PUBLIC SECTOR ICT SURVEY REPORT 2016

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**PUBLIC SECTOR ICT
SURVEY REPORT 2016**

Foreword

This report is the outcome of an extensive process that spanned several months and benefited from inputs of stakeholder institutions, experts and users. It is the first dedicated Public Sector ICT survey 2016 for public institutions in Kenya covering over 800 entities and provides information for a wide range of indicators. The Communications Authority of Kenya (CA) and the Kenya National Bureau of Statistics (KNBS) jointly carried out the Public Sector ICT survey 2016 to provide comprehensive information on ICT.

The Kenya Vision 2030 identified ICTs as a key enabler to the attainment of its goals and aspirations. In the vision, the ICT sector is envisaged to transform Kenya into knowledge and information-based economy by enabling access to quality, affordable and reliable ICT services which plays an important catalytic role in the economic and social development of the country.

The main objective of the survey was to measure access to and use of ICT by the public institutions in Kenya. The results of the survey will be useful in informing policy makers, investors, academicians and business leaders on the current uptake of Information and Communication Technologies (ICTs) in the country.

The finding of the Public Sector ICT Survey 2016 provides ICT baseline indicators on availability of ICT, access to and use of ICTs, availability of ICT infrastructure and application, provision of services through e-government platform, the extent of use of E-procurement and the existence of ICT policies in public institutions. We are confident that this report will become a key reference document for those involved directly or indirectly in making policy and business decisions on ICT.

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Acknowledgement

Acronyms

CA	Communications Authority of Kenya
FTTO	Fiber to the Office
ICT	Information Communication Technology
ICTs	Information Communication Technologies
IFMIS	Integrated Financial Management Information System
ISIC	International Standard Industrial Classification
ITU	International Telecommunications Union
KNBS	Kenya National Bureau of Statistics
Ke-CIRT/CC	Kenya National Computer Incident Response Team/Coordination Centre
SDGs	Sustainable Development Goals
UNCTAD	United Nations Conference on Trade and Development
UNECA	United Nations Economic Commission for Africa
UNEP	The United Nations Environment Programme

Executive Summary

The role of Information and Communication Technology (ICT) in public sector operations and service delivery is well documented and its impact is undeniable. This report provides a reference for baseline indicators on access to and use of ICTs in the country's public institutions. The findings are based on percentage (proportion) as the method of analysis.

The use of computers was reported by 75.1 per cent of public sector employees in 2015 with slightly higher use among males than females. However, 95.6 per cent of surveyed institutions reported to have used a computer. The ownership of mobile phone was high in public institutions at 65.8 per cent. However, only 20.7 per cent and 19.2 per cent of the institutions operated mobile payment and mobile money accounts, respectively. The use of both mobile payment and money accounts was high in learning institutions and state corporations. About 50.0 per cent of the surveyed public institutions had a fixed telephone number.

The survey also established that 80.2 per cent of the sampled institutions had Internet connection in their premises mainly through fixed broadband at 64.4 per cent, while 52.0 per cent had mobile broadband. Hospitals reported to have the highest use of mobile broadband at 65.7 per cent. About a third (36.3 per cent) of the institutions reported to have had an intranet in 2015. Having web presence allows an institution to serve the public better. A total of 57.5 per cent of public institutions reported to have a web site. In 2015, 63.7 per cent of the public institutions had Local Area Network (LAN), with 69.9 per cent of the employees reporting to have routinely used the Internet. At least 58.0 per cent of the institutions used one form of social media in 2015.

The provision of government services online (e-government) was reported by 43.4 per cent of the public institutions. The provision of services online reduces the need for physically visiting the government offices to receive such services. The delivery of e-government services was highest among learning institutions and state corporations at 74.3 per cent and 60.2 per cent, respectively. The use of cloud computing was reported by 35.8 per cent of institutions while the presence of e-procurement facility was reported by 44.2 per cent of public institutions who had a website. The commonly cited benefits of the e-procurement platform were; reduced corruption and fraud and increased transparency of processes. However, commonly cited challenges with e-procurement system was system slowdown and failures. Slightly less than half (48.1 per cent) of public institutions had an ICT policy in place while 43.4 per cent of them had an ICT security policy. The survey findings indicate that, 45.5 per cent of the public institutions were aware of ICT equipment waste disposal methods.

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Institutions that responded	890
Sampled Institutions by category	
County Government	306
Hospitals (Level 4 and 5 hospitals)	251
State Corporations	211
National Government (includes Judiciary and Legislature)	75
Learning institutions	35
Constitutional Commissions/ Independent offices	12
Core Indicators	**Per cent**
EG1: Proportion of persons employed using a computer	75.1
EG2: Proportion of persons employed using Internet	69.9
EG3: Proportion of institutions with Local Area Network (LAN)	63.7
EG4: Proportion of institutions with intranet	36.3
EG5: Proportion of institutions with Internet access, by type of access	
Fixed broadband	64.4
Mobile broadband	52.0
EG6: Proportion of institutions with web presence	57.5
Country Specific Indicators	**Per Cent**
Proportion of institutions with mobile telephone number	65.8
Proportion of institutions with fixed telephone number	49.2
Proportion of institutions with facsimile	21.6
Proportion of institutions with mobile money account	19.2
Proportion of institutions with mobile payment account	20.7
Proportion of institutions using a computer	95.6
Proportion of institutions with Internet connection in their premises	80.2
Proportion of institutions accessing Internet elsewhere	17.8
Proportion of institutions using the Internet by type of activity:	**Per cent**
Internet banking	31.4
Accessing other financial services	36.8
Staff training	42.0
Sending or receiving email	98.3
Telephoning over the Internet/ VoIP including video conferencing VoIP	22.5
Use of instant messaging such as Whatsapp etc	55.2

Table 0: Summary of the survey findings

Use of social media e.g. Facebook for work purpose	56.5
Internal or external recruitment	31.5
Providing public services	52.3
Data collection	58.8
Research	51.4
Receiving feedback from public	52.0
Purchasing/ ordering goods and services	43.0
Tracking of goods and services	21.0
Advertising	43.4
Selling goods and services	10.6
Sending and Receiving information	0.9
Proportion of institutions offering e-government services	43.4
Proportion of institutions using cloud computing	35.8
Proportion of institutions using cloud computing, by type of service	**Per cent**
Email and messaging	83.2
Data storage	63.9
Application hosting	40.2
Desktop/office software	29.7
Server capacity	23.1
Content management system/ Document management system	19.9
Finance and enterprise resource planning	11.7
Customer relationship Management	9.8
Application development	9.5
Business Intelligence	4.7
Business process manager on cloud	4.4
Business specific	3.8
Enterprise Service Bus	0.9
Benefits accrued from use of cloud computing in institutions	**Per cent**
More flexibility	82.6
Cost savings	74.8
Improved security	55.5
Complexity reduction (Simplicity)	46.7

Table 0: Summary of the survey findings

Better scalability	45.1
Disaster recovery	43.8
Automatic Software updates	39.7
Collaboration	38.5
More (Core) business focus	20.8
Reasons for not using cloud computing in institutions	**Per cent**
Insufficient knowledge within the organization	53.1
The cost is high	26.0
Insufficient regulatory framework	24.6
Security concerns	19.1
No need	10.9
Lack of technical capacity	3.8
Under development	0.8
Lack of guiding policy	0.2
Proportion of institutions with future plans to adopt cloud services, by timeline	**Per cent**
No plan	50.4
More than 12 months	27.2
Within 12 months	16.7
Proportion of institutions hosting website Locally	83.6
Proportion of institutions hosting website Internationally	15.0
Reliability	72.7
Security	58.4
Cost	41.6
Technical know how	27.3
Institution's policy	7.8
Proportion of institutions using social network by type	58.0
Social networking sites such as Facebook, Google+	85.1
Microblog sites such as Twitter	58.5
Instant messaging such as WhatsApp	45.0
Video sites such as You tube	27.9
Linked-In	14.9
Photo sites such as Flicker, Instagram and others	9.1
Blogs such as WordPress, Blogspot and others	8.9

Table 0: Summary of the survey findings

Proportion of institutions with intranet by type of information shared	Per cent
The general policy or strategy of the industry/sector	57.2
Internal company newsletter or daily news	49.5
Day to day/ working documents	83.7
Publications, manuals, guides or training materials	67.4
Product or services catalogues	40.6
Pictures/ video files	48.6
Communication and Management tools	7.7
Proportion of institutions using specialized applications for human resource	56.5
Proportion of institutions using e-procurement system	44.2
Proportion of institutions selling goods online	19.9
Benefits accrued from use of e-procurement	Per cent
Reduced corruption and fraud	73.1
Increased transparency	72.3
Reduced transaction time	69.5
Improved quality of customer service	52.5
Increased efficiency due to competition	48.0
Track suppliers	47.3
Lower transaction costs	46.7
Track customers	23.8
Increased sales volume and/ or number of customers	13.1
None	6.0
Challenges encountered in e-procurement	Per cent
System slow down	80.4
System failure	69.6
Lack of skills among staff	58.1
Security concerns	20.2
None	3.4
lack of infrastructure/Equipment	2.6
System Maintenance	2.4
System Incompatibility	0.8
Proportion of institutions with IT policy	48.1

Table 0: Summary of the survey findings

Proportion of Institutions with ICT Security Policy	43.4
Proportion of institutions aware of National KE-CIRT/CC	26.9
Proportion of Institutions with IT Security Measures	**Per cent**
Anti-virus	96.4
Computer password	91.9
Regular back up of data critical to your business operations	54.1
Firewall	49.8
Anti-spyware	41.2
Spam filter	39.4
Authentication software or Hardware for Internal users	35.6
Secured communication between clients and servers	33.4
Off-site data backup	30.8
Intrusion detection system	16.9
Authentication software or hardware for external users	15.8
No response	2.8
Proportion of Institutions that experienced cyber-crime by type	**Per cent**
None	47.5
Computer virus	44.8
Hacking	7.1
Phishing	4.4
Website vandalism	3.7
Identity theft	2.2
Theft of information (online)	2.0
Theft of money (online)	0.3
Proportion of institutions aware of modes of disposing electronic waste	45.5
Proportion of institutions with e-waste management	34.1
Proportion of institutions disposing ICT equipment by method of disposal	**Per cent**
Sold	17.1
Waste bin	28.4
Sent for recycling	7.2
Donation	8.5

Chapter 1:   Introduction

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1.1   Background

There is a growing recognition that the use of information and communication technologies (ICTs) by the public sector can improve efficiency in delivery of government services to the citizenry. The provision of government services online (e-government) and innovations offers significant opportunities for transforming the public administration into an instrument of sustainable economic growth and development.

The Government of Kenya has identified ICTs as a key enabler to the attainment of Vision 2030 goals and its aspirations. The thrust of the vision with regard to the ICT sector is to transform Kenya into a knowledge and information based economy by enabling access to quality, affordable and reliable ICT services through innovation and e-government. This leads to a more efficient public administration, provision of better services and response to demands and enhancing transparency and accountability. E-government can help institutions go-green and promote effective natural resource management, as well as stimulate economic growth and promote social inclusion, particularly for the disadvantaged and vulnerable groups. The use of ICTs in government also facilitates knowledge sharing, skills development, transfer of innovative e-government solutions, capacity-building for sustainable development as well as acting as catalyst for new employment.

Information and Communication Technology (ICT) provides the underpinning platform for the growth of digital economy in which production, distribution and consumption depend on broadband networks and services which act as a critical enabler for sustainable development. All the three pillars of sustainable development namely; economic development, social inclusion and environmental protection need ICTs as key catalysts in achieving the seventeen sustainable development goals (SDGs) and the 169 targets. ICT has tremendous potential to accelerate achievement of all the SDGs by enhancing capability to measure progress toward all the SDGs, providing opportunities to streamline and enhance the efficiency and effectiveness of the activities for development landscape and provide access to new digital enabled products and services that strengthen local economies, local innovation and local communities.

Kenya National Bureau of Statistics (KNBS) and Communications Authority of Kenya (CA) jointly carried out public sector ICT survey 2016 with technical assistance from United Nations Conference on Trade and Development (UNCTAD). The generation of data through these specialized surveys is crucial in measuring the progress of the information society and ICT related goals and targets in the SDGs. This report provides an analysis of the Kenyan situation in terms of availability of ICT infrastructure, access and use of ICT applications in the public sector in different dimensions.

1.2   Justification

There is need for quality and comprehensive statistics on ICT infrastructure and use of its applications necessary for use by policy makers, academicians, and technologists to make better decisions towards improving the ICTs and to foster economic development.

1.3   Objectives of the Survey

The main objective of the survey was to measure access to and use of ICTs in the public sector. The specific objectives of the survey were to:

a) Measure the access to and use of ICTs by government institutions

b) Measure availability of ICT infrastructure and application in government

c) Measure the supply of e-government services to citizens

d) Generate ICT baseline indicators for government

e) Measure the penetration of e-procurement in public institutions

f) Establish the existence of ICT related policies in public institutions

1.4   Legal, Regulatory and Institutional Framework

The Public Sector ICT survey 2016 was conducted under the Statistics Act, 2006. The Act empowers KNBS to collect, compile, analyse, publish and disseminate statistical information and to co-ordinate the National Statistical System (NSS). The Act provides for confidentiality of information provided by the respondents. The NSS comprises of government ministries, departments and agencies and users of official statistics. The Act encourages collaboration among institution for the purpose of producing and promoting the use of statistical information.

Chapter 2:   Methodology

2.1   Survey Design

The Public Sector ICT survey 2016 was designed to provide reliable estimates on access to and use of ICTs in public institutions at national level. The survey targeted the National Government, County Governments, State Corporations, Learning Institutions, Constitutional Commissions and Independent Offices and Hospitals.

The sample was stratified based on public institution category, and institution size as per the recommendations of the manual for measuring e-government, prepared by United Nations Economic Commission for Africa (UNECA). Table 2.1 shows the distribution of the targeted institutions by category and response rate. A total of 1,030 institutions were sampled. Out of these, 890 institutions responded translating to an overall response rate of 86.4 per cent.

Table 2. 1: Distribution of Sampled Public Institutions and Response Rate

Institution Category	Number of Sampled Institutions	Number of Institutions that Responded	Response rate (Per cent)
National Government including institutions under Judiciary and Legislature	75	75	100.0
County Governments	344	306	89.0
State Corporations	313	211	67.4
Constitutional Commissions/ Independent offices	12	12	100.0
Learning Institutions	35	35	100.0
Hospitals (level 4 and 5)	251	251	100.0
Total	**1,030**	**890**	**86.4**

2.2   Survey Instruments

Data collection instruments comprising of the questionnaire and survey manual were developed by a technical team from KNBS, Communications Authority of Kenya and UNCTAD. A stakeholder workshop was held to review the survey instruments. The participants in the stakeholder's workshop included representatives from Government Ministries, Departments, Agencies and private sector.

The Public Sector ICT survey 2016 questionnaire, was designed in line with the guidelines from manual for measuring e-government, United Nations Economic Commission for Africa (UNECA); World Telecommunication/ICT Development Report 2010, International Telecommunication Union (ITU); manual for the production of statistics on the information economy, revised edition United Nations Conference on Trade and Development (UNCTAD); and methodological manual for statistics on the information society from Eurostat. Additional indicators were included to meet domestic requirements for planning and policy making.

The questionnaire collected the following information;

- General information of the institution
- Use of ICT infrastructure
- Ownership, access and use of Internet
- Use of mobile phone applications
- Use of communication applications such as website, email and social media
- Use of ICT applications such as cloud computing, e-commerce
- Existence of ICT policies in security and e-waste management
- Expenditure on ICT in institutions
- Perception on the use of ICTs

2.3   Training

To ensure consistency and quality of data, an instructions manual was developed for training and for reference by survey personnel. It contained instructions on how to administer the questionnaire and definition of concepts.

2.4   Data Collection

The fieldwork procedures involved distribution of questionnaires to the respondents, face-to-face interviews and follow-up to collect the completed questionnaires. A total of eighty-one (81) research assistants, grouped into twenty-seven teams, were deployed to administer the questionnaires. The deployment of teams to counties was done according to the number of sampled public institution in a particular region. To enhance the response rate, public awareness and sensitization workshop was held and press advertisements were placed in the local dailies.

2.5   Data Processing

Data processing entailed data editing, entry, cleaning and analysis. Data entry was done using CSPro software Version 6.2 running on desktop computers. Data editing guidelines were developed for use by data editing personnel. To minimize errors and to ensure data quality, all questionnaires were double-entered and internal consistency checks performed. Data editing which involved consistency checks in the questionnaires were done concurrently with data entry.

Data cleaning and validation involved elimination of duplicates and checking for proper classification of public institutions in the data set. All similar responses in the 'other specify' category in the dataset were also merged and coded for ease of analysis. Data validation was based on edit specifications which were used to check for structural and internal data inconsistencies resulting from response errors. Data were analysed using the Statistical Package for Social Sciences (SPSS) software Version 21. The generation of tables was guided by a tabulation plan.

Chapter 3:   ICT Devices and Use

3.1   Institutions with Telephones

3.1.1   Use of mobile phones

The survey sought to establish the use of mobile phones in the sampled institutions. For purposes of the survey, a mobile phone includes smart phones but excludes tablets and phablets. The mobile phone was for exclusive use by an institution for its official communication. Overall, 65.8 per cent of the public institutions indicated that they had an official mobile phone while 28.1 per cent did not have as illustrated in Figure 3.1.

Figure 3. 1: Proportion of Institutions with Mobile Phones

28.1

6.1

65.8

■ With Mobile Phones   ■ Without Mobile Phones   ■ Non-Response
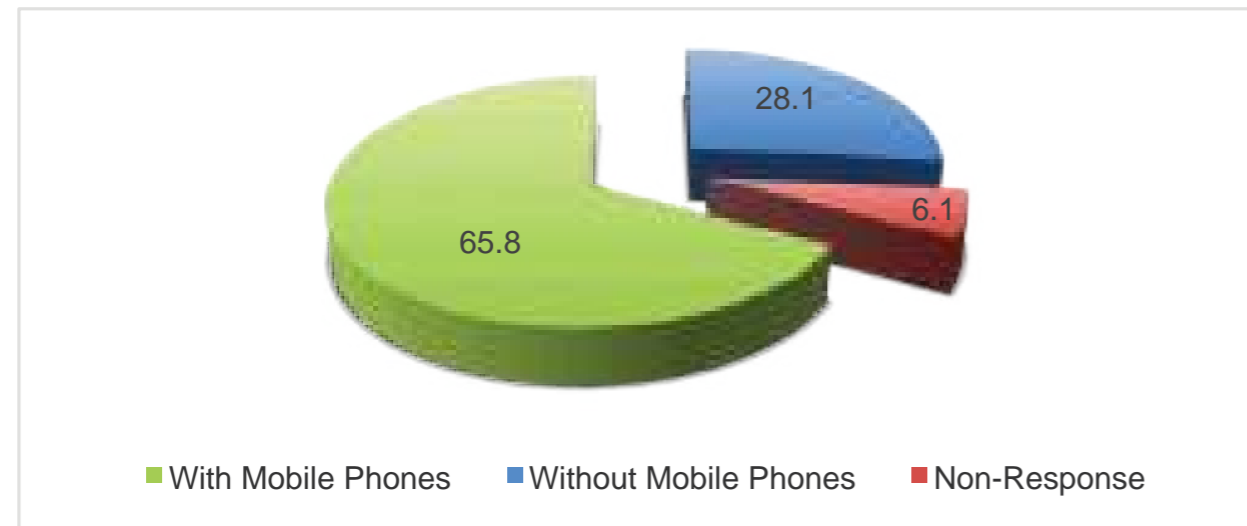
Figure 3. 2: Proportion with Mobile Phones by Institution category
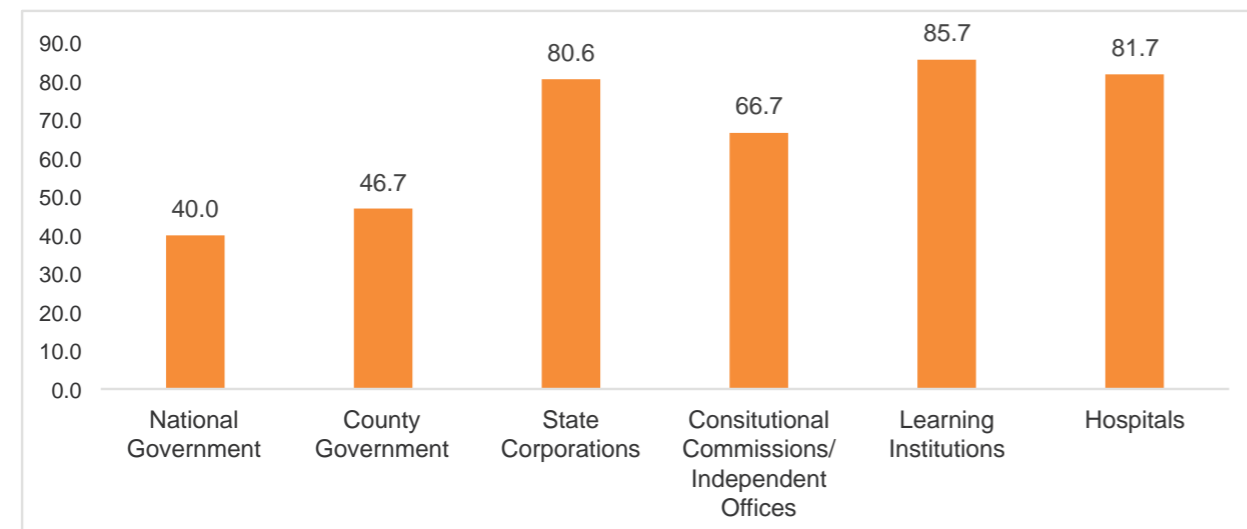
Learning institutions had the highest proportion (85.7 per cent) of public institutions with a mobile phone followed by hospitals (81.7 per cent) and state corporations (80.6 per cent) as shown in Figure 3.2. The use of Mobile Phone as a channel for official communication is still low in the National and County government at 40.0 per cent and 46.7 per cent, respectively.

3.1.2   Fixed Telephone

Overall, 49.2 per cent of the public institutions reported to have fixed telephones as presented in Figure 3.3. All Constitutional Commissions and Independent Offices had fixed telephones. Most State Corporations (80.6 per cent) and Learning Institutions (80.0 per cent) had fixed telephones.

Figure 3. 3: Proportion of Institutions with Fixed Telephone
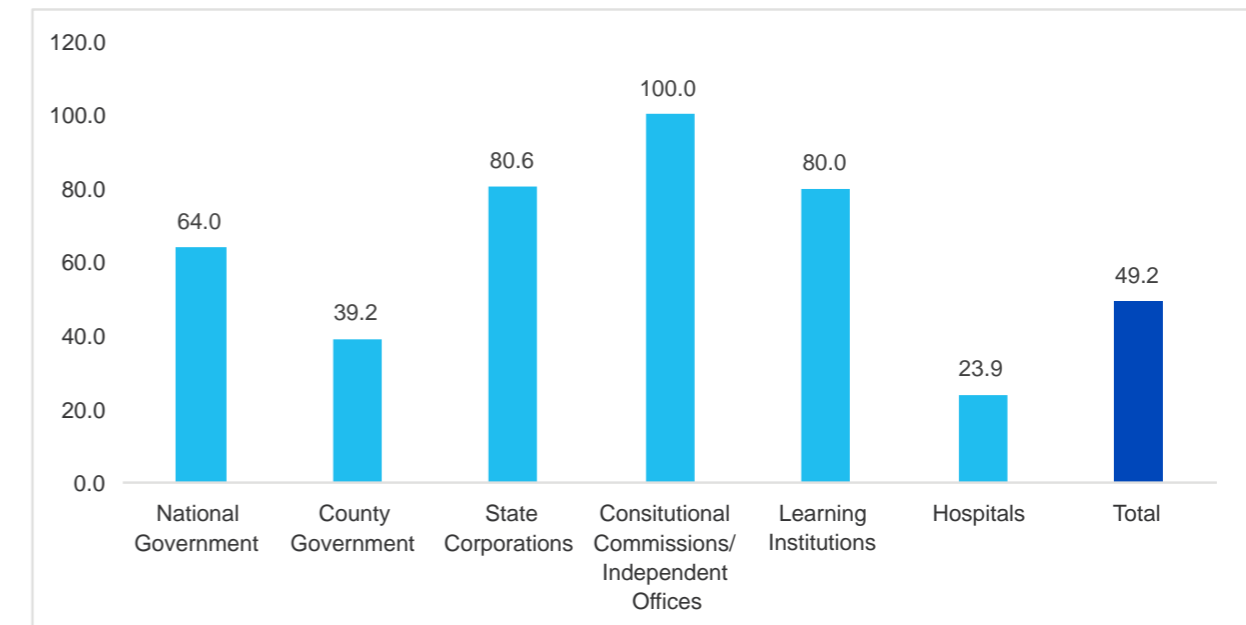
3.1.3   Facsimile

According to the findings, 21.6 per cent of public institutions had facsimile with the highest proportion being in the National Government category at 48.0 per cent. Only 7.2 per cent of hospitals had fax machines as presented in Figure 3.4.

Figure 3. 4: Proportion of Institutions with Facsimile (Fax)
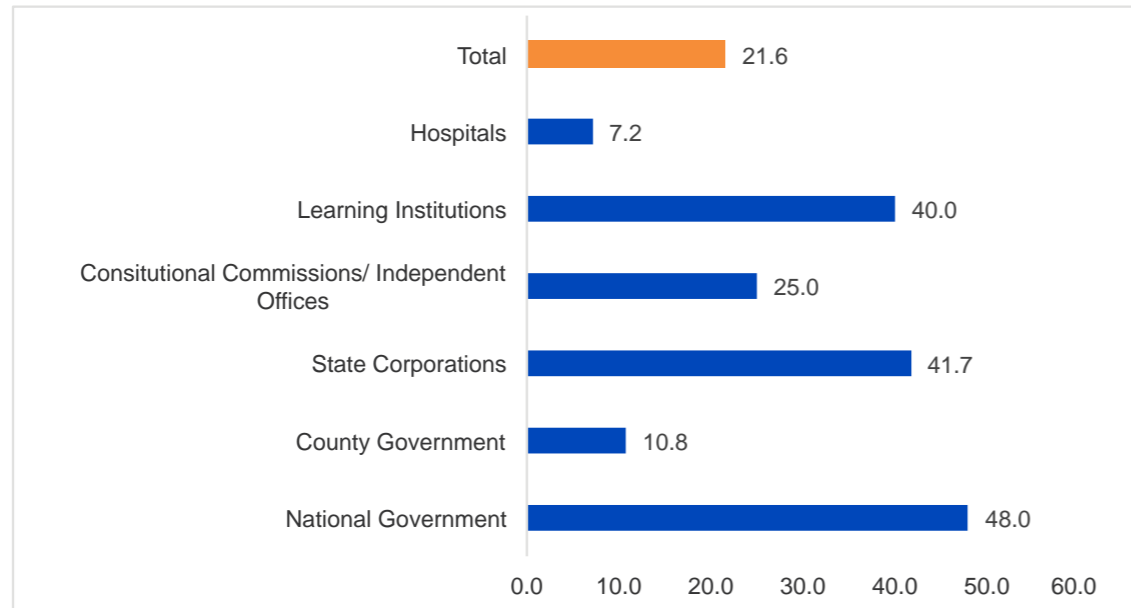
3.2   Mobile Money Platform

3.2.1   Mobile Money Accounts

Figure 3.5 shows the proportion of public institutions with mobile money accounts which include M-pesa, Airtel Money and Orange money. The survey findings reveal that mobile money accounts were not common in public institutions. About 2 in 10 surveyed institutions reported to have a mobile money account with Learning Institutions and State Corporations posting the highest proportions at 45.7 per cent and 41.2 per cent, respectively.

Figure 3. 5: Proportion of Institutions with Mobile Money Account
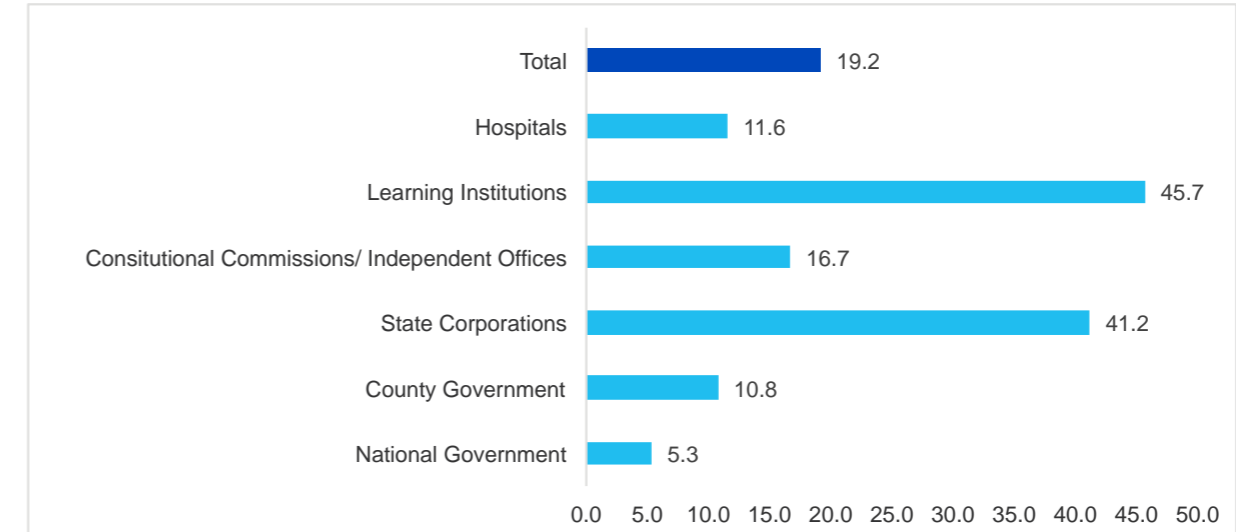
3.2.2   Mobile Payment Accounts

The proportion of public institutions with mobile payment accounts are shown in Figure 3.6. Overall, 20.7 per cent of the public sector institutions had a mobile payment account. The highest proportion of institutions with mobile payment account were Learning Institutions (48.6 per cent) and State Corporations (44.5 per cent) with few institutions from National government (5.3 per cent) reporting to have had an account.

Figure 3. 6: Proportion of Institutions with Mobile Payment Account
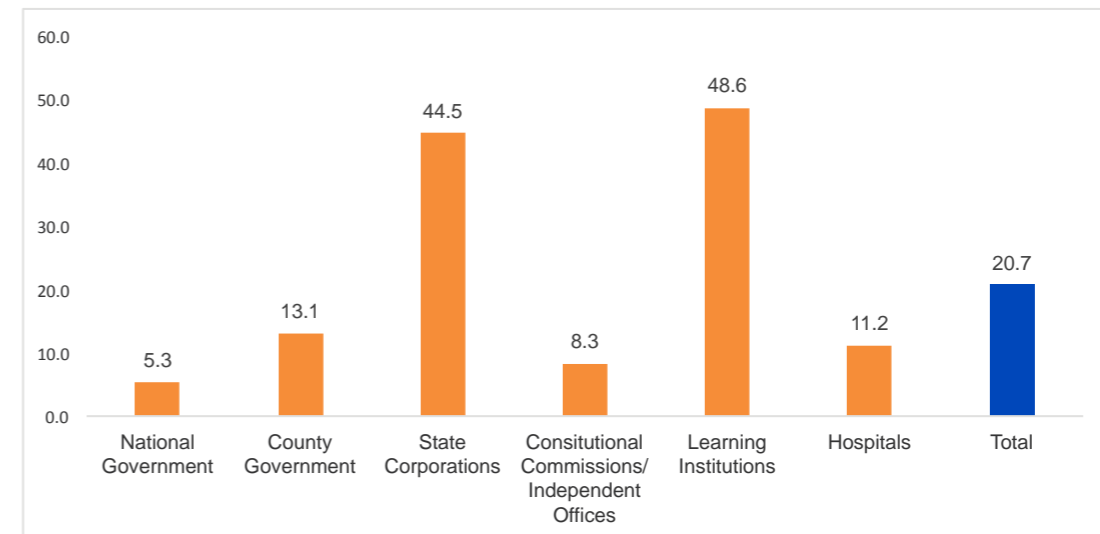
3.2.3   Use of Computer and Other ICT Devices

Figure 3.7 shows the proportion of employees who routinely used a computer in 2015. The findings show that 75.1 per cent of employees in the public sector used a computer. Out of those who used computer routinely, 76.1 per cent were male while 73.5 per cent were female.
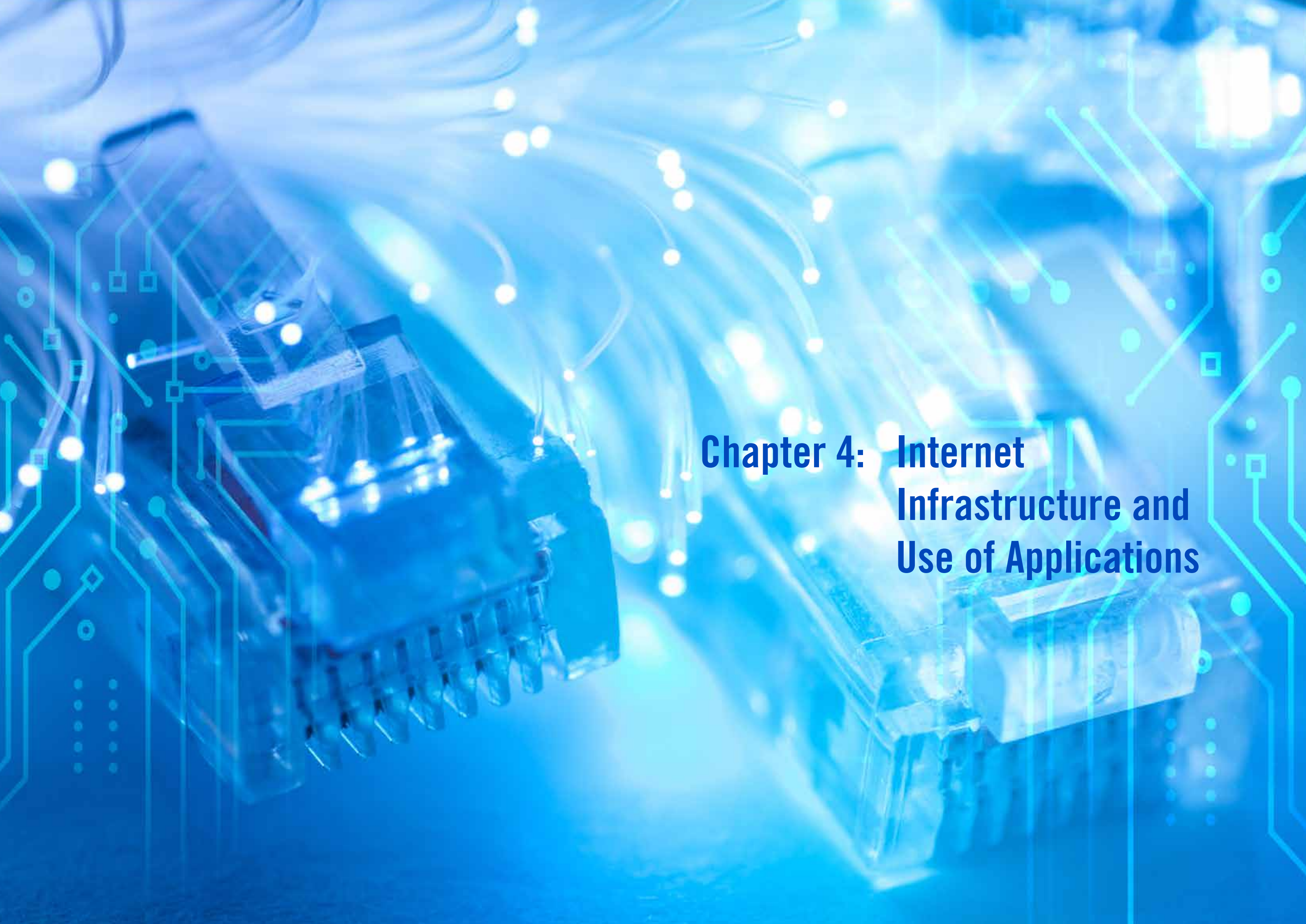
Figure 3. 7: Proportion of Employees Using a Computer by Sex
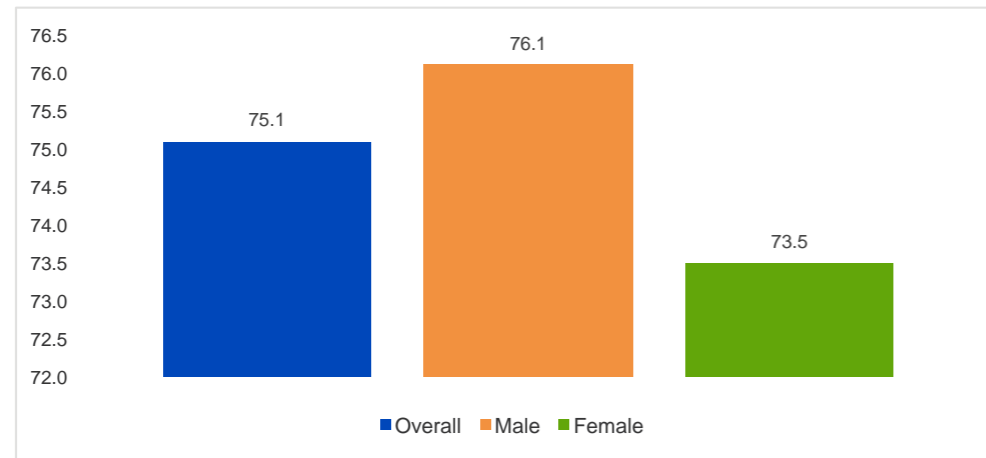
The provision of ICT devices to employees enhances sharing of documents and conducting office work more effectively. As shown in Table 3.1, at least 81.3 per cent of the surveyed public institutions provided their employees with modems for Internet connection while 65.1 per cent of them provided employees with a tablet or phablet. About 64.0 per cent of the institutions provided their employees with mobile phones. Sim cards were the least provided devices to employees as reported by 42.8 per cent of the institutions. More males than females were found to have been provided with a mobile phone, modems and sim cards in the National Government except tablets where the provision was in equal proportions. The provision of devices in institutions under County government category was largely in favour of males with significant disparities reported in items such as tablets and mobile phone.

Table 3. 1: Proportion of Institutions Providing their Employees with Selected ICT Devices

Selected ICT Devices	Sex	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Tablet/ Phablet	Male	34.7	44.4	55.9	50.0	51.4	9.6	**36.9**
	Female	34.7	26.5	48.3	50.0	51.4	7.2	**28.2**
	Total	69.3	70.9	100.0	100.0	100.0	16.7	**65.1**
Mobile Phone	Male	28.0	36.9	36.0	50.0	42.9	23.5	**32.6**
	Female	24.0	26.5	39.8	50.0	40.0	28.7	**30.9**
	Total	52.0	63.4	75.8	100.0	82.9	52.2	**63.5**
Modems	Male	30.7	49.0	39.8	16.7	37.1	42.6	**42.6**
	Female	26.7	40.8	36.5	25.0	37.1	42.6	**38.8**
	Total	57.3	89.9	76.3	41.7	74.3	85.3	**81.3**
Sim cards	Male	10.7	19.3	23.7	16.7	42.9	22.7	**21.5**
	Female	9.3	16.0	27.5	8.3	42.9	23.9	**21.3**
	Total	20.0	35.3	51.2	25.0	85.7	46.6	**42.8**

Chapter 4: Internet Infrastructure and Use of Applications

4.1   Internet in Government

The global spread of the Internet and the application of Information and Communication Technologies (ICTs) is fundamental for government and its benefits can only be harnessed effectively through an inclusive approach. Harnessing ICT in government requires provision of relevant infrastructure and online government services coupled with building capacity in human capital. E-government is a unique platform for innovation, creativity, economic opportunity and social inclusion, which can make a major contribution towards enabling social and economic change. It can transform how government interacts with citizens, businesses and other agencies hence offering new ways of addressing development challenges. The Public Sector ICT survey 2016 included indicators on availability, access and use of Internet and government services offered online. This chapter highlights findings on the use of cloud computing, e-procurement and use of social media.

4.1.1   Internet Availability

The measure of Internet availability collected through the survey were fixed and mobile broadband. The fixed broadband includes cable modem, copper line, fiber to the office, satellite and fixed wireless while mobile broadband entails phones and modems. The survey findings indicate that 80.2 per cent of the public institutions had Internet in their premises. The highest proportion of institutions with Internet availability were constitutional commissions and independent offices and learning institutions as seen in Figure 4.1. Hospitals had the lowest proportion of institutions with Internet availability at 63.3 per cent.

Figure 4. 1: Proportion of Institutions with Internet
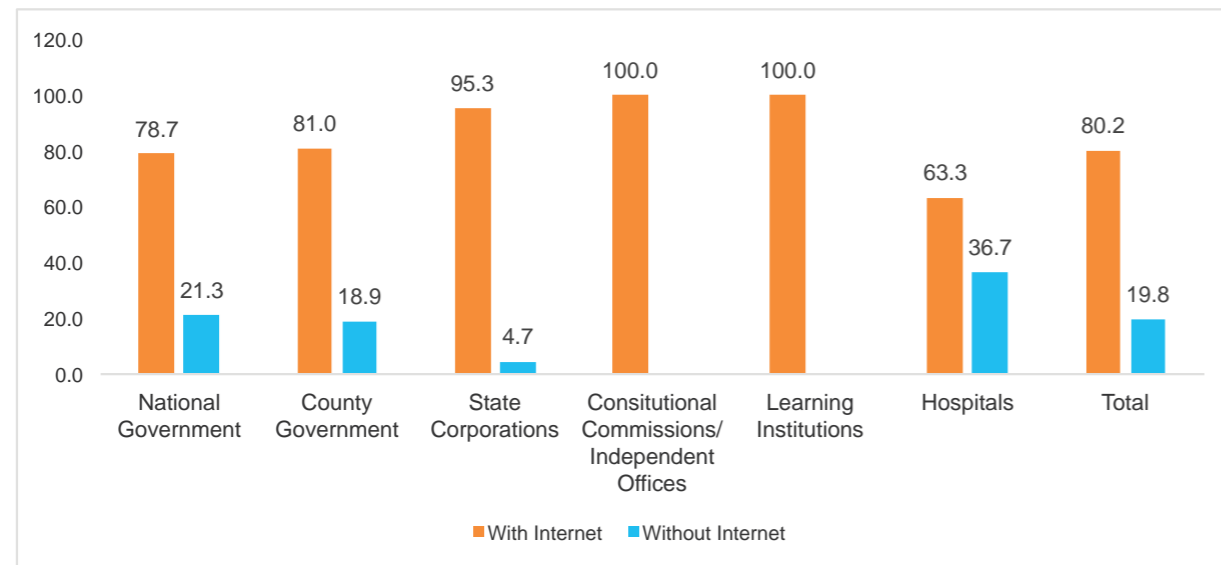
Figure 4.2 shows the proportion of institutions who did not have Internet in their work environment but accessed it either in other offices or in cyber cafés. Out of the total institutions without Internet in their premises, 89.8 per cent of them accessed Internet elsewhere. About 10 per cent of the institutions who did not have Internet in their premises did not access it in any other place.

Figure 4. 2: Proportion Accessing Internet Elsewhere by Institution Type
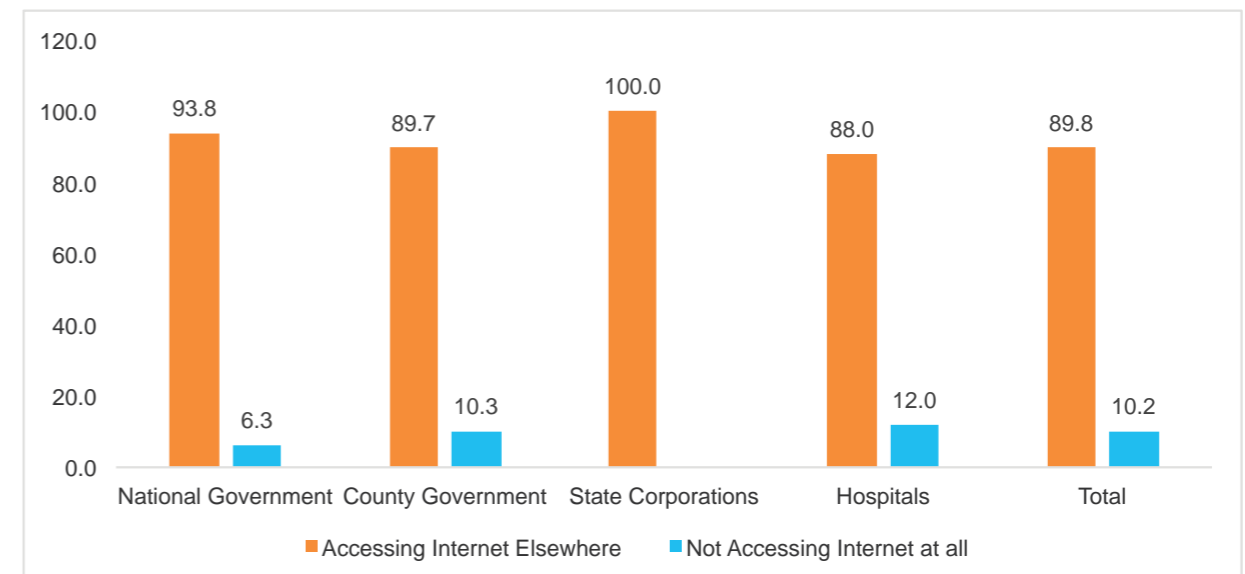
4.1.2   Broadband

Among institutions with Internet, 64.4 per cent had fixed broadband while 52.0 per cent had mobile broadband as seen in Figure 4.3. About 91.7 per cent of the institutions under Constitutional commissions and Independent offices used fixed broadband while hospitals had the largest proportion (65.7 per cent) of institutions using mobile broadband. Learning institutions category had the lowest proportion of institutions using mobile broadband at 28.6 per cent.

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Figure 4. 3: Proportion of Institutions Using Broadband by Type
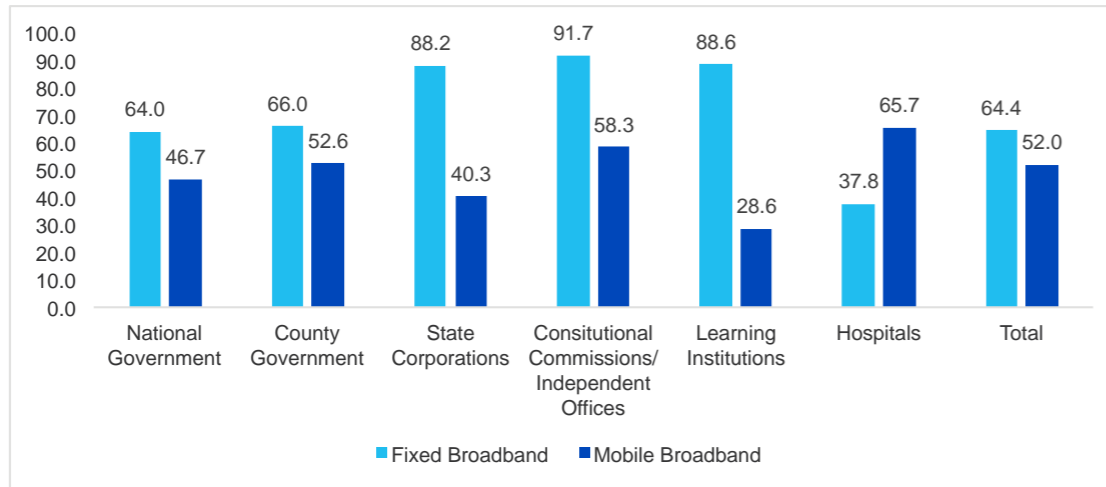
4.1.2.1   Fixed Broadband

Figure 4.4. shows the proportion of institutions with fixed broadband by type. Out of the institutions with fixed broadband, 55.8 per cent had Fiber to the Office (FttO), 44.0 per cent used fixed wireless. The least used were Satellite and Copper line at 6.6 per cent and 6.3 per cent, respectively.

Figure 4. 4: Proportion of Institutions with Fixed Broadband by Type
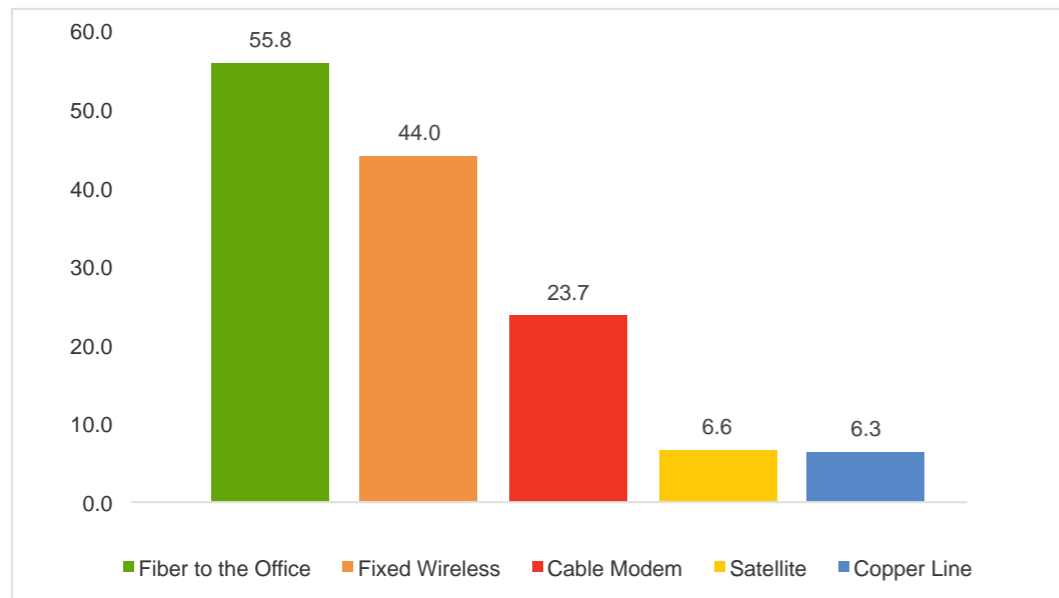
Figure 4.5 shows the distribution of institutions by type of fixed broadband connections used. All institutions under the Constitutional Commissions and Independent offices category used Fiber to the Office (FttO) while 27.3 per cent used fixed wireless. Slightly more than half (52.6 per cent) of the Hospitals used cable modem, while 54.5 per cent of institutions under County government used fixed wireless.

Figure 4. 5: Proportion of Institutions by Type of Fixed Broadband Used
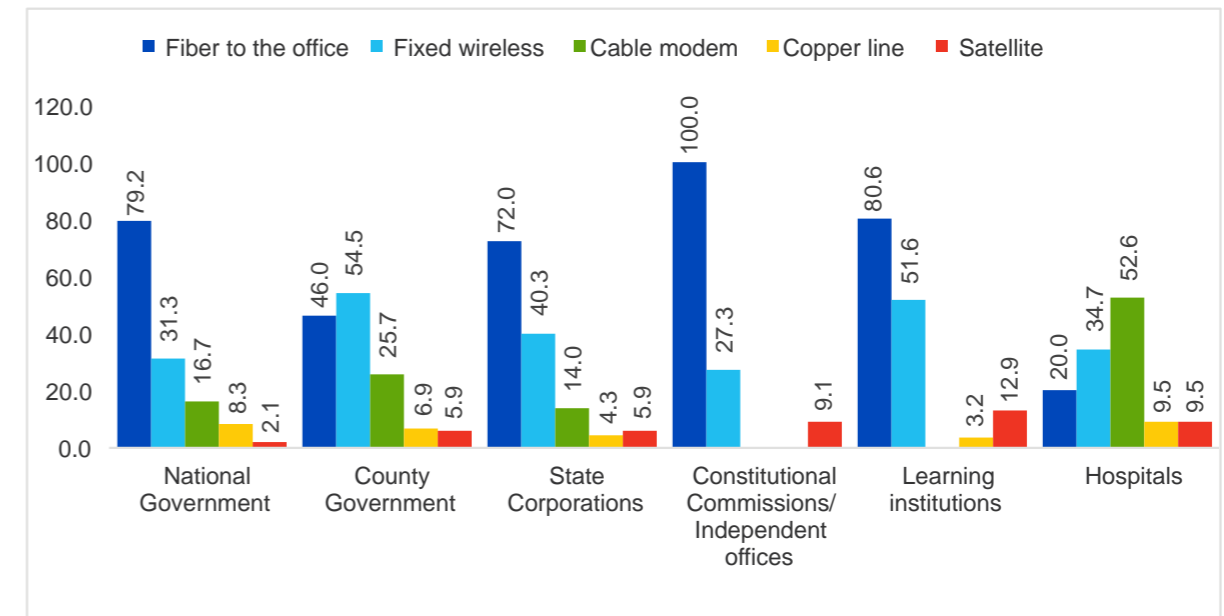
4.1.2.2   Mobile Broadband

Almost half (47.0 per cent) of the institutions using mobile broadband used modems while 23.5 per cent of them used mobile phones. The use of modems in institutions was higher in Hospitals at 62.2 per cent while 33.3 per cent of Constitutional Commissions and Independent offices used mobile phones as seen in Figure 4.6.

Figure 4. 6: Proportion of Institutions with Broadband by Type
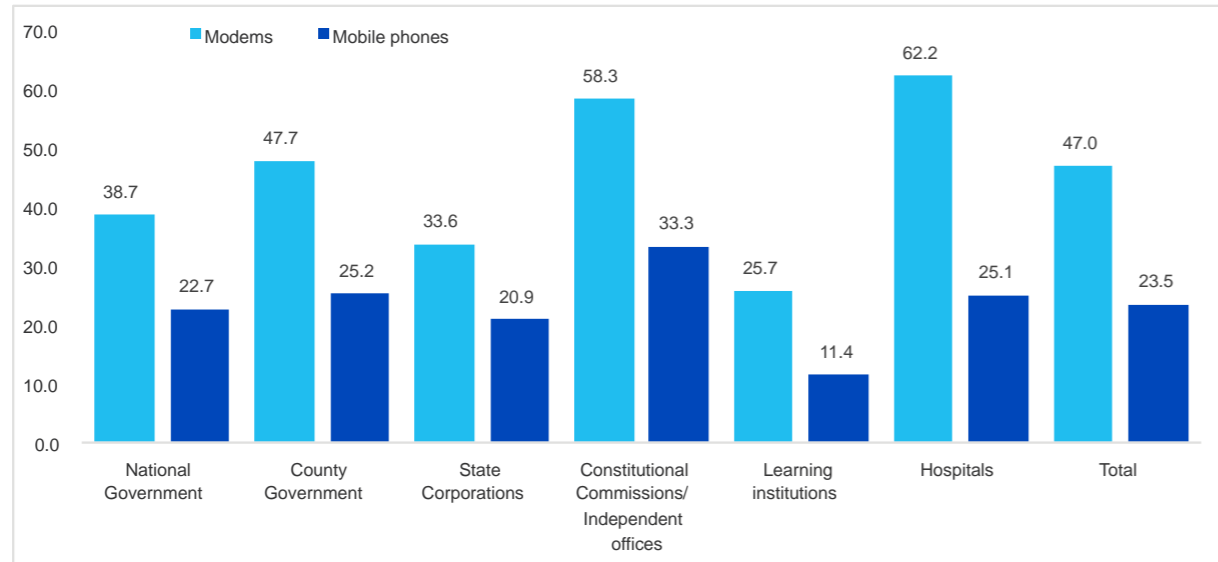
4.1.3 Use of Internet by Type of Activity

Figure 4.7 presents the proportion of institutions using Internet by type of activity. From the survey findings, 98.3 per cent of the public institutions used Internet to send and receive emails. The least activity carried out online was tracking of goods and services reported by 21.0 per cent of the institutions as seen in Figure 4.7.

Figure 4. 7: Proportion of Institutions Using Internet by Type of Activity
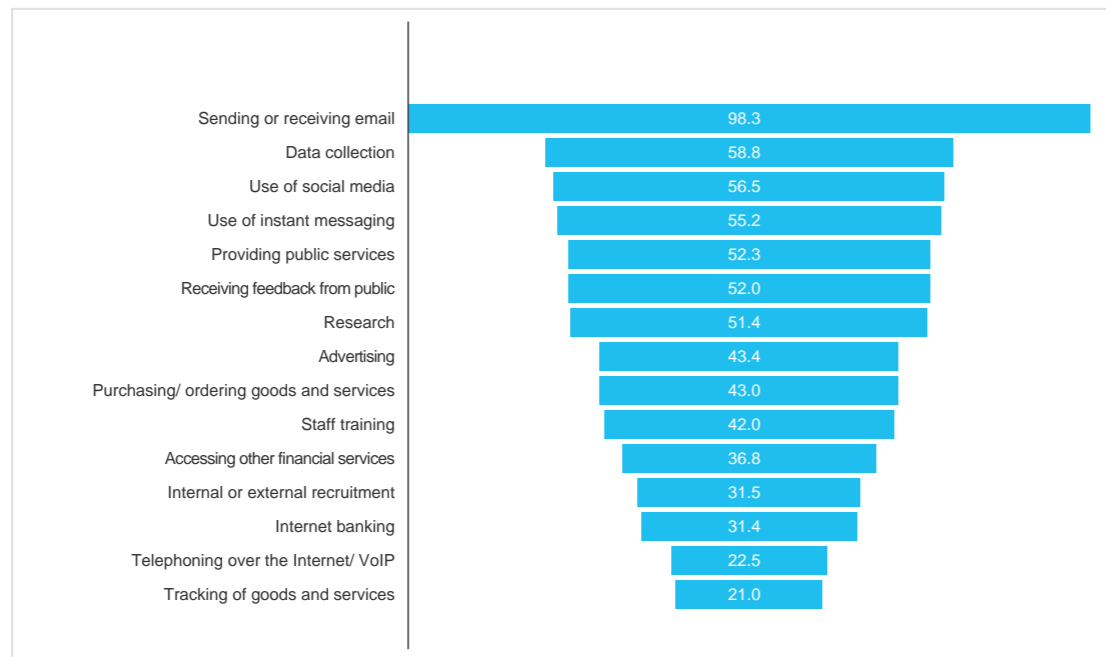
4.1.4 E-government Services

E-government services are referred to as government services offered through online platform and are accessible to citizens, agencies and other users. The services provided via online reduce the need for physically visiting the government offices to receive such services. E-government ensure timely service delivery to the citizens at minimal costs by saving on time and transportation costs.

The public sector has embraced the use of Internet with at least 43.4 per cent of the institutions reporting to have offered e-government services. About 74.3 per cent of the Learning institutions offered their services online while 24.7 per cent of the Hospitals reported to have offered some services online as seen in Figure 4.8. This could probably be explained by the difference in nature of services offered by each institutions.

Figure 4. 8: Proportion of Institutions Offering E-government Services
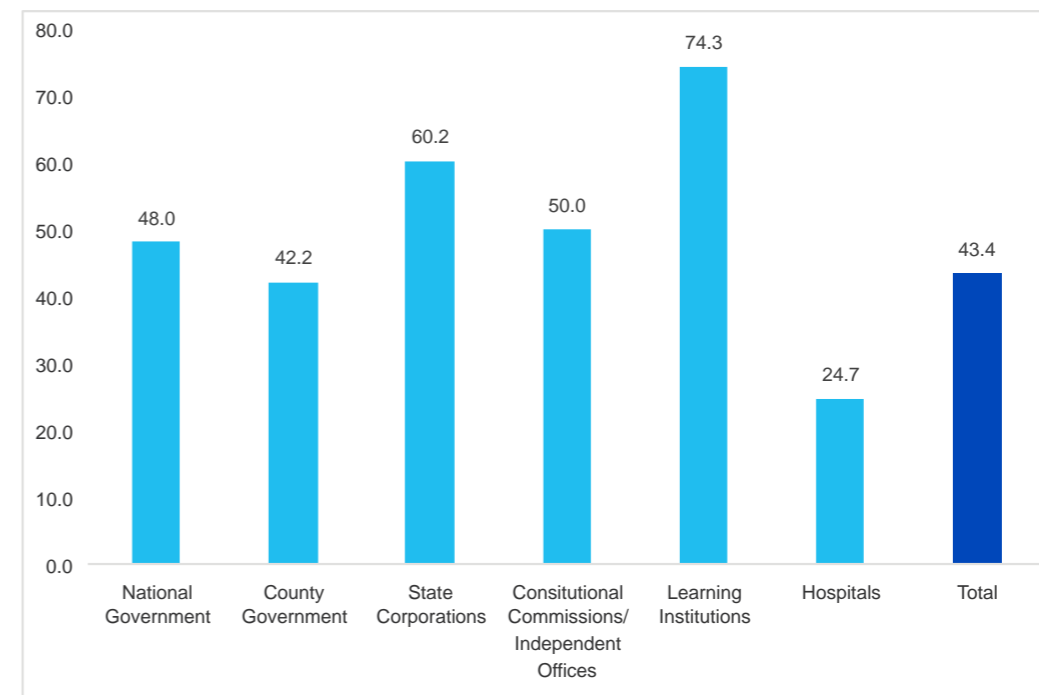
4.2   Intranet

An intranet comprise a restricted computer network controlled by and usually reserved for a single entity. An institution can have its own physical infrastructure separate from the Internet. Some intranet infrastructure offer Internet access and some do not due to privacy, security issues or lack of need.

4.2.1   Use of Intranet in Public Institutions

The use of intranet as an internal communication network tool was reported by 36.3 per cent of the institutions. At institution level, 83.3 per cent of Constitutional commissions/Independent offices used intranet while 65.7 per cent of the Learning institutions and 57.8 per cent of State corporations used intranet shown in Figure 4.9.

Figure 4. 9: Proportion of Institutions with Intranet
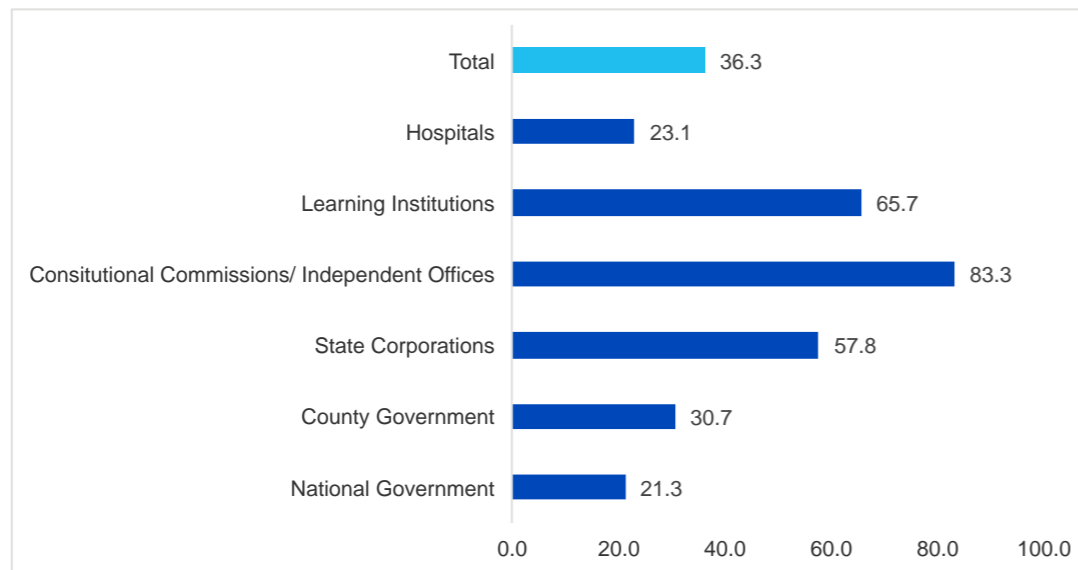
4.2.2   Use of Intranet by Type of Information Shared

Sharing of information especially working files, is one of the major reasons institutions use intranet. Majority (83.7 per cent) of institutions shared working documents using intranet with 67.4 per cent of them using it to share their publications, manuals, guides or training materials. About 57.2 per cent and 49.5 per cent of the institutions used intranet for general policy or strategy of the institution; and internal institution newsletter or daily news, respectively, as shown in Figure 4.10.

Figure 4. 10: Proportion of Institutions using Intranet by Type of Information Shared
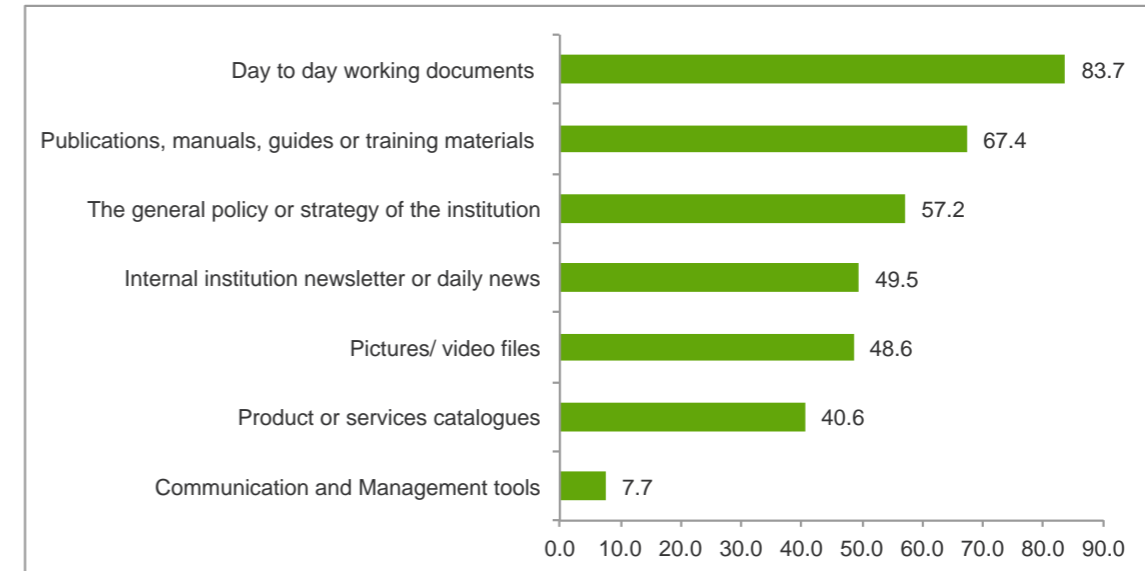
Most institutions shared day to day working documents via intranet. All Constitutional Commissions and Independent offices and 95.7 per cent of Learning institutions used intranet for sharing day to day working documents as seen in Table 4.1.

Table 4. 1: Proportion of Institutions Using Intranet by Type of Information Shared

Type of Information Shared	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning Institutions	Hospitals
Communication and Management tools	6.3	7.7	5.0	10.0	0.0	16.7
Product or services catalogues	37.5	30.8	50.4	70.0	56.5	24.1
Pictures/ video files	37.5	42.9	52.9	100.0	82.6	27.8
Internal institution newsletter or daily news	50.0	35.2	65.5	100.0	73.9	18.5
The general policy or strategy of the institution	56.3	46.2	74.8	80.0	82.6	22.2
Publications, manuals, guides or training materials etc	75.0	53.8	80.7	100.0	87.0	44.4
Day to day/ working documents	75.0	75.8	85.7	100.0	95.7	87.0

4.2.3   Use of Specialized Applications for Human Resource Services

The proportion of institutions using specialized applications for human resource services such as requesting for annual leave via a computer programme, viewing or downloading payslips was reported by 56.5 per cent of public institutions in 2015. Constitutional Commissions and Independent offices had the largest proportion of institutions using specialised applications at 75.0 per cent followed by the National Government at 73.3 per cent. Hospitals reported the least use of the applications with 45.0 per cent of them using the applications as shown in Figure 4.11.

Figure 4. 11: Proportion of Institutions Using Specialised Applications for Human Resource Services
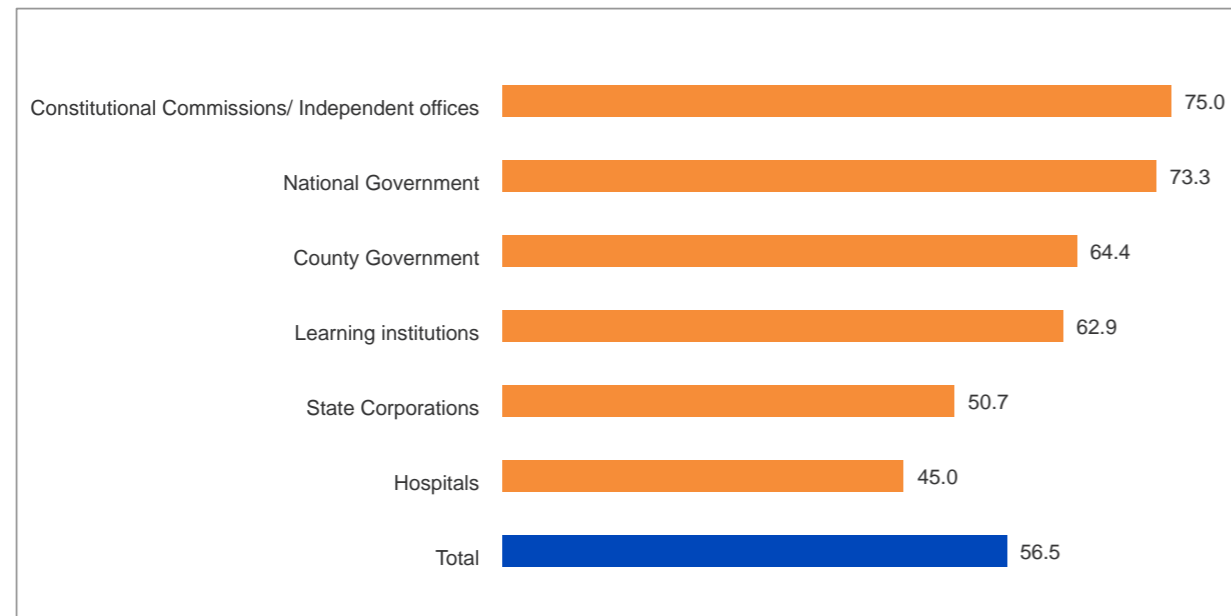
4.3   Website, Email and Social Media

The provision of public services is simplified and more effective with the availability of ICT technologies and innovations. Web presence of institutions is an indication of innovation that can be used in improving government service delivery. This section highlights the findings on online presence of public institutions in terms of use of website, email and social media.

4.3.1   Public Institutions with Web Presence and Domain Names

Overall, 57.5 per cent of the institutions reported to have web presence. All institutions under Constitutional commissions and Independent offices category and 94.3 per cent of Learning institutions had an active website. Only 13.1 per cent of the hospitals had an active website in 2015 as seen in Figure 4.12.

Figure 4. 12: Proportion of Institutions with Web Presence
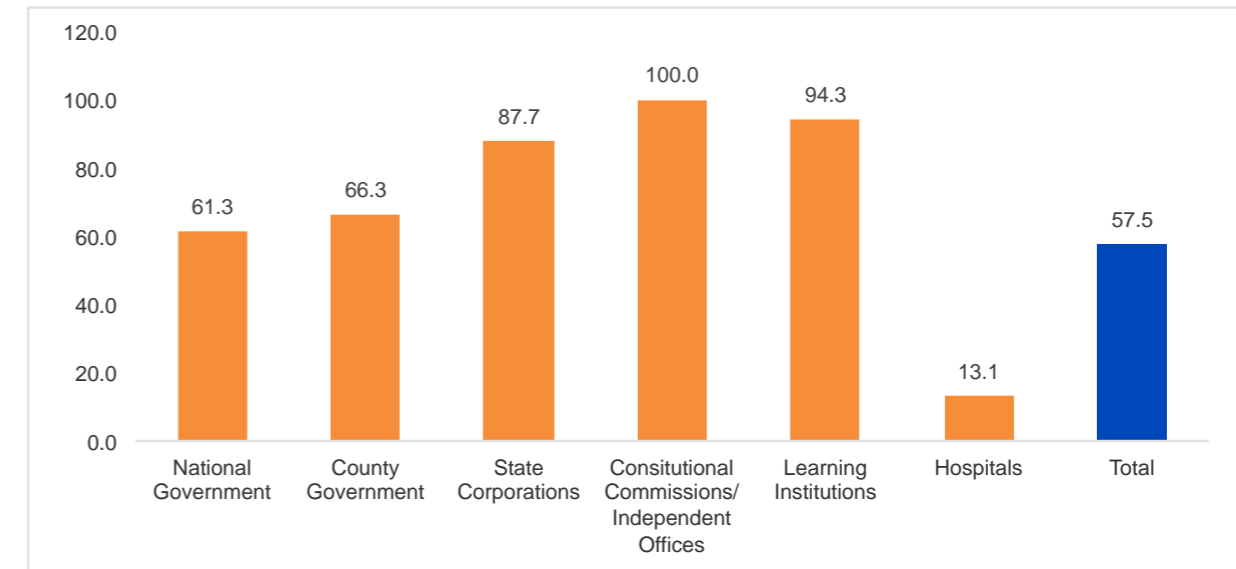
4.3.2   Domain Names

A summary of reported domain names are presented in Table 4.2. The choice of domain name is often indicative of the nature, affiliation or activity of an institution. As is expected, the uptake of "dot go.ke" was high in public institutions at 61.9 per cent. Over 90.0 per cent of public institutions under National government category had "dot ke" domain names with those under County government category reporting use of the domain at 87.2 per cent. The uptake of "dot ac.ke" as anticipated, was mainly high in Learning institutions (78.8 per cent).

Table 4. 2: Proportion of Institutions with Web Presence by Domain Name

Institution Type	Domain name					
	.ac.ke	.co.ke	.go.ke	.or.ke	.com	.org
National Government	0.0	6.5	93.5	0.0	0.0	0.0
County Government	1.5	6.4	87.2	2.5	1.5	1.0
State Corporations	3.2	29.2	38.9	13.0	5.9	9.7
Constitutional Commissions/ Independent offices	0.0	0.0	58.3	16.7	0.0	25.0
Learning institutions	78.8	6.1	6.1	3.0	6.1	0.0
Hospitals	3.0	15.2	48.5	12.1	15.2	6.1
Total	**7.0**	**15.0**	**61.9**	**7.0**	**4.1**	**4.9**

4.3.3   Website Hosting

Web hosting is a service that enables a website to be accessible via the Internet. The service is supported through a server that ensures the hosting of data is visible on a website including, images, content and administration codes/rights. The choice of location for hosting a firm's website is usually informed by several factors including affordability, reliability of the service, security of information and institutions' policies.

Overall, out of the 57.5 per cent of the institutions that reported to have a website, 83.6 per cent hosted their website locally while 15.0 per cent preferred to host internationally. Websites with domains such as "dot org" and "dot com" are usually referred to as international domains and hence institutions with such domains will be regarded as hosting their website internationally. This scenario was observed in 24.2 per cent of learning institutions and 18.2 per cent of hospitals as shown in Figure 4.13.

Figure 4. 13: Proportion of Institutions with a Website, by Type of Host
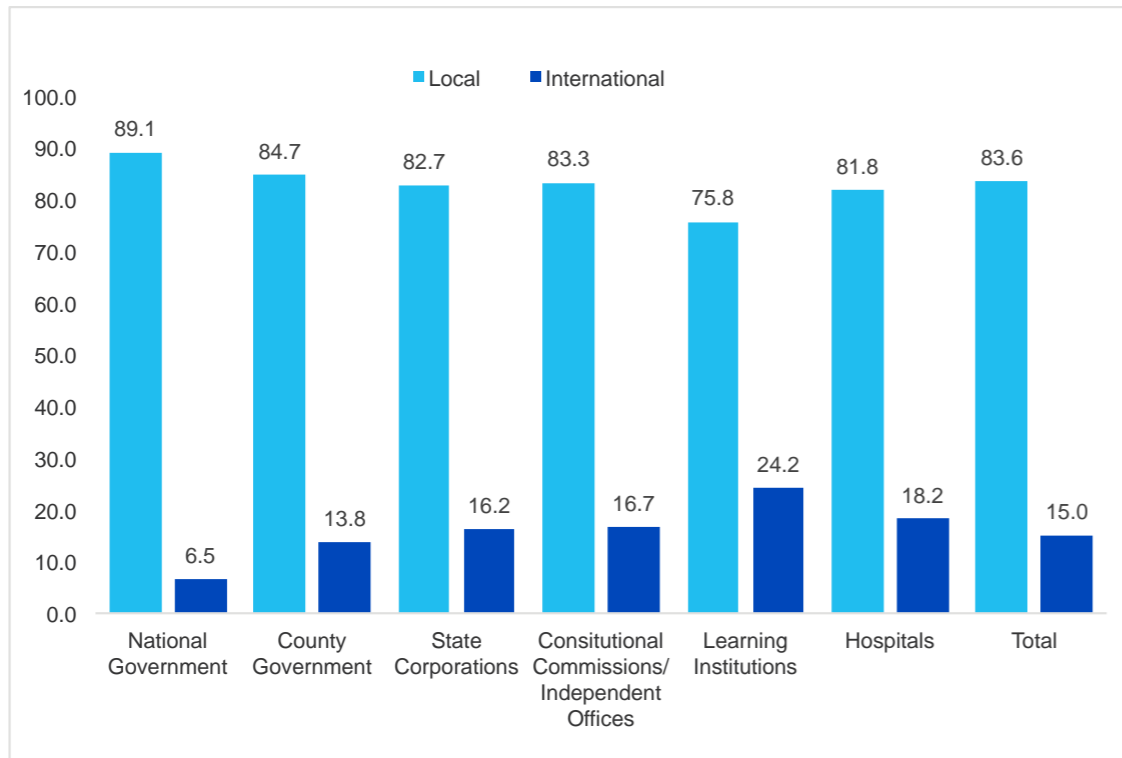
Overall, reliability of international web hosting was the predominant reason for international website hosting as cited by 72.7 per cent of the public institutions as shown in Figure 4.14. Other factors were security concerns and cost which were cited by 58.4 per cent and 41.6 per cent of the institutions, respectively.

Figure 4. 14: Proportion of Institutions Hosting Website Internationally by Reason
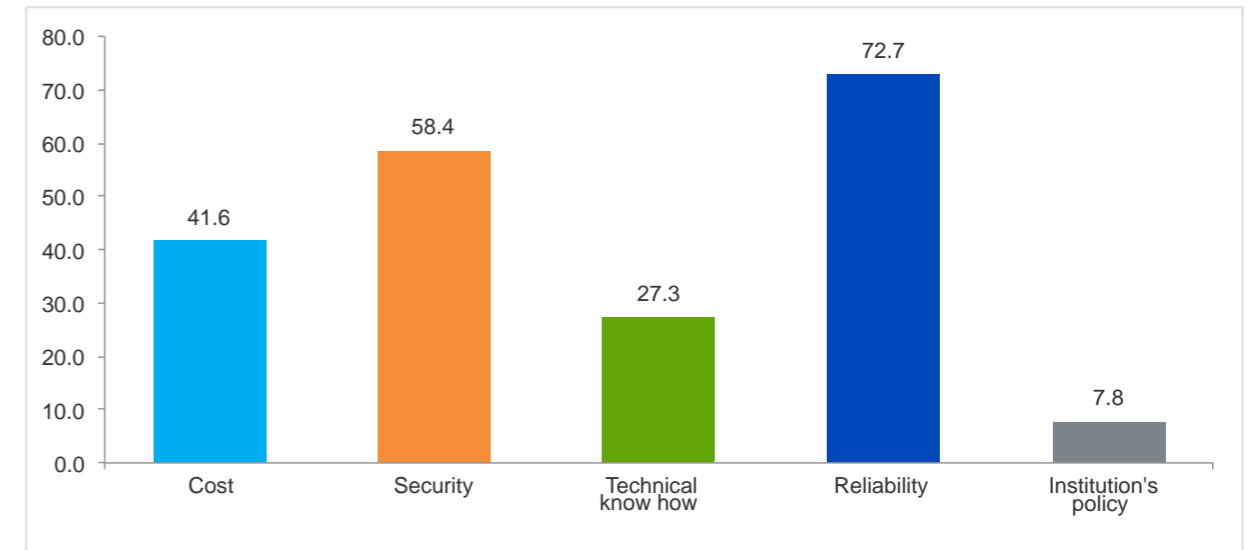
4.3.4   Type of Content on Public Institution Websites

The survey sought to find out the content on the websites of public institutions. These included general information and contacts, advertisement of tenders, jobs and online payments. Website features are discussed in subsequent sections.

4.3.4.1   General Information and Contacts

The provision of information on the website of an institution is important as it enhances transparency, communication and feedback between government as a service provider and the public. A total of 89.6 per cent of public institutions with websites had updated institution contacts. More than 90.0 per cent of the institutions (92.4 per cent) had their profiles on the website as seen in Table 4.3.

Table 4. 3: Proportion of Institutions with Website by General Features

Feature	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Updated Institution Contacts	87.0	80.3	94.1	91.7	97.0	84.8	**89.6**
Industry/ sector information	58.7	57.6	76.8	75.0	57.6	48.5	**66.0**
Institution's profile	91.3	85.2	94.6	91.7	100.0	84.8	**92.4**
Links to other institutions	73.9	44.3	69.7	66.7	81.8	39.4	**60.2**
Feedback form	65.2	52.7	69.2	75.0	72.7	54.5	**63.2**
Downloadable materials	87.0	77.8	87.6	91.7	90.9	51.5	**83.6**

4.3.4.2   Advertisement of Tenders, Jobs and Online Payment

Advertising tenders in the institution's website is an important element for enhancing equality of access to information and opportunities available in the public sector. According to the findings, 86.6 per cent of institutions with a website placed tender adverts in their website as seen in Figure 4.15. The advertisement of tenders was reported by 97.0 per cent of learning institutions, 91.7 per cent by constitutional commissions and Independent offices and 84.9 per cent of State Corporations. Only 57.6 per cent of public hospitals with a website had an advertisement feature for tenders on their websites. Advertisement of job vacancies was available in 76.4 per cent of public institutions with websites. Online payment feature was found in only 14.0 per cent of the public institutions with the highest proportion in National Government at 19.6 per cent.

Figure 4. 15: Proportion of Institutions with Website by Advertisement of Jobs and Tenders, and Online Payment Features
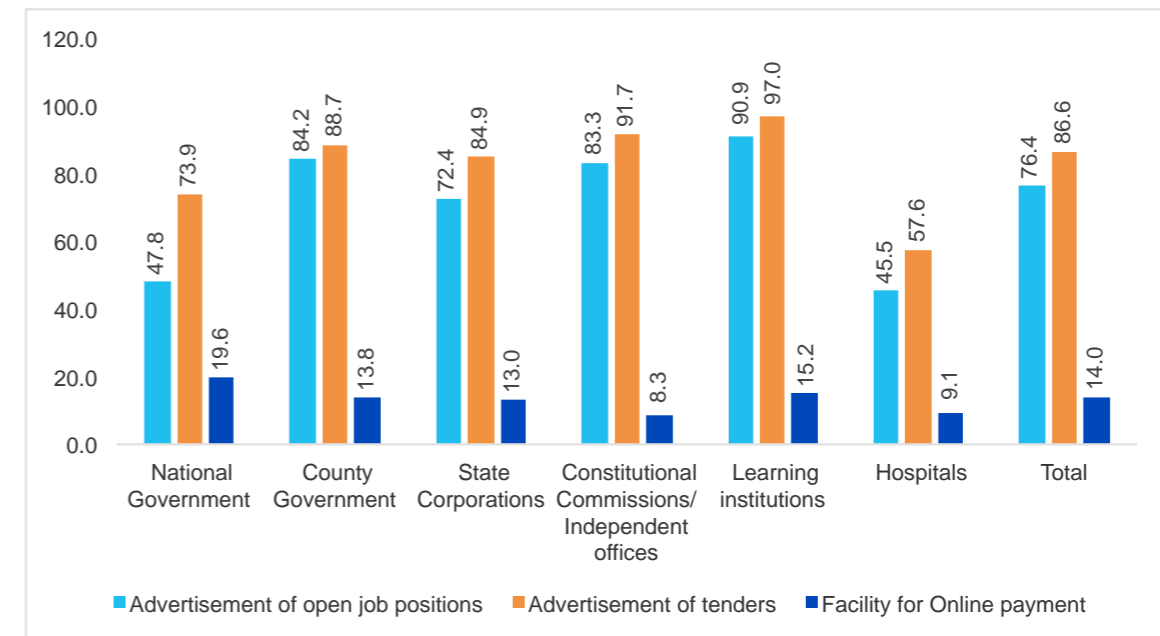
4.3.4.3   Other Features on Websites

The survey sought information on availability of a security policy, privacy policy and staff email features on institution websites. Among surveyed institutions with a website, 68.4 per cent had a staff email feature. Staff email feature was fairly common across public institutions with Learning institutions; and Constitutional Commissions and Independent offices reporting availability at 93.9 per cent and 83.3 per cent, respectively as shown in Figure 4.16.

The availability of a privacy policy is an important feature on websites as it often declares the institutions' policy on how it collects, stores, and releases information. Such a policy informs the public on the nature of information being collected, and whether it is kept confidential or shared and the purpose for its collection. A security policy on the other hand outlines rules and addresses issues on information access, website use and misuse. Of the public institutions with a website, 21.6 per cent and 17.4 per cent had privacy and security policy statements on their website, respectively.

Figure 4. 16: Proportion of Institutions with Website, by Type of Other Features

■ A security policy statement/ seal/certification   ■ A privacy policy statement/ seal/ certification   ■ Staff email portal
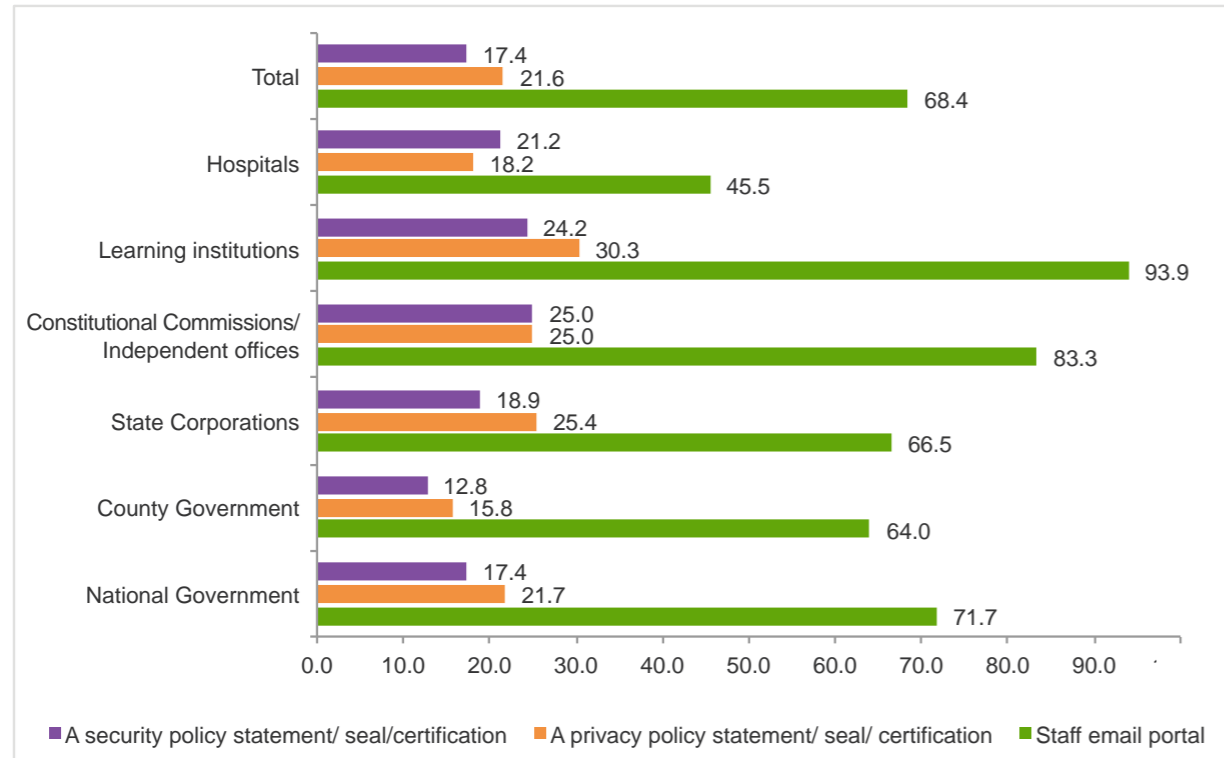
4.3.5   Website Updating

The frequency of updating an institutions' website is an important element in search engine optimization (SEO). Frequently updated websites are more likely to rank high in search engine results and hence ensure visibility of an institution. In addition, an updated website also gives up-to-date information to the public and often has a high number of online visitors. Overall, 38.7 per cent of public institutions updated their websites on a weekly basis with 18.4 per cent updating it on a daily basis as presented in Table 4.4. At institutional level, Learning institutions; and Constitutional commissions and independent offices had the highest proportion of institutions updating their websites daily at 36.4 per cent and 33.3 per cent, respectively.

Table 4. 4: Proportion of Public Institutions Updating Website by Frequency

Frequency	National Government	County Governments	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Daily	23.9	12.8	20.0	33.3	36.4	12.1	**18.4**
Weekly	39.1	40.4	37.8	50.0	36.4	30.3	**38.7**
Monthly	6.5	26.6	27.6	8.3	21.2	27.3	**24.4**
Quarterly	17.4	11.8	8.6	8.3	3.0	12.1	**10.5**
Mid-year	0.0	0.5	2.2	0.0	0.0	6.1	**1.4**
Annually	8.7	1.5	2.2	0.0	0.0	3.0	**2.3**
More than a year	2.2	1.5	1.1	0.0	0.0	3.0	**1.4**

4.4   Use of Social Media

Social media has evolved to become an important tool of communication between the Government and the citizens. Social media provides an avenue for greater citizen participation, involvement and information as well as enhancing transparency and accountability. In public institutions, the use of social media is common with 58.0 per cent of public institutions using at least one form. All institutions under constitutional and independent offices used at least one type of social media. However, only 35.5 per cent of hospitals used social media as shown in Figure 4.17.

Figure 4. 17: Proportion of Institutions with Social Media Account
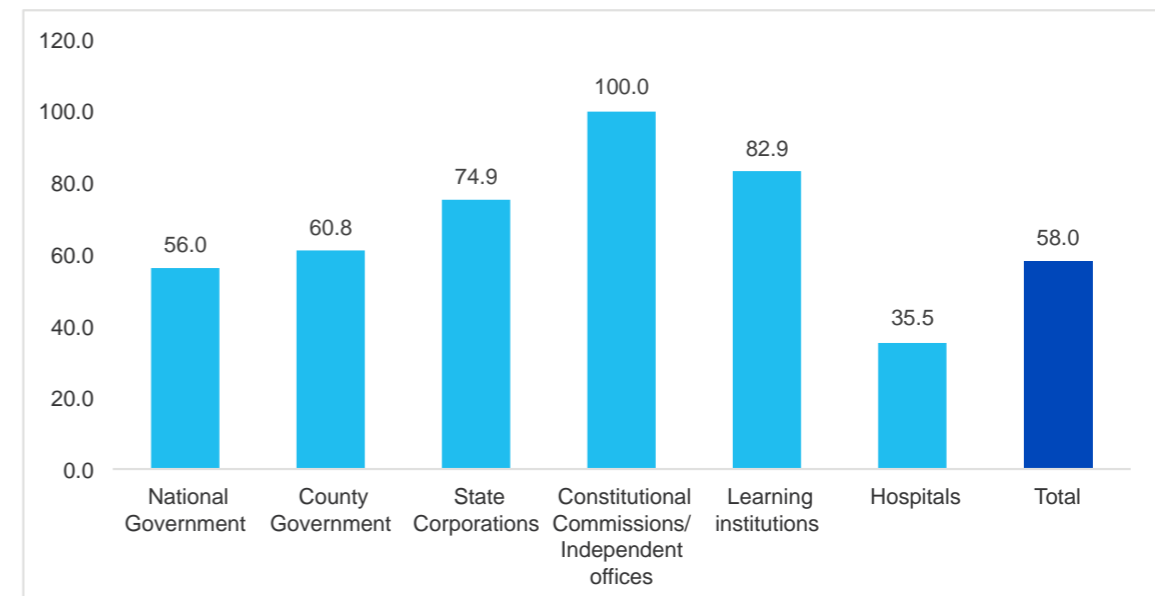
Figure 4.18 shows the proportion of public institutions that used social networking websites by purpose in 2015. Social networking sites such as Facebook and Google+ were used by 85.1 per cent of public institutions while microblog sites and instant messaging were used by 58.5 per cent and 45.0 per cent of the institutions, respectively.

Figure 4. 18: Proportion of Institutions Using Social Media by Type
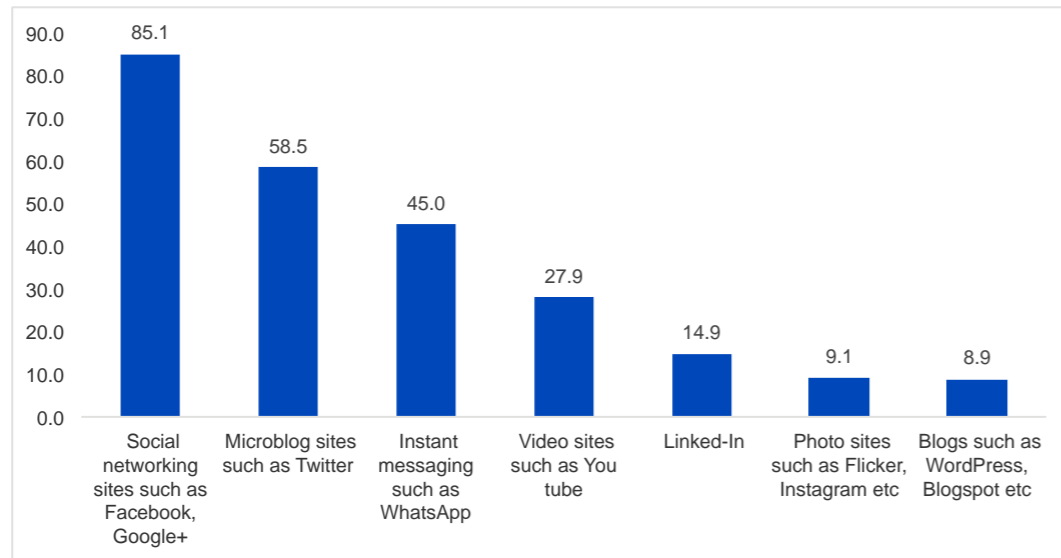
The proportion of public institutions using the most common social media sites (social network site, micro blog sites and instant messaging apps) is shown in Figure 4.19. The survey findings show that all Learning institutions followed by state corporations (94.9 per cent) used social networking sites. The highest proportion of institutions using instant messaging services were Hospitals followed by County Government institutions at 58.4 per cent and 55.4 per cent, respectively.

Figure 4. 19: Proportion Using Most Common Social Media Sites by Institution Type
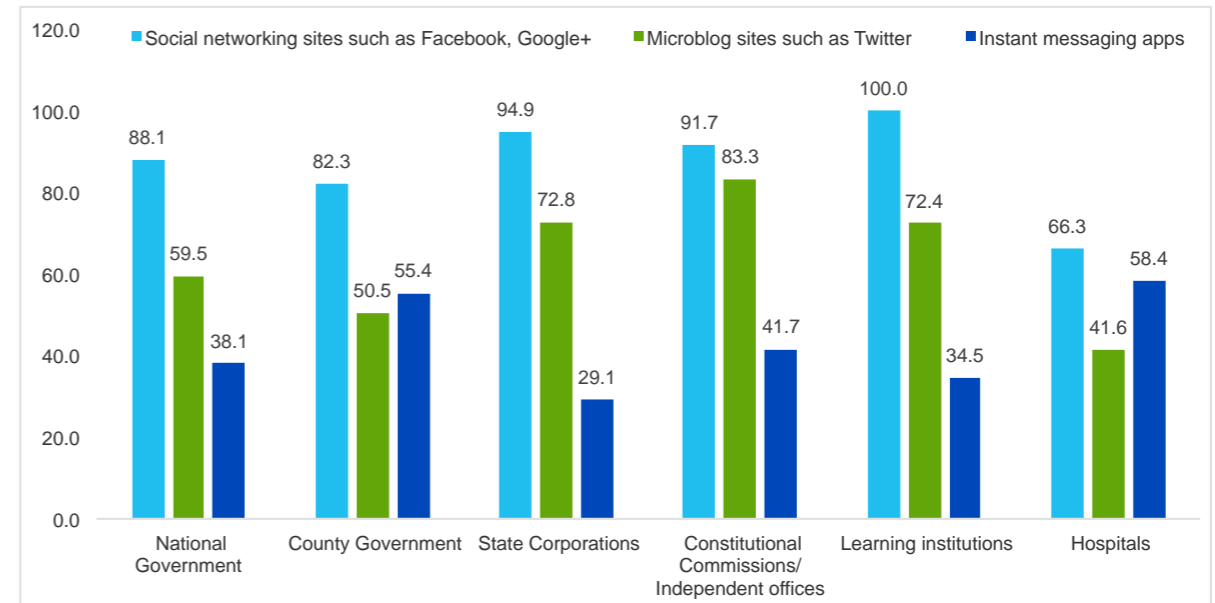
There was a significant variation in the use of video sites in the surveyed institutions. Video sites were largely used by Learning institutions and Constitutional commisions and Independent offices at 50.0 per cent and 55.2 per cent, respectively. Linked-in was highly used by Learning insitutions at 34.5 per cent while photo sites were not used in Hospitals as shown in Figure 4.20.

Figure 4. 20: Proportion Using Other Social Media Sites by Institution Type
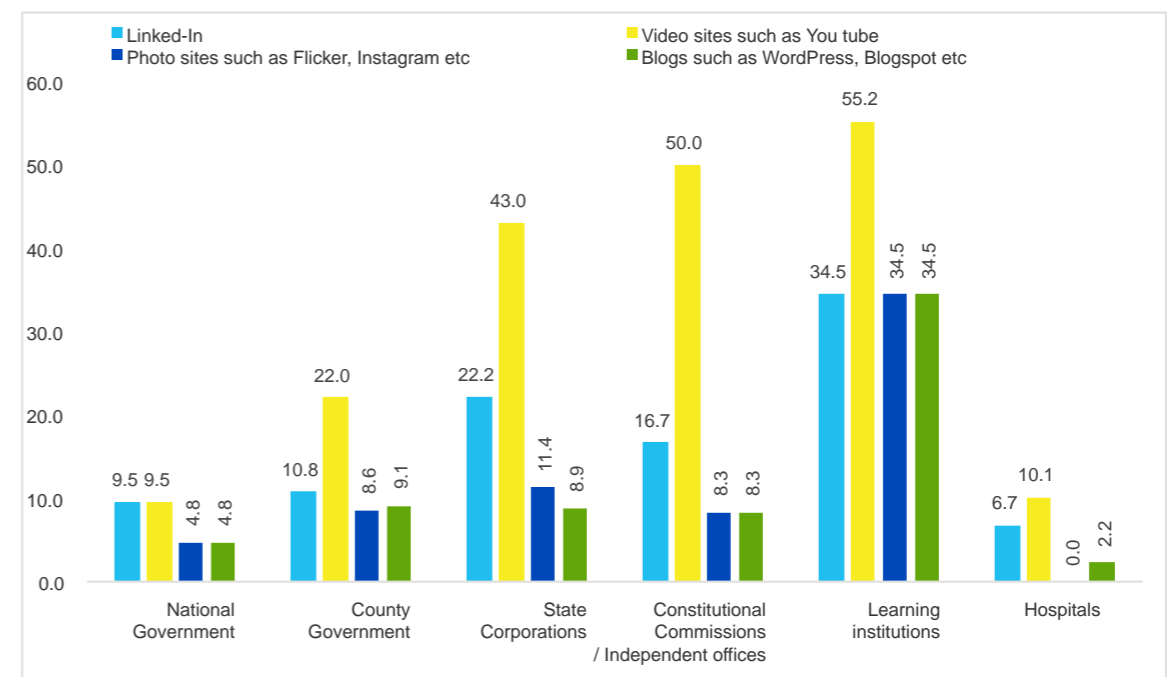
4.5 Cloud Computing

Cloud computing is an emerging IT development, deployment and delivery model, enabling users to have ubiquitous, convenient and on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service-provider interaction. This section discusses the survey findings on the use of cloud computing services and benefits accrued by public institutions using the service. The section also provides the highlights on the reasons for not using cloud computing and the plans for adopting it.

According to the survey, 35.8 per cent of the institutions deployed the use of cloud services. Uptake of cloud computing was highest in the Learning institutions with 68.6 per cent of them using the platform as shown in Figure 4.21.

Figure 4. 21: Proportion Using Cloud Computing by Institution Type
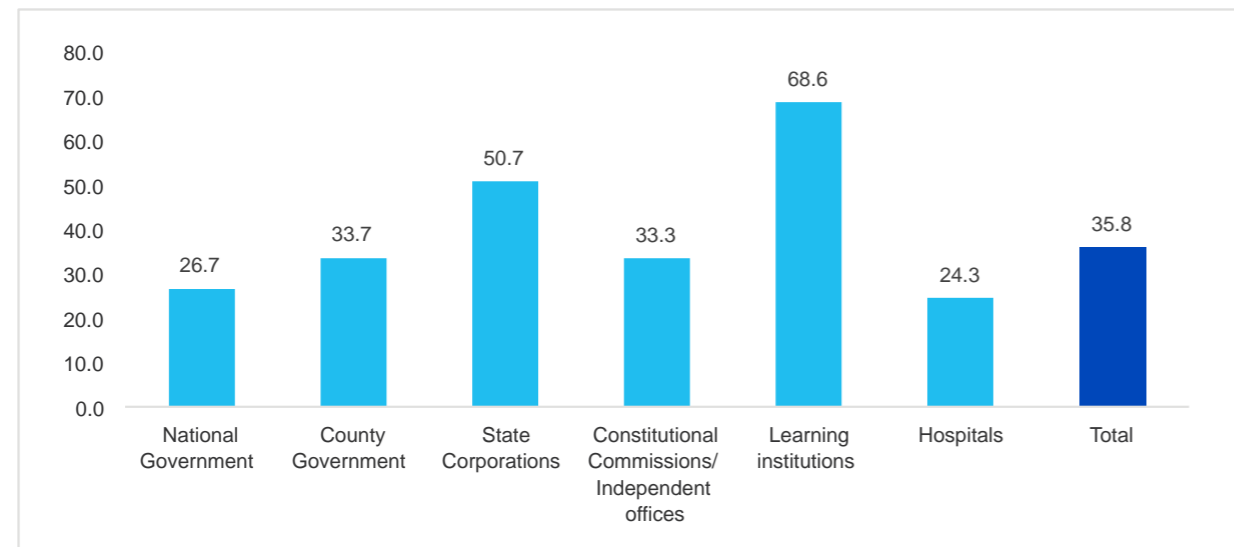
4.5.1 Cloud Services

The most popular cloud computing service was Email and Messaging with 83.2 per cent of the institutions reporting its use in 2015. The least used cloud computing service was Enterprise service bus as shown in Figure 4.22.

Figure 4. 22: Proportion of Institutions Using Cloud Computing by Type of Service
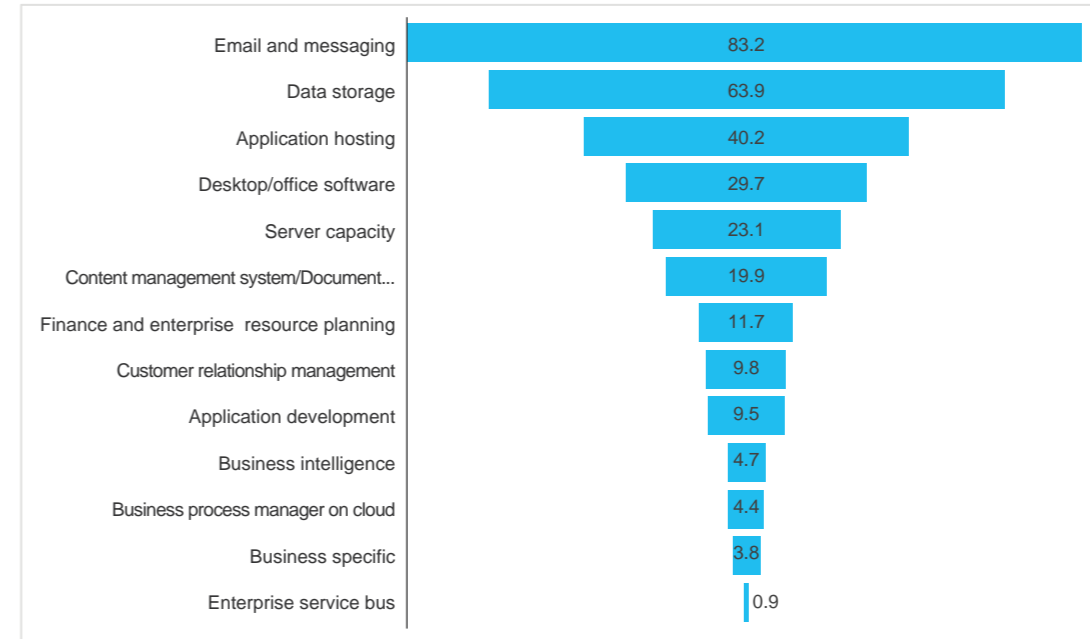
The greatest benefit accrued from using cloud computing was flexibility as reported by 82.6 per cent of the institutions using it. Cost saving was the second most important benefit from cloud computing cited by 74.8 per cent of the institutions. The least cited benefits were collaboration and freeing of institutions to focus on their core business as shown in Figure 4.23.

Figure 4. 23: Proportion of Institutions Using Cloud Computing by Type of Benefit Accrued
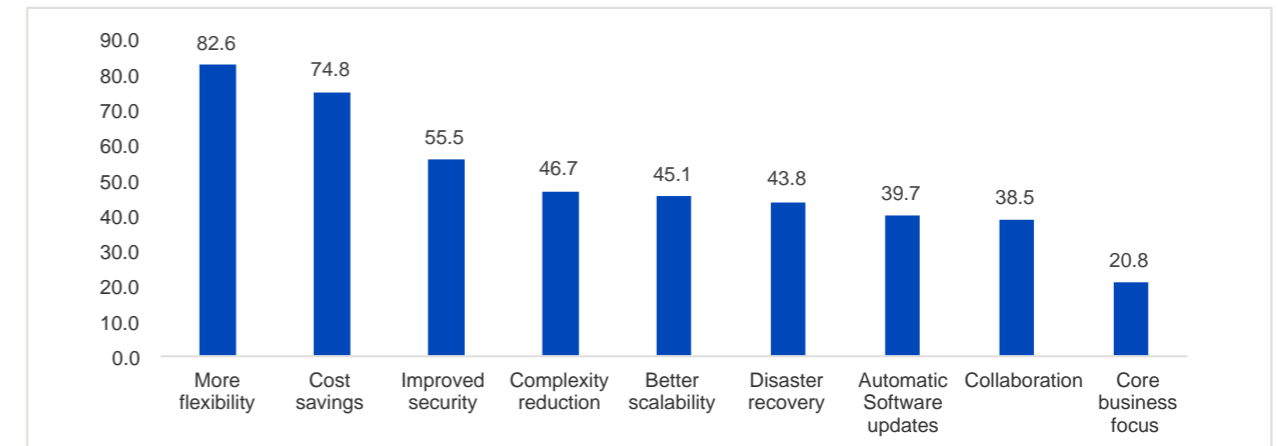
4.5.2   Reasons for Not Using Cloud Computing

Majority of institutions (53.1 per cent) did not use cloud computing due to insufficient knowledge within the organisation. Lack of technical capacity was the least cited reason for non-use of the application as seen in Figure 4.24.

Figure 4. 24: Proportion of Institutions Not Using Cloud Computing by Reason
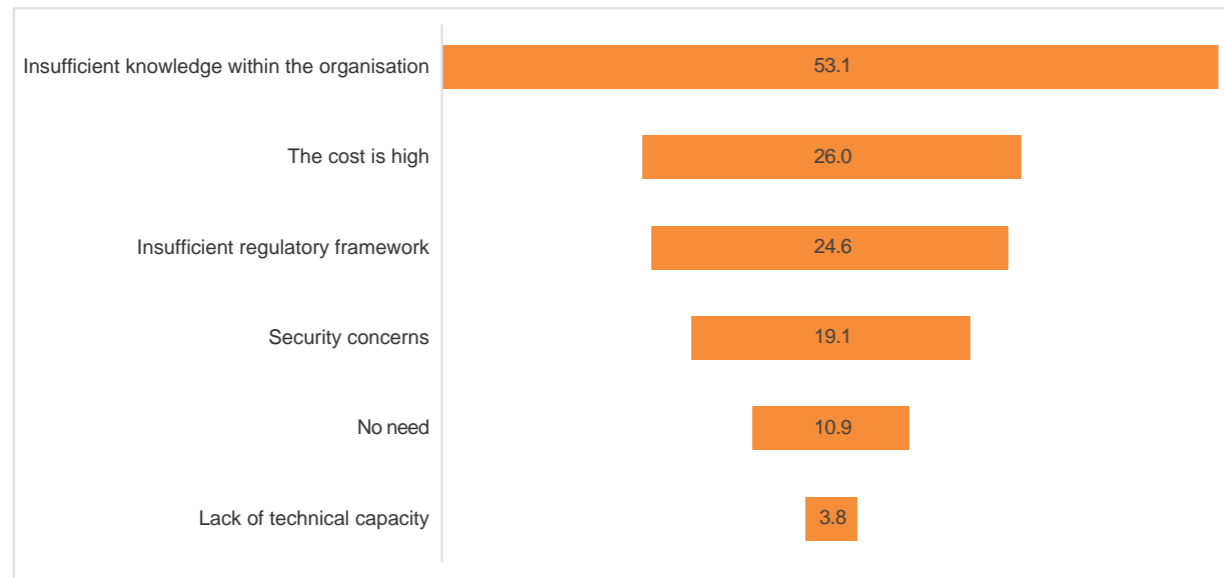
4.5.3   Adoption of Cloud in Future

Although some of the surveyed institutions had not adopted cloud computing, 43.9 per cent had plans to adopt the service. About half (50.4 per cent) of the institutions had no plan to adopt cloud computing in the future. Three quarters (75.0 per cent) of Constitutional Commissions and Independent offices had plans to adopt cloud computing. However, only 43.3 per cent of National government institutions that were not using cloud computing had plans of adopting it as shown in Figure 4.25.

Figure 4. 25: Proportion Planning to Adopt Cloud Computing by Institution Type
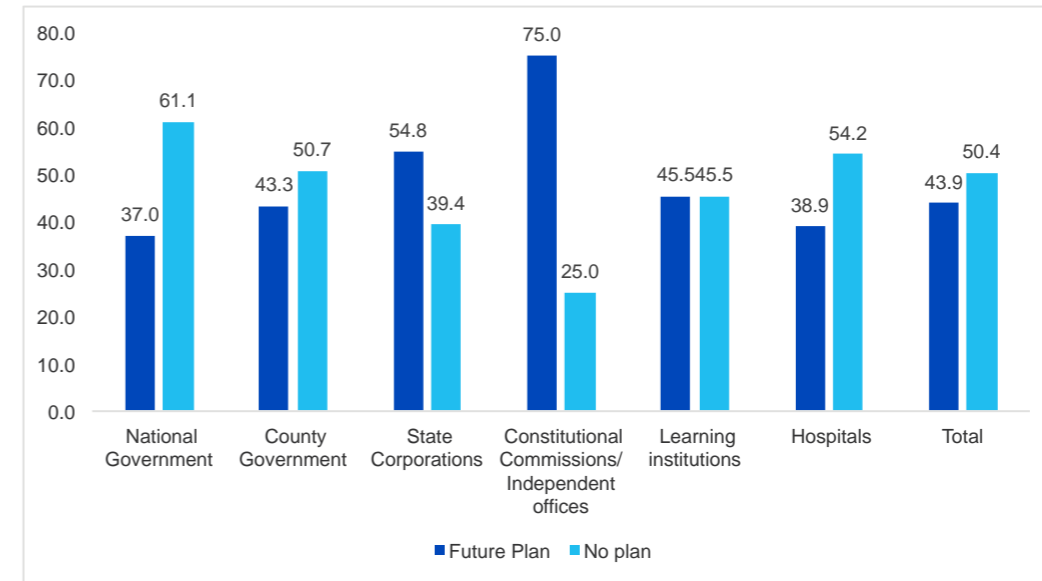
4.6   E-Procurement

Section 227 of the Constitution of Kenya provides for the establishment of a system for procurement of goods and services that is fair, equitable, transparent, competitive and cost-effective. The Public Procurement and Asset Disposal Act, 2015 is the law governing public procurement. E-procurement was established in Kenya as a system for public procuring since the year 2014. This system has existed under the Government's Integrated Financial Management Information System (IFMIS) which is used by National and County Governments for planning, budgeting, procurement, expenditure management and control, accounting, auditing and reporting. The Government aims to achieve transparency, cost savings, internal arbitrage, consistent and sustainable contractor development and transactional effectiveness through the implementation of e- procurement system.

4.6.1   Use of E-procurement Systems

The proportion of public institutions using e-procurement was 44.2 per cent as shown in Figure 4.26. All Constitutional commissions and Independent offices reported to have had e-procurement systems in place while 62.1 per cent and 57.1 per cent of County Government and Learning Institutions had e-procurement systems, respectively. Adoption of e-procurement was modest at 39.3 per cent and 20.3 per cent in State Corporations and Hospitals, respectively.

Figure 4. 26: Proportion Using E-Procurement System by Institution Type
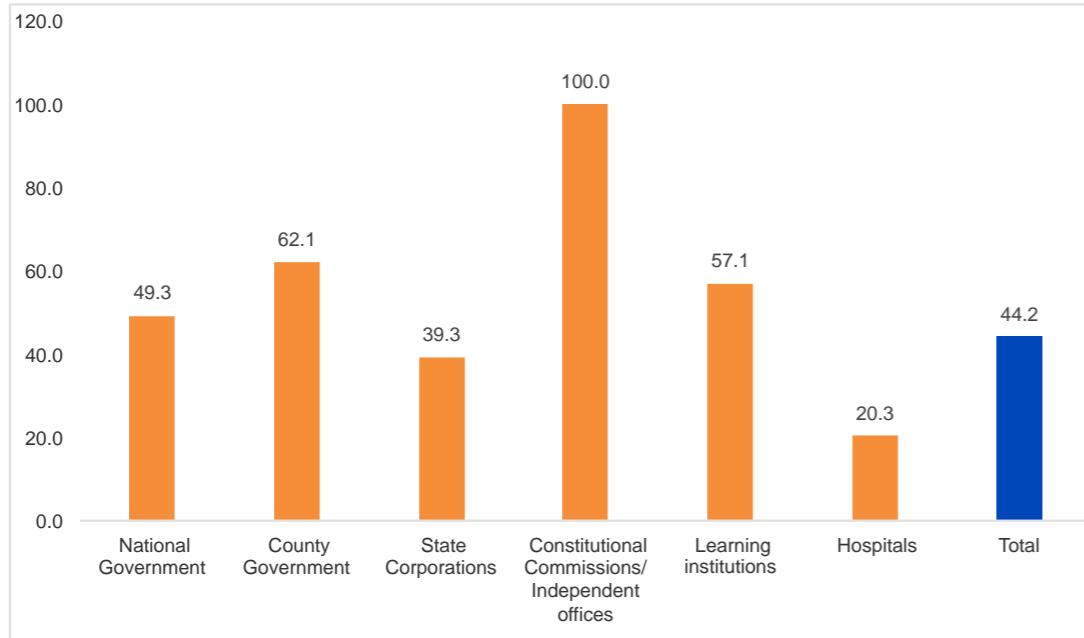
4.6.2   Use of E-procurement Systems to Float Tenders

The survey findings indicate that 67.4 per cent of institutions who had e-procurement systems used it to float tenders. The use of e-procurement systems to float tenders was highest in County governments and Learning institutions at 70.0 per cent. About two thirds of National Government institutions and Hospitals used e-procurement to float tenders. E-procurement usage in Constitutional Commissions and Independent offices was lowest with only half of the institutions using the system to float tenders as illustrated in Figure 4.27.

Figure 4. 27: Proportion of Institutions Using E-procurement Systems to Float Tenders
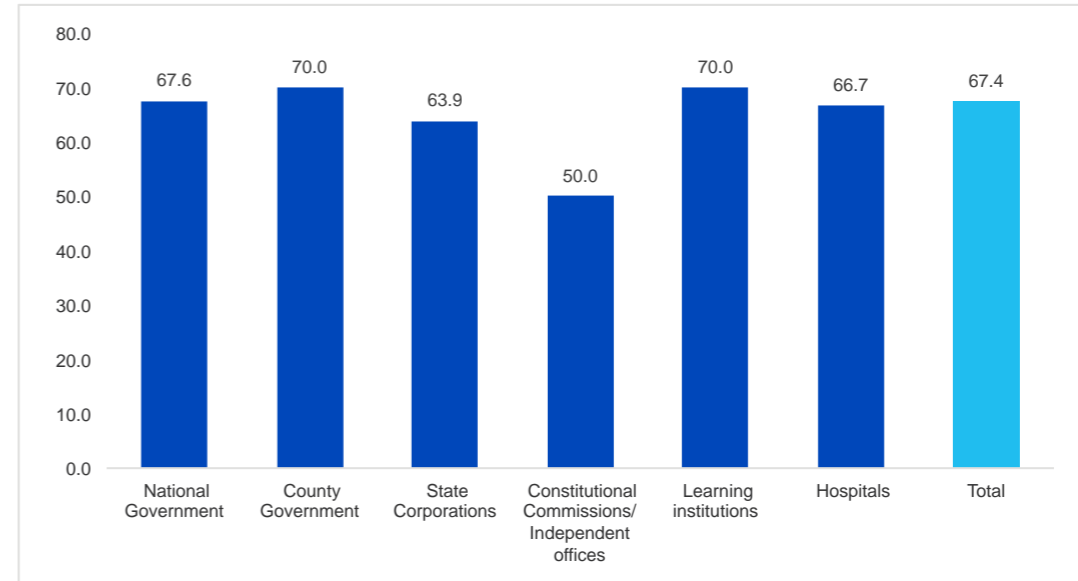
4.6.3   Mode of Delivery of E-procured Items

The proportion of institutions by mode of delivery of e-procured items is shown in Figure 4.28. Physical delivery of items was by far the most common mode of delivery as reported by 99.0 per cent of the institutions. This was followed by use of courier companies at 20.9 per cent. The least used mode was online/electronic delivery at 9.8 per cent.

Figure 4. 28: Proportion of Institutions that Purchased Goods Using E-Procurement, by Mode of Delivery

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KNBS
KENYA NATIONAL
BUREAU OF STATISTICS
Keeping you informed

COMMUNICATIONS
AUTHORITY OF KENYA

43
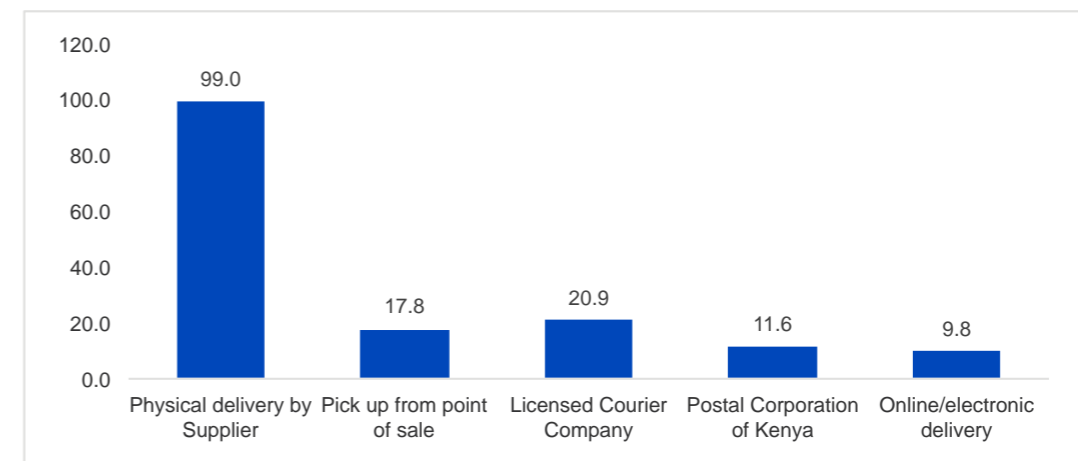
4.6.4   Receiving of Orders Online

The survey findings indicate that 19.9 per cent of the institutions received orders over the Internet with Constitutional Commissions and Independent offices accounting for the largest proportion of institutions receiving orders online at 58.3 per cent. Receiving of orders online was reported by 37.1 per cent and 24.6 per cent of Learning institutions and State corporations, respectively, as shown in Figure 4.29. The proportion of Hospitals that received orders online was the lowest at 12.7 per cent.

Figure 4. 29: Proportion of Institutions that Received Sales Orders Online
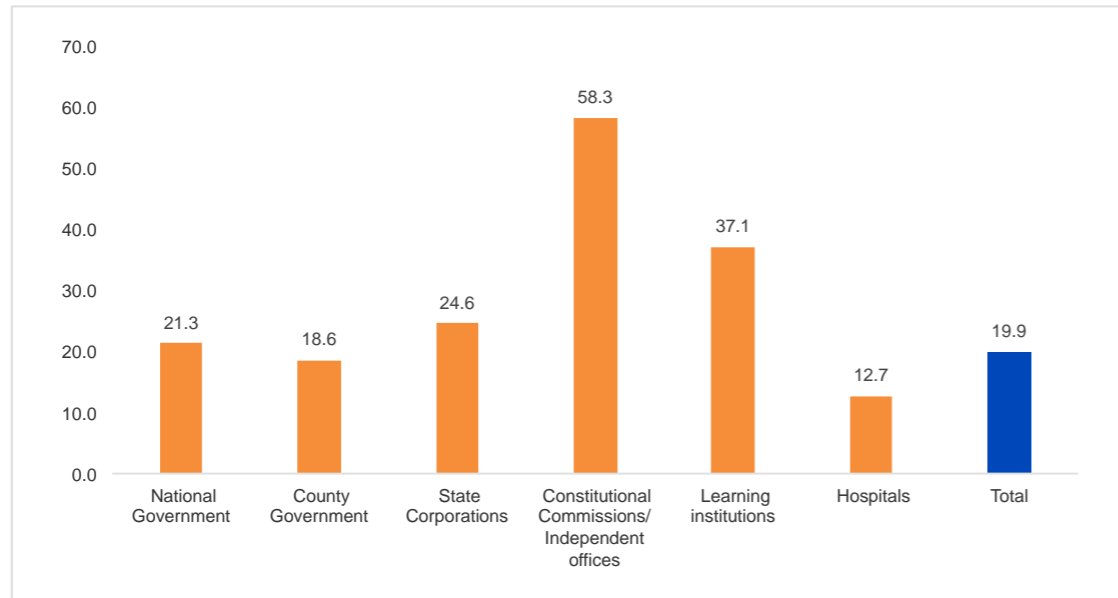
4.6.5   Mode of Delivery of Items Sold over the Internet

The proportion of mode of delivery of items sold over the Internet is shown in Figure 4.30. Physical delivery was established as the most common mode of delivery of items as reported by 87.5 per cent of the institutions who sold their items over the Internet in 2015. Delivery by use of courier company services was the second most common method as reported by 35.4 per cent of the public institutions that engaged in selling items over the Internet. About 33.0 per cent of the public institutions that sold items through Internet indicated that the customers collected them from their point of sale. The least used mode of delivery of items was online/electronic delivery at 18.8 per cent.

Figure 4. 30: Proportion of Mode of Delivery of Items Sold Over the Internet
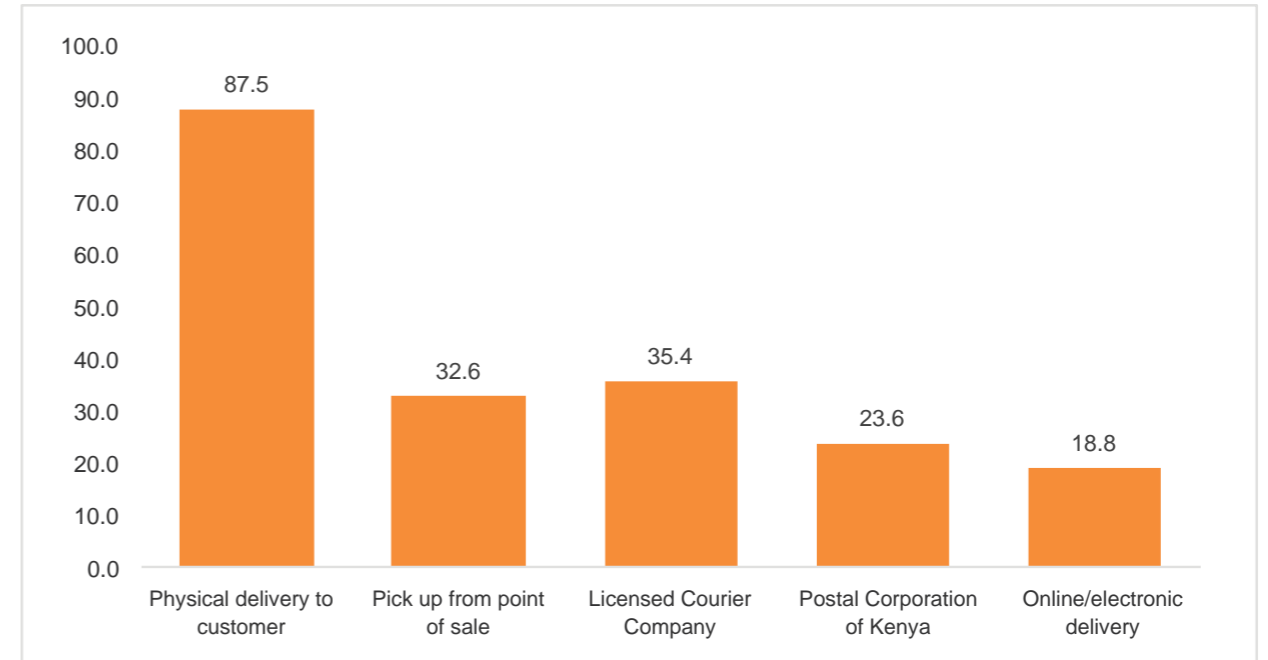
4.6.6   Challenges in the Use of E-procurement System

System slowdown was the most common challenge of using e-procurement as reported by 80.4 per cent of public institutions that used e-procurement system in 2015. System failure and lack of skills amongst staff was cited by 69.6 per cent and 58.1 per cent of the institutions, respectively. System maintenance and system incompatibility was not much of a challenge with only 2.3 per cent and 0.8 per cent of the institutions experiencing it, respectively. However, 3.4 per cent of the institutions did not face any challenge in the use of e-procurement systems as shown in Figure 4.31.

Figure 4. 31: Proportion of Institutions by Type of E-procurement System Challenge Faced

Figure 4. 32: Proportion of Institutions that Used E-procurement by Type of Benefit
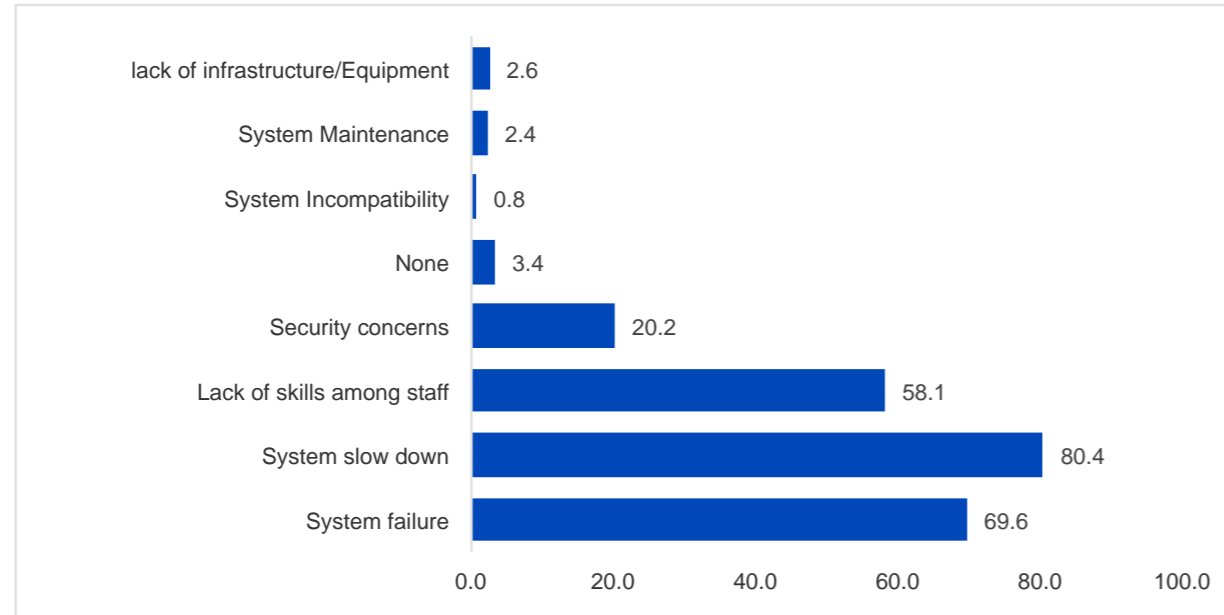
4.6.7   Benefits of Using E-procurement

As shown in Figure 4.32, the most cited benefit from e-procurement was reduced corruption and fraud as reported by 73.1 per cent of the institutions that used e-procurement system in 2015. Reduced transaction time and increased transparency was the second most cited benefit as reported by more than two thirds of institutions. Six per cent of the institutions using e-procurement did not realize any benefits from using the system.

Chapter 5:   ICT Management and Security

5.1   ICT Management

ICT management involves the implementation and maintenance of an organisation's ICT system with reference to its guiding policies and procedures. It requires monitoring of the organisation's operational requirements and research and implementation of strategies in order to build a cost-effective and efficient system.

5.1.1   Information Technology Policy

Information and Communications Technology (ICT) has become a central part of modern society. ICT has transformed the way that information is packaged, accessed and distributed. Information and communications technology have changed both the way we communicate with each other and the way we get jobs done. The IT Policy lays down guidelines and framework for use and management of an institution's information technology resource at work place. Out of all the public institutions surveyed, 48.1 per cent of them reported to have an IT policy in place with learning institutions reporting the highest proportion at 91.4 per cent as shown in Figure 5.1.

Figure 5. 1: Proportion of Institutions with IT Policies
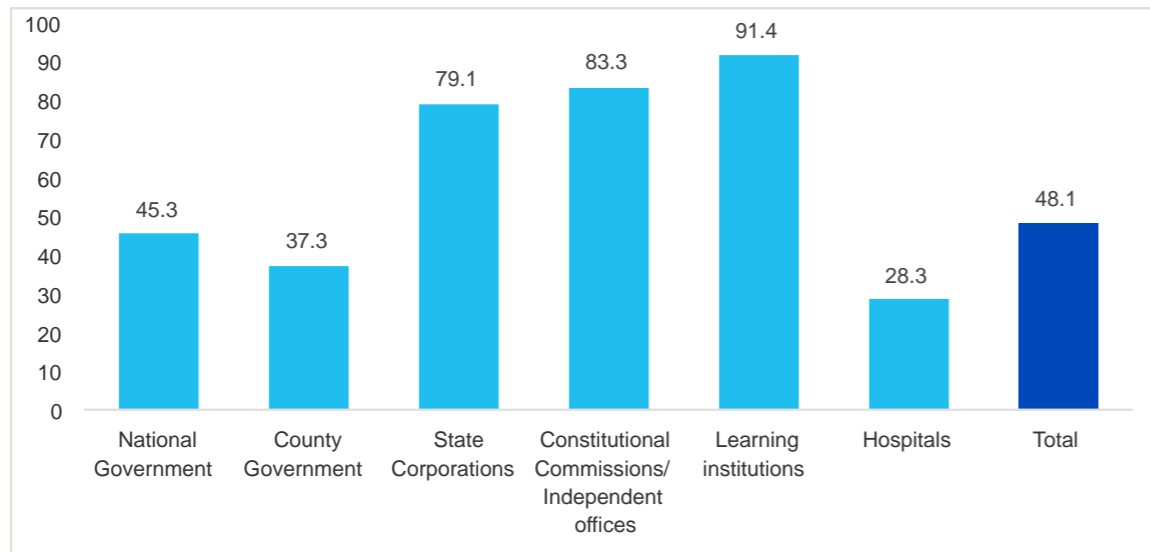
5.1.2   ICT Security Policy

Information security policies typically contain guidelines on information and system protection requirements and standards; security and network operational guidelines; incident response procedures; the acceptable use of systems and the enforcement of compliance with regulations and legislation. It is the process of protecting information from unauthorised access, disclosure, modification or destruction. An ICT security policy is usually a commitment by an institution to address confidentiality, integrity and risks of compromising information within its ICT systems.

The survey findings show that 43.4 per cent of institutions had an ICT security policy as shown in Figure 5.2. Constitutional commissions and independent offices reported the highest proportion of institutions with ICT security policy at 75.0 per cent. Significant proportions of State Corporations and Learning institutions had ICT policies in place at 68.2 per cent and 65.7 per cent, respectively. County governments had the lowest proportion of institutions with ICT policies at 32.4 per cent.

Figure 5. 2: Proportion of Institutions with ICT Security Policies
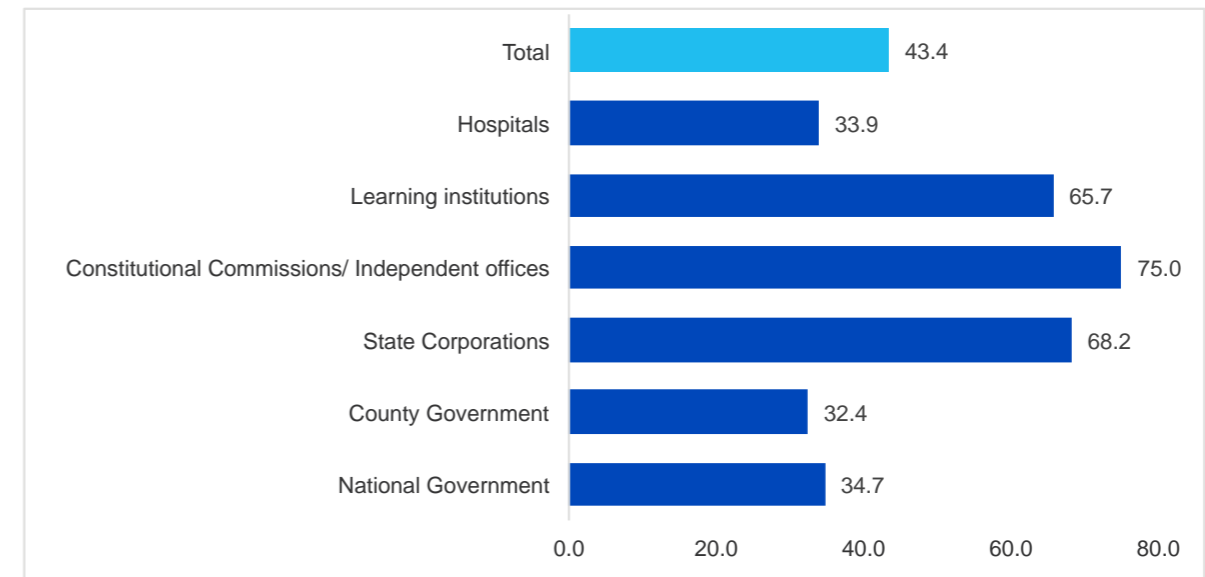
5.2   IT Security Measures and Cyber Security

IT security measures are usually taken to prevent compromise and deliberate or accidental loss of data. Security measures are taken to prevent unauthorized access to sensitive Government data. The survey sought to establish the type of IT security measures institutions had in place in 2015. The most common IT security measures deployed by public institutions were antivirus and computer passwords reported by 96.4 per cent and 91.9 per cent of the institutions, respectively. Slightly more than a half of the institutions had regular back up of data critical to their operations as a security measure. Authentication software or hardware for internal users and intrusion detection system were the least employed security measures with 15.8 per cent and 16.9 per cent of the institutions using it in 2015, respectively as presented in Table 5.1.

Table 5. 1: Proportion of Institutions by Type of IT Security Measures Taken

Type of IT Security Measures Taken	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Antivirus	100.0	97.7	99.5	100.0	94.3	91.2	**96.4**
Anti-spyware	43.7	34.9	63.8	91.7	65.7	22.2	**41.2**
Firewall	38.0	44.6	75.2	100.0	82.9	30.1	**49.8**
Spam filter	32.4	28.5	67.6	91.7	60.0	24.7	**39.4**
Secured communication between clients and servers (e.g. via SSL, SHTTP)	29.6	23.5	54.8	83.3	65.7	20.9	**33.4**
Authentication software or hardware for internal users	32.4	22.1	62.9	66.7	62.9	23.8	**35.6**
Authentication software or hardware for external users e.g. Customers	11.3	10.7	29.5	50.0	37.1	6.7	**15.8**
Intrusion detection system	15.5	9.7	34.3	41.7	40.0	6.3	**16.9**
Regular back up of data critical to your business operations	53.5	40.3	79.0	100.0	94.3	41.4	**54.1**
Off-site data backup	22.5	22.8	47.6	33.3	54.3	24.7	**30.8**
Computer password	83.1	91.6	95.7	91.7	100.0	90.4	**91.9**

5.2.1   Loss of Data Due to Virus Attacks

While most viruses typically cause system slowdown, some cause outright destruction like computer crashes, deletion of important files, corruption of data and hiding or making data inaccessible. The survey sought to establish the extent of loss from such attacks. Overall, about a half (48.4 per cent) of the public institutions reported to have lost data due to virus attacks in 2015. Institutions within the County government were more vulnerable with 65.0 per cent of them reporting data loss through virus attacks in in 2015. Constitutional Commissions (including Independent offices) emerged least susceptible as only 25.0 per cent of them reported to have fallen victims as shown in Figure 5.3.

Figure 5. 3: Proportion of Public Institutions that Lost Data Due to Virus Attacks
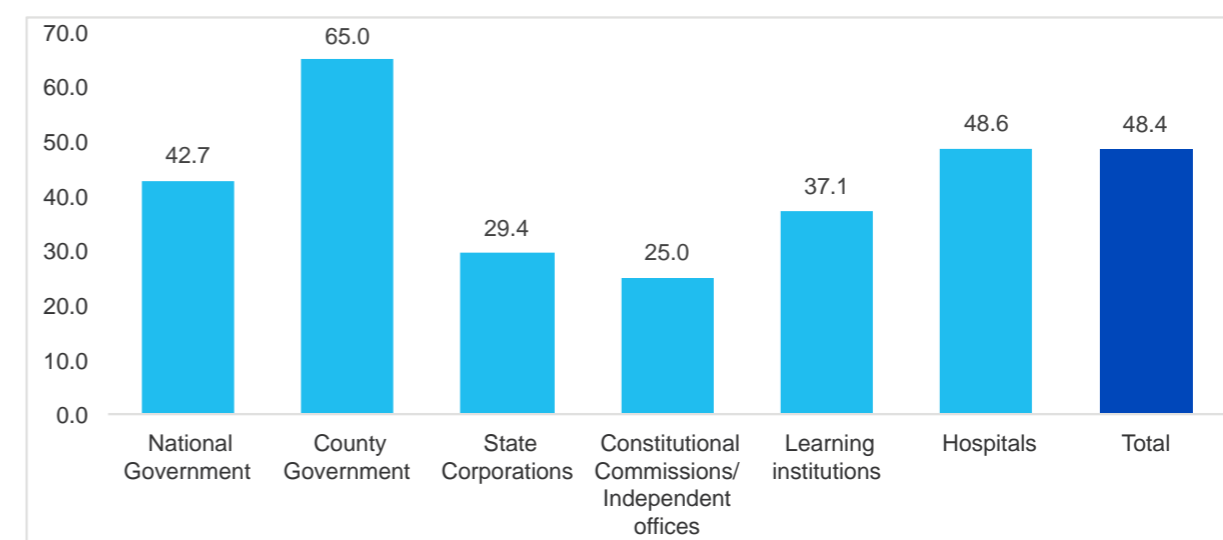
5.2.2   Cyber Security

Online crime also referred to as cyber security is an offence committed through the Internet using computer systems, hardware and networks such as hacking, phishing, identity theft and cyber bullying. Organized crime has been quick to take advantage of the opportunities offered by the Internet, particularly the growth in e-commerce and online banking. Online criminal groups target individuals, government institution networks to steal personal information in bulk in order to profit from the compromised data available to them.

Slightly less than a half (47.5 per cent) of the public institutions did not experience any online crime in 2015. Computer virus was the most prevalent online crime as cited by 44.8 per cent of the institutions as seen in Table 5.2. The least prevalent online crime was theft of money as reported by only 0.3 per cent of the public institutions.

Table 5. 2: Proportion of Institutions by Type of Online Crime

Type of Online Crime	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Hacking	8.0	9.8	5.7	0.0	11.4	4.4	**7.1**
Phishing	1.3	3.9	9.0	8.3	11.4	0.8	**4.4**
Theft of money (online)	0.0	0.3	0.5	0.0	0.0	0.4	**0.3**
Theft of information (online)	1.3	3.3	1.9	0.0	5.7	0.4	**2.0**
Identity theft	6.7	2.3	2.4	0.0	5.7	0.4	**2.2**
Website vandalism	2.7	4.2	4.7	0.0	20.0	0.4	**3.7**
Computer virus	38.7	54.9	37.9	25.0	60.0	39.0	**44.8**
None	54.7	39.5	49.3	66.7	28.6	55.4	**47.5**

5.2.3   Online Crime and Institutions Reported To Organisations in Charge

The survey established that over a third (39.7 per cent) of the public institutions did not report online crime to any institution as shown in Table 5.3. Those who reported the crimes did so to the following: ICT Authority (27.9 per cent), internally, within the institution (17.6 per cent), Kenya Police (14.0 per cent), Communications Authority of Kenya (3.7 per cent) and Central Bank (1.5 per cent).

Table 5. 3: Proportion of Public Institutions by Type of Institution the Online Crime was reported to

Institution	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Kenya Police Service	7.1	18.2	12.5	100.0	0.0	10.8	**14.0**
Communications Authority of Kenya	7.1	0.0	8.3	0.0	20.0	2.7	**3.7**
ICT Authority	50.0	21.8	45.8	0.0	20.0	18.9	**27.9**
Central Bank of Kenya	7.1	1.8	0.0	0.0	0.0	0.0	**1.5**
Reported Internally	14.3	18.2	8.3	0.0	60.0	18.9	**17.6**
Did not report	21.4	41.8	29.2	0.0	40.0	51.4	**39.7**

5.2.4   Awareness of Existence and Functions of National KE-CIRT/CC

The Kenya Computer Incident Response Team - Coordination Centre (National KE-CIRT/CC) is the country's national point of contact for cyber security matters. The centre is charged with the responsibility of coordinating response and offering advice on cyber security matters. The National KE-CIRT/CC works with various stakeholders at the national level including law enforcers, the private sector, academia, the financial sector and civil society among others.

Overall, 26.9 per cent of surveyed public institutions were aware of either the existence or functions of the National KE-CIRT/CC as shown in Figure 5.4. At least seven out of ten public institutions were not aware of its existence. One quarter of the institutions (25.1 per cent) were aware of the existence of the National KE-CIRT/CC's with 12.2 per cent of them reporting knowledge of its functions.

Figure 5. 4: Proportion of Public Institutions that Reported Awareness of Existence and Functions of the National KE-CIRT/CC
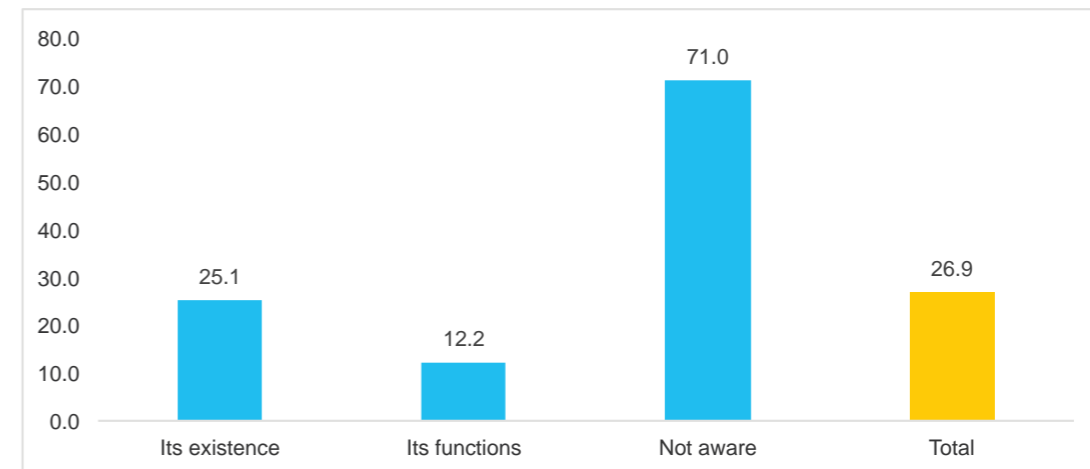
5.2.5   Approximate Value of Loss through Online Crime

Over the years, there has been a substantial increase in the number of online transactions in Kenya mainly driven by enhanced communications infrastructure especially availability of high-speed Internet. Cyber criminals have taken advantage to infiltrate business systems and communication channels and cause losses to unsuspecting business owners as well as government institutions.

Table 5.4 gives the approximate value of data recovery costs by type of public entity. Majority of the institutions reported to have spent less than KSh 50,000 in data recovery in 2015. About 6.0 per cent of the surveyed institutions reported to have spent between KSh 500,000 and KSh 1 million on data recovery.

Table 5. 4: Proportion of Institutions by Cost of Data Recovery

Public Institution Category / KSh	National Government	County Government	State Corporations	Learning Institutions	Hospitals	Total
<10,000	1.3	3.3	1.9	0	4.4	**37.7**
10,001 - 50,000	0	2.9	1.9	8.6	5.2	**42**
50,001 - 100,000	0	1	0.5	0	1.2	**10.1**
100,001 - 500,000	0	0.3	0	2.9	0.4	**4.3**
500,001 - 1,000,000	0	1.3	0	0	0	**5.8**

5.3   Type of Operating Systems Used by Public Institutions

Microsoft was the most widely used operating system as reported by 92.4 per cent of the public institutions as shown in Table 5.5. Linux and Macintosh operating systems were used by 28.1 per cent and 13.5 per cent of the institutions, respectively. Of the public institutions that used Windows, 97.1 per cent were Learning institutions while 93.8 per cent were County Government institutions and State Corporations.

Table 5. 5: Proportion of Public Institutions by Type of Operating System Used

Public Institution Category/Operating System	Microsoft Windows	Linux	Macintosh
National Government	92.0	33.3	20.0
County Government	93.8	11.4	11.4
State Corporations	93.8	36.5	22.7
Constitutional Commissions/ Independent offices	75.0	25.0	16.7
Learning institutions	97.1	80.0	22.9
Hospitals	89.6	32.7	4.8
Total	**92.4**	**28.1**	**13.5**

5.4   IT Capacity Building by Type of Training

The survey revealed that public institutions relied more on in-house than outsourced IT training as shown in Table 5.6. Slightly more than 46.0 per cent of the institutions received in-house training while 43.8 per cent and 31.0 per cent outsourced the IT capacity training within government and outside public sector, respectively. More than half of the institutions did not receive any IT capacity training in 2015.

Table 5. 6: Proportion of Public Institutions by IT Capacity Training Received and Type

Public Institution Category	In-House (within the Institution)	Outsourced (within Government)	Outsourced (Outside Public Sector)	No Training
National Government	44.0	42.7	40.0	49.3
County Government	46.7	36.6	36.3	60.8
State Corporations	59.2	29.4	63.5	53.6
Constitutional Commissions/ Independent offices	91.7	75.0	83.3	25.0
Learning Institutions	74.3	31.4	57.1	54.3
Hospitals	28.7	19.9	33.9	66.9
Total	**46.1**	**31.0**	**43.8**	**59.1**

5.5   ICT Expenditure

Over the years, public institutions have progressively adopted modern technology in their day to day activities albeit slower than their counterparts in the private sector. Table 5.7 shows that 49.3 per cent of the institutions in National Government spent more than a million shillings on ICT items. Approximately 83.0 per cent of State Corporations and Learning institutions incurred expenditures of over one million shillings on ICT items. Most of the Hospitals spent between KSh 100,001 and KSh 500,000 while almost all the Constitutional offices spent more than one million shillings.

Table 5. 7: Proportion of Public Institutions by Size of ICT Expenditure

Public Institution Category	<=10,000	10,001 – 50,000	50,001 – 100,000	100,001 – 500,000	500,001 – 1,000,000	>1,000,000
National Government	14.7	5.3	18.7	9.3	2.7	49.3
County Governments	20.6	2.6	3.9	13.4	11.4	48
State Corporations	5.2	1.9	0.5	5.2	4.7	82.5
Constitutional Commissions/ Independent Offices	8.3	0.0	0.0	0.0	0.0	91.7
Learning Institutions	11.4	0.0	0.0	5.7	0.0	82.9
Hospitals	17.1	8.4	10.8	31.1	12.4	20.3
Total	**14.9**	**4.2**	**6.1**	**15.6**	**8.8**	**50.4**

Most of the surveyed public institutions estimated their expenditures on ICT during the financial year 2014/15 at KSh 40.0 million, representing an 18.5 per cent increase from KSh 33.8 million in 2013/14. Estimated total expenditure on ICT for the entities covered in the survey amounted to KSh 13.1 billion in 2014/15 compared to KSh 9.7 billion in 2013/14. State corporations accounted for the bulk of the ICT expenditure while Constitutional commissions and Independent offices and Hospitals spent less than a billion shillings on ICT items. It is worth noting that County Governments spent more on ICT items than the National Government mainly due to purchase of office equipment for establishing their offices during this period.

Table 5. 8: Total and Median Public Institutions' Expenditure on ICT, 2013/14 -2014/15

Public Institution Category	2014/15		2013/14	
	Sum (KSh '000)	Median (KSh)	Sum (KSh '000)	Median (KSh)
National Government	1,403,622	1,400,000	1,119,862	1,100,000
County Governments	2,675,901	1,155,725	2,110,947	830,250
State Corporations	7,054,491	5,903,000	4,880,173	4,663,852
Constitutional Commissions/ Independent offices	359,268	16,736,370	343,431	15,384,000
Learning Institutions	1,250,703	14,660,000	1,095,410	11,652,448
Hospitals	390,091	155,900	173,018	142,206
Total	**13,134,075**	**40,010,994**	**9,722,842**	**33,772,756**

5.6   ICT Waste Disposal

Access to Information and Communication Technology (ICT) is pivotal to Kenya's economic and social development. However, ICT contributes to the ever-growing amount of e-waste when appliances reach their end of life either through wear and tear or obsoleteness. E-waste has been acknowledged as a complex waste stream containing hazardous substances but also valuable secondary resources. E-waste contains more than 1,000 different substances many of which are toxic, such as lead, mercury, arsenic, cadmium, selenium, hexavalent chromium, and flame retardants that create dioxin emissions when burned.

The United Nations Environmental Programme (UNEP) estimated annual e-waste generated in Kenya at 11,400 tonnes from refrigerators; 2,800 tonnes from TVs; 2,500 tonnes from personal computers; 500 tonnes from printers and 150 tonnes from mobile phones (Press Release UNEP, 2010). The study also found that consumers were likely to dispose of 1,210.4 tonnes in the second-hand market, 18.6 tonnes to recyclers while recyclers and refurbishes send 605.2 tonnes for disposal.

5.6.1   Uptake of Waste Disposal Methods

This section presents survey findings on awareness of ICT waste disposal methods. Out of all surveyed public institutions, 45.5 per cent had knowledge on appropriate waste disposal methods as shown in Figure 5.5.

Figure 5. 5: Proportion of Institutions Aware of Recommended Waste Disposal Methods

- Aware of Recommended Waste Disposal Methods
- Not Aware of Recommended Waste Disposal Methods
- No response

5.6.2   Awareness of Recommended E-Waste Disposal Methods and Presence of E-waste Management Policy

Presence of an electronic waste disposal policy indicates institution's commitment to protect the environment. Slightly over a third (34.1 per cent) of public institutions had an electronic waste management policy as shown in Figure 5.6. Learning institutions had the highest proportion of institutions with electronic waste disposal policies at 46.4 per cent followed by State Corporations at 41.8 per cent. Awareness of recommended ICT waste disposal methods was highest in Learning institutions and lowest in Public hospitals. Less than half (37.3 per cent) of the institutions under County government were aware of the recommended methods for waste disposal.
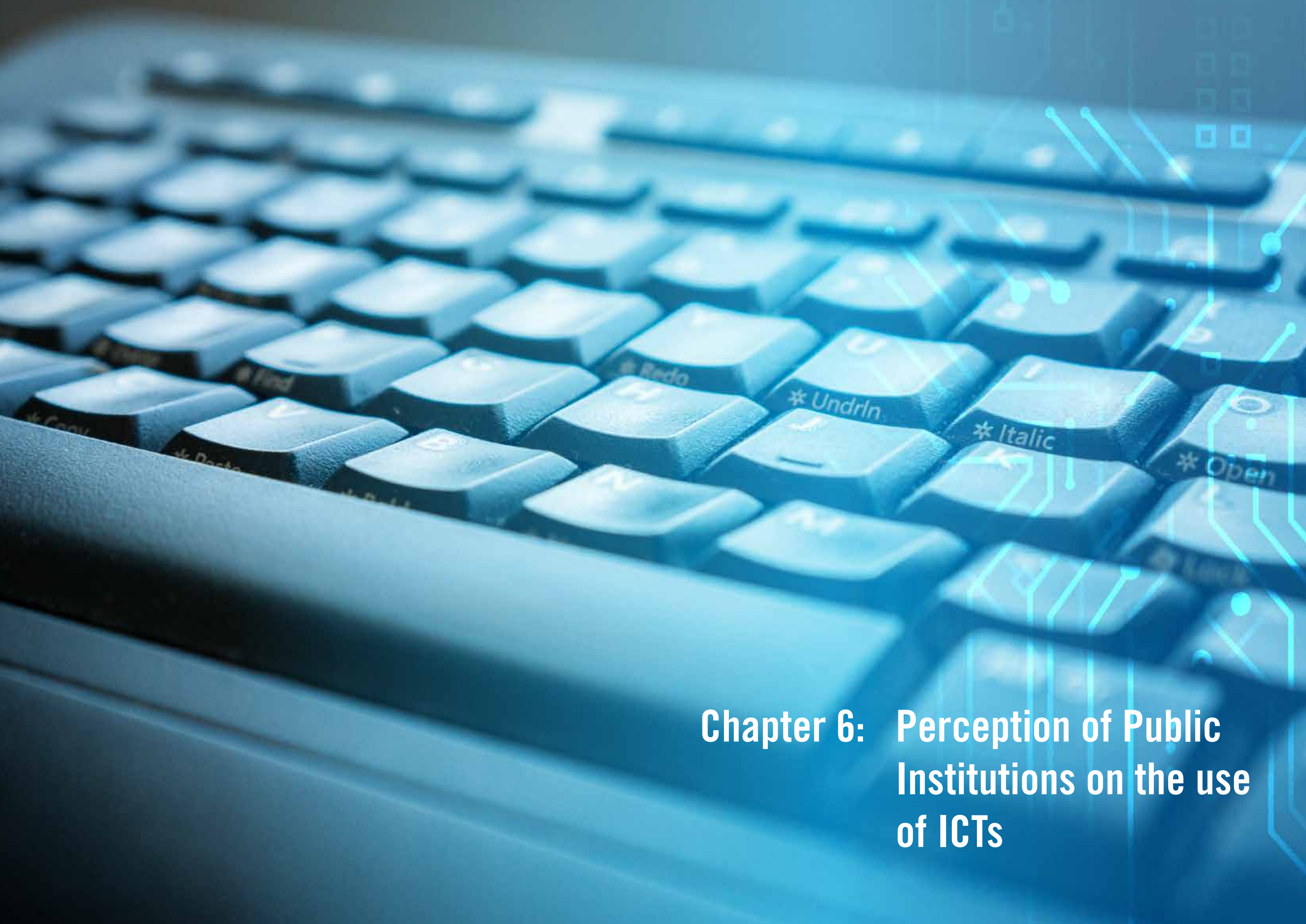
Figure 5. 6: Proportion of Public Institutions with a Waste Management Policy
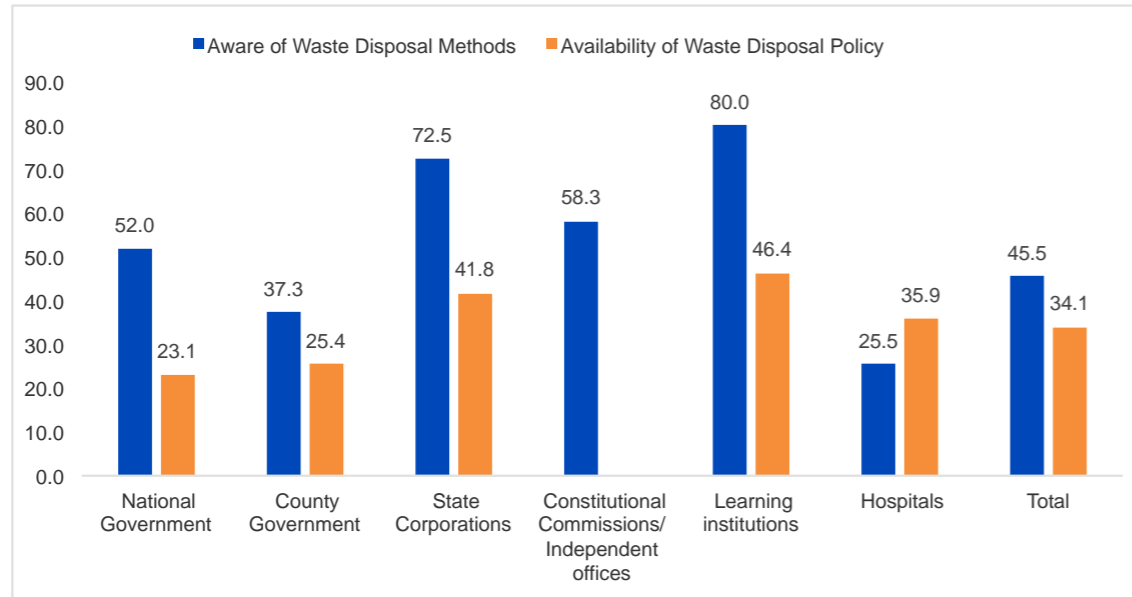
5.6.3   E-Waste Disposal Methods Used in Public Institutions

Overall, institutions preferred to sell their ICT equipment or throw them in the waste bin as presented in Table 5.9. Desktop computer and peripherals, Printers, copiers, scanners and fax machines, Server routers and data storage equipment were mainly sold off while Telephones (including cables) and CDs, DVDs, flash disks were thrown in the waste bins. At the institution level, State corporations preferred to sell their ICT equipment apart from the CDs, DVDs and flash disks that were disposed of in waste bins.

Table 5. 9: Proportion of Public Institutions by ICT Equipment Disposal Method

Type of Equipment	Method of Disposal	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Total
Telephone including cables	Sold	20.0	4.9	29.9	25.0	20.0	2.0	12.1
	Waste bin	13.3	16.7	6.6	0.0	11.4	13.5	12.7
	Sent for recycling	4.0	2.6	3.3	0.0	5.7	4.0	3.4
	Donations	5.3	3.6	7.1	0.0	5.7	2.0	4.2
Desktop computer and laptop, TV monitors	Sold	25.3	6.2	35.5	25.0	28.6	3.2	15.1
	Waste bin	2.7	8.8	5.2	0.0	8.6	10.0	7.6
	Sent for recycling	8.0	2.6	3.8	0.0	14.3	5.6	4.6
	Donations	13.3	7.5	12.8	0.0	20.0	1.2	7.9
Printers, photocopier and scanners and fax machines	Sold	25.3	6.9	36.5	25.0	28.6	3.2	15.5
	Waste bin	4.0	9.8	5.2	0.0	8.6	9.6	8.0
	Sent for recycling	6.7	2.3	1.9	0.0	14.3	5.6	3.9
	Donations	6.7	5.2	7.6	0.0	2.9	0.4	4.4
Servers routers, data storage equipment's	Sold	16.0	5.2	27.0	16.7	17.1	2.0	11.0
	Waste bin	9.3	8.5	3.8	0.0	5.7	8.4	7.2
	Sent for recycling	4.0	2.3	1.9	0.0	8.6	3.6	2.9
	Donations	5.3	2.6	2.4	0.0	0.0	0.0	1.9
CDs, DVDs, external hard drive, flash disks	Sold	12.0	2.9	11.8	8.3	11.4	1.2	5.7
	Waste bin	29.3	28.1	23.7	8.3	40.0	23.1	26.0
	Sent for recycling	5.3	2.0	3.3	0.0	5.7	2.4	2.8
	Donations	2.7	0.3	1.4	0.0	0.0	0.0	0.7

Chapter 6: **Perception of Public Institutions on the use of ICTs**

6.1 Introduction

The assessment of perceptions was deemed necessary to provide a qualitative analysis of the institution's opinions on the use of ICTs and the changes as a result of developments in the ICT sector. The likert scale was applied to evaluate the opinions of institutions on the use of various ICTs.

6.2 Perception on Calling Costs and Quality of Mobile Network

The Public Sector ICT Survey 2016 sought to find out the perception on the costs of calling for public institutions. The findings indicate that 42.0 per cent of institutions agreed that the cost of calling was affordable, 10.0 per cent strongly agreed, while 18.0 per cent and 7.3 per cent disagreed and strongly disagreed, respectively.

Figure 6. 1: Perception on the affordable of making calls
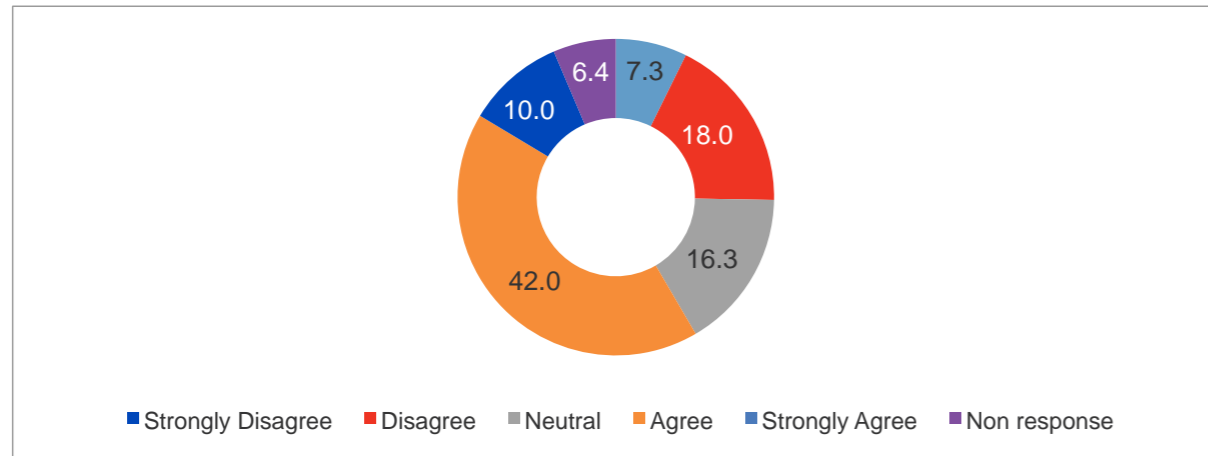
Institutions' perception on the reliability of service networks was also assessed. In general, most institutions, with and without mobile phones, stated that mobile service network was good.

Figure 6. 2: Perception regarding quality of mobile service network
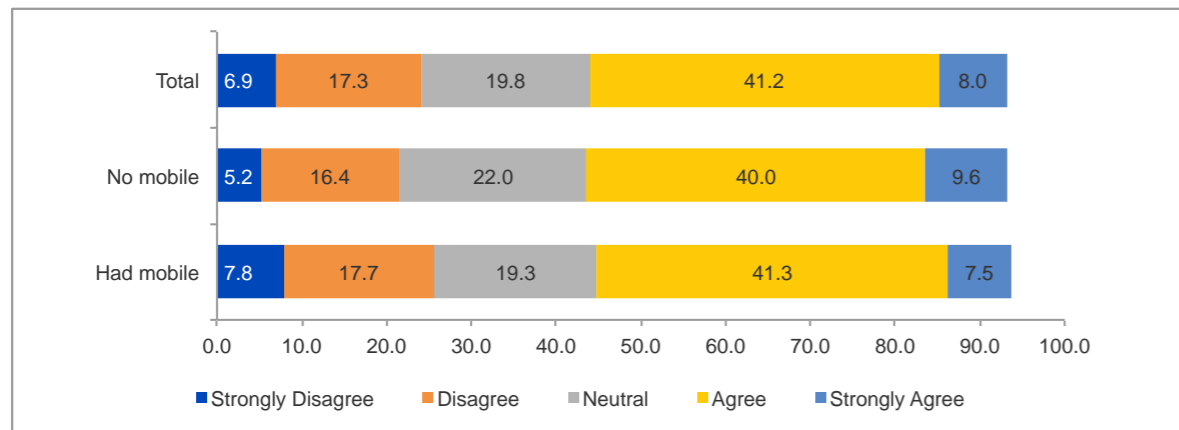
6.3 Perception on Internet Costs, Connectivity, and Ease of Doing Business

The survey sought to establish the general perception on the cost of Internet for the institutions regardless of the type of medium used to access it. Overall, 44.3 per cent of public institutions agreed that costs were affordable while 21.7 per cent strongly agreed as seen in Figure 6.3.

Figure 6. 3: Perception regarding affordability of Internet
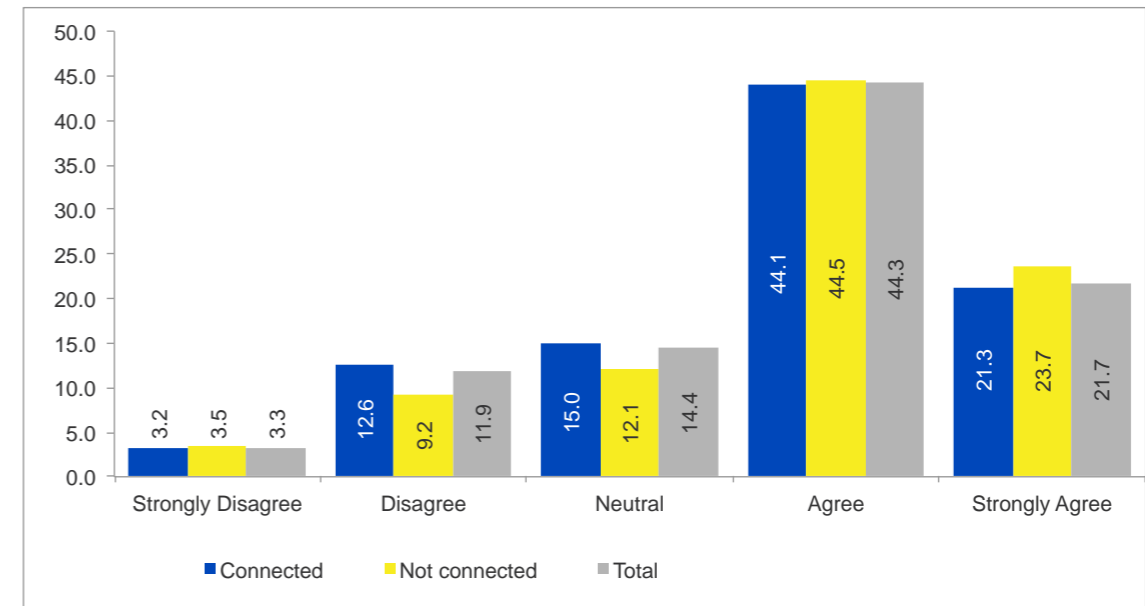
The perception on Internet costs was however slightly varied among public institutions as shown in Table 6.1. A higher proportion of Learning institutions (40.0 per cent) and Hospitals (24.3 per cent) strongly agreed that Internet was affordable compared to other institutions.

Table 6. 4: Perception on affordability of Internet by Institution type

Rating	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals
Strongly Disagree	2.7	3.9	2.4	0.0	0.0	4.0
Disagree	16.0	11.8	16.1	25.0	5.7	7.6
Neutral	17.3	14.1	15.2	16.7	14.3	13.1
Agree	44.0	41.2	46.4	41.7	34.3	47.8
Strongly Agree	16.0	22.5	17.1	8.3	40.0	24.3

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The reliability of Internet connection is critical to service delivery and work flow in institutions. The survey sought to establish the opinion of institutions on Internet connectivity, irrespective of the technology used. A comparison has been made between those that had Internet connected to their premises and those that were not connected. Overall, most institutions agreed that Internet connectivity was reliable, however, majority of those that were connected agreed or strongly agreed compared to those that did not have a connection to their premises as seen in Figure 6.4.

Figure 6. 4: Perception on reliability of Internet connectivity
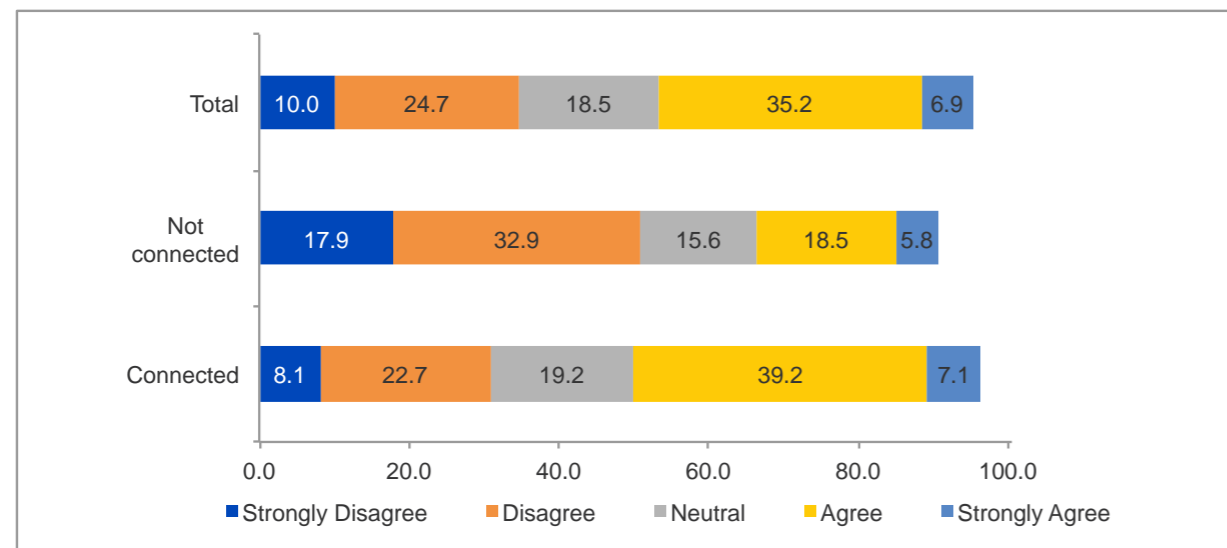
The role of Internet in easing transactions and communication is unparalleled. The survey sought to find out the perception of institutions on whether increased Internet access eased doing business. Overall, 45.6 per cent of public institutions agreed while 29.1 per cent strongly agreed with the statement as shown in Figure 6.5. Only 4.5 per cent of the institutions disagreed with the statement.

Figure 6. 5: Perception on whether increased Internet Connectivity has Improved Ease of Doing Business
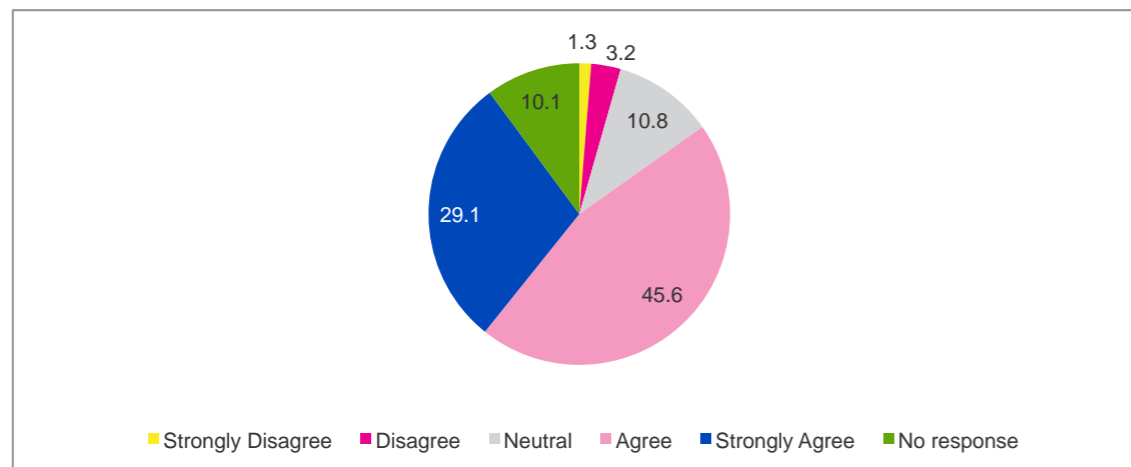
A significant proportion of institutions connected to the Internet agreed (43.8 per cent) and (41.7 per cent) strongly agreed that increased Internet connectivity had improved the ease of doing business as shown in Figure 6.6. It is noteworthy that a greater proportion of institutions connected with Internet strongly agreed on the role of the Internet in easing business transactions and operations.

Figure 6. 6: Perception on Whether Internet Connectivity has Improved Ease of Doing Business
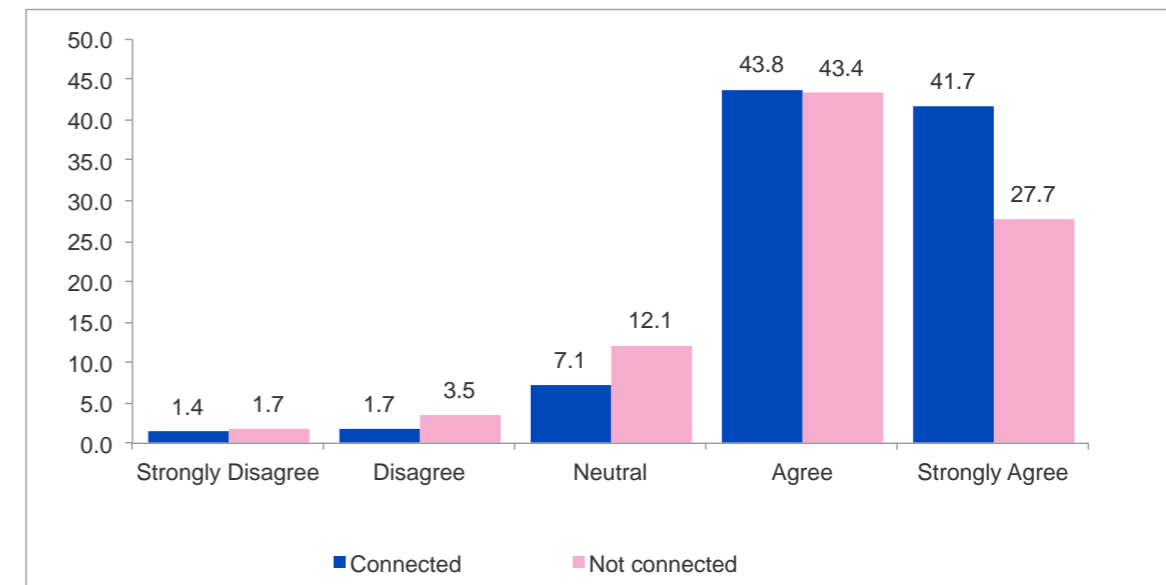
6.4   Perceptions on Online Banking

According to the findings, majority of the institutions (46.0 per cent) were in concurrence that transacting money through online, in most cases using Internet banking and bank cards, is safe as seen in Figure 6.7. At least 27.6 per cent were neutral with regard to the safety of the platform, while 13.7 per cent either strongly disagreed or disagreed that the platform was unsafe.

Figure 6. 7: Institution's Perception on Online Transactions

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree
- No Response
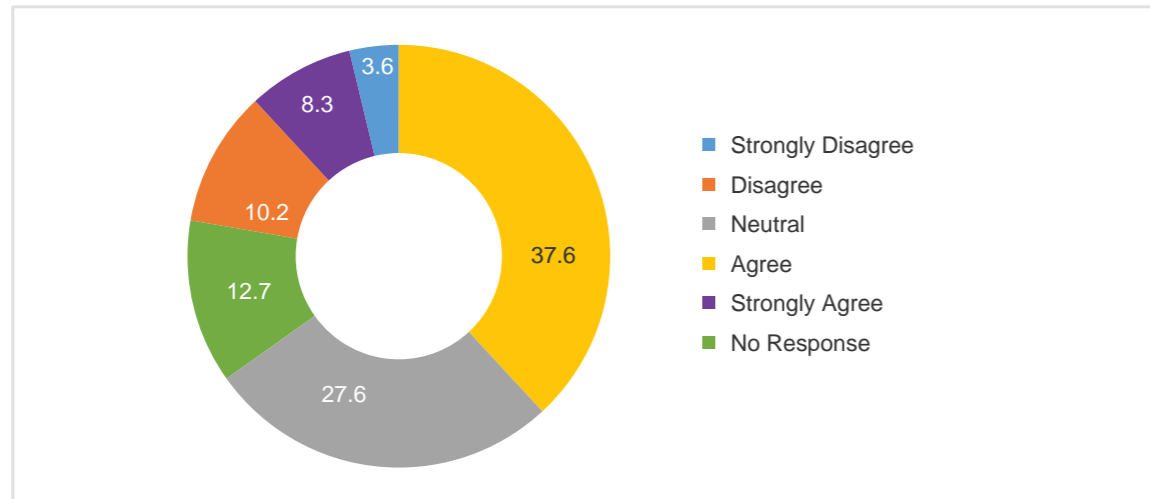
6.5   Perceptions on Delivery of Goods Using E-procurement

The survey sought to establish perception on the delivery of goods sold through the e-procurement platform. Delivery of goods on time and as per the expected conditions enhances efficiency in institutions. Majority of institutions neutrally perceived that goods bought via the platform will be delivered while 42.8 per cent perceived that the items would be delivered on time as seen in Figure 6.8. However, only 36.8 per cent agreed that goods would be delivered while only 27.1 per cent positively perceived that they would be delivered on time. Institutions that agreed goods would be delivered on time also agreed that the goods would be delivered were as expected.

Figure 6. 8: Institution's Perception on Goods Delivered via e-procurement
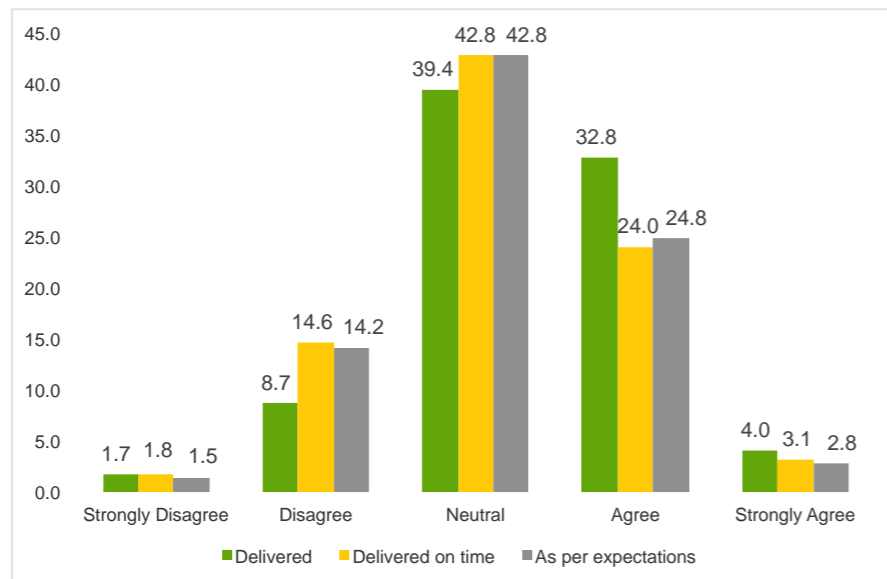
6.6   Perceptions on Delivery of Goods Sold Online

Among institutions that received orders online, 40.1 per cent were confident that the goods would be delivered on time. More importantly, a significant proportion of those that did not receive orders (41.4 per cent) and those that received (36.2 per cent) were neutral on the delivery of online goods. Timeliness of deliveries reflected a similar pattern as shown in Figure 6.9 and 6.10.

Figure 6. 9: Institution's Confidence that Goods Sold Online would be Delivered
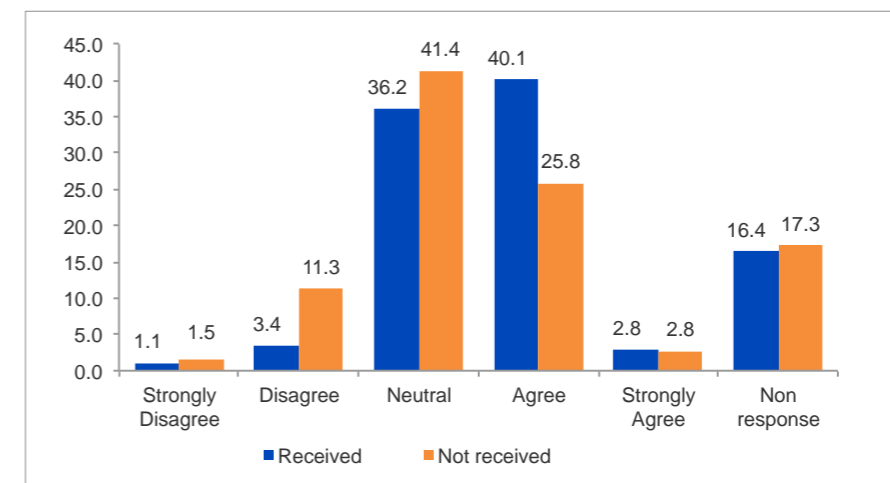
Figure 6. 10: Institution's Confidence that Goods Sold Online would be Delivered on Time
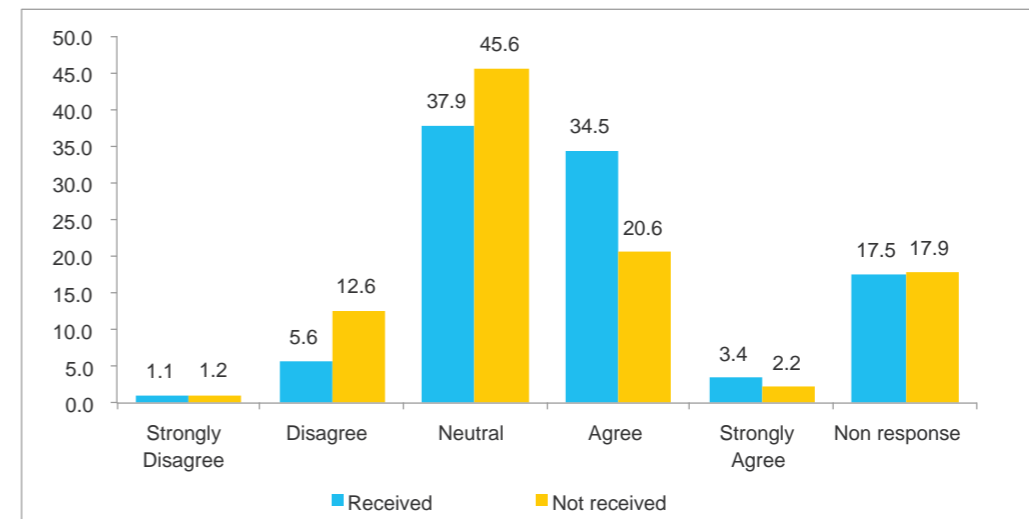
Chapter 7:   Comparative Analysis

7.1 Comparative Analysis of Public Institutions and Enterprises

The ICT Survey 2016 captured data on access and usage of ICTs in both public institutions and enterprises in Kenya. This chapter presents a comparison of public institutions and enterprise indicators as shown in Table 7.1. According to the survey, there was high mobile phone use in enterprises at 85.7 per cent compared to 65.8 per cent in public institutions. This could be explained by the practise of enterprises providing their employees with mobile handsets and lines to facilitate work. Majority of public institutions (85.6 per cent) and enterprises (87.7 per cent) had official email addresses. Over 60.0 per cent of the public institutions and enterprises had Local Area Network (LAN).

The results of the surveys reveal that a high proportion of public institutions and enterprises had high Internet connectivity at 80.2 per cent and 84.2 per cent, respectively. Those accessing Internet elsewhere was high at 17.8 per cent and 9.1 per cent in public institutions and enterprises, respectively. The most popular forms of Internet connectivity were mobile Internet via modems at 47.0 per cent and 31.5 per cent in public institutions and enterprises, respectively. Fixed Internet through fiber to the office was found in 55.8 per cent and 41.8 per cent of public institutions and enterprises, respectively. Mobile Internet through phones was reported by 23.5 per cent of institutions and 17.6 per cent of the surveyed enterprises.

Over half (57.5 per cent) of public institutions and 50.3 per cent of the enterprises reported to have established websites. Locally hosted websites were reported at 83.6 per cent for public institutions and 60.9 per cent for enterprises. The main reason for international web hosting was reliability at 76.0 per cent and 56.8 per cent for institutions and enterprises, respectively. Security reasons were cited by 60.0 per cent and 38.1 per cent of institutions and enterprises, respectively

The survey results show that, about a half (48.1 per cent) of public institutions had IT policies in place to guide the usage and management of the IT resources. On the other hand, a smaller proportion of enterprises (37.0 per cent) had IT policies in place. Further, the survey established that the use of cloud computing as a way of delivering information technology services was still very low in institutions (35.8 per cent) and enterprises (22.9 per cent). Similarly, the proportion of institutions and enterprises that had ICT security policies was low at 43.4 per cent and 36.6 per cent, respectively.

A higher proportion of public institutions (46.4 per cent) reported to have experienced computer virus attacks compared to enterprises (21.7 per cent). Other forms of online crimes experienced included hacking at 7.3 per cent and 5.5 per cent for institutions and enterprises, respectively

The results of ICT Survey 2016 indicate that despite the existence of the National Kenya Computer Incident Response Team Coordination Centre (National KI-CERT/CC), a considerable proportion of public institutions (39.7 per cent) and enterprises (46.3 per cent) did not report online crime to the centre. This implies inadequate awareness by both public institutions and enterprises on the role of National KI-CERT/CC. Online crimes were mainly reported to ICT Authority, Kenya Police Service and Communications Authority of Kenya.

Table 7. 1: Comparative analysis of Public Institutions and Enterprises

Indicators	Public Institutions	Enterprises
	Per Cent	
Proportion of enterprises/institutions with mobile phone	65.8	85.7
Proportion of enterprises/institutions with fixed telephone	49.2	50.5
Proportion of enterprises/institutions with facsimile machine	21.6	11.3
Proportion of enterprises/institutions with mobile payment account	20.7	72.7
Proportion of enterprises/institutions with Internet in their premises	80.2	84.2
Proportion of enterprises/institutions with Internet in their premises by type of Internet connectivity:		
Fixed Internet - Cable modem	23.7	18.9
Fixed Internet - Copper line (dial-up, DSL and xDSL)	6.3	4.1
Fixed Internet - Fiber to the office	55.8	50.7
Fixed Internet - Satellite	6.6	6.2
Fixed Internet - Fixed wireless e.g. Wi-Max	44.0	40.5
Mobile Internet - Phones	23.5	17.6
Mobile Internet - Modems	47.0	26.2
Proportion of enterprises/institutions with accessing Internet elsewhere	17.8	9.1
Proportion of enterprises/institutions with LAN	63.7	60.4
Proportion of enterprises/institutions with Intranet	36.3	39.6
Proportion of enterprises/institutions using specialised applications for human resource	56.5	27.1
Proportion of enterprises/institutions with official email address	85.6	87.7
Proportion of enterprises/institutions with website	57.5	50.3
Proportion of enterprises/institutions hosting website locally	83.6	60.9
Proportion of enterprises/institutions hosting website internationally	15.0	36.7
Proportion of enterprises/institutions hosting website internationally, by type of reason:		
Cost	41.6	35.0
Security	58.4	38.1
Technical know how	27.3	27.5
Reliability	72.7	56.8
Institution's policy	7.8	32.0
Proportion of enterprises/institutions using Cloud computing	35.8	22.9
Proportion of enterprises/institutions with information technology policy	48.1	37.0
Proportion of enterprises/institutions with ICT security Policy	43.4	35.9
Proportion of enterprises/institutions aware of National KE-CIRT/CC	26.9	14.6

Indicators	Public Institutions	Enterprises
	Per Cent	
Proportion of enterprises/institutions that experienced Online crime, by type:		
Hacking	7.1	5.1
Phishing	4.4	3.3
Theft of money (online)	0.3	0.7
Theft of information (online)	2.0	1.1
Identity theft	2.2	0.8
Website vandalism	3.7	1.5
Computer virus	44.8	20.3
Proportion of enterprises/institutions who reported online crime by type of organisation:		
Kenya Police Service	14.0	25.9
Communications Authority of Kenya	3.7	4.6
ICT Authority	27.9	15.3
National Kenya Computer Incident Response Team- Coordination Centre	0.0	1.4
Central Bank of Kenya	1.5	1.4
Engaged IT Consultant	0.0	6.9
Did Not Report	39.7	46.3
Internet Service Provider (ISP)	0.0	3.7
Reported internally	17.6	0.0
Proportion of enterprises/institutions with E-waste management policy	34.1	37.0

Annex

Annex I: Detailed Results Tables

Table 1: Availability of ICT Infrastructure and Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/Independent offices	Learning Institutions	Hospitals	Count
Proportion of Institution with Mobile	Yes	40.0	46.7	80.6	66.7	85.7	81.7	586.0
	No	52.0	45.4	12.3	8.3	11.4	16.3	250.0
	No Response	8.0	7.8	7.1	25.0	2.9	2.0	54.0
Proportion of Institutions with Fixed Telephone	Yes	64.0	39.2	80.6	100.0	80.0	23.9	438.0
	No	32.0	54.9	15.6	0.0	20.0	68.5	404.0
	No Response	4.0	5.9	3.8	0.0	0.0	7.6	48.0
Proportion of Institutions with Facsimile	Yes	48.0	10.8	41.7	25.0	40.0	7.2	192.0
	No	44.0	79.7	43.1	41.7	51.4	83.7	601.0
	No Response	8.0	9.5	15.2	33.3	8.6	9.2	97.0
Proportion of Institutions with Mobile Money Account	Yes	5.3	10.8	41.2	16.7	45.7	11.6	171.0
	No	80.0	79.7	47.9	50.0	48.6	81.7	633.0
	No Response	14.7	9.5	10.9	33.3	5.7	6.8	86.0
Proportion of Institutions with Mobile Payment account	Yes	5.3	10.8	41.2	16.7	45.7	11.6	171.0
	No	80.0	79.7	47.9	50.0	48.6	82.7	633.0
	No Response	14.7	9.5	10.9	33.3	5.7	6.8	86.0
Proportion of Institutions with LAN	Yes	58.7	55.6	90.5	91.7	97.1	46.6	567.0
	No	34.7	40.8	9.0	8.3	2.9	49.4	296.0
	No Response	6.7	3.6	0.5	0.0	0.0	4.0	27.0

Table 1: Availability of ICT Infrastructure and Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/Independent offices	Learning Institutions	Hospitals	Count
Proportion of Institutions with E-government services	Yes	48.0	42.2	60.2	50.0	74.3	24.7	386.0
	No	41.3	45.8	28.0	25.0	14.3	69.3	412.0
	No Response	10.7	12.1	11.8	25.0	11.4	6.0	92.0
Proportion of Public Institutions Web presence	Yes	61.3	66.3	87.7	100.0	94.3	13.1	512.0
	No	38.7	33.7	12.3	0.0	5.7	86.5	377.0
	No Response	0.0	0.0	0.0	0.0	0.0	0.4	1.0
Proportion of institutions with intranet	Yes	21.3	30.7	57.8	83.3	65.7	23.1	323.0
	No	77.3	69.0	42.2	16.7	31.4	75.3	560.0
	No Response	1.3	0.3	0.0	0.0	2.9	1.6	7.0
Proportion of institutions using specialized applications for human resource services	Yes	73.3	64.4	50.7	75.0	62.9	45.0	503.0
	No	24.0	33.3	46.9	25.0	37.1	54.2	371.0
	No Response	2.7	2.3	2.4	0.0	0.0	0.8	16.0
Proportion of institutions with e-procurement system	Yes	49.3	62.1	39.3	100.0	57.1	20.3	393.0
	No	50.7	37.3	58.8	0.0	40.0	78.9	488.0
	No Response	0.0	0.7	1.9	0.0	2.9	0.8	9.0
Proportion of institutions with IT policy	Yes	45.3	37.3	79.1	83.3	91.4	28.3	428.0
	No	52.0	60.8	20.4	16.7	8.6	69.3	447.0
	No Response	2.7	2.0	0.5	0.0	0.0	2.4	15.0

Table 1: Availability of ICT Infrastructure and Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Count
Proportion of institutions with ICT security policy	Yes	34.7	32.4	68.2	75.0	65.7	33.9	386.0
	No	65.3	66.0	31.3	25.0	34.3	64.9	495.0
	No Response	0.0	1.6	0.5	0.0	0.0	1.2	9.0
Proportion of institutions with e-waste management policy	Yes	23.1	25.4	41.8	0.0	46.4	35.9	138.0
	No	74.4	71.9	56.2	100.0	50.0	59.4	256.0
	No Response	2.6	2.6	2.0	0.0	3.6	4.7	11.0
Proportion of institutions aware of waste disposal methods	Yes	52.0	37.3	72.5	58.3	80.0	25.5	405.0
	No	48.0	59.5	26.5	41.7	20.0	73.7	471.0
	No Response	0.0	3.3	0.9	0.0	0.0	0.8	14.0
Proportion of institutions that lost data due to virus attack	Yes	42.7	65.0	29.4	25.0	37.1	48.6	431
	No	56.0	34.6	69.2	75.0	62.9	50.2	451
	No Response	1.3	0.3	1.4	0.0	0.0	1.2	8

Table 2: Use of ICT Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Count
Proportion of Institutions using cloud computing and its services	Application hosting	3.2	12.0	18.0	0.9	2.8	3.2	127
	Data storage	3.2	21.8	19.0	0.3	4.7	14.9	202
	Email and messaging	6.0	27.5	24.4	0.9	7.3	17.1	263
	Customer relationship Management	0.9	2.8	2.8	0.3	0.6	2.2	31
	Server capacity	1.3	7.3	7.6	0.6	1.9	4.4	73
	Application development	0.6	2.8	2.5	0.3	1.3	1.9	30
	Business specific	0.6	0.6	1.6	0.6	0.0	0.3	12
	Finance and enterprise resource planning	1.9	4.1	3.8	0.0	0.9	0.9	37
	Desktop/ office software	1.6	12.0	7.3	0.3	2.2	6.3	94
	Content management system/ Document management system	1.6	5.1	7.0	0.3	2.5	3.5	63
	Business Intelligence	0.3	2.2	1.6	0.3	0.3	0.0	15
	Business process manager on cloud	0.3	1.9	1.6	0.3	0.0	0.3	14
	Enterprise Service Bus	0.3	0.0	0.6	0.0	0.0	0.0	3
	Total No. of Institution	20	101	107	4	24	60	316

Table 2: Use of ICT Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Count
Proportion of Institutions using cloud computing with benefits accrued	More flexibility	5.4	25.3	28.8	0.3	6.3	16.5	261
	Cost savings	5.1	24.7	22.8	0.9	7	14.2	236
	Better scalability	4.1	11.7	16.1	0.6	4.7	7.6	142
	Complexity reduction (Simplicity)	4.4	11.7	14.9	0.3	4.4	10.8	147
	More (Core) business focus	1.6	6	9.8	0	2.2	1.3	66
	Collaboration	3.5	9.5	13.9	0.6	3.2	7.6	121
	Automatic Software updates	3.5	12.3	13.6	0.3	3.5	6.6	126
	Improved security	4.1	16.1	17.4	0.6	5.1	12	175
	Disaster recovery	2.2	11.1	17.7	0.9	4.7	7	138
	Total No. of Institution	19	102	107	4	24	60	316

Table 2: Use of ICT Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Count
Proportion of Institutions by reason not using cloud computing	Insufficient knowledge within the organization	4.6	21.9	4.6	0	0.6	21.3	278
	The cost is high	1	7	5.5	0	0.4	12	136
	Insufficient regulatory framework	2.3	7.8	5.1	1	0.4	8	129
	Security concerns	1.3	5.7	7	0.6	0.2	4.2	100
	No need	1.7	2.9	3	0.2	0.6	2.5	57
	lack of technical capacity	0.6	0.6	0.4	0	0	2.3	20
	Lack of guiding policy	0	0.2	0	0	0	0	1
	under development	0	0.2	0.4	0	0	0	3
	Total No. of Institution	49	185	95	7	11	178	525
Proportion of institutions hosting website locally and internationally	Locally	89.1	84.7	82.7	83.3	75.8	81.8	428
	Internationally	6.5	13.8	16.2	16.7	24.2	18.2	77
	No Response	4.3	1.5	1.1	0	0	0	7

Table 2: Use of ICT Applications

Indicator	Responses	National Government	County Government	State Corporations	Constitutional Commissions/ Independent offices	Learning institutions	Hospitals	Count
Proportion of Institutions updating website by frequency	Daily	23.9	12.8	20	33.3	36.4	12.1	94
	Weekly	39.1	40.4	37.8	50	36.4	30.3	198
	Monthly	6.5	26.6	27.6	8.3	21.2	27.3	125
	Quarterly	17.4	11.8	8.6	8.3	3	12.1	54
	Mid-year	0	0.5	2.2	0	0	6.1	7
	Annually	8.7	1.5	2.2	0	0	3	12
	More than a year	2.2	1.5	1.1	0	0	3	7
	No response	2.2	4.9	0.5	0	3	6.1	15
	Total No. of Institution	46	203	185	12	33	33	512
Proportion of institutions by type of social networking websites	Social networking sites such as Facebook, Google+	88.1	82.3	94.9	91.7	100	66.3	439
	Microblog sites such as Twitter	59.5	50.5	72.8	83.3	72.4	41.6	302
	Instant messaging such as WhatsApp	38.1	55.4	29.1	41.7	34.5	58.4	232
	Linked-In	9.5	10.8	22.2	16.7	34.5	6.7	77
	Video sites such as You tube	9.5	22	43	50	55.2	10.1	144
	Photo sites such as Flicker, Instagram etc	4.8	8.6	11.4	8.3	34.5	0	47
	Blogs such as WordPress, Blogspot etc	4.8	9.1	8.9	8.3	34.5	2.2	46

Annex II: Concepts and Definitions

Skilled Workers: This includes paid employees, working owners/operators, unpaid family workers (contributing family workers) or apprentice who have served an apprenticeship, practice the trade learned or similar activity, and by reason of their knowledge and vocational capacity are given tasks which are particularly difficult, involving varied responsibilities or fields. They include those who are paid or not paid

Semi-skilled workers: This includes paid employees, working owners/operators, unpaid family workers (contributing family workers) or apprentice. These are workers who can only perform their job after a period of instructions of several months in general and are given tasks – mostly specific to the industry – which are regularly repeated, are less difficult and involve less responsibility.

Unskilled, Unqualified Workers: This includes paid employees, working owners/operators, unpaid family workers (contributing family workers) or apprentice. These are workers who require no specific vocational training or only brief initiation and work on auxiliary tasks.

Application Hosting: A hosted application is a software as a service (SaaS) solution that allows users to execute and operate a software application entirely from the cloud on a recurring subscription. Hosted applications are hosted and powered from the remote cloud infrastructure and are accessed globally through the Internet.

Email and messaging: Email is a service of sending quick mails. The Internet is used to transport mail. In this network, each server at regular intervals calls another server, often using a modem, so that they exchange letters. A mail server responds to requests for routing email. The server stores the received messages and sends outbound messages to the recipient (another mail server). A mail server also responds to requests for manipulation and retrieval of stored messages.

Customer Relationship Management (CRM): is where the CRM management software, CRM tools and organisations customer data resides in the cloud and is delivered to end users via the Internet. Cloud CRM typically offers access to the application via Web-based tools (or Web browser) logins where the CRM system administrator has previously defined access levels across the organization. Employees can log in to the CRM system, simultaneously, from any Internet-enabled computer or device. Often, cloud CRM provide users with mobile apps to make it easier to use the CRM on smartphones and tablets.

Server capacity: corresponds to the total volume of digital data that can be stored therein. For example, the total storage capacity of a cinema server or a centralized library server (which is expressed in terabytes).

Application development: This is developing applications while using the application program that are not entirely residing in the desktop. They are more of web app that are entirely stored on a remote server and is delivered over the Internet through a browser interface.

Business specific: Applications that are used as a delivery mechanism for providing specific goods or services to customers.

Finance and enterprise resource planning: Offered through SaaS, the finance and enterprise resource planning is offered through cloud rather than proprietary server infrastructure to help companies share information across departments. Cloud ERP software integrates some or all of the essential functions for running a business, e.g. accounting, inventory and order management, human resources, customer relationship management (CRM), etc. - into one complete system.

Desktop/office software: Offers users to access and manage the contents through cloud rather than on the desktop as is in the ordinary way

Content management system/Document management system: Enables users to access their files such as content library, records of changes to each document and audit trails at any time at any device. These systems are mainly house in based depending on the need of each enterprise.

Business Intelligence: It is the process of gathering data to convert it into meaningful information using software, tools and methodologies. This in turn aids the decision making of any organization. Business intelligence systems help with activities ranging from discovering-mapping-extracting of data to transforming-modelling-validating the information.

Business process manager on cloud: This is the use of (BPM) tools that are delivered as software services (SaaS) over a network. Cloud BPM business logic is deployed on an application server and the business data resides in cloud storage. Business process management enables organizations to be more efficient, more effective and more capable of change than a functionally focused traditional hierarchical management approach.

Enterprise Service Bus (ESB): This is an integrated platform that provides fundamental interaction and communication services for complex software applications via an event driven and standards-based messaging engine, or bus, built with middleware infrastructure product technologies. The ESB platform is geared toward isolating the link between a service and transport channel and is used to fulfil service-oriented architecture (SOA) requirements. The enterprise service bus (ESB) is a middleware computer technology. Its purpose is primarily to allow communication applications that were not designed to work together.

More flexibility: A cloud service tailored precisely to customer needs can be seamlessly integrated into the existing IT infrastructure – without installing additional programs, adding new hardware or gobbling up huge amounts of storage space. Once you have registered with the service provider over the Internet, you simply log on and begin using the cloud solution. Not only does this cut costs, it also accelerates the implementation of new systems – significantly streamlining your processes. And because you are not dependent on local hardware or software, you gain a whole new level of flexibility in terms of accessing the solution. Cloud applications are available around the clock; all you need is an Internet connection. So you can work whenever and wherever you like – remotely, from home, or on the move. Cloud-based services are ideal for businesses with growing or fluctuating bandwidth demands. If your need increases it's easy to scale up your cloud capacity, drawing on the service's remote servers.

Cost savings: Saves cost e.g. server costs. An enterprise doesn't need to invest heavily on server(s).

Better scalability: Cloud solutions are infinitely scalable, meaning you can access the resources you need in line with your changing requirements. Usage-based pricing models ensure that you only pay for the services you actually use. And this cost transparency gives you a reliable basis for planning. Cloud computing minimizes the risks associated with capital expenditure and the cost and effort of in-house operation and maintenance. You gain access to high-performance resources and professional solutions without needing to make upfront investment. By reducing the need for local resources, the cloud reduces expenditure in the long term. Therefore, cloud computing allows your business to easily upscale or downscale your IT requirements as and when required.

Complexity reduction (Simplicity): Anyone can use cloud computing as long as they are connected to Internet. Minimal skills are needed to use major cloud services.

More (Core) business focus: At times referred to as "Cloudonomics" or "economics of cloud computing". Refers to allowing a business or enterprise to focus on their core business and minimize investment in IT infrastructure.

Collaboration: Cloud collaboration is a type of enterprise collaboration that allows employees to work together on documents and other data types, which are stored off-premises and outside of the company firewall. Employees use a cloud-based collaboration platform to share, edit and work together on projects. Cloud collaboration enables two or more people to work on a project at once. A cloud collaboration project begins when one user creates the file or document and then gives access to certain individuals; for example, the project creator may share a link to the project that allows others to view and edit it. Users can make changes to the document at any time, including when employees are viewing and working simultaneously. All changes are saved and synced so every user sees the same version of the project.

Automatic Software updates: In cloud computing, the servers are off-premises. Suppliers take care of them for you and roll out regular software updates – including security updates – so you don't have to worry about wasting time maintaining the system yourself. This leaves you free to focus on the things that matter, like growing your business.

Improved security: Lost laptops are a billion-dollar business problem. And potentially greater than the loss of an expensive piece of kit is the loss of the sensitive data inside it. Cloud computing gives you greater security when this happens. Because your data is stored in the cloud, you can access it no matter what happens to your machine. And you can even remotely wipe data from lost laptops so it doesn't get into the wrong hands.

Disaster Recovery: Businesses of all sizes should be investing in robust disaster recovery, but for smaller businesses that lack the required cash and expertise, this is often more an ideal than the reality. Cloud therefore offers small businesses to recover their data and reduce time and avoid large up-front investment.

Dedicated Facsimile (fax): A facsimile (fax) machine uses public switched telephone networks (PSTN) and the Internet for the electronic fax transmission of text and images. Also referred to as tele copying or telefax, is the telephonic transmission of scanned printed material (both text and images), normally to a telephone number connected to a printer or other output device.

Dedicated mobile phone: It refers to a mobile phone owned by the business. A mobile phone may also include smart phones but excludes tablet, phablets etc.

LAN connection: A LAN refers to a network connecting computers within a localized area such as a single building, department or site; it may be wireless.

Narrowband: Refers to analogue modem (dial-up via standard phone line), ISDN (Integrated Services Digital Network), DSL at speeds below 256kbit/s, and mobile phone and other forms of access with an advertised download speed of less than 256 kbit/s. Note that narrowband mobile phone access services include CDMA 1x (Release 0), GPRS, WAP and i-mode.

Cable modem: Is a type of modem that connects a computer or local network to broadband Internet service.

Copper line (dial up and DSL and xDSL): Is used to transmit digital data over telephone lines. The DSL services can be delivered simultaneously with wired telephone service on the same telephone line. xDSL refers collectively to all types of digital subscriber lines that is: Asymmetric Digital Subscriber Line (ADSL), Symmetric Digital Subscriber Line (SDSL), High data rate digital subscriber line (HDSL) and Very high DSL (VDSL). All operate over existing copper telephone lines. xDSL offers high speeds of upto 32 mbps for upstream traffic and from 32 kbps to over 1 mbps for down streaming traffic.

Satellite: It is an artificial object which has been intentionally placed into the orbit. Such objects are sometimes called artificial satellites to distinguish them from natural satellites such as Earth's Moon.

Fixed wireless: It is the operation of wireless devices or systems used to connect two fixed locations (e.g., building to building or tower to building) with a radio or other wireless link, such as laser bridge. Usually, fixed wireless is part of a wireless LAN infrastructure. Fixed wireless devices usually derive their electrical power from the utility mains, unlike mobile wireless or portable wireless which tend to be battery-powered. They include WiMAX, Wi-Fi, etc.

Fiber to the office: Refers to technology associated with the transmission of information as light impulses along a glass or plastic wire or fiber. Fiber optic wire carries much more information than conventional copper wire and is far less subject to electromagnetic interference. Fiber optic has much greater bandwidth than metal cables, they are thinner and lighter than metal

Fixed broadband: Refers to technologies such as DSL (Digital Subscriber Line) at speeds of at least 256kbit/s, cable modem, high speed leased lines, fibre-to-the-home, power line, satellite, fixed wireless, Wireless Local Area Network and WiMAX.

Mobile broadband: Refers to access services including Wideband CDMA (W-CDMA), known as Universal Mobile Telecommunications System (UMTS) in Europe; High-speed Downlink Packet Access (HSDPA), complemented by High-Speed Uplink Packet Access (HSUPA); CDMA2000 1xEV-DO and CDMA 2000 1xEVDV. Access can be via any device (mobile cellular phone, laptop, PDA, etc.)

Intranet: Refers to an internal communication network using Internet protocols and allows communication within an organization (and to other authorized persons). It is typically set up behind a firewall to control access.

E-commerce: Is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over computer-mediated networks. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or offline.

Phishing: Is the attempt to acquire sensitive information such as passwords, usernames, credit card etc for malicious reasons, by masquerading as a trustworthy entity via computer, phone etc.
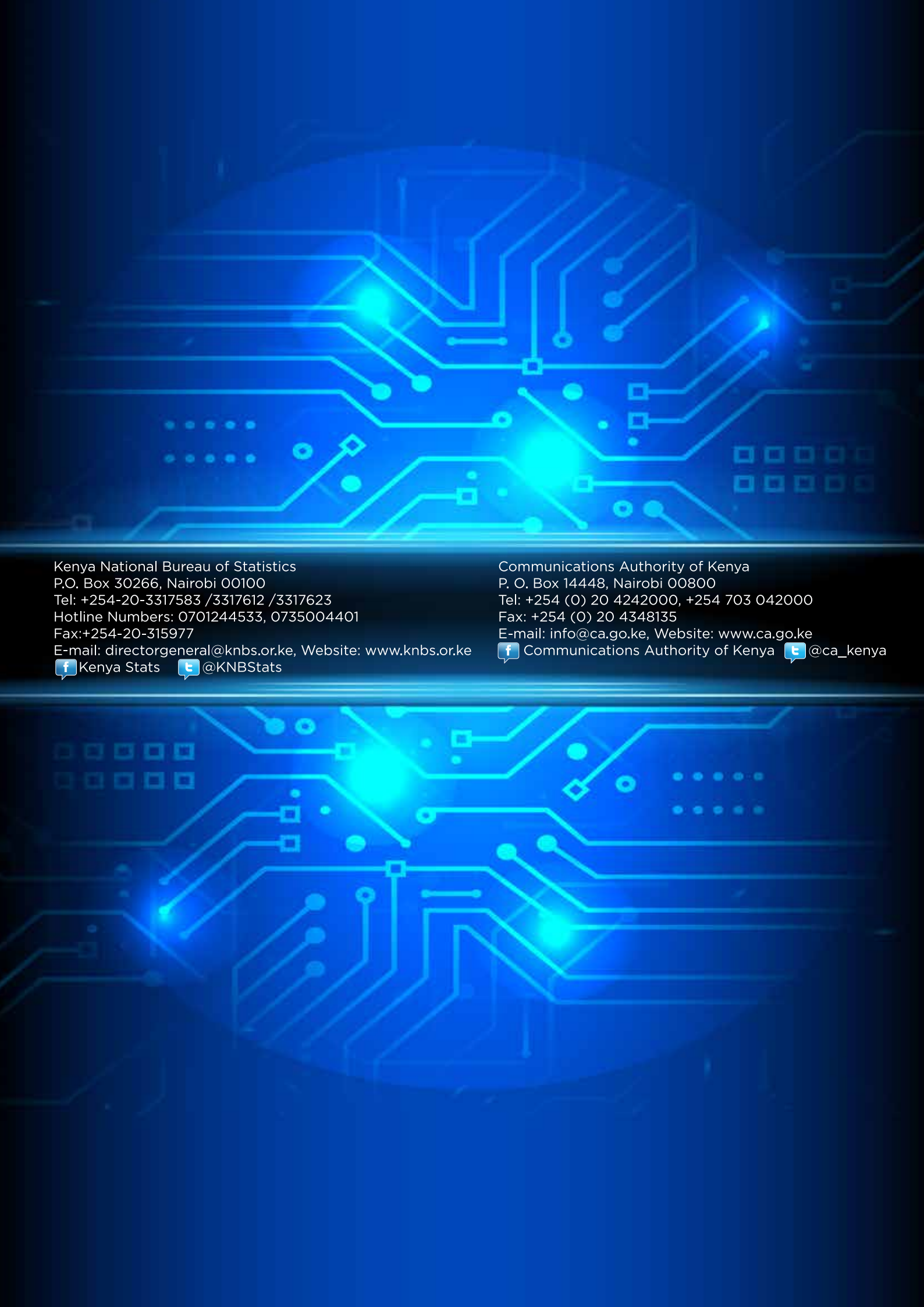
Hacking/ theft of information: The practice of accessing computer networks illegally and stealing information without the user's knowledge or permission by using exploits. Hacking can also be done on phones, where one intercepts telephone calls or voicemail messages without consent of the phone owner. In a hack, information is extracted involuntarily, forcing the perpetrator to first take over your computer system, through brute force or more sophisticated methods, to access sensitive data.

Theft of money (online): This may be part of phishing, but it is important to capture it separately. This entails theft of money via stealing credit/debit card information, stealing password for Internet banking, etc.

Identity theft: Is the same as phishing although it differs depending where it is used. For example, in Facebook, one can sign up and pretend to be someone else and trick the victim maliciously.

Website vandalism: It includes destroying, changing or defacing other's website content. Website vandals are usually software or high tech gurus involved.

Computer virus: A virus is a small piece of software that piggybacks on real programs. For example, a virus might attach itself to a program such as a spreadsheet programme. Each time the spreadsheet program runs, the virus runs too and it has the chance to reproduce (by attaching itself to other programs) or wreak havoc. These includes Trojan and worms.