this device is used to detect cars that violate traffic rules and immediately punish the offenders through fining them via SMS, RURA and RNP introduced a Driver Vocation Card which will be issued to public passenger transporters/drivers with a credit reduction code; whenever a driver breaks a traffic rule, some credit will be reduced from their vocation card.

**Table 14: Perceived safety intervention initiatives by public transport stakeholders**

<b>Variable</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Effectiveness of road safety campaigns	Strongly disagree	2	.5
	Disagree	80	20.9
	Indifferent	10	2.6
	Agree	190	49.6
	Strongly agree	101	26.4
Effectiveness of bus regular inspection every six months	Strongly disagree	2	.5
	Disagree	75	19.6
	Indifferent	8	2.1
	Agree	194	50.7
	Strongly agree	104	27.2
Effectiveness of speed governor's installation for safety	Strongly disagree	2	.5
	Disagree	63	16.4
	Indifferent	32	8.4
	Agree	191	49.9
	Strongly agree	95	24.8
Effectiveness of enforcements	Strongly disagree	2	.5
	Disagree	65	17
	Indifferent	27	7
	Agree	196	51.2
	Strongly agree	93	24.3
Effectiveness of Communication tools for safe and secure travel	Strongly disagree	2	.5
	Disagree	62	16.2
	Indifferent	21	5.5
	Agree	202	52.7
	Strongly agree	96	25.1
Effectiveness of usage of technology in safety (CCTV, DVCs,.....)	Strongly disagree	2	.5
	Disagree	61	15.9
	Indifferent	24	6.3
	Agree	200	52.2
	Strongly agree	96	25.1

Source: Own visualization

**Table 15: Perceived security intervention initiatives by public transport stakeholders**

<b>Variable name</b>	<b>Answer category</b>	<b>Frequency</b>	<b>Percentage</b>
Effectiveness of surveillance CCTV cameras for security	Disagree	32	8.4
	Indifferent	11	2.9
	Agree	182	47.5
	Strongly agree	158	41.3
Effectiveness of security patrols, check and presence	Strongly disagree	2	.5
	Disagree	75	19.6
	Indifferent	34	8.9
	Agree	180	47
	Strongly agree	92	24
Effectiveness of lighting on bus passenger sense of security	Strongly disagree	2	.5
	Disagree	24	6.3
	Indifferent	78	20.4
	Agree	255	66.6
	Strongly agree	24	6.3
Effectiveness of commercial activities on bus passenger sense of security	Disagree	17	4.4
	Indifferent	91	23.8
	Agree	268	70
	Strongly agree	7	1.8

Source: Own visualization

Table 15 The effectiveness level of usage of surveillance CCTV cameras in security is high as per perception of passengers 47.5% agreed, 41.3% strongly agreed, there are cameras which was installed in bus terminal, taxi parks and some buses which are fruitful in preventing security incidences cases in public transport in the City of Kigali.

The effectiveness of security patrols, check and presence of security staff is high as per perception of passengers 47% agreed, 24% strongly agreed, the presence, patrols and checks of security staff among others police staff, Rwanda Utilities Regulatory Authority inspectors, security companies' staff has contributed to reduction to crimes incidences in bus terminal, taxi parks and buses in public transport in the city of Kigali.

Effectiveness of lighting on bus passenger sense of security is high as 66.6% agreed, 6.3% strongly agreed, public lighting initiative undertaken by the City of Kigali in different street and roads especially in night hours has increased the security level of passengers.

Effectiveness of commercial activities on bus passenger sense of security is high as 70% agreed, 1.8% strongly agreed, the presence of business and commercial activities in different bus stop, bus terminal and taxi parks has contributed to passengers feeling of security with movement of people but in some cases can attract crimes incidence in public transport in the City of Kigali.

#### **4.4 Views of city of Kigali bus operators on safety and security of passengers**

The City of Kigali public transport bus service is provided by three bus operators namely Kigali Bus Service Ltd, Royal Express Ltd and Jali Transport Ltd.

Three Representatives from the three bus operators were interviewed to provide their views on different aspect of safety and security as below.

According to the interview conducted with bus operators they said that they had a lot of responsibilities in improving safety and security in public transport among other getting bus license and complying with its conditions; paying insurance for all public transport buses in operations; equipping all buses with speed limiters; regular maintenance and refuelling of buses in operations; recruitment of professional drivers and organizing driver trainings programs; compliance on usage of cashless transport payment system in all buses like tap and go system and passenger complaints handling.

Public transport bus service has improved and according to interviews with bus operators they said that the current status of safety and security is overall good where small buses were replaced with big buses; all public transport buses were installed with speed limiters (speed governors); numbers of City of Kigali public transport bus accidents reduced; usage of Rwanda Utilities Regulatory Authority licensed public transport buses; CCTV cameras installation in some buses and bus terminals; presence of company security staff, deployed controllers and supervisors in some buses, bus stop and bus terminals; active collaboration with Rwanda National Police, Rwanda Utilities Regulatory Authority, City of Kigali, Security companies on ensuring passenger safety

and security; reduced number of crimes and insecurity cases in buses, bus stop and bus terminals; driver behaviour changed and regularly monitored and public transport bus inspected every six months by Rwanda National Police.

When asked on common causes of public transport bus accidents in the City of Kigali, bus operators responded that the common causes are driver behaviour (non-experienced; fatigue, reckless driving, bad maneuverer, traffic rules violation); road users (private cars, motorcyclist, bicycle and pedestrians); poor road condition; climate conditions and bad weather (heavy rain, wind); bus characteristics (long buses) and road structure; old buses; and buses not regularly maintained.

Insecurity and offense cases in public transport, bus stop and bus terminal are frequent according to bus operators they are commonly caused by the presence of commercial activities, street vendors in bus stops, and bus terminal which attract beggars, vandalism, fraud and theft; bus passengers not taking responsibilities for their personal security; presence of brokers (Abakarasi) in bus stop, bus terminals who are involved sometimes in fraud, vandalism, theft activities; bus stop, shelter and bus terminals not covered enough to protect passengers against bad weather (rain, wind) and theft by bus drivers who receive fare payment by cash and not fare payment via automated fare collection system, although there were no cyber incident that happened but there is fear by bus operators that the automated fare collection system can be vulnerable to cyber-attack.

#### **4.5 Views of RURA on safety and security of passengers**

The reviewed Law N° 09/2013 of 01/03/2013 establishing RURA gives it a mandate to ensure that transport services are available throughout the country to meet, in transparency, all reasonable demands of all natural persons and organizations.

RURA is also responsible for issuing and renewing licenses and authorizations for transport service operations, planning of routes and terminals, monitoring of service levels and enforcement of transport service regulations.

According to interview conducted with RURA representative he noted that among the responsibilities of Rwanda Utilities Regulatory Authority in ensuring safety and security include issuance of authorizations and licenses for public transport buses in

consideration of safety requirement fulfilling; developing the sub sector's regulations setting safety and security aspect in obligations and requirements; handling customer's complaints among others safety and security issues; conducting regular inspections in the City of Kigali to ensure compliance with regulations governing passenger bus and minibuses and protecting also passenger safety and security; sensitization campaigns on radio and television for passengers on safe and secure travel aspect (how to protect themselves, report and communicate crime and unsafe cases) and behaviour change and issuance of driver vocational cards (DVCs) to monitor behaviours of public transport drivers.

Public transport bus service according to regulator representative point of view is improving, he stated that regulations were put in places considering passenger's safety and security requirement; there is collaboration with stakeholders on passenger's safety and security issues handling; Driver Vocational cards and driver code of conduct in place to monitor behaviours of public transport drivers; regular inspections and identifies insecurity cases and passenger complaints handled.

Also Rwanda Utilities Regulatory Authority encounter many challenges in the implementation of safety and security according to the interview it includes bad driver behaviour; City of Kigali public transport bus operators not complying with regulation and using unfit buses; bus passenger behaviour which had to be changed and respect safety and security measures.

#### **4.6 Views of City of Kigali on safety and security of passengers**

The City of Kigali as per interview conducted with its official has responsibilities of ensuring the implementation of national policies; to develop infrastructure and urbanization of the City of Kigali; to develop and implement the plan of action for the transport of persons and goods in the City of Kigali; to develop of public transport infrastructure (roads, bus stop, shelter, bus terminal etc) considering passenger safety and security features; Smart Transportation system design (smart light).

On the current status of public transport safety and security City of Kigali official noted that there is transportation master plan in place considering safety and security of passengers; collaboration with public transport stakeholders on passenger safety and security issues; public transport infrastructure developed (Roads constructed, public

lighting, bus terminal, bus stop and shelter constructed); contracting in collaboration with stakeholders (RURA) public transport bus operators for service provision.

When asked on the challenges encountered in the implementation of safety and security the official said that there is non-integrated public transport system for passenger safety and security issues; gaps in public transportation system planning in the City of Kigali; no emergency and evacuation systems building for accidents and limited knowledge and capacity in public transport bus service safety and security planning; issues in financing public transport infrastructure catering passenger safety and security issues and no clear policy in the City of Kigali public transport bus service catering for passenger safety and security issues.

#### 4.7 Factor analysis

Factor analysis was applied to highlight the loading factor of each response from the respondent concerning perception of safety and security. Factor analysis allows the researcher to impose a particular factor model on the data to see how well that model explains responses to the set of measures.

Before performing factor analysis, test need to be conducted to be certain that analysis can be performed to the variables in order to categorize them according to their mutual relations. To do the factor analysis test. SPSS was used and it was found that the factor analysis was valid and successful.

**Table 16: KMO and Bartlett's Test**

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.925
Bartlett's Test of Sphericity	Approx. Chi-Square	15,050
	df	210
	Sig.	.000

Source: Own visualization

In Table 16 the Kaiser-Meyer-Olkin (KMO) test is a measure of how suited your data is for factor analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. The lower the proportion,

the more suited your data is to factor analysis. KMO test returns values between 0 and 1. The KMO value is .925 which is meritorious and indicate that the sampling is adequate also the Bartlett's test of sphericity which test the hypothesis that your correlation matrix is an identity matrix, which would indicate that your variables are unrelated and therefore unsuitable for structure detection; the test result is significant with a p-value of  $< 0.000$  and mean that the variables are related and suitable for structural detection.



**Table 17: Communalities**

Variables	Initial	Extraction
Risk of bus accident happening at pedestrian crossings	1.000	.889
Risk of bus accident happening caused by driver behaviour	1.000	.915
Risk of bus accident happening inside the bus during the journey	1.000	.899
Risk of bus accident happening caused by unsafe road condition	1.000	.918
Risk of bus accident happening caused by vehicle mechanical problems	1.000	.930
Risk of bus accident happening caused by climate condition (rain, wind, earthquake...)	1.000	.921
Risk of bus accident happening caused by pedestrian not respecting traffic rules	1.000	.855
Experience with accidents by the passengers or other friend and relatives	1.000	.894
Risk of theft happening	1.000	.876
Risk of fraud happening	1.000	.912
Risk of harassment happening	1.000	.932
Risk of aggression happening	1.000	.900
Nights time hours to affect sense of security	1.000	.946
Feel secure in desolated places	1.000	.929
Effectiveness of road safety campaigns	1.000	.869
Effectiveness of bus regular inspection every six months	1.000	.876
Effectiveness of speed governor's installation for safety	1.000	.933
Effectiveness of enforcements	1.000	.883
Effectiveness of Communication tools for safe and secure travel	1.000	.966
Effectiveness of security patrols, check and presence	1.000	.886
Effectiveness of usage of technology in safety	1.000	.958

Extraction Method: Principal Component Analysis.

Source: Own visualization

Table 17 reveals actual communalities, which mean ratios of latent variable on variance of observed variable based on this table, all variables have high communalities and this indicate that our variables contribute much to measuring the underlying factors.

**Table 18: Rotated component matrix**

Variable name	Component		
	1	2	3
Risk of bus accident happening caused by vehicle mechanical problems	.930		
Risk of bus accident happening caused by climate condition (rain,wind, earthquake...)	.917		
Risk of bus accident happening caused by unsafe road condition	.915		
Experience with accidents by the passengers or other friend and relatives	.913		
Risk of bus accident happening at pedestrian crossings	.903		
Risk of bus accident happening caused by driver behaviour	.901		
Risk of bus accident happening inside the bus during the journey	.898		
Risk of bus accident happening caused by pedestrian not respecting traffic rules	.870		
Effectiveness of Communication tools for safe and secure travel		.954	
Effectiveness of usage of technology in safety		.949	
Effectiveness of speed governor's installation for safety		.941	
Effectiveness of enforcements		.918	
Effectiveness of security patrols, check and presence		.917	
Effectiveness of bus regular inspection every six months		.908	
Effectiveness of road safety campaigns		.892	
Nights time hours security risk			.937
Risk of harassment happening			.936
Security risk in desolated places			.935
Risk of aggression happening			.917
Risk of fraud happening			.907
Risk of theft happening			.904
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. a. Rotation converged in 5 iterations.			

Source: Own visualization

Table 18 above shows the results for rotated components. The varmax rotation have been used for the purpose of distributing the factor loadings such that each variable measures precisely the grouping of related factors to safety and security parameters.

The first loading factors created is “safety” and it is created by eight latent variable, it includes, risk of bus accident happening caused by vehicle mechanical problems, risk of bus accident happening caused by climate condition (rain, wind, earthquake...), risk of bus accident happening caused by unsafe road condition, experience with accidents by the passengers or other friend and relatives, risk of bus accident happening at pedestrian crossings, risk of bus accident happening caused by driver behavior, risk of bus accident happening caused by pedestrian not respecting traffic rules and risk of bus accident happening inside the bus during the journey. The second loading factors created used seven variables, effectiveness of communication tools for safe and secure travel, effectiveness of usage of technology in safety, effectiveness of speed governor's installation for safety, effectiveness of enforcements, effectiveness of security patrols, check and presence, effectiveness of bus regular inspection every six months and effectiveness of road safety campaigns. The third loading factors created used six observed variables is “security” it is created usinof harassment happening, security risk in desolated places, risk of aggression happening, risk of fraud happening and risk of theft happening. All have been evaluated and estimated communality value are all above 0.7, variables exhibit a good values and are highly correlated with the factors. These factors were used for structure equation model variables.

**Table 19: Reliability analysis**

Components	Reliability Statistics	
	Cronbach's Alpha	Number of Items
Safety parameters	0.984	8
Security parameters	.981	6
Perceived Safety and Security	.983	7

Source: Own visualization

Results from table 19 on reliability analysis for obtained components level that all Cronbach's Alpha coefficient for all three components are greater than 0.7 and this indicate that the variables forming these components are consistent. This also proves that these components can be used to make Structural Equation Model (SEM).

#### 4.8 Validity of the structural model

The relations between latent endogenous (Perceived Safety and Security) and latent exogenous (Safety and Security parameters) variables in the structural model were tested.

**Table 20: Values of standardized regression coefficients in the structural model.**

Latent endogenous variable (Dependent)	Latent exogenous variable (Independent)	Standardized regression coefficients	p-value
Perceived Safety and Security	Safety	- 0.34	0.000
	Security	- 0.17	0.000

Source: Own visualization

In table 20, the relation between the latent variable safety and the latent variable perceived safety and security and also the relation between the latent variable security parameters and the latent variable perceived safety and security are statistically reliable at the significance level of 0.05. Typically, it is the overall relationships between the variables that will be of the most importance in a linear regression model, not the value of the constant.

However, the variable security is more important than the variable safety parameters in explaining overall perception with safety and security as the actual value of its standardized regression coefficient is higher compared to safety parameters.

#### 4.9 Validation of the proposed model

The Comparative Fit Index (CFI), Normed Fit Index (NFI) and Root Mean Square Residual (RMR) were applied to in order to validate the proposed model. These coefficients were calculated in STATA. The following table 21 present the values of the CFI, NFI and RMR indexes for the proposed model.

**Table 21: Performance metrics indices for the estimated model.**

Model	CFI	NFI	RMR
Default model	0.917	0.907	0.030

Source: Own visualization

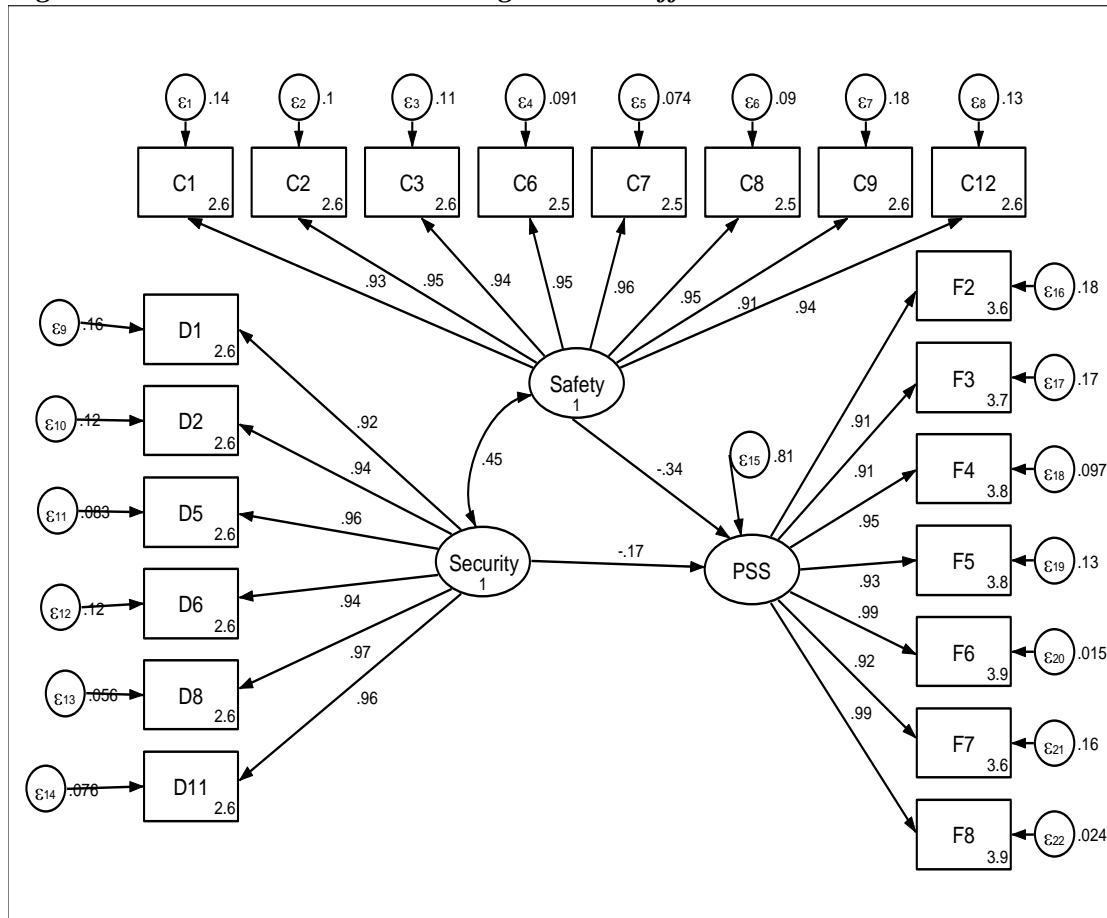
The Comparative Fit Index (CFI: Bentler, 1990) is a revised form of the Normed Fit Index (NFI) which takes into account sample size (Byrne, 1998) that performs well even when sample size is small (Tabachnick and Fidell, 2007). This index was first introduced by Bentler (1990) and subsequently included as part of the fit indices in his EQS program (Kline, 2005). Like the Normed Fit Index (NFI), this statistic assumes that all latent variables are uncorrelated (null/independence model) and compares the sample covariance matrix with this null model. As with the Normed Fit Index (NFI), values for this statistic range between 0.0 and 1.0 with values closer to 1.0 indicating good fit. A cut-off criterion of  $CFI \geq 0.90$  was initially advanced however, recent studies have shown that a value greater than 0.90 is needed in order to ensure that mis-specified models are not accepted (Hu and Bentler, 1999). The Comparative Fit Index (CFI) of the estimated model takes the value of 0.917 which is greater than 0.90. Values for this statistic range between 0 and 1 with Bentler and Bonnet (1980) recommending values greater than 0.90 indicating a good fit.

As per table 21 above the Normed Fit Index (NFI), which takes the value of 0.907 which is greater than 0.90. According to the Normed Fit Index (NFI), the proposed model fits the real data with 90.1 %. The actual value of the Root Mean Square Residual (RMR) is 0.030 is also acceptable and greater than 0.05. Therefore, all used indexes confirmed that the proposed model is optimal and fit.

#### **4.10 Structural Equation Modeling predicting perception of safety and security**

The values of standardized regression coefficients and validation indexes were calculated in STATA figure 9 shows relations between variables in the measurement model and relations between variables in the structural model.

**Figure 9: Model with standardized regression coefficients**



Source: Own visualisation

According to the output in figure 9, safety and security are positively correlated with 0.45 and can be used to predict perception of bus passengers on safety and security. The covariance between observed variables and latent variables are all greater than 0.7. From this, it can be said that there are validated relations between observed and latent variables in the measurement model.

The values shown in the arrows represent regression coefficients between variables. As with all regression models these values can range between -1.0 (perfect negative relationship) to 0.0 (no relationship) to 1.0 (perfect positive relationship) and represent the standardised relationship between variables. That is, if variable X has a .50 effect on variable Y, that means that for every standard deviation that X increases Y will increase by .50 standard deviations. Indirect effects are interpreted by multiplying coefficients along a path. All of the regressions in this form of the model were significant at  $p < .05$ . The strongest direct predictor of safety on public transport was risk of bus accident happening caused by vehicle mechanical problems (.96), the next-highest direct influence was risk of bus accident happening caused by driver behaviour

and risk of bus accident causes by unsafe road condition and climate condition both with (0.95). In security parameters nights time hours risk to sense of security (0.97) followed by security risk in desolated places (0.96) and risk of aggression happening (0.96);

Perceived Safety and Security (PSS) of bus passengers in the City of Kigali is negatively predicted by both safety (-.34) and security (-.17). From this result, it can be said that 1 standard deviation change in safety parameters would result in a negative 0.34 change in standard deviation in overall perception of safety and security if other factors are held fixed. In the same way, 1 standard deviation change in security parameters would result in a 0.17 reduction standard deviation in overall perception of safety and security if other factors are held fixed, which imply that the further the increase in safety and security risks and incidences the negative it will affect passengers perception of safety and security of public transport bus service in the City of Kigali which will also affect negatively ridership.

Perception of safety and security in public transport is also affected positively by different initiatives undertaken by the government and stakeholders where effectiveness of usage of technology in safety (0.99), effectiveness of communication tools for safe and secure travel (0.99) are leading parameters.

The table 22 also shows the values of the standardized regression coefficients in the structural model are significant at the significance level of 0.05.

All observed variables in the measurement model are statistically significant at the significance level of 0.05. Based on the outputs from the table, the latent variable safety parameter is best explained by its observed variables since they are highly correlated with it. Output also reveals the latent variable safety is best explained by its observed variables.

According to (Hair Joseph F,2010). Standardized regression coefficients should take values equal or higher than 0.5 (optimally 0.7) if the relations between the variables are significant. From this, we can say that the measurement model is valid.



**Table 22: Values of standardised regression coefficients in the measurement model**

Latent variables	Codes	Observed variables	p-value	Standardised regression Coefficient
Safety	C1	Risk of bus accident happening at pedestrian crossings,;	0.000	0.928 (0.93)
	C2	Risk of bus accident happening caused by driver behaviour and risk of bus accident	0.000	0.948 (0.95)
	C3	Risk of bus accident happening inside the bus during the journey	0.000	0.941 (0.94)
	C6	Risk of bus accident happening caused by unsafe road condition	0.000	0.954 (0.95)
	C7	Risk of bus accident happening caused by vehicle mechanical problems,	0.000	0.963 (0.96)
	C8	Risk of bus accident happening caused by climate condition (rain,wind, earthquake...)	0.000	0.954 (0.95)
	C9	Risk of bus accident happening caused by pedestrian not respecting traffic rules	0.000	0.908 (0.91)
	C12	Risk of experience with accidents by the passengers or other friend and relatives	0.000	0.936 (0.94)
Security	D1	Risk of theft happening	0.000	0.917 (0.92)
	D2	Risk of fraud happening	0.000	0.936 (0.94)
	D5	Risk of harassment happening	0.000	0.958 (0.96)
	D6	Risk of aggression happening	0.000	0.937 (0.94)
	D8	Nights time hours risk to sense of security	0.000	0.971 (0.97)
	D11	Security risk in desolated places (bus stop,..)	0.000	0.962 (0.96)
Perceived Safety and Security (PSS)	F2	Effectiveness of road safety campaigns	0.000	0.903 (0.9)
	F3	Effectiveness of bus regular inspection every six months	0.000	0.908 (0.91)
	F4	Effectiveness of speed governor's installation for safety	0.000	0.948 (0.95)
	F5	Effectiveness of enforcements	0.000	0.930 (0.93)
	F6	Effectiveness of Communication tools for safe and secure travel	0.000	0.992 (0.99)
	F7	Effectiveness of security patrols, check and presence	0.000	0.912 (0.91)
	F8	Effectiveness of usage of technology in safety	0.000	0.987 (0.99)

Source: Own construct

## **CHAPTER FIVE: DISCUSSION AND CONCLUSION**

### **5.1 Introduction**

This chapter summarizes the findings results and concludes with recommendations for future improvement required in terms of public transport safety and security in the City of Kigali. The results discussion is based on theoretical frameworks discussed in literature reviews and findings are clearly stated to give a clear picture of public transport safety and security in the city of Kigali.

### **5.2 Summary of findings**

This study aimed at assessing passengers' safety and security for public transport in Rwanda the case of the city of Kigali, for this, data was gathered from different sources to better understand the key aspects of safety and security in public transport in the City of Kigali. Data were collected in different taxi parks, bus terminal and inside buses on the sampled bus passengers in the city of Kigali, also interviews were conducted to respective public transport stakeholders. The findings were confirmed through extensive analysis procedures using descriptive analysis, factor analysis and structural equation model. The objectives of the thesis were first to determine the level of security and protection provided to passengers; second to identify the safety and security risk associated to public transport use; and third to design a structural equation model to estimate safety and security parameters in public transport bus service.

On the first objective passengers' perceptions on the level of security provided to passengers is highly appreciated by passengers which acknowledge that they are overall safe and secure (94.26% agree and disagree) while in public transport bus, bus stop and bus terminal, the level of safety and security provided to bus passengers also were measured by considering public transport stakeholders' interventions and initiatives taken to tackle safety and security issues in transit environment. Passengers' perceptions level on road safety campaigns, speed governor's installation for safety, enforcements, communication tools for safe and secure travel, security patrols, check and presence, usage of technology in safety and security, public lighting, presence of commercial activities is highly appreciated in improving bus passenger safety and security.

On the second objective the study assessed safety and security risk associated to using public transport bus services and being in transit environment in the City of Kigali

results from the analysis shows that these risk were overall low among others risk of bus accident happening at pedestrian crossings, risk of bus accident happening caused by driver behaviour; risk of bus accident happening inside the bus during the journey; risk of bus accident happening caused by unsafe road condition; risk of bus accident happening caused by vehicle mechanical problems; risk of bus accident happening caused by climate condition, risk of bus accident happening caused by pedestrian not respecting traffic rules; risk of experience with accidents by the passengers or other friend and relatives; risk of theft happening; risk of fraud happening; risk of harassment happening; risk of aggression happening; nights time hours risk to sense of security which is high; security risk in desolated places which is high.

On the third objective a structural equation model were estimated where the unobserved variable Perceived Safety and Security (PSS) is predicted by safety parameters and security parameters. Safety is predicted using eight parameters such as risk of bus accident happening at pedestrian crossings, risk of bus accident happening caused by driver behaviour, risk of bus accident happening inside the bus during the journey, risk of bus accident happening caused by unsafe road condition, risk of bus accident happening caused by vehicle mechanical problems, risk of bus accident happening caused by climate condition, risk of bus accident happening caused by pedestrian not respecting traffic rules and risk of experience with accidents by the passengers or other friend and relatives. Security is predicted by six parameters such as risk of theft happening, risk of fraud happening, risk of harassment happening, risk of aggression happening, nights time hours risk to sense of security and security risk in desolated places. Based on the model results safety parameters (-.34) and security parameters (-.17) affect negatively bus passenger perception of safety and security (PSS) in the city of Kigali, by increasing safety and security parameters results in increase of risks associated to safety and security indicators which proved to negatively affect passengers perception on safety and security of the public transport bus service which in turn can have negative impact on ridership.

### **5.3 Conclusion**

Overall public transport bus service is safe and secure, the level of safety and security provided to passengers is highly appreciated in safety area the risk of bus accident happening caused by vehicle mechanical problems, risk of bus accident happening caused by driver behaviour and risk of bus accident happening caused by climate

condition are small and and has been proven in the predicted to be low, much effort also has been put to reduce security risk associated to public transport bus usage in nights time hours, desolated places (bus stop,..),risk of harassment happening in the City of Kigali are low.

Government and public transport stakeholders' interventions in the area of safety and security is perceived by passengers as yielding positive results in improving the image of safety and security in public transport. Technology usage for safety of passengers and communication tools and means used has been proven by passenger perception as effective. However, caution should be taken when it comes to safety area like risk of bus accident happening at pedestrian crossings, risk of bus accident happening caused by pedestrian not respecting traffic rules. In security area much emphasis had to be put to theft, aggression, and fraud which happen in transti areas, also road safety campaigns and security patrols, check and presence of security staff had to be improved and increased.

Although the study focused on public transport in Kigali City, the results and recommendations can be used for safety and security quality enhancement and consequently improving passengers' ridership and positive image of public transport in the country.

#### **5.4 Recommendations**

From the above analysis and conclusions, recommendations for safety and security in public transport improvement in the City of Kigali and Rwanda are;

- Put in place a good regulatory environment to combat safety and security incidences on public transportation which include public safety policies requiring public transportation operators to prevent and respond to safety and security incidence by installing cameras in buses, conducting regular patrols and security checks; phasing out long served buses; regular maintenance of buses; increasing supervision and trainings of bus drivers in crime prevention and accident prevention; safety and first aid tools in buses; reducing of bus emission from Euro 2 to Euro 5 buses.
- Improving technology usage by increasing the number of fixed and mobile cameras in public roads, taxi park, bus terminal, bus stop since they were

proved effective in preventing and reducing traffic violation and crimes in taxi parks, bus terminal and in buses;

- Constructing more roads, street/taxi park lighting for security at night and dedicated bus lane for passenger safe travel and reduction in travel time;
- Rwanda national Police and Rwanda Utilities Regulatory Authority had to put in place a joint department in charge of transportation security which work closely with transportation sector stakeholders, public, law enforcement and intelligence community to regulate and ensure passenger and transit system is safe and secure;
- Public transport planning improvement and stakeholder capacity building in area of safety and security of passengers;
- Conducting regular road safety awareness campaigns for all roads users using different tools and incorporating the aspect of passenger security.
- Increase the number of security personal either in uniform or without uniform especially in taxi parks, bus terminal, bus stop and buses and regular presence, patrols, checks to prevent and reduce security incidences;
- A safe and secure journey of passengers is a priority especially during Covid-19 pandemic, passengers had to respect and follow government set guidelines to fight and prevent against Covid-19.

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## ANNEXES

**Table A1: Offenses in the City of Kigali**

Year	2018	2019	2020
Harassment of spouse	54	355	401
Assault and battery	1,511	1,924	3,291
Rape	104	128	174
Theft (Not-aggravated theft)	3,059	2,617	4,744
Fraud	525	557	957
Use of threat	297	353	759

Source: RIB, 2021

**Table A2: Road accidents trends**

ACCIDENTS		2015	2016	2017	2018	TOTAL
	Fatal accidents	584	593	549	597	2,323
	Serious injury accidents	583	629	733	885	283
	Minor injury accidents	1,767	1,794	1,896	1,887	7,344
	Property damage accidents	3,348	3,347	2,577	2242	11,514
	Total	6282	6363	5755	5611	24,011

Source: NISR statistical year book 2019

**Table A3: Top 10 Offenses of 2018**

Offenses	Total
Theft	10,392
Assault and battery	7,448
Narcotic drugs	5,004
Child defilement	3,146
Use of threats	2,084
Fraud	1,056
Harassment of spouse	967
Breach of trust	962
Forged document	765
Rape	554
<b>TOTAL</b>	<b>32,378</b>

Source: NISR statistical year book 2019

# 1. BUS PASSENGER QUESTIONNAIRE

ZONE I II III IV

Socio-Economic Characteristics		
1	Age range	16-35 <input type="checkbox"/> 36-54 <input type="checkbox"/> 55-64 <input type="checkbox"/> 65 and above <input type="checkbox"/>
2	What is your gender ?	Male <input type="checkbox"/> Female <input type="checkbox"/>
3	What is your educational background ?	None <input type="checkbox"/> Primary <input type="checkbox"/> Lower secondary <input type="checkbox"/> Upper secondary <input type="checkbox"/> Polytechnic <input type="checkbox"/> University <input type="checkbox"/>
4	What is your monthly income level ?	0 - 10,000 <input type="checkbox"/> 10,001 - 50,000 <input type="checkbox"/> 50,000 - 100,000 <input type="checkbox"/> 100,000 - 300,000 <input type="checkbox"/> 300,000 - 500000 and above <input type="checkbox"/>
Travel Behaviour		
1	What is the purpose of your travel/trip?	Work <input type="checkbox"/> Business <input type="checkbox"/> Shopping <input type="checkbox"/> Visiting Friends and relatives <input type="checkbox"/> School <input type="checkbox"/> If others specify .....
2	What is your bus frequency of use for your trip during the week in the city of Kigali ?	0 – 2 <input type="checkbox"/> 3 – 4 <input type="checkbox"/> 5 - 7 <input type="checkbox"/> 7 and more <input type="checkbox"/>
3	Do you own a motor vehicle (Car)	Yes <input type="checkbox"/> No <input type="checkbox"/>

Safety and Security						
No	Statement	Strongly unsafe	unsafe	indifferent	Safe	Strongly safe

1	What is your overall safety and security perception of public transport bus service and bus terminal or stop? (VF)					
2	In your opinion do you feel unsafe/insecure when the bus delay?					
<b>Safety Issues</b>						
No	Statement	Strongly unlikely	unlikely	indifferent	likely	strongly likely
1	In your opinion is there any risk of bus accident happening at pedestrian crossings outside this bus terminal or stop?					
2	In your opinion is there any risk of bus accident happening inside the bus during the journey?					
3	In your opinion is there any risk of bus accident happening in waiting areas in this bus terminal or bus stop?					
4	In your opinion is there any risk of bus accident happening while standing on a bus platform?					
5	In your opinion is there any risk of bus accident happening caused by unsafe road condition?					
7	In your opinion is there any risk of bus accident happening caused by vehicle mechanical problems?					
8	In your opinion is there any risk of bus accident happening caused by climate condition (rain, wind,...)?					
9	In your opinion is there any risk of bus accident happening caused by pedestrian not respecting traffic rules?					

10	In your opinion is there any risk of bus accident happening in day hours?					
11	In your opinion is there any risk of bus accident happening in night hours?					
12	Did you or your relatives experience or witnessed accident while in bus, bus stop or terminal?	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
13	If any what was the Level of seriousness of the accident experienced or witnessed?	Very light	Light	Fair	Serious	Very serious
<b>Security Issues</b>						
No	Statement	Strongly unlikely	Unlikely	Indifferent	Likely	Strongly likely
1	In your opinion is there any risk of theft happening in a bus, bus terminal or stop?					
2	In your opinion is there any risk of fraud happening in a bus, bus terminal or stop?					
3	In your opinion is there any risk of threats happening in a bus, bus terminal or stop?					
4	In your opinion is there any risk of terrorism attack happening in a bus, bus terminal or stop?					
5	In your opinion is there any risk of harassment (Rape,..) happening in a bus, bus terminal or stop ?					
6	In your opinion is there any risk of aggression (assault,...) happening in a bus, bus terminal or stop ?					
No	Statement	strongly ineffective	ineffective	indifferent	effective	strongly effective

7	How the presence of other people affects your sense of security in this terminal or stop?					
8	How the night time affects your sense of security in bus, terminal or stop?					
9	How the day time affects your sense of security in a bus, terminal or stop?					
10	How the presence of security staff affects your sense of security bus, terminal or stop?					
11	How effective do you rate lighting for your security in roads, bus terminal or bus stop?					
12	How effective do you rate commercial activities for your security in this bus terminal or bus stop?					

**Personal Attitudes**

No	Statement	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
1	Do you feel safe while in a desolated spaces condition?					
2	Do you feel safe while in a specific poor environment condition?					

**Stakeholders interventions and measures in Safety and Security**

No	Statement	Strongly ineffective	Ineffective	Indifferent	Effective	Strongly effective
1	How effective do you rate surveillance cameras (CCTV) for your security in this bus terminal or bus stop?					

2	How effective do you rate road safety campaigns undertaken by Rwanda National police and stakeholders for your safe travel?					
3	How effective do you rate bus regular inspection every six months undertaken by Rwanda National police for your safe travel?					
4	How effective do you rate speed governor's installation for your safety in bus?					
5	How effective do you rate enforcements undertaken by Rwanda National police and stakeholders (RURA, CoK,...) for your safe travel?					
6	How effective do you rate usage of communication tools for your safe and secure travel?					
7	How effective do you rate security patrols, check and presence for your security in this bus terminal or stop?					
8	How effective do you rate the usage of technology (CCTV, Motor vehicle tracking system, Driver vocational cards...) by Rwanda National police and stakeholders for your safe travel?					
<b>Overall safety and Security</b>						
No	Statement	Strongly unsafe	Unsafe	Indifferent	Safe	Strongly safe
1	What is your overall safety and security perception of public transport bus service and bus terminal or stop? (VF)					
<b>Recommendation</b>						

1	In your opinion do you think passengers should pay for safety and security cost in public transport tariff?	Strongly disagree	Disagree	Indifferent	Agree	Strongly agree
2	Any other recommendation for improving passenger safe and secure travel to government, regulator, R.N.P, City of Kigali or bus operators considering during and post Covid-19:					

**2. Questionnaire for discussion with stakeholders in public transport**

1. Institution name :.....
2. What is your position? .....
3. What is the role and responsibilities of ..... in safety and security for public transport bus services?  
.....  
.....  
.....
4. How would you describe the current situation of public transport bus services safety and security in the City of Kigali?  
.....  
.....  
.....
5. What is according to you the most common cause of public transport bus services accidents in the City of Kigali?  
.....  
.....  
.....
6. What is according to you the most common cause of public transport bus services insecurity in the City of Kigali?  
.....

.....  
.....

7. What are your futures plans and recommendations to improve public transport bus services safety and security in the City of Kigali?

.....  
.....

.....



## ASSESSING PERCEPTIONS OF PASSENGERS' SAFETY AND SECURITY IN PUBLIC TRANSPORT IN RWANDA. THE CASE OF CITY OF KIGALI

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