ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 7, July 2013

Open Information Communication Technology Infrastructure Sharing Framework. Site Sharing and Its Challenges to Mobile Service Providers of Kenya

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Abstract: Open Information Communication Technology Infrastructure Sharing can be defined as the joint use of network facilities by two or more operators subject to agreement specifying relevant technical and commercial conditions. The main reason for ICT infrastructure sharing in mobile service industries in the countries that have implemented has been to cut down expenditure and reduce the need to build new masts on which to locate their equipment. In Kenya, each licensee is expected to build or lease the infrastructure it requires, although the license they own allows them to share their infrastructure on commercial arrangements. As a result of this, penetration of masts in rural areas is increasing at an exponential rate. The construction of towers is mushrooming and in near future towers population across the country will change urban and rural landscape. Despite the Mobile Service Providers interest in Open ICT infrastructure sharing, little attention is being paid to conclusion of deals that leads to Infrastructure sharing. The purpose of the study was to investigate the Challenges to Open ICT Infrastructure sharing by Mobile Service Providers in Kenya. This study was conducted through survey design. Data was collected from employees from Safaricom, Airtel, Yu and Orange was used to study the population. A target population of 2600 employees from the four Mobile Service Providers in Kenya was considered. Both Stratified and purposive sampling techniques was used to identify the respondents. A sample size of 93 respondents was used in this study. Both structured questionnaires and scheduled interviews were used in data collection. Both descriptive and inferential statistics was used to analyse data collected from respondents in this study. The study found out Asset Valuation and Management, Stakeholders cost pressure and cultural alignment as the main challenges to site sharing by Mobile Service Providers in Kenya. The results obtained from this study will be beneficial to stakeholders in Mobile Service industry formulate policies that promote ICT Infrastructure sharing with a view to promoting universal access and saving on expenditures.

Keywords: Open ICT infrastructure sharing; site sharing, Mobile Service Providers, Challenges, Kenya

I. INTRODUCTION

(Isamuyo, 2006) defines Open Information Communication Technology Infrastructure sharing as the joint use of network facilities by two or more operators subject to agreement specifying relevant technical and commercial conditions. The main reason for ICT infrastructure sharing in mobile service industries in the countries that have implemented has been to cut down expenditure and reduce the need to build new masts on which to locate their equipment (Punie, 2007).The term Information Communication Technology Infrastructure sharing incorporates Site sharing, Network sharing and Spectrum sharing (Bauer, Westerveld, & Maitland, 2001). The term Site sharing may be defined as sharing the passive elements of network infrastructure (mast, sites, cabinet, power, and conditioning) (Zahra, Azim, & Mahmood, 2008). For instance, in India, the regulator, Telecom Regulatory of India (TRAI), proposed Site sharing rules for the Mobile sector in February 2007, both for active and passive components. As a result, Bharti Group, Vodafone Group, and Aditya Birla Telecom (Idea Cellular) created Indus Towers, a joint venture that controls over 100,000 towers and provides passive infrastructure service to its shareholders and others (Hasbani, El-Darwiche, Mourad, & Chanab, 2009). However, despite the growth, there have been some challenges faced in implementing Site sharing. Asset Management and Valuation and risk sharing has been

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
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identified as major barrier in conclusion of some deals such as the one between Bharti, Vodafone and Idea (Saphyre, 2010). The three operators had to create a tower company (Indus Towers) to facilitate the capitalization of tower assets and subsequent cash injection.

Open ICT infrastructure sharing can substantially reduce capital and operational expenditure thereby increasing the speed of network rollouts, improve coverage and help meet the capacity demands of increased data traffic (Sony Ericsson, 2010). This approach can promote Universal access that Government of Kenya is trying to achieve(Republic of Kenya, 2007). The penetration of masts in rural areas is increasing at an exponential rate. The construction of towers is mushrooming and in near future towers population across the country will change urban and rural landscape (Mahmood, 2012). This study seeks to assess these challenges that are making Open ICT Infrastructure sharing remain a mirage despite the enormous benefits that come with Open ICT infrastructure sharing. In light of the findings, the study intends to determine a framework for Open ICT Infrastructure sharing for use by Mobile Service Providers in Kenya.

A. Problem of Research

Site sharing can substantially reduce capital and operational expenditure thereby increasing the speed of network rollouts, improve coverage and help meet the capacity demands of increased data traffic (Sony Ericsson, 2010). This can promote Universal access that the Government of Kenya is trying to achieve (CCK, 2010). In Kenya, each licensee is expected to build or lease the infrastructure it requires, although the license they own allows them to share their infrastructure on commercial arrangements (CCK, 2004). As a result of this, penetration of masts in rural areas is increasing at an exponential rate. The construction of towers is mushrooming and in near future towers population across the country will change urban and rural landscape. Despite the Mobile Service Providers interest in Open ICT infrastructure sharing, little attention is being paid to conclusion of deals that leads to Infrastructure sharing (Mahmood, 2012). So, why are Mobile Service Providers reluctant to embrace Open ICT infrastructure sharing in Kenya?

The main objectives of this were to:

a) To evaluate challenges facing Site Sharing by Mobile Service Providers in Kenya.

b) To determine the bottlenecks to developing a framework to Open ICT Infrastructure sharing for Mobile Service Providers in Kenya

c) To evaluate the effects of regulatory regime on Open ICT Infrastructure sharing by Mobile Service Providers in Kenya

B. Research Focus

This study identified three forms of open ICT infrastructure sharing namely: Site sharing, Network sharing and Spectrum sharing. The focus of this paper is site sharing and its challenges. The study also focused on 2G and 3G network technology without considering 4G networks, since no Mobile Service Provider in Kenya has migrated to 4G. This study identified steel towers, BTS shelters, Power supply, Generators, Batteries and Air conditioners as the main components that can be shared. Based on findings from other literary sources, the research identified Asset valuation and Management, shareholder and Cost Pressure, Cultural alignment, Stakeholder management and sponsorship as the main challenges facing Site sharing by Mobile Service Operators. This study has also find out that each sharing environment is different and may have pressures and priorities that change throughout the process of establishing a partnership between two or more Mobile Service operators (Sony Ericsson, 2010). Based on this, the challenges facing Open ICT Infrastructure sharing in Europe, for instance, may be different from Kenya. Despite various studies conducted in various countries such as Europe and India, there is no conclusive study that has been conducted in Kenya to ascertain the main challenges facing site sharing by Mobile Service Providers from available literature.

II. METHODOLOGY OF RESEARCH

A. *General Background of Research*

This was a quantitative study and was conducted through survey design. Data was collected from employees from Safaricom, Airtel, Yu and Orange to study the population.

B. *Sample of Research*

A target population of 867 expert employees from the four Mobile Service Providers in Kenya was considered(KNBS, 2012). These employees included engineers, system administrators, technicians and IT Experts.

Table 1: Number of Expert Employees in Four Mobile Service Providers in Kenya

Name of Mobile Service Provider	Number of Employees
Safaricom	400
Airtel	167
Yu	233
Orange	67
Total	867

Source: (KNBS, 2012)

C. Instruments and Procedures

Stratified sampling technique was used to identify the respondents. A sample size of 93 respondents was used in the study. Both structured questionnaires and scheduled interviews will be used in data collection.

ISSN (Print) : 2319-5940
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International Journal of Advanced Research in Computer and Communication Engineering
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D. Data Analysis

Both descriptive and inferential statistics was used to analyse data collected from respondents in this study. Descriptive statistics used in this study included use of frequencies, histograms, pie- charts to summarize the sample data collected from the respondents.

Inferential statistics was used to determine the relationship between the different variables as outlined in the research objectives. Specifically, Chi-square test was used to test the following hypotheses which are based on the Objectives of the study:

a) Ho: There exists a relationship between Challenges facing Site Sharing in each of the four Mobile Service Providers in Kenya.

b) H1: There is no relationship between challenges facing Site Sharing in each of the four Mobile Service Providers in Kenya.

Data from open ended questionnaires and interviews will be grouped under broad themes and converted into frequency counts. All data was analysed at level significance of 95% or α =0.05 and the degrees of freedom depending on the particular case as will be determined. The study used R Version 3.0.0 software package to analyse the data collected.

E. Results of the Research

The main objectives of this study were to:

a) To evaluate challenges facing Site Sharing by Mobile Service Providers in Kenya.

b) To determine the bottlenecks to developing a framework to Open ICT Infrastructure sharing for Mobile Service Providers in Kenya

c) To evaluate the effects of regulatory regime on Open ICT Infrastructure sharing by Mobile Service Providers in Kenya.

The study found out the following results:

Table 2: Descriptive statistics of Results obtained

	Mean	**Median**	**S. E of Mean**	**Std Deviation**	**Sum**
Asset Valuation and Management in Steel Towers	1.53	1.00	.07	.69	142.00
Asset Valuation and Management in BTS Shelters	1.71	2.00	.07	.72	159.00
Asset Valuation and Management in Power Supply	1.53	1.00	.07	.69	142.00
Asset Valuation and Management in Generators	1.60	1.00	.07	.69	149.00
Asset Valuation and Management in Batteries	1.71	2.00	.07	.67	159.00
Asset Valuation and Management Air Conditioners	1.54	1.00	.07	.70	143.00
Shareholder Cost Pressure in Steel Towers	1.66	2.00	.07	.65	154.00
Shareholder Cost Pressure in BTS Shelters	1.53	1.00	.07	.69	142.00
Shareholder Cost Pressure in Power Supply	1.66	2.00	.07	.68	154.00
Shareholder Cost Pressure in Generators	1.56	1.00	.07	.65	145.00
Shareholder Cost Pressure in Batteries	1.57	1.00	.07	.70	146.00
Shareholder Cost Pressure Air Conditioners	1.71	2.00	.07	.67	159.00
Cultural Alignment in Steel Towers	1.57	1.00	.07	.70	146.00
Cultural Alignment in BTS Shelters	1.61	2.00	.07	.68	150.00
Cultural Alignment in Power Supply	1.66	2.00	.07	.63	154.00

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

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Cultural Alignment in Generators	1.53	1.00	.07	.69	142.00
Cultural Alignment in Batteries	1.57	1.00	.07	.70	146.00
Cultural Alignment Air Conditioners	1.60	1.00	.07	.69	149.00

From the results, it was found that:

a) Majority of the respondents have a clear understanding of Open ICT infrastructure sharing with respect to site sharing and its challenges. The study found out that 72% of the respondents have a clear understanding of what constitutes site sharing.

b) Majority of the respondents were in agreement that steel towers, BTS shelters, Air conditioners, Batteries, Generators and Air conditioners can be shared. The study found out that 78.5%, 75.3%, 78.5%, 73.2%, 76.2% and 71.4% of the respondents were in agreement that steel towers, BTS shelters, Air conditioners, Batteries, Generators and Air conditioners respectively can be shared.

c) 58.1% of the respondents cited Asset Valuation and Management as the main impediment to site sharing by Mobile Service Providers. This indicates that most Mobile Service Providers have their own fears on how they will manage the components of site sharing.

d) 44.1% of the respondents cited Shareholder Cost Pressure as the major challenge to site sharing. 46.2% of the respondents did not agree that Shareholder Cost Pressure is a challenge to site sharing. This shows that Shareholders of the Mobile Service Providers may not object to site sharing by Mobile Service Providers in Kenya.

e) 58.1% of the respondents cited Cultural alignment as the major challenge to site sharing by Mobile Service Providers in Kenya. This shows that majority of Mobile Service Providers may not be willing to engage in site sharing due to differences in cultures.

Chi-square test was used to test the null hypothesis: Ho: There exists a relationship between Challenges facing Site Sharing in each of the four Mobile Service Providers in Kenya and alternative hypothesis H1: There is no relationship between challenges facing Site Sharing in each of the four Mobile Service Providers in Kenya. The study identified the Components of Site sharing as Steel towers, BTS Shelters, Power Supply, Generators, Batteries and Air Conditioners. It is on this basis that the following hypotheses were tested.

a) H0: There is exists a relationship between Challenges facing Steel Towers in each of the four Mobile Service Providers

Ha: There is no significant relationship between the Challenges facing Steel Towers in each of the four Mobile Service Providers in Kenya.

Table 3: Chi-Square test to test the Null Hypothesis, There is significant relationship between the Challenges facing Steel Towers in each of the four Mobile Service Providers in Kenya.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.726(a)	12	.257
Likelihood Ratio	17.788	12	.122
Linear-by-Linear Association	3.270	1	.071
N of Valid Cases	93		

From the results above, the Pearson Chi-Square Asymp. Sig (2 sided)"* is 0.257 which is greater than 0.05. This shows that the Null Hypothesis is not true. Hence, there is no significant relationship between the Challenges facing Steel Towers in each of the four Mobile Service Providers in Kenya.

b) H1: There is exists a relationship between Challenges facing BTS Shelters in each of the four Mobile Service Providers

Ha: There is no significant relationship between the Challenges facing BTS Shelters in each of the four Mobile Service Providers in Kenya.

Table 4: Chi-Square test to test the Null Hypothesis, There is significant relationship between the Challenges facing BTS Shelters in each of the four Mobile Service Providers in Kenya.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.588(a)	12	.017
Likelihood Ratio	29.377	12	.003
Linear-by-Linear Association	1.419	1	.234
N of Valid Cases	93		

From the results above, the Pearson Chi-Square Asymp. Sig (2 sided)"* is 0.017 which is less than 0.05. This shows that the Null Hypothesis is true. Hence, there is significant relationship between the Challenges facing BTS Shelters in each of the four Mobile Service Providers in Kenya.

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
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c) H2: There is exists a relationship between Challenges facing Power Supply in each of the four Mobile Service Providers

Ha: There is no significant relationship between the Challenges facing Power Supply in each of the four Mobile Service Providers in Kenya.

Table 5: Chi-Square test to test the Null Hypothesis, There is significant relationship between the Challenges facing Power Supply in each of the four Mobile Service Providers in Kenya.

Chi-Square Tests

	Value	df	Asymp. Sig. (2 sided)
Pearson Chi-Square	14.726(a)	12	
Likelihood Ratio	17.788	12	
Linear-by-Linear Association	3.270	1	
N of Valid Cases	93		

From the results above, the Pearson Chi-Square Asymp. Sig (2 sided)"* is 0.257 which is greater than 0.05. This shows that the Null Hypothesis is not true. Hence, there is no significant relationship between the Challenges facing Power Supply in each of the four Mobile Service Providers in Kenya.

d) H3: There is exists a relationship between Challenges facing Generators in each of the four Mobile Service Providers

Ha: There is no significant relationship between the Challenges facing Generators in each of the four Mobile Service Providers in Kenya.

Table 6: Chi-Square test to test the Null Hypothesis, There is significant relationship between the Challenges facing Generators in each of the four Mobile Service Providers in Kenya.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.588(a)	12	
Likelihood Ratio	29.377	12	
Linear-by-Linear Association	1.419	1	
N of Valid Cases	93		

From the results above, the Pearson Chi-Square Asymp. Sig (2 sided)"* is 0.017 which is less than 0.05. This shows that the Null Hypothesis is true. Hence, there is significant relationship between the Challenges facing Generators in each of the four Mobile Service Providers in Kenya.

e) H4: There is exists a relationship between Challenges facing Batteries in each of the four Mobile Service Providers

Ha: There is no significant relationship between the Challenges facing Batteries in each of the four Mobile Service Providers in Kenya.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.726 (a)	12	.457
Likelihood Ratio	17.788	12	.122
Linear-by-Linear Association	3.270	1	.071
N of Valid Cases	93		

From the results above, the Pearson Chi-Square Asymp. Sig (2 sided)"* is 0.457 which is greater than 0.05. This shows that the Null Hypothesis is not true. Hence, there is no significant relationship between the Challenges facing Batteries in each of the four Mobile Service Providers in Kenya.

f) H5: There is exists a relationship between Challenges facing Air Conditioners in each of the four Mobile Service Providers

Ha: There is no significant relationship between the Challenges facing Air Conditioners in each of the four Mobile Service Providers in Kenya.

Table 7: Chi-Square test to test the Null Hypothesis, There is significant relationship between the Challenges facing AirConditioners in each of the four Mobile Service Providers in Kenya.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.588(a)	12	.017
Likelihood Ratio	29.377	12	.003
Linear-by-Linear Association	1.419	1	.234
N of Valid Cases	93		

ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
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From the results above, the Pearson Chi-Square Asymp. Sig (2 sided)"* is 0.017 which is less than 0.05. This shows that the Null Hypothesis is true. Hence, there is significant relationship between the Challenges facing Air Conditioners in each of the four Mobile Service Providers in Kenya.

III. DISCUSSIONS

This study has found out that the Mobile Service Providers in Kenya have minimal or no problem with sharing BTS shelters, Generators, Air Conditioners, Batteries and Steel towers. This has been illustrated by the percentage of respondents who were in agreement that these components can be shared. Despite the interest in sharing these components, there exist some challenges. This include: Asset Valuation and management, Stakeholder cost pressures and cultural alignment as the main challenges to site sharing in the context of open ICT infrastructure sharing in the Mobile Service industry. However, Asset Valuation and Management and Cultural alignment were found to be the major impediments to site sharing by Mobile Service Providers in Kenya. This study also found out that there is a significant relationship between challenges facing BTS shelters, Generators and Air Conditioners. This can be attributed to the fact that these components have minimal effect on Asset Valuation and Management, Shareholder cost pressure and cultural alignment. The study also found out that there is no significant relationship between challenges facing Steel towers, Batteries and Power supply in four Mobile Service Providers in Kenya. Further research needs to be conducted to ascertain the reasons why there is no significant relationship between challenges facing Steel towers, Batteries and Power supply in four Mobile Service Providers in Kenya.

IV. CONCLUSIONS

This study investigated the challenges of site sharing in the context of Open ICT infrastructure sharing by Mobile Service Providers. This study has found out that the Mobile Service Providers in Kenya have minimal or no problem with sharing BTS shelters, Generators, Air Conditioners, Batteries and Steel towers. Despite the interest in sharing these components, there are some challenges to site sharing. This include: Asset Valuation and management, Stakeholder cost pressures and cultural alignment as the main challenges to site sharing in the context of open ICT infrastructure sharing in the Mobile Service industry. However, Asset Valuation and Management and Cultural alignment were found to be the major impediments to site sharing by Mobile Service Providers in Kenya. Due to these challenges, there is need to formulate a proper legislative framework that governs how the Mobile Service Providers can share the components in a manner that does not create suspicions among them. CCK should take the lead in formulating these rules that will guide the Mobile Service Providers in promotion of site sharing. This study also found out that there is a significant relationship between challenges facing BTS shelters, Generators and Air Conditioners. This can be attributed to the fact that these components have minimal effect on Asset Valuation and Management, Shareholder cost pressure and cultural alignment. The study also found out that there is no significant relationship between challenges facing Steel towers, Batteries and Power supply in four Mobile Service Providers in Kenya. Further research needs to be conducted to ascertain the reasons why there is no significant relationship between challenges facing Steel towers, Batteries and Power supply in four Mobile Service Providers in Kenya.

V. ACKNOWLEDGEMENTS

Foremost, I would like to express my sincere gratitude to Dr. Maurice Sakwa for the continuous support of my research, for his patience, motivation, enthusiasm, and immense knowledge. I that the Almighty God for him. His guidance helped me in all the time of research and writing of this study. I could not have imagined having a better advisor and mentor for my study. Last but not the least; I would like to thank my family: my wife Judith Orony and my son Troy Mulati for supporting me spiritually throughout my life.

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Vol. 2, Issue 7, July 2013

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