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Security Risk Analysis and Management in GSM Operations Using MTN as a Case Study.

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ABSTRACT

Risk analysis is a process that helps identify and manage potential problems that could undermine key business processes. Security risk analysis on GSM operations using MTN as a case study was carried out in this research. The objective is to ensure confidentiality, integrity and availability of GSM operations. Our motivation for takling risk analysis is that small business owners take risks every day putting too much at stake and their businesses in the long run could suffer. Qualitative method was used for this research where 70 Questionnaire was prepared and distributed to users of MTN using five components of the business processes measures and 50 were received, as duly completed by the users of the products in context. Chi square was used in the analysis to determine where there is association between mobile electricity, mobile app., SIM card, recharge card, customer name and security. The p - values of chi square of analysis is greater than 0.05 indicating independence in association between security, mobile electricity, mobile app, recharge card, SIM card and customer name. Findings revealed the sucesptibility to risks by business owners which then necessitate our reccomendations that MTN should put into consideration security of the components .

Keywords: Security analysis, risk analysis and management, MTN operations & GSM operations.

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1. INTRODUCTION

The telecommunications industry is currently Nigeria's second most important beneficiary of FDI after the extractive oil industry (Nigeria Bureau of Statistics, 2013). Another interesting statistic of the Nigerian telecoms industry is the origin of the foreign direct investment(FDI) in the industry (Osabutey & Okoro, 2015).The two types of risk analysis methods are Quantitative risk analysis methods which use mathematical and statistical tools to represent risk and qualitative risk analysis methods where risk is analyzed with the help of adjectives instead of using mathematics. Risk analysis methods which use intensive quantitative measures are not suitable for today's information security risk analysis (Karabacak & Sogukpinar, 2005). It is said that poor risk analysis brings more risk to a business. Also, risk analysis cannot be considered as independent from risk response stage and the contract strategy.

The assumptions made in the risk analysis stage determine the overall success of the risk management process (Dikmen, Birgonul, & Arikan, n.d, 2004). The loss of confidentiality, integrity, availability, accountability, authenticity and reliability of information and services can have harmful impacts on M commerce.(Seify & Bijani, 2009)

This research work has the following sections, section one is the introduction, two is the related works, three is the method, four is the result and discussion, five is the conclusion and finally six is the recommendation.

2. RELATED WORKS

Seify & Bijani (2009) based on the risk analysis done in the GSM network of Iran a methodology for cellular mobile network risk management is established. Fluorescent proteins with light wavelengths within the optical window are one of the improvements in in vivo imaging techniques (Tran et al., 2014). This means that it is important and strategic to consider how much impact political risk influenced the FDI flows in the Nigerian telecommunications industry (Osabutey & Okoro, 2015). With the introduction of GSM devices, use of ebook readers such as iPad and Kindle and the success of social networking giants such as Facebook, the demand for mobile data traffic has also grown significantly in recent years. Hence, mobile users find meeting these new demands in wireless mobile networks inevitable, while they have to keep their costs minimum (Hasan, Boostanimehr, & Bhargava, 2011).

This paper describe the risks to electronic security via identity theft, hacking, etc. that wireless technologies may present in the context of delivery of financial services. Although the extent of security measures to be taken is not independent of the size of the transactions contemplated, the paper points out a variety of ways that interactions between technologies create points of vulnerability for security of financial transactions when wireless technology is used (Kellermann, n.d. 2002). The paper used a novel method and ISRAM, is proposed for information security risk analysis.

The proposed method was based on a quantitative approach that uses survey results to analyze information security risks (Karabacak & Sogukpinar, 2005). Authors of this paper try to develop a Risk Management support tool which is capable of identification of relationship between risk sources, consequences, responses and project success criteria, and integrating all tasks of risk management.(Dikmen et al., n.d.).

This paper discuss tools for seismic risk and loss assessment but the tool are underdevelopment(Molina, Lang, & Lindholm, 2010)

3. METHOD

In a bid to get the views and opinions of users of MTN product, 70 questionnaires were printed for this fact-finding on security risk pose on the products. 49 questionnaires were received, as duly completed by the users of products, at the conclusion of the survey. The questionnaires were designed using a 5-scale response pattern comprising which are Very low =1, Low = 2, Medium =3, High = 4, Very high = 5 and IBM SPSS statistics 23 was used to analyzed the result of table 1 below. The survey was carried out at Federal Polytechnic, Bida , Federal University of Technology Minna and out the schools campus in Nigeria. Thus stated below is a summary of the survey and analysis:

Table1. The five (5) component used with the frequency generated from the questionnaires

	Very low	low	Medium	High	Very high
Mobile electricity					
Cost of relation	6	3	6	1	1
Cost of modification	3	4	4	4	2
Loss of access	5	4	3	3	2
Mobile app.					
Cost of relation	5	4	2	4	3
Cost of modification	4	3	4	5	2
Loss of access	4	5	7	1	1
SIM card number					
Cost of relation	2	5	4	3	2
Cost of modification	3	3	2	2	6
Loss of access	3	3	7	2	2
Recharge card					
Cost of relation	5	3	1	5	7
Cost of modification	2	3	4	6	3
Loss of access	2	2	2	4	7
Customer name					
Cost of relation	2	5	5	4	1
Cost of modification	4	2	7	1	4
Los of access	1	4	5	3	3

4. RESULT AND DISCUSSION

The following are result analysis generated from IBM SPSS statistics 23 using table 1 above

Table 2: Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
mobile_electricity * security	51	100.0%	0	0.0%	51	100.0%

From table 2 there are 51 participants in the survey and no missing value so therefore our judgment on the association between mobile electricity and security is going to be based on the fifty-one (51) participant.

Table 2.1: mobile_electricity * security Crosstabulation

			security			
			lost_access	modification	revelation	Total
mobile_electricity	high	Count	3	4	1	8
		Expected Count	2.7	2.7	2.7	8.0
		% within security	17.6%	23.5%	5.9%	15.7%
	low	Count	4	4	3	11
		Expected Count	3.7	3.7	3.7	11.0
		% within security	23.5%	23.5%	17.6%	21.6%
	medium	Count	3	4	6	13
		Expected Count	4.3	4.3	4.3	13.0
		% within security	17.6%	23.5%	35.3%	25.5%
	Very high	Count	2	2	1	5
		Expected Count	1.7	1.7	1.7	5.0
		% within security	11.8%	11.8%	5.9%	9.8%
	Very low	Count	5	3	6	14
		Expected Count	4.7	4.7	4.7	14.0
		% within security	29.4%	17.6%	35.3%	27.5%
Total		Count	17	17	17	51
		Expected Count	17.0	17.0	17.0	51.0
		% within security	100.0%	100.0%	100.0%	100.0%

From table 2.1 we can see that dependent variable is mobile electricity the influencing variable is the security. In the first column 3 participant choose that security impact on loss of access to mobile electricity is high, 4 participants chooses that security impact is low, 3 chooses is medium, 2 chooses very high and 5 choose that it is very low. Second column is the security impact in modification of mobile electricity 4 participant choose it high, 4 participant choose that it is low, 4 choose medium,2 choose very high and 3 choose very low. Third column is the security impact in cost of revelation of mobile electricity 1 participant choose it high, 3 participant choose that it is low, 6 choose medium,1 choose very high and 6 choose very low.

Table 2.2: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.409[a]	8	.818
Likelihood Ratio	4.727	8	.786
N of Valid Cases	51		

a. 15 cells (100.0%) have expected count less than 5. The minimum expected count is 1.67.

From table 2.2 above chi square value 4.409 and degree of freedom is 8, p- value is 0.818 indicating that null hypothesis should be accepted that is the association between security and mobile electricity is independent.

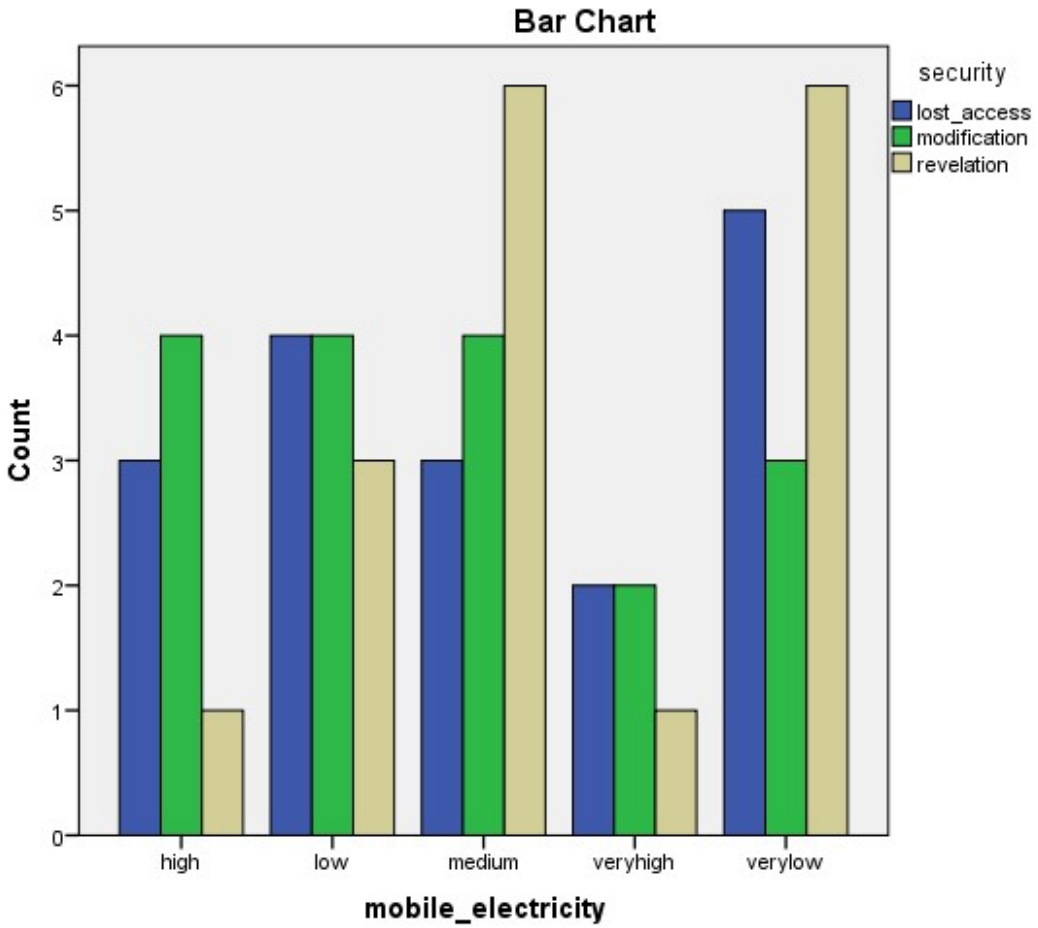

Figure 1: Bar chart representation of responses for mobile electricity

Figure 1 above show bar chart represent of responses for mobile electricity which shows that cost of revelation is medium, cost of modification is between medium and high and cost of lost of access is very low.

Table 3: Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
mobile_app * security	54	100.0%	0	0.0%	54	100.0%

From table 3 there are 54 participants in the survey and no missing value so therefore our judgment on the association between mobile app and security is going to be based on the fifty-four (54) participant.

Table 3.1 mobile_app * security Cross tabulation

			security			Total
			lost_access	modification	revelation	
mobile_app	high	Count	1	5	4	10
		Expected Count	3.3	3.3	3.3	10.0
		% within security	5.6%	27.8%	22.2%	18.5%
	low	Count	5	3	4	12
		Expected Count	4.0	4.0	4.0	12.0
		% within security	27.8%	16.7%	22.2%	22.2%
	medium	Count	7	4	2	13
		Expected Count	4.3	4.3	4.3	13.0
		% within security	38.9%	22.2%	11.1%	24.1%
	veryhigh	Count	1	2	3	6
		Expected Count	2.0	2.0	2.0	6.0
		% within security	5.6%	11.1%	16.7%	11.1%
	verylow	Count	4	4	5	13
		Expected Count	4.3	4.3	4.3	13.0
		% within security	22.2%	22.2%	27.8%	24.1%
Total		Count	18	18	18	54
		Expected Count	18.0	18.0	18.0	54.0
		% within security	100.0%	100.0%	100.0%	100.0%

From table 3.1 we can see that dependent variable is mobile app the influencing variable is the security. In the first column 1 participant choose that security impact on loss of access to mobile app. is high, 5participants chooses that security impact is low, 7 chooses is medium, 1 chooses very high and 4 choose that it is very low. Second column is the security impact in modification of mobile electricity 5 participant choose it high, 3 participant choose that it is low, 4 choose medium,2 choose very high and 4 choose very low. Third column is the security impact in cost of revelation of mobile electricity 4 participant choose it high, 4 participant choose that it is low, 2 choose medium,3 choose very high and 5 choose very low.

Table 3.2 Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.177[a]	8	.518
Likelihood Ratio	7.788	8	.454
N of Valid Cases	54		

a. 15 cells (100.0%) have expected count less than 5. The minimum expected count is 2.00.

From table 3.2 above chi square value 7.177 and degree of freedom is 8, p- value is 0.518 indicating that null hypothesis should be accepted that is the association between security and mobile app. is independent.

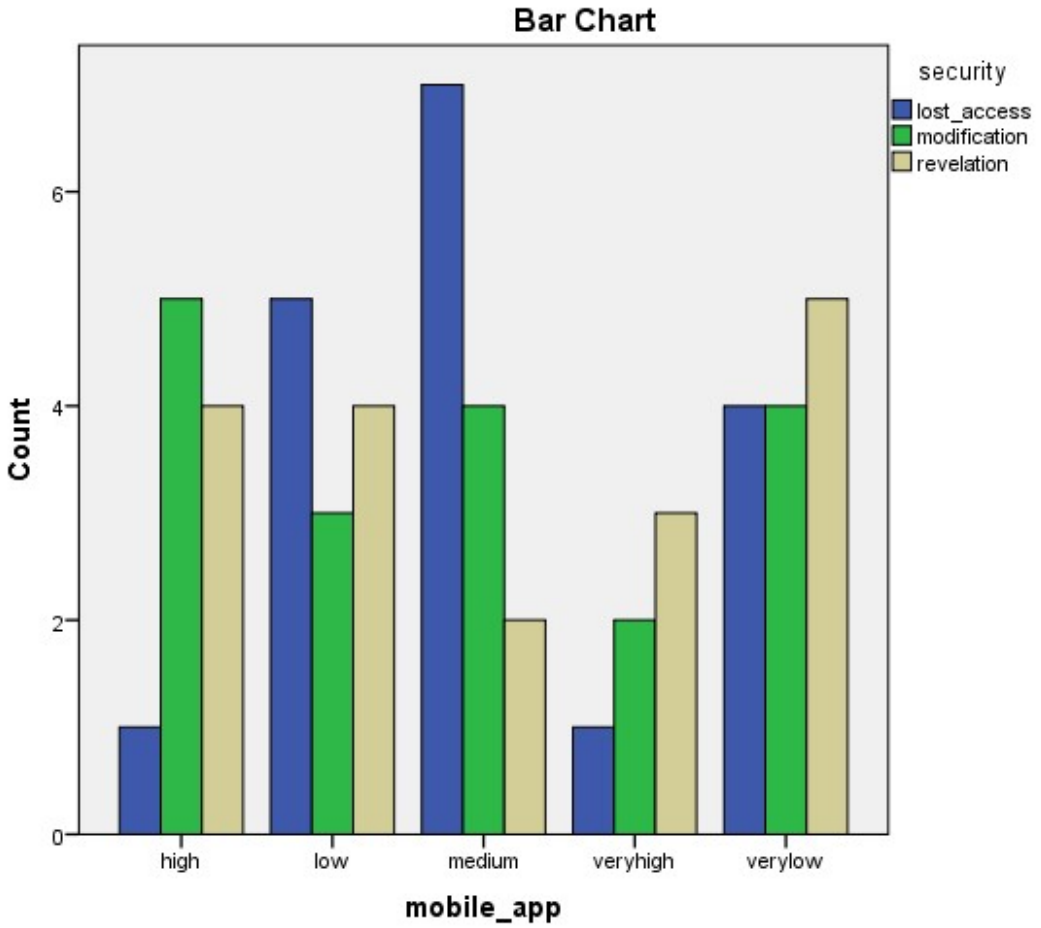

Figure 2: Bar chart representation of responses for mobile app

Figure 2 above show bar chart represent of responses for mobile app which shows that cost of revelation is very low, cost of modification is high and cost of lost of access is medium.

Table 4: Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
sim_card * security	49	100.0%	0	0.0%	49	100.0%

From table 4 there are 49 participants in the survey and no missing value so therefore our judgment on the association between sim card and security is going to be based on the forty nine (49) participants.

Table 4. 1: sim_card * security Crosstabulation

			security			
			lost_access	modification	revelation	Total
sim_card	high	Count	2	2	3	7
		Expected Count	2.4	2.3	2.3	7.0
		% within security	11.8%	12.5%	18.8%	14.3%
	low	Count	3	3	5	11
		Expected Count	3.8	3.6	3.6	11.0
		% within security	17.6%	18.8%	31.3%	22.4%
	medium	Count	7	2	4	13
		Expected Count	4.5	4.2	4.2	13.0
		% within security	41.2%	12.5%	25.0%	26.5%
	veryhigh	Count	2	6	2	10
		Expected Count	3.5	3.3	3.3	10.0
		% within security	11.8%	37.5%	12.5%	20.4%
	verylow	Count	3	3	2	8
		Expected Count	2.8	2.6	2.6	8.0
		% within security	17.6%	18.8%	12.5%	16.3%
Total		Count	17	16	16	49
		Expected Count	17.0	16.0	16.0	49.0
		% within security	100.0%	100.0%	100.0%	100.0%

From table 4.1 we can see that dependent variable is SIM card the influencing variable is the security. In the first column 2 participant choose that security impact on loss of access to SIM card is high, 3 participants chooses that security impact is low, 7 chooses is medium, 2 chooses very high and 3 choose that it is very low. Second column is the security impact in modification of mobile electricity 2 participant choose it high, 3 participant choose that it is low, 2 choose medium,6 choose very high and 3 choose very low. Third column is the security impact in cost of revelation of mobile electricity 3 participant choose it high, 5 participant choose that it is low, 4 choose medium,2 choose very high and 2 choose very low.

Table 4.2: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.357[a]	8	.499
Likelihood Ratio	7.138	8	.522
N of Valid Cases	49		

a. 15 cells (100.0%) have expected count less than 5. The minimum expected count is 2.29.

From table 4.2 above chi square value 7.357 and degree of freedom is 8 the p - value is 0.499 indicating that null hypothesis should be accepted that is the association between security and sim cardis independent.

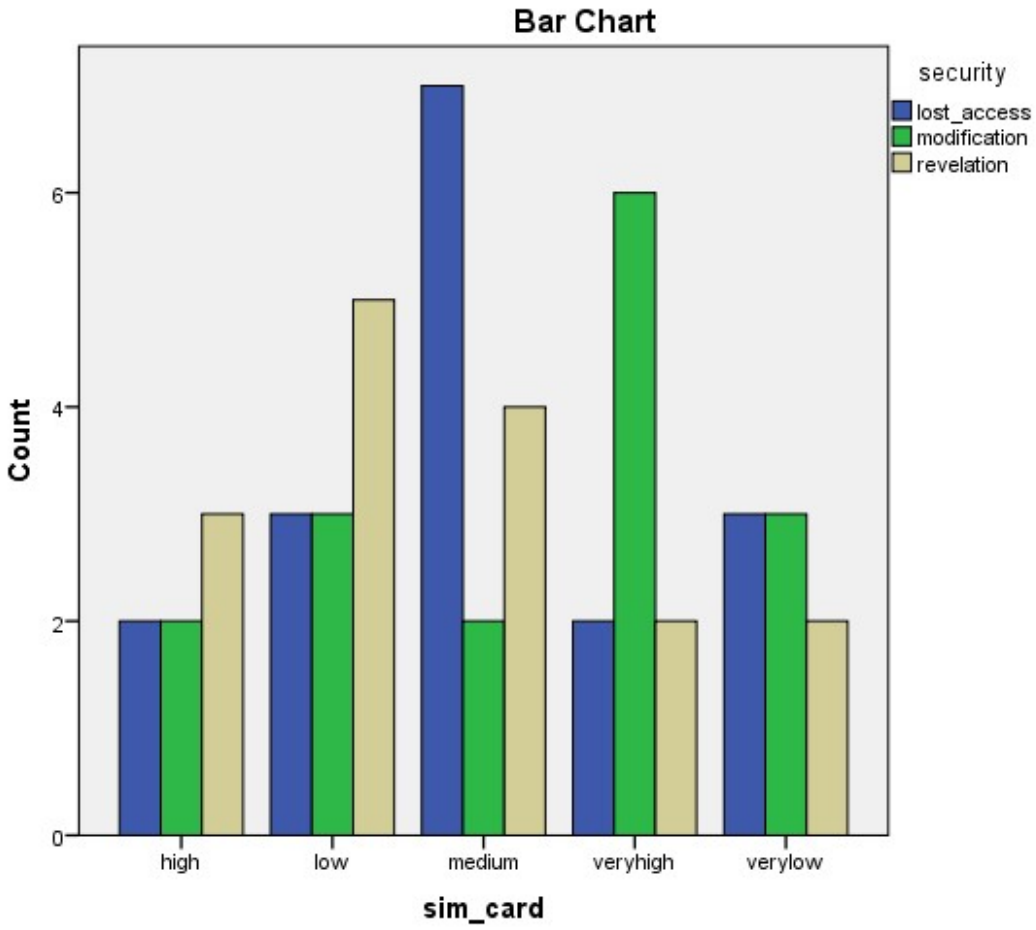

Figure 3: Graphical representation of responses for SIM card

Figure 3 above show graphical represent of responses for sim card which shows that cost of revelation is low, cost of modification is very high and cost of lost of access is medium.

Table 5: Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
recharge_card * security	56	100.0%	0	0.0%	56	100.0%

From table 5 there are 56 participants in the survey and no missing value so therefore our judgment on the association between recharge card and security is going to be based on the fifty-six (56) participants.

Table 5.1: recharge card * security Cross tabulation

			security			Total
			lost_access	modification	revelation	
recharge_card	high	Count	4	6	5	15
		Expected Count	4.6	4.8	5.6	15.0
		% within security	23.5%	33.3%	23.8%	26.8%
	low	Count	2	3	3	8
		Expected Count	2.4	2.6	3.0	8.0
		% within security	11.8%	16.7%	14.3%	14.3%
	medium	Count	2	4	1	7
		Expected Count	2.1	2.3	2.6	7.0
		% within security	11.8%	22.2%	4.8%	12.5%
	veryhigh	Count	7	3	7	17
		Expected Count	5.2	5.5	6.4	17.0
		% within security	41.2%	16.7%	33.3%	30.4%
	verylow	Count	2	2	5	9
		Expected Count	2.7	2.9	3.4	9.0
		% within security	11.8%	11.1%	23.8%	16.1%
Total		Count	17	18	21	56
		Expected Count	17.0	18.0	21.0	56.0
		% within security	100.0%	100.0%	100.0%	100.0%

From table 5.1 we can see that dependent variable is recharge card the influencing variable is the security. In the first column 4 participant choose that security impact on loss of access to recharge card is high, 2 participants chooses that security impact is low, 2 chooses is medium, 7 chooses very high and 2 choose that it is very low. Second column is the security impact in modification of mobile electricity 6 participant choose it high, 3 participant choose that it is low, 4 choose medium,3 choose very high and 2 choose very low. Third column is the security impact in cost of revelation of mobile electricity 5 participant choose it high, 3 participant choose that it is low, 1 choose medium,7 choose very high and 5 choose very low.

Table 5.2: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.029[a]	8	.644
Likelihood Ratio	6.174	8	.628
N of Valid Cases	56		

a. 11 cells (73.3%) have expected count less than 5. The minimum expected count is 2.13.

From table 5.2 above chi square value 6.029 and degree of freedom is 8, p- value is 0.644 indicating that null hypothesis should be accepted that is the association between security and recharge card is independent.

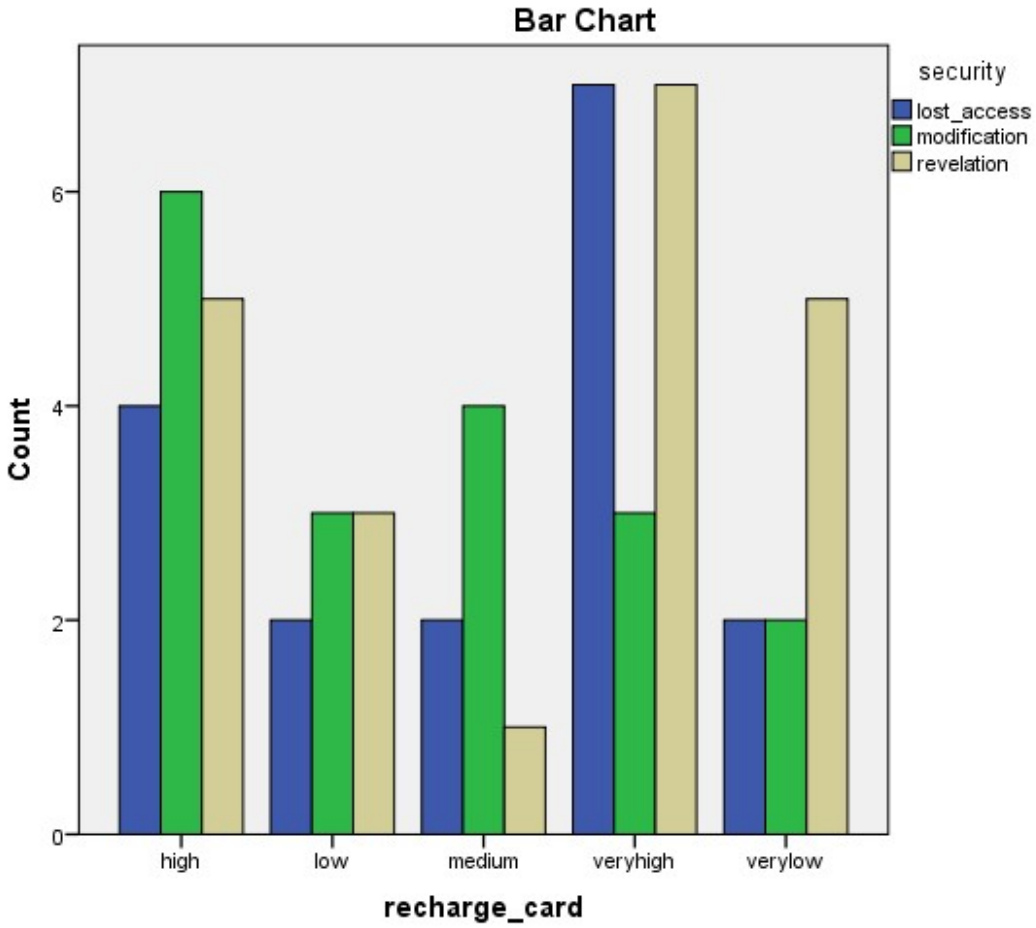

Figure 4: Bar chart representation of responses for recharge card

Figure 4 above show bar chart represent of responses for recharge card which shows that cost of revelation is very high, cost of modification is very high while cost of lost of access is high.

Table 6. Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
customer_name * security	51	100.0%	0	0.0%	51	100.0%

From table 6 there are 51 participants in the survey and no missing value so therefore our judgment on the association between customer name and security is going to be based on the fifty-one (51) participants.

Table 6. 1: customer_name * security Crosstabulation

			security			
			lost_access	modification	revelation	Total
customer_name	high	Count	3	1	4	8
		Expected Count	2.5	2.8	2.7	8.0
		% within security	18.8%	5.6%	23.5%	15.7%
	low	Count	4	2	5	11
		Expected Count	3.5	3.9	3.7	11.0
		% within security	25.0%	11.1%	29.4%	21.6%
	medium	Count	5	7	5	17
		Expected Count	5.3	6.0	5.7	17.0
		% within security	31.3%	38.9%	29.4%	33.3%
	very high	Count	3	4	1	8
		Expected Count	2.5	2.8	2.7	8.0
		% within security	18.8%	22.2%	5.9%	15.7%
	verylow	Count	1	4	2	7
		Expected Count	2.2	2.5	2.3	7.0
		% within security	6.3%	22.2%	11.8%	13.7%
Total		Count	16	18	17	51
		Expected Count	16.0	18.0	17.0	51.0
		% within security	100.0%	100.0%	100.0%	100.0%

From table 6.1 we can see that dependent variable is customer name the influencing variable is the security. In the first column 3 participant choose that security impact on loss of access to customer name is high, 4 participants chooses that security impact is low, 5 chooses is medium, 3 chooses very high and 1 choose that it is very low. Second column is the security impact in modification of mobile electricity 1 participant choose it high, 2 participant choose that it is low, 7 choose medium,4 choose very high and 4 choose very low.

Third column is the security impact in cost of revelation of mobile electricity 4 participant choose it high, 5 participant choose that it is low, 5 choose medium,1 choose very high and 2 choose very low.

Table 6.2: Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	6.964[a]	8	.540
Likelihood Ratio	7.689	8	.464
N of Valid Cases	51		

a. 12 cells (80.0%) have expected count less than 5. The minimum expected count is 2.20.

From table 6.2 above chi square value 6.964 and degree of freedom is 8, p- value is 0.540 indicating that null hypothesis should be accepted that is the association between security and customer name is independent.

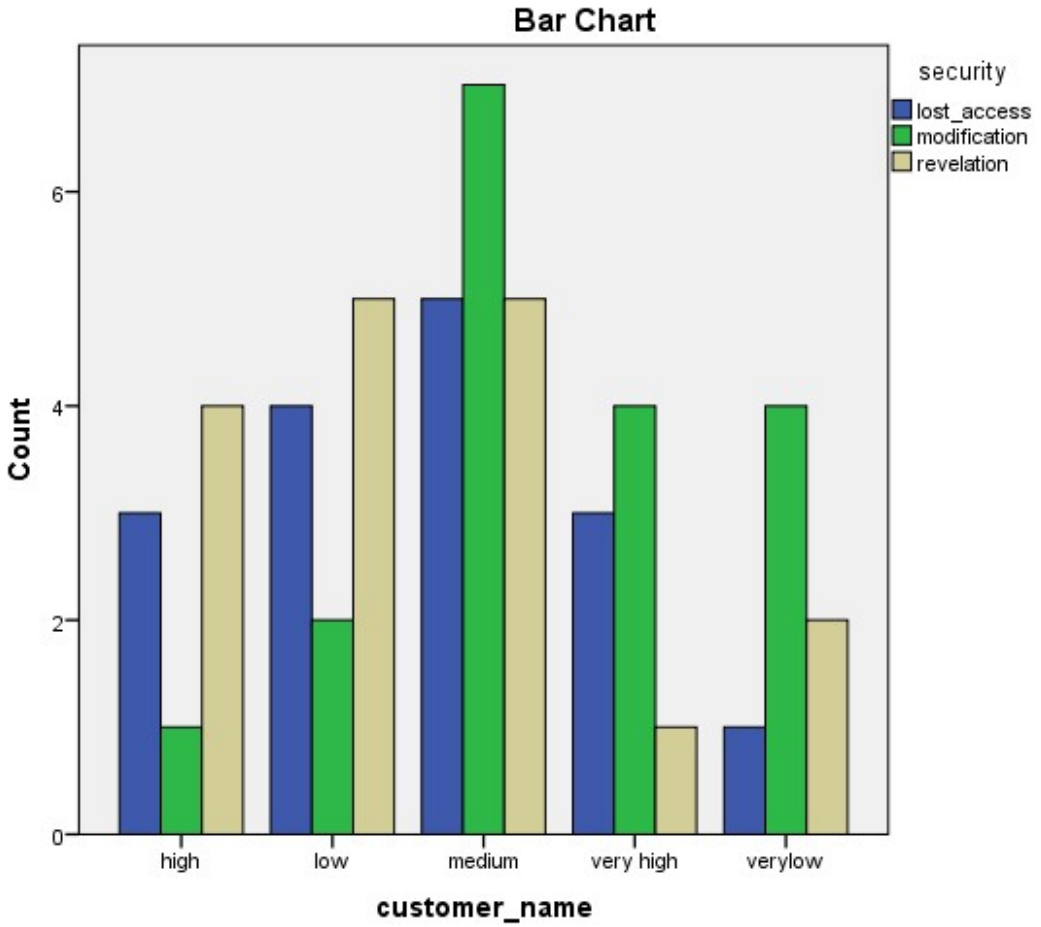

Figure 5: Bar chart representation of responses for customer name

Figure 5 above show bar chart represent of responses for customer name which shows that cost of revelation is low and medium, cost of modification is medium while cost of loss of access is medium.

5. CONCLUSION

There is evidence of independence between the association security, mobile electricity, mobile app, SIM card, and customer name. since the p – value of each of them is greater than 0.05.

Recommendations
It is recommended that MTN Nigeria should put more security on component with high risk impact and other GSM network providers should also carryout risk analysis on their component to find out the component with high vulnerability so that they can increase security of the component. It is also recommended that further research can be carry out on other component of MTN business since this research covers five (5) component of the business.

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