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A Study on Select IoT Devices and Systems – Applications and Challenges.

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Abstract: The evaluation of Internet of Things (IoT) has emerged from the convergence of wireless technology, micro-electromechanical systems and the Internet. The objectives of the present study are To study the applications of Internet of Things (IoT) among the sample respondents. To study and analyze the usage of Internet of Things (IoT). To identify the challenges faced in usage of IoT. The study used descriptive statistics and ANOVA for analyzing the data. The results show that sample respondents are spending 1-3 hours per day on internet access. Most of the people are using smart phone. The IoT applications such as online money transfer and security surveillance is commonly used by most of the people.

Keywords: IoT, ANOVA, Devices, Applications

Introduction:

The evaluation of Internet of Things (IoT) has emerged from the convergence of wireless technology, micro-electromechanical systems and the Internet. IoT has led a large number of people who can sense, communicate and share all interconnected information over public or private Internet protocol networks. IoT also have a great impact on our everyday lives in that it has changed the way traffic, weather, pollution and the environment are monitored and how data is collected (Janna, 2009). Smart devices are giving us deeper control over our lives such as enhancing a door lock so that it contacts you when someone opens it or breaks in (Samuel, 2008). The scope of Internet of Things applications is expected to greatly contribute to addressing today societal challenges. Health monitoring systems help meet the challenges of an ageing society, connected trees help fight deforestation because they are able to send alerts when a tree is cut and connected cars help reduce traffic congestion (Commission of The European Communities, 2009).

Review of Literature:

According to a study conducted by Baym (2001) on IoT it was found that scenario in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet (Kraut, 1998).

Swickert (2002) in their study on Internet of Things they viewed IOT as a a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network

Although the concept was not named until 1999, the Internet of Things has been in development for decades. The first Internet appliance was a Coke machine at Carnegie Melon University in the early 1980s. The programmers could connect to the machine over the Internet, check the status of the machine and determine whether or not there would be a cold drink awaiting them should they decide to make the trip down to the machine (Kevin, 1999). The Internet of Things was known as control networks, it was discussed in IEEE Spectrum as moving small packets of data to a large set of nodes so as to integrate and automate everything from home appliances to entire factories. The local operating control networks could be linked to the Internet and intranets where information could flow from anywhere and from anybody to anything. People could now reach things as well as other people (Raji, 1998)

Objectives of the Study:

1. To study the applications of Internet of Things (IoT) among the sample respondents.
2. To study and analyze the usage of Internet of Things (IoT)
3. To identify the challenges faced in usage of IoT

Hypotheses:

Based on the objectives the following hypotheses were formulated.

H01: There is no significant difference between age and access to internet.
H02: There is no significant difference between age and usage of devices.
H03: There is no significant difference between profession and usage of devices.
H04: There is no significant difference between gender and cyber crimes.
H05: There is no significant difference between profession and cyber crimes.

Research Methodology:

In order to achieve the desired objectives, the researcher has formulated a structured questionnaire (the questionnaire which is being used in a research work of Musyimi Moses Mwanjangi "Impact of OIT on People working in Nairobi Central Business District). The first part of the questionnaire consists of demographic data. The second part of the questionnaire focused on usage, applications, benefits and challenges in usage of connected devices and systems. Likerts Scale has been used.

Sample Size:

A total of 132 sample respondents were collected for the purpose of the study. The data has been collected using googledocs.

Tools for analysis:

Descriptive analysis has been used for analyzing the demographic factors. Mean, graphs and ANOVA were used for analyzing the data.

Data Analysis: The following section deals with the data analysis, findings and conclusions of the study.

Table1: Table showing Demographic features of the sample respondents.

Gender	No of Respondents	Percentage
Male	70	53
Female	62	47
Profession		
Student	51	39
IT & ITES	19	14
Teaching	27	20
Administration	1	0.007
Home Maker	2	0.015
Entrepreneur	7	0.053
Others	25	18.9
Hours Spent on Internet		
Less than 1 hour	24	18
1-3 hours	67	51
4-6 hours	18	14
More than 6 hours	23	17
Age Group		
Less than 20	10	7
20 -30 years	74	56
31-40 years	27	20
41-50 years	19	14
More than 50	2	0.015

(Source: Primary Data)

Table 1 represents the demographic features of the sample respondents, from the above table it can be observed that 53% of the sample respondents are male and 47% of them are female. The majority of the sample respondents are students (39%) followed by teaching profession (20%). Most of the sample respondents i.e., 51% of the sample respondents will spend 1-3 hours on browsing the internet. It can be observed from the above table that the maximum number of respondents is in the age group of 20-30 years.

Table 2: Table showing the mean value of usage of devices.

Device	Mean
Smart Phone	3.74
Laptop	3.22
Debti/Credit Card	3.01
ATM	2.89
Tablet/ipad	1.89
GPS	2.51
Smart TV	2.19
Smart Bands	1.15

Graph 1: Graph showing the mean value of usage of devices.

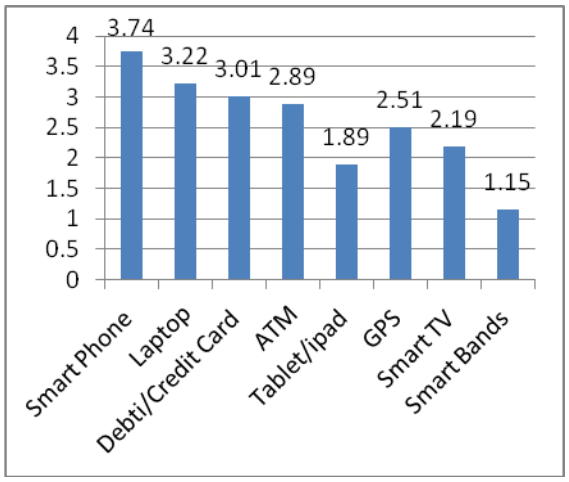


Table 2 represents the mean value of usage of devices. From the above table it can be understood that usage of smart phone is more among the sample respondents with a mean value of 3.74 and the least usage is smart bands with a mean value of 1.15. The usage of other devices are laptop 3.22, debit/credit card 3.01, ATM 2.89,

Tablet/ipad 1.89, GPS 2.51, Smart TV 2.19. The same analysis is depicted in the graph 1.

Table 3: Table showing the mean value of application of connected devices and systems

Device	Mean
Locating a Library Book	3.01
Automated Doors	1.91
Weather Conditions	2.59
Fire Alarms	1.72
Shopping Malls (Use of Debit and Credit Cards)	3.14
Tracking of Vehicles	2.39
Monitoring Real time traffic	2.52
Online Money Transfer	3.15

Graph 2: Graph showing the mean value of application of connected devices and systems

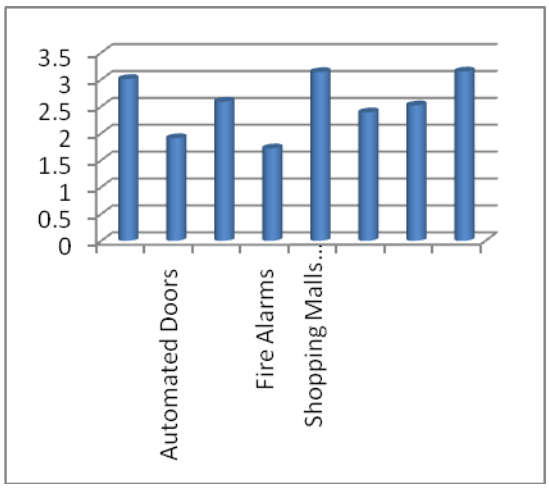
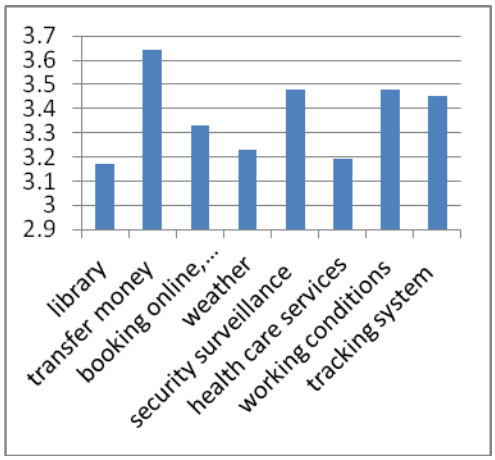


Table 3 and graph 2 represents the mean value of application of connected devices and systems. It can inferred from the above table that the online money transfer is the IoT application, which is used by the majority of the sample respondents. Use of credit cards and debit cards and the locating of the book in the library is the second and third application which is used by the respondents.

Table 4: Table showing the mean value of benefits of using connected devices and systems

Device	Mean
You can easily search for individual items like locating a book in a library	3.17
Connected devices allow me to transfer money easily.	3.64
Connected devices eases traffic control by automatic services like booking online, traffic lights	3.33
Connected devices facilitates accurate forecasting of weather	3.23
Connected devices improves security surveillance in restricted areas	3.48
Connected devices improves health care services	3.19
Connected devices and systems improves working conditions by easing processes	3.48
Connected devices have improved the tracking system of items like vehicles	3.45

Graph 3: Table showing the mean value of benefits of using connected devices and systems



in developed countries	
Connected devices have no privacy and data protection	2.86
Connected devices increases cyber crimes	3.55
User have been over reliance on connected devices	3.20
Connected devices are expensive to implement and maintain	3.31
cyber security awareness is essential	3.98

From the above table and graph it is observed that benefits of the connected devices are maximum in the usage of money transfer followed by security surveillance and working conditions.

Table 5: Table showing challenges faced by using connected devices and systems.

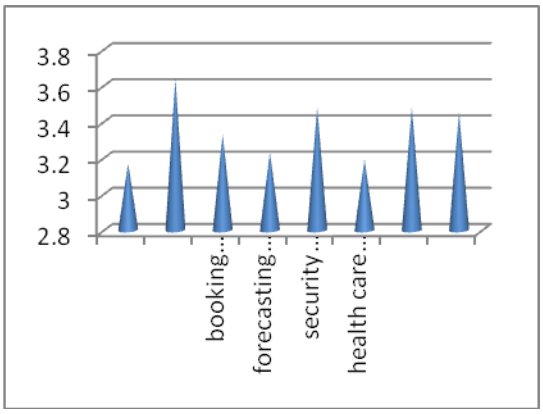
SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Age group	132	325	2.462121	0.784813787
Internet access	132	132	1	0

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	141.094697	1	141.0947	359.5622283	**4.58E-51**	3.87 7196
Within Groups	102.8106061	262	0.392407			
Total	243.905303	263				

Device	Mean
Connected devices makes individual users lazy because most of processes are done by machines	3.46
Connected devices are expensive to acquire	3.20
Users do not have skilled to use connected devices	2.86
Connected devices are common	3.56



From the above table it can be observed that most of the respondents feel that awareness of cyber security is a biggest challenge, increase cyber crimes and they feel that they are becoming lazy by using the connected devices and systems.

Table 6: ANOVA Results:

	P – Value	Result
Age Group and Internet Access	**4.58E-51**	Significant
Age group and usage of devices	0.014695	Significant
Profession and usage of devices	0.189881	Not Significant
Gender and awareness Cyber Crimes	5.86E-54	Significant
Profession and awareness of Cyber Crimes	0.021173	Significant

Based on ANOVA results we can conclude that there is a significant difference between age group and internet access, age group and usage of devices. There is no significant difference between profession and usage of devices. The study also reveals that there is a significant difference between gender and awareness of cyber crimes and significant difference between profession and cyber crimes.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Age group	132	325	2.462121	0.784814
use of devices	132	363	2.75	1.028626

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*
Between Groups	5.469697	1	5.469697	6.0324	0.014695
Within Groups	237.5606	262	0.90672		
Total	243.0303	263			

Anova: Single Factor

SUMMARY

Groups	Count	Sum	Average	Variance
Profession	132	401	3.037879	5.303898
use of devices	132	363	2.75	1.028626

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.46969697	1	5.469697	1.727494	0.189881	3.877196
Within Groups	829.5606061	262	3.166262			
Total	835.030303	263				

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Gender	132	194	1.46969697	0.250983
cyber crimes	132	469	3.553030303	1.210907

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	286.4583333	1	286.4583333	391.9014	5.5E-54	3.877196
Within Groups	191.5075758	262	0.730944946			
Total	477.9659091	263				

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Profession	132	401	3.037878788	5.303898
cyber crimes	132	469	3.553030303	1.210907

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	17.51515152	1	17.51515152	5.377031	0.021013	3.877196
Within Groups	853.4393939	262	3.257402267			
Total	870.9545455	263				

Summary of Findings and Conclusions:

Among the total sample respondents 53% of the sample respondents are male and 47% of them are female. The majority of the sample respondents are students (39%) followed by teaching profession (20%). Most of the sample respondents i.e., 51% of the sample respondents will spend 1-3 hours on browsing the internet. The maximum number of respondents is in the age group of 20-30 years.

Usage of smart phone is more among the sample respondents with a mean value of 3.74 and the least usage is smart bands with a mean value of 1.15. The usage of other devices are laptop 3.22, debit/credit card 3.01, ATM 2.89, Tablet/ipad 1.89, GPS 2.31, Smart TV 2.19.

The results show that the online money transfer is the IoT application, which is used by the majority of the sample respondents. Use of credit cards and debit cards and the locating of the book in the library is the second and third application which is used by the respondents. It can be observed that most of the respondents feel that awareness of cyber security is a biggest challenge, increase cyber crimes and they feel that they are becoming lazy by using the connected devices and systems

Based on ANOVA results we can conclude that there is a significant difference between age group and internet access, age group and usage of devices. There is no significant difference between profession and usage of

devices. The study also reveals that there is a significant difference between gender and awareness of cyber crimes and significant difference between profession and cyber crimes.

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Musyimi Moses Mwanjangi "Impact of OIT on People working in Nairobi Central Business District

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