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Effect of Airports Infrastructure Development Projects on the Performance of Aviation Industry in Rwanda: A Case Study of Kigali International Airport

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Abstract: **The Government of Rwanda is heavily investing in airport infrastructure development, but there is limited study linking airports infrastructure development to civil Aviation performance. Therefore this study intended to assess the effect of airports infrastructure development projects on civil aviation performance. The general objective of the study was to assess the effect of Airports Infrastructure Development projects on Rwanda's Civil Aviation Performance. Specific objectives of this study were: To assess the effect of airports' terminal building facilities on service delivery. To identify the effect of airside infrastructure on aviation safety. To identify the effect of air traffic control facilities on air traffic management. The target population in this study was 243 RCAA staff anda sample of 30 respondents were selected using purposive sampling technique. Questionnaires were distributed to selected Rwanda Civil Aviation staff at Kigali International Airport to collect primary data. Descriptive and correlation research statistics were used to analyze the data gathered. Findings of the study on respondents' perceptions on airports terminal building and civil aviation performance revealed a strong positive correlation between the airports' terminal building and civil aviation performance (r = .69, n = 30, p < .001).Two variables – airside infrastructure and aviation performance – also indicated a positive correlation value of (r = 0.067, p-value <0.001). This showed that upgrades on airside infrastructure led to improved performance of aviation industry in Rwanda. Consequently, further correlation tests on research question three variables revealed a significant relationship (r =0.360, p-value < 0.001); this revealed that enhancement of air traffic control facilities registered better civil aviation performance. Respondents tended to agree that airports' terminal building facilities installed during the airport upgrade, the status of airside infrastructure and air traffic control facilities affects the performance of Rwanda's civil aviation.During the study, it was noted that there is still congestion at peak hour (the peak hour passenger numbers is 450 yet the terminal upgrade was designed to handle 300 passengers at peak hour. The authority should therefore consider further expansion of the terminal building, the apron and construction of a parallel taxiway so as to further improve on Civil Aviation performance.**

Keywords: **Airports infrastructure, Development Projects, Civil Aviation Performance.**

1. INTRODUCTION

1.1. Background of the Study:

As demand for air transportation continues to grow, it will become increasingly difficult to accommodate the resulting traffic levels without significantly expanding airport infrastructure. However, many larger airports are already constrained in their ability to expand, and surrounding communities often strongly resist the construction of additional runways. A

growing number of metropolitan areas, therefore, will need to use secondary airports or even construct new airports (Gosling, 2013).

Air transport infrastructure comprises airports, air traffic control (ATC) and the organizations involved in coordinating their provision and use between airlines, their handling agents and commercial concessionaries. They determine how airports ground handling services are provided.

To date, Governments and Private Sector have invested in airports infrastructure projects. According to the World Bank, between 2010 and 2014, 132 Airports infrastructure projects were undertaken worldwide. These projects have attracted more than US$32.8 billion(World Bank, 2014)

While airports infrastructure development plays an important role in terms of generating economic activity, its main role in the increasingly global environment is to facilitate service delivery in the aviation industry. Investment in airports infrastructure enriches countries by introducing new production capacity and jobs. While profits of domestic industry flow back into the economy, thereby furthering growth, foreign direct investment results in transfers of technology and know-how, as well as linkages to the global marketplace. Air transport is vital to tourism, which also is a source of enrichment for countries. (Phillip, 2008)

African Airports Infrastructure development is still lagging behind those of the rest of the world. The rapid expansion in Africa's aviation industry is hampered by a number of factors including; inadequate infrastructure development, poor record of safety and security, lack of adequate resources, distance and limited connectivity, lack of regulation and government actions are among the main constraints the industry is facing. These constraints add to competition and high operating costs resulting from surging oil prices. Addressing these challenges could significantly unlock the industry's potential for future growth(Ken, 2011).

A landlocked country, Rwanda faces various limitations in connecting the country to the rest of the world. Over the last decade, air transport has become a reliable solution as a mean to connect the country to the outside world. Acknowledging the large potential of air transport users, the government of Rwanda is trying to accommodate the air transport growth by rebuilding its Airports Infrastructure. Currently, the government is trying to build a new airport and renovate the exiting major airports so as to increase their capacity (RCAA, 2012).

The quality of air transport infrastructure is a key determinant of performance in the Aviation sector and development of air transport infrastructure supports Rwanda's economic growth. The Government of Rwanda spends each year a considerable amount of money to build, maintain and improve its air transport infrastructure in response to the growing number of passenger and freight mobility. This has greatly improved trade and commerce for a land locked country like Rwanda (Lufthansa, 2013).

In replacement of the Rwanda Airport Authority established in 1986, Civil Aviation Authority (CAA) was created by law no 21/2004 of 10/08/2004 to take on the management, operation and maintenance of airport infrastructure. The Act was later revised in 2006 by law no. 44/2006 of 05/10/2006 forming Rwanda Civil Aviation Authority (RCAA). Its headquarters are situated in the city of Kigali, capital of the Republic of Rwanda and is managed in compliance with laws relating to public service. Rwanda is a signatory to the Chicago Convention of 7 December 1944 on International Civil Aviation Organization (ICAO). The Rwanda Civil Aviation's vision is to "Be a world class Civil Aviation Authority in safety, security and the provision of quality services." and its mission is to "Develop an efficient, safe and secure Civil Aviation industry in Rwanda." (RCAA, 2015)

1.2. Statement of the Problem:

Effective performance of aviation industry is mainly determined by its Airports infrastructure facilities; such facilities include runways, taxiways, apron, passenger terminals, navigation aid and air traffic control facilities. (Ken,2011)

Majority of airports in Africa are undergoing expansion in a bid to cater for rapidly growing passenger and cargo traffic volumes. Booming tourism and renewed interest in investing in Africa by foreign companies has left many countries struggling to boost the capacity of their airports. For instance, between 2011 and 2012 business activities at African airports rose from 45% to 80%. This trajectory has largely been attributed to the growth of the continents GDP of 6.1% contrary to the global estimation of 5.8%. (AfDB, 2014)

The World Bank recommends that African airports should restructure to facilitate commerce and tourism within and out of the continent, fostering sustainable development. However, there are a number of challenges facing governments and airport authorities as they seek to enhance Civil Aviation Performance. (World Bank 2015)

According to Rwanda Civil Aviation Authority, In 2007 Kigali International Airport recorded 15 aircraft incidences; the terminal capacity 150 passengers at peak hour, with bottle necks in passenger processes. The apron configuration (Norse-in system) limited its capacity thus causing constant aircraft holding. (RCAA 2008)In effect, between 2009- 2013, RCAA invested more than USD 40 million annually in infrastructure development projects aimed at upgrading Kigali International Airport. Such projects included Apron upgrade from nose-in to nose-out parking system, runway resurfacing, upgrade of its radar system, installation of an automated weather observing system and upgrade of the terminal building. (RCAA, 2014)

However, there is no research relating airports infrastructure development projects to civil aviation performance. This research therefore, intended to assess the effect of airports infrastructure development projects on the performance of Rwanda's Aviation Industry.

1.3 Objectives of the Study:

1.3.1. General Objective:

The general objective of the study was to assess the effect of Airports Infrastructure Development projects on the performance of Aviation Industry in Rwanda.

1.3.2. Specific Objectives:

1. To assess the effect of airports' terminal building facilities on the performance of Aviation Industry in Rwanda.
2. To assess the effect of airside infrastructure on the performance of Aviation Industry in Rwanda.
3. To assess the effect of air traffic control facilities on the performance of Aviation Industry in Rwanda.

1.4 Research Questions:

1. What is the effect of airports' terminal building facilities on the performance of Aviation Industry in Rwanda?
2. What is the effect of airside infrastructure on the performance of Aviation Industry in Rwanda?
3. What is the effect of air traffic control facilities onthe performance of Aviation Industry in Rwanda?

1.5. Justification of the Study:

Analysis of past infrastructure developments suggested that, improved performance of the aviation industry largely depends on the level of airports infrastructure development (Air Transport Association Group, 2015).

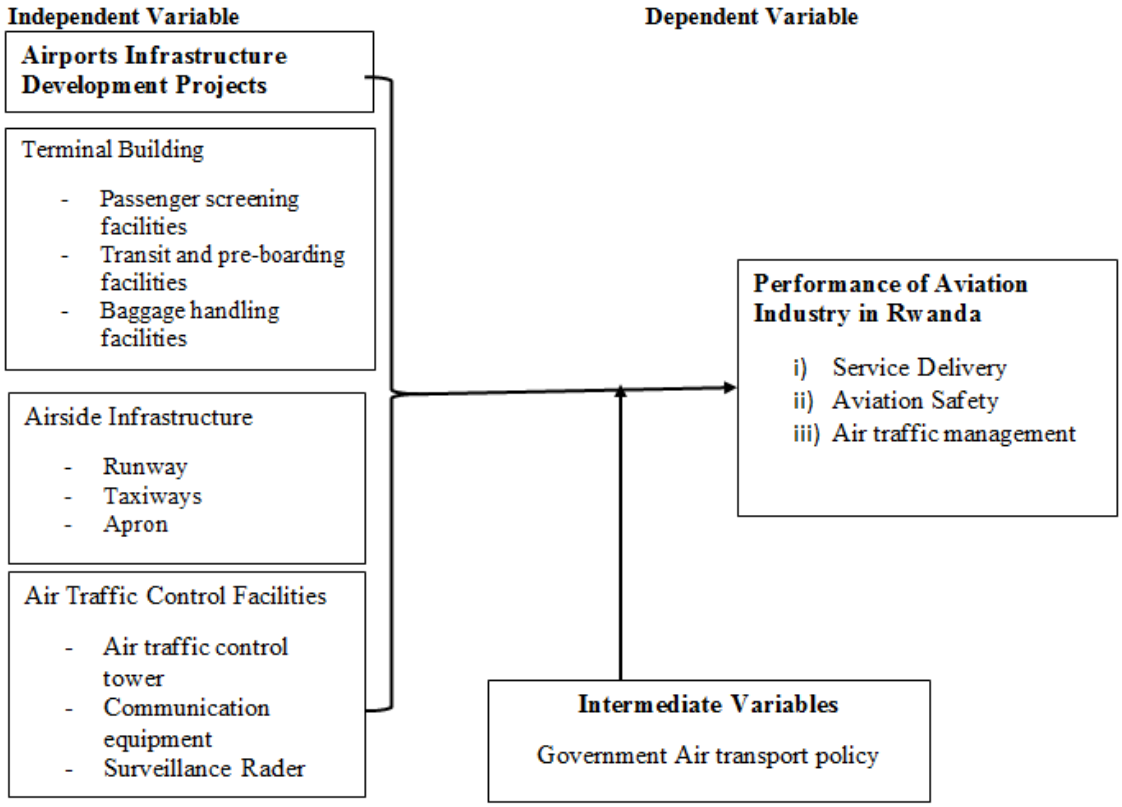
The research findings will significantly contribute to policy decisions on the development of airports infrastructure by implementing the recommendation of the researcher. The study helped the researcher to gain knowledge of conducting research through the first-hand experience of data collection and interpretation. It shall also help academic researchers by comparing the results or findings with related studies. The study will be a basis for other potential researchers for drawing up relevant data and putting up their supplementation especially on areas that may not have been fully considered by the researcher.

1.6. Scope of the Study:

Geographically, this research report was undertaken from Kicukiro District, Kigali City while focusing on Airport infrastructure at Kigali International Airport. Time scope, the research considered activities and reports of Rwanda Civil Aviation Authority Projects for the periods of 2009 – 10 to 2013 – 14 financial years. Conceptually, this study focused on performance indicators of Rwanda's Civil Aviation Industry.

1.7 Conceptual framework:

A conceptual frame work is the system of concepts, assumptions, expectations, beliefs, and theories that support and inform a research. Explains either graphically or in narrative form the main variables to be studied and the presumed relationships between them (Miles & Huberman, 1994).



Source: Researcher, 2016

Figure 1: Conceptual Framework

2. RESEARCH METHODOLOGY

2.1. Research Design:

The study employed a case study research design.

2.1.1Case study:

The study adoptedKigali International Airport as a case study.

2.2 Target population:

The target population of this study was 242 staff of Rwanda Civil Aviation (RCAA).

2.3. Sampling Frame:

A list of RCAA staff indicating their posts was used as a sampling frame.

2.4. Sample Size and Sampling Techniques:

A sample of 30 respondents wereselected purposively as follows5 Unit Directors, 4 Inspectors and 21 heads of departments.

Table 2.1 Sample distribution

Category of Respondents	Number of respondents
Unit Directors	5
Inspectors	4
Heads of Departments	21
Total	30

Source: Researcher, 2016

2.5. Data Collection Instruments:

Primary data was collected through structured questionnaires.

2.6. Data Processing and Analysis:

The raw data collected from primary sources by the researcher was edited and coded, statistically treated and drafted in tables, the statistical package for social sciences (SPSS) was used to produce results that are further interpreted. Correlation and regression were computed.

3. RESEARCH FINDINGSAND DISCUSSION

3.1 The effect of airport's terminal buildingson the performance of aviation industry in Rwanda:

Table 3.1: The effect of Airport's Terminal Building on Performance of Aviation Industry in Rwanda

Statements	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
The facilities installed at Kigali International Airport (KIA) during its upgrade facilitate passengers with reduced mobility.	0	-	0	-	2	6.7	7	23.3	21	70.0	30	100.0
The Immigration counters installed at KIA contribute to reduced queuing time.	0	-	3	10.0	1	3.3	9	30.0	17	56.7	30	100.0
During peak hour, the check-in space is enough to allow effective passenger flow.	2	6.7	7	23.3	0	-	13	43.3	8	26.7	30	100.0
The conveyer belts installed at KIA contribute to a reduction in baggage delivery time.	0	-	0	-	0	-	12	40.0	18	60.0	30	100.0
During peak hour, the departure area is enough to allow standing and circulation of passengers without disturbing others.	3	10.0	2	6.7	0	10.0	14	46.7	11	36.7	30	100.0

The table above indicates that respondentswho strongly agreed to the statements given, were ranging from 26.7% to 70%. Those who agreed to the statements were between 23.3% and 46.7%. It was also noted that some respondents strongly disagreed to two statements, that is: "During peak hour, the check-in space is enough to allow effective passenger flow" and "During peak hour, the departure area is enough to allow standing and circulation of passengers without disturbing others", accounting for 6.7% and 7% respectively. This indicates that although there have been significant upgrade to the terminal building, the number of airport users also increased significantly, leading to congestion during peak hours. According to RCAA statistical reports passenger movement have been increasing at an average of 15% annually during the period under study. The responses in the table above confirms that the size of an airport's terminal building affects the quality of service delivery.

3.2 Respondents' Perception on the Capacity of the Cargo Warehouse at KIA:

Table 3.2: Respondents' perception on capacity of the cargo warehouse at KIA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Big enough	8	26.7	26.7	26.7
	Capacity beyond demand	22	73.3	73.3	100.0
	Total	30	100.0	100.0	

According to findings in the table above, 73.3% of respondents indicated that capacity of Kigali International Airport's cargo warehouse is beyond demand. This indicates that the airport's infrastructure upgrade project have significantly affected the quality of service delivery in cargo handling.

3.3. Perception on whether there are facilities for perishable goods at KIA:

This section was intended to find out if the upgrade project considered improvement on handling perishable goods. Findings from respondents on this research question are indicated in the table below.

Table 3.3: Perception on availability facilities for perishable goods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, with enough space	24	80.0	80.0	80.0
	Yes, but not always operational	6	20.0	20.0	100.0
	Total	30	100.0	100.0	

From the table above, 80% of respondents confirmed that the cargo warehouse at KIA has a cold room with enough space to accommodate the volume of cargo handled at the airport. Although, 20% respondents agreed to the fact that there is a facility for perishable goods at KIA, they argued that the facility is not reliable as it is not always functional.

3.4 Availability of special equipment for handling fragile goods at KIA.

Table 3.4: Perception on the availability of special equipment for handling fragile goods at KIA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	27	90.0	90.0	90.0
	Not Sure	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

Results from the table above, indicates that 27 respondents accounting for 90% affirmed that there are special equipment for handling fragile goods at Kigali International Airport and 3 representing 10% were not sure about the existence of such equipment. It was therefore concluded that there is special equipment for handling fragile goods at KIA.

3.5 Correlation Analysis of Airport's Terminal Building and Civil Aviation Performance

The researcher set out to test for relationship between airport's terminal building and Civil Aviation performance, correlation coefficients were computed. Below is the relationship of variables on research question one; what is the effect of airports' terminal building on civil aviation performance.

Table 3.5: Statistics for the effect of Airports' terminal building on Civil Aviation Performance

Statistics			
		Airports' Terminal Building	Civil Aviation Performance
N	Valid	30	30
	Missing	0	0
Mean		4.3333	3.9000
Median		5.0000	4.0000
Mode		5.00	5.00
Std. Deviation		.95893	1.21343

The sample sizes, means, median, mode and standard deviations relating to our pair of variable of interest (i.e., airports' terminal building and civil aviation performance) was presented as shown in Table .3. 6Even though the data showed presence of linearity in the scatterplots, a quick check to see if the absolute values of the skewness coefficients are less than two times their standard errors showed that variable 1 (airports' terminal building) skewness coefficient was large enough to warrant concern over normality of the data. Correspondingly, a non-parametric procedure, Spearman's correlation coefficient was adopted to look into the research question as indicated in the table below.

Table 3.6: Effect of airports' terminal building on Civil Aviation Performance

Spearman's rho Correlations				
			Airports' Terminal Building	Civil Aviation Performance
Spearman's rho	Airports' Terminal Building	Correlation Coefficient	1.000	.687**
		Sig. (2-tailed)	.	.000
		N	30	30
	Service Delivery	Correlation Coefficient	.687**	1.000
		Sig. (2-tailed)	.000	.
		N	30	30
**. Correlation is significant at the 0.01 level (2-tailed).				

Spearman's correlation coefficient also referred to as Spearman's rho conducted between the two respondents' perceptions on airports terminal building and civil aviation performance as shown in Table 3.6 reveals a statistically significant relationship. The findings reveal a strong positive correlation between the airports' terminal building and civil aviation performance ($r = .69$, $n = 30$, $p < .001$). This showed that a positive change in airports' terminal building resulted improved civil aviation performance.

3.6 Effect of Airside Infrastructure on the Performance Aviation Industryin Rwanda:

The third research question of the study was to assess the effect of airside infrastructure on Civil Aviation performance in terms of safety. The research focused on key infrastructure projects that were undertaken during the years under study. Such infrastructure includes runway, construction airside intervention roads, taxiway and apron. Findings on this research question are detailed in the table below.

Table 3.7: Perception on the effect of airside infrastructure on Civil Aviation performance

Statements	Strongly disagree		Disagree		Neutral		Agree		Strongly Agree		Total	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
The status of runway contributes to the runway incidents and accidents.	0	-	0	-	0	-	7	23.3	23	76.7	30	100.0
Airside intervention roads affect search and rescue operations in case of an accident.	0	-	0	-	3	10.0	8	26.7	19	63.3	30	100.0
The single taxiway configuration at KIA affect aircraft handling during landing and take-off.	0	-	6	20.0	2	6.7	7	23.3	15	50.0	30	100.0
The Apron parking system at KIA affect the safety of aircrafts during ground handling operations.	1	3.3	4	13.3	0	-	12	40.0	13	43.3	30	100.0

The table above shows that 76.7% of the respondents strongly agree and 23.3% agreed that the status of the runway prior to its upgrade contributed to incidents and accidents. Furthermore, 63.3% of the respondents strongly agreed that airside intervention roads affects search and rescue operations in case of an accident, 26.7 respondents agreed to the statement and 10% were neutral. Regarding the effect of the single taxiway configuration on aircraft handling during landing and takeoff, 50% respondents strongly agreed to the statement, 23.3 agreed whereas 6.7% were neutral and 20% disagreed to the statement.In response to the effect of apron parking system on aircraft safety during ground handling, 43.3% strongly agreed, 40% agreed, 13.3% disagreed and 3.3% strongly disagreed.

3.6.1 Rate of incidents and accidents at KIAA per 1000 aircraft movement:

In view of the major airside upgrade projects carried out at the airport, this information sought to find out if the rate of accidents and incidents have reduced at the airport during the period under review in this study. Results on the subject matter are indicated in the table below.

Table 3.8: Respondents' perception on whether the rate of incidents and accidents have reduced since 2009.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	27	90.0	90.0	90.0
	No	3	10.0	10.0	100.0
	Total	30	100.0	100.0	

Results from the table 3.8 above indicated that 90% respondents confirmed that the rate of accidents and incidents per 1000 aircraft movement at the airport have reduced since 2009 and 10% disagree. This therefore confirms that the airfield infrastructure upgrade projects have contributed to the reduction in accidents and incidents at the airport.

3.6.2 Rwanda's safety compliance level to ICAO standards and recommended practices:

This information sought to find out if Rwanda's compliance level to ICAO standards and recommended practices is above the minimum 60% compliance level recommended by the Abuja declaration as a result of the infrastructure upgrade projects. Results of the study are indicated in the table below.

Table 3.9: Rwanda's safety compliance to ICAO standards and recommended practices

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Above 60% (minimum recommendation of the Abuja Declaration)	26	86.7	86.7	86.7
	Not sure	4	13.3	13.3	100.0
	Total	30	100.0	100.0	

According to table 3.9 above, 86.7% respondents confirmed that Rwanda's compliance to ICAO standards and recommended practice is above the minimum 60% compliance level recommended by the Abuja declaration as a result of the infrastructure upgrade projects. On the other hand, 13.3% respondents were not sure if the level has been achieved.

3.6.3 Reliability of weather data generated by the Weather Observing System at KIA:

Table 3.10: Reliability of weather data generated by the Weather Observing System installed at KIA

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very accurate	14	46.7	46.7	46.7
	Moderately accurate	9	30.0	30.0	76.7
	Sometimes non-operational	7	23.3	23.3	100.0
	Total	30	100.0	100.0	

Findings in the table above indicated that 46.7% respondents believed that the automated weather observing system is very accurate. While 30% believed that the system is moderately accurate and 23.3% confirmed that the system at times is non-operational.

3.6.4 Correlation Analysis of Airside Infrastructure and Aviation Performance:

To test the relationship between airside infrastructure and Civil Aviation performance, correlation coefficients were computed. Below is the relationship of variables on research question two; what is the effect of airside infrastructure on civil aviation performance.

Table 3.11: Spearman's rho correlation of the variables

			Airside Infrastructure	**Civil Aviation performance**
Spearman's rho	**Airside Infrastructure**	Correlation Coefficient	1.000	
		Sig. (2-tailed)		
	Civil Aviation Performance	Correlation Coefficient	.067**	1.000
		Sig. (2-tailed)	.000	
****. Correlation is significant at the 0.01 level (2-tailed)**				

From the above findings, research question two variables airside infrastructure and civil aviation performance indicate a positive correlation value of ($r = 0.067$, p-value <0.001). This showed that upgrades on airside infrastructure led to improvements on the performance of aviation industry in Rwanda.

3.7 The effect of air traffic control facilities on the Performance of Aviation Industry in Rwanda:

Table 3.12: Effect of air traffic control facilities on Civil Aviation Performance

Statements	**Strongly Disagree**		**Disagree**		**Neutral**		**Agree**		**Strongly Agree**		**Total**	
	F	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**	**F**	**%**
The Radar System installed in Rwanda is effective for air traffic management and surveillance.	0	-	0	-	7	23.3	14	46.7	9	30.0	30	100
The navigation aids installed at KIA contributes to effective air traffic management.	0	-	0	-	5	16.7	17	56.7	8	26.7	30	100
The Area Control Center (ACC) installed at KIA contributes to effective air traffic management.	0	-	4	13.3	9	30.0	12	40.0	5	16.7	30	100
The communication equipment installed at KIA are effective for air traffic control.	0	-	0	-	4	13.3	22	73.3	4	13.3	30	100

Results from table 3.12 above shows that 73.3% respondents agreed that communication equipment at Kigali International Airport (KIA) are effective and 30% strongly agreed to the statement. Regarding the contribution of Navigation Aids installed at the Airport to effective air traffic management, 56.7% agreed and 26.7% strongly agreed to the statement. Another area that was assessed is the effectiveness of Radar system in regard to air traffic management and surveillance of Rwanda's airspace, 46.7% agreed and 30% strongly agreed to the statement and 23.3% remained neutral.

3.8 Effectiveness of air traffic control facilities for Air Traffic Management:

This section sought to assess the effectiveness of air traffic control facilities on air traffic management, responses in this regard are tabulated below.

Table 3.13: Perception on the effectiveness of air traffic control facilities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Effective	23	76.7	76.7	76.7
	Moderately Effective	5	16.7	16.7	93.3
	No Idea	2	6.7	6.7	100.0
	Total	30	100.0	100.0	

Findings from the table 3.13 above indicated that 76.7% respondents confirmed that the Air Traffic control facilities installed at Kigali International airport are effective for air traffic management. Well as 16.7% were of the view that the equipment is moderately effective and 6.7% had no idea.

In view of the above, it is evident that the air traffic control equipment installed during the airport upgrade project are effective for air traffic control, thus leading to improved performance of the aviation sector in Rwanda.

3.8.1Correlation analysis of the relationship betweenair traffic control facilities and Civil Aviation Performance:

Table 3.14: Correlation analysis of air traffic control facilities and Civil Aviation Performance

			Air Traffic Control facilities	**Civil Aviation Performance**	
Spearman's rho	**Air Traffic Control facilities**	Correlation Coefficient	-.792**	.667**	1.000
		Sig. (2-tailed)	.000	.000	
	Civil Aviation Performance	Correlation Coefficient	.709**	-.604**	.360**
		Sig. (2-tailed)	.000	.000	.000
****. Correlation is significant at the 0.01 level (2-tailed)**					

Correlation tests on research question three variables reveal a significant relationship (r =0.360, p-value < 0.001); this revealed that enhancement of air traffic control facilities registered better air traffic management. As the Airport invested in buying modern equipment and upgrading the existing (upgrade of the radar from primary to secondary radar) air traffic management improved from approach ta Radar control methods. **3.6. Respondents' views on improving Rwanda's 3.8.2Civil Aviation Performance;**

The research question was intended to descriptively assess respondents' perception on what can be done to further improve Civil Aviation performance in terms of service delivery, aviation safety and air traffic management. The findings are elaborated bellow as answers to the open question number sixteen (16).

3.8.3 Improving service delivery at Kigali International Airport

While assessing responses on the above question, 24 respondents accounting for 80% emphasized the need for further expansion of the main terminal building. They argued that, during the 2010 – 2013 upgrade the peak our passenger was 150, and the upgrade was targeting a peak hour passenger capacity of 300 passengers, by end of 2014 peak hour passenger movement was 350 and projected to increase at an average of 12% per year. This requires further expansion of the transfer area, pre-boarding gate and arrival VIP lounge.

In addition, some respondents argued that the automated car park system installed does not have key futures like automatic notification of expiry dates for airport users who pay long term parking fees. Other key features lacking in the system is automated data link between the autopay stations and finance system. In this regard, respondents suggested to upgrade the parking system.

Further to the above, most of the respondents mentioned the need to for construction of walkway canopies at the car park and passenger drop-off point. This would facilitate passengers during diverse weather conditions when it is raining.During the study, some respondents pointed out the need for more space is needed for duty free shops as well as food and beverage sales points. They mentioned that, during the upgrade, more space was allocated to transit and pre-boarding areas and minimal space was allocated for duty free shops as well as food and beverage sales points. This would greatly improve service delivery at the airport.

3.8.4 Respondents' views on improving Aviation Safety.

During the study, 23 respondents pointed out the need to upgrade the Airfield ground lighting (AGL) system from category I to category II. They mentioned that 14 incidences resulting from limited visibility at the airport were recorded in 2013 alone. Some of the incidences recorded were aircraft skedding off the runway and missed approach. They therefore argued that upgrade of the AGL system would increase safe landing and takeoff of aircraft during harsh weather conditions like when it's raining, in fog etc,

Another factor some of the respondents mentioned that affects aviation performance in terms of safety is the lack of a bird hazard avoidance system. It was pointed out that bird strikes accounted for more than 75% incidences at Kigali International airport during the years under study. They thus suggested that Installation of a bird hazard avoidance system to limit bird strikes on aircraft during approach, landing and take-off thus improving aviation safety.

During the study, it was revealed that terrorism in increasing worldwide and airports have become a soft target by terrorist. In a bid to improve security at Kigali International Airport, there is need for Installation of lights and intrusion detection system on the airport's perimeter fence. This would in term improve civil aviation performance in terms of ensuring security at the airport.

In order to further improve civil aviation performance in the area of passenger and aircraft safety, there is need for construction of the Runway end safety areas (RESAs) and strip grading. It was pointed out that the RESAs and strip grading will significantly reduce the impact on aircraft and passengers in case of aircraft skidding off the runway.

Other respondents mentioned that the other infrastructure projects that need to be implemented in order to improve Civil Aviation Performance is construction of a parallel taxiways and further expansion of the main apron. They argued that the exiting taxiway configuration limits quick aircraft movement leading to holding aircrafts thus barning more fuel. It was also pointed out that the existing apron is too congested and therefore requires expansion.

3.8.5 Air Traffic Management:

In regard to improving air traffic management as one of Civil Aviation key performance indicators, most respondents suggested that there is need to start use of satellite based navigation system. After upgrade of the radar system from Primary to secondary radar. Air traffic controllers need to be trained on radar approach procedures there by shifting from the old conventional procedures approach based on VOR-DME to Radar approach procedures.

Others suggested that there is need for construction of a new air traffic control tower, the existing was constructed in late 50's and its height does not meet the sight requirements for the Controllers seating in the tower cabin.

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

4.1 The profile of respondents in terms of managerial position, educational level, employment terms and years of experience:

Results of the study in regard to education level revealed that respondents with a master's degree accounted for 26.7%, those with a bachelor's degree were 40% and respondents with technical qualification accounted for 33.3%. The respondents' work experience in the aviation sector was also assessed and results indicated that 50% respondents have been working for Rwanda Civil Aviation Authority for more than 10 years, 36.7% had experience of 5-10 years in the sector and 13.3% had worked for the Authority for less than 5 years. In regard to position held, 16.7% are senior managers, 63.3% are middle managers and 20% are inspectors. While assessing the employment terms of respondents, it was revealed that 80% are permanent employees and 20% are on fixed term contract.

4.2 The effect of airport's terminal building on civil aviation performance.

The absolute values of the skewness coefficients are less than two times their standard errors. Correspondingly, a non-parametric procedure, Spearman's correlation coefficient was adopted to look into the research question. This also revealed that revealed a statistically significant relationship. The findings reveal a strong positive correlation between the airports' terminal building and service delivery ($r = .69$, $n = 30$, $p < .001$). This showed that a positive change in airports' terminal building resulted into an increase in service delivery, thus improved aviation performance in general.

4.3 The effect of airside infrastructure on civil aviation performance:

A positive correlation value of (r = 0.067, p-value <0.001). This showed that upgrades on airside infrastructure led to improvements on the aircraft safety and in general, the performance of aviation industry in Rwanda.

4.4 Conclusions:

The findings revealed that:

The airports' terminal building facilities installed during the airport upgrade affects service delivery at the airport. Such facilities includes; lifts that have facilitated passengers with reduced mobility, increased number of check-in counters which, has reduced passenger queuing time, modern conveyer belts etc.

Respondents also tended to agree that the status of airside infrastructure affects aviation safety. Some of the airside infrastructure development projects respondents agreed that have affected aviation safety includes the runway re-surfacing, airside intervention roads that have improved search and rescue coordination in case of an accident and changing the apron parking system from Norse-in to Norse-out.

In addition to theair traffic control facilities affects air traffic management. Such facilities includes communication equipment like Very High Frequency Omnidirectional Range (VHF-OR) and Navigation Aidslike Distance Measuring Equipment (DME) and Instrument Landing System (ILS) as well as the secondary radar system.

4.5 Recommendations:

Based on limitations in terms of airside infrastructure, size of the terminal building and air traffic control facilities that still hinder Civil Aviation performance, following are the recommendation for improving Civil Aviation Performance:

1. The Rwanda Civil Aviation Authority (RCAA) should consider construction of a parallel taxiway to ease traffic movement during landing and takeoff.

2. The Air Traffic Control tower should be separated from the presidential terminal so as to improve on safety and security.

3. The authority (RCAA) should also consider construction of Runway End Safety Areas (RESAs) so as to minimize damage on aircraft and causalities in case of missed landing.

4. During the study, it was noted that there is still congestion at peak hour (the peak hour passenger numbers is 450 yet the terminal upgrade was designed to handle 300 passengers at peak hour. The authority should therefore consider further expansion at arrival and departure areas.

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