



UNIVERSITY OF NAIROBI

**SCHOOL OF COMPUTING AND
INFORMATICS**

**“M-COMMERCE VALUE ADDED SERVICES AND THEIR
IMPACT ON
E-COMMERCE: A SOCIO - CULTURAL CASE STUDY
OF NAIROBI, KENYA AND ITS ENVIRONS” //**

BY

Jerome my
Murori Arimbi
P56/P/8598/03

Supervisor

Mr. Mutahi Theuri

September 2010

Submitted in partial fulfillment of the requirements of the Master of Science in Information
Systems

University of NAIROBI Library

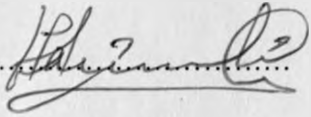


0439191 8

Declaration

This project, as presented in this report, is my original work and has not been presented for any other University award.

Candidate: Mr. Murori Jeremy Arimbi

Signature: 

Reg. No.: P56/P/8598/03

Date: ...10/09/2010.....

This project has been submitted as part of fulfillment of requirements for the Master of Science in Information Systems of the University of Nairobi with my approval as the University supervisor.

Supervisor: Mr. Mutahi Theuri

Signature: 

Date:13:09:2010.....

Dedication

To my late Mother Teresia Nchoga who taught me the virtue of humility and love for mankind.

Acknowledgement

I take this opportunity to thank the MSc. class of year 2004 for their enjoyable company and numerous academic discussions we held together in the course of this program.

My sincere thanks go to the faculty and staff of School of Computing and Informatics for their help and support during the course program sessions. Special thanks go to Mr. Mutahi Theuri, my supervisor for guiding me through this project and for reading through the project report.

Finally, my appreciation goes to my family for their patience and understanding during my busy schedule as I pursued this program.

Thank you and GOD bless you all.

Abstract

Since the introduction of mobile phone communication in Kenya in late 1999, the client base has grown steadily to about 18 million (Safaricom: 15M, Zain: 2.5M, Orange/YU: 600 thousand-September 2009) and it is still on the rise. In a span of about 10 years, communication through mobile phones has leapfrogged other communication technologies to immerse the communication medium of choice for majority of Kenyans. Use of mobile phones has created a variety of applications and value added services that have influenced the traditional e-commerce in Kenya.

This case study was based in Nairobi and its environs. The aim of the study was to understand the behavior and attitudes of Kenyans towards use of mobile phones with a view to identifying popular applications and value added services suitable for m-commerce and the impact of m-commerce on traditional e-commerce. Results of study were used to leverage m-commerce framework for the Kenyan environment.

The study revealed that cultural beliefs and practices influence use of mobile phones. It further revealed that the social nature of Kenyans and their close family ties influence use of mobile phones. Geographical factors and a person's mood influence the use of mobile phones. Social security influences the use of mobile phone services. Fairuse, privacy and intellectual property rights are important factors in the developer/provider planes that influence use of mobile phone infrastructure.

Employees were found to contribute to the social class that controls m-commerce. The age group 26 to 45 years was found to control the m-commerce economy (i.e. about 9 million or 25% of Kenyan population.-source: Kenya National Bureau of Statistics 2008). Entertainment services (Music, games and ring tones) were identified as the core m-commerce value added services driving our m-commerce, closely followed by information services (checking of account balance and bills). Third in line were transactional services of sending money (M-Pesa, Zap). Transactional services are in the upward trend because of M-Pesa and Zap and may soon catch up or overtake the entertainment services. Mobile value and wireless value have improved performance, efficiency, productivity and telecommuting over and above traditional e-commerce. Homegrown solutions in terms of frameworks, business models and policies provide suitable platforms for success of m-commerce.

Table of Contents	Pages
Declaration	i
Dedication	ii
Acknowledgement	iii
Abstract	iv
List of Abbreviations	vi
List of Tables (Appendix B)	vi
List of Diagrams (Appendix C).....	viii
Chapter 1: Introduction	1
1.1 General statement of the problem.....	1
1.2 Purpose statement	1
1.3 Significance of the study.....	2
Chapter 2: Literature Review	3
2.1 Theory	5
2.2 Basic assumptions and Research hypotheses.....	6
2.3 Research Model	7
Chapter 3: Methodology	10
3.1 Research design	10
3.2 Data collection procedures.....	10
3.3 Response rate	12
3.4 Data analysis	12
Chapter 4: Results and findings	14
4.1 Background data	14
4.2 General Network information.....	15
4.3 Culture against age and gender of the respondents.....	16
4.4 Mood and Use of mobile Phone.....	17
4.5 Geographical factors against age, gender and occupation.....	18
4.6 Mobile Commerce Value Added Services in Urban and Urban Environs	19
4.7 Security Concern in Mobile Commerce Infrastructure.....	21
4.8 Ethical issues vs. Content Providers/Application Developers.....	23
4.9 Mobile Commerce Value added Impact on E- Commerce.....	25
4.10 General mobile top up considerations.....	27
CHAPTER 5: Discussion and Conclusions	30
5.1 Hypothesis H1 and H2.....	30
5.2 Hypothesis H31	31
5.3 Hypothesis H32.....	31
5.4 Hypothesis H41	32
5.5 Hypothesis H42.....	33
5.6 Hypothesis H5.....	34
5.7 General Conclusions.....	35
5.7 Achievements.....	36
5.8 Refinement of Upkar Varchney and Ron Vetter m-commerce framework.....	37
5.10 Limitations of the study	38
5.11 Recommendations for further work	39
References and Bibliography	40
APPENDIX A: M-Commerce Assessment Questionnaire – User Perceptions	43
APPENDIX B: Tables Of Result Findings.....	51
APPENDIX C: Diagrams.....	65

List of Abbreviations

1. **ISP:** Internet Service Provider
2. **MSP:** Mobile Service provider
3. **CCK:** Communication commission of Kenya
4. **MCP:** Mobile Cellular Provider
5. **LLCP:** Local Loop Cellular provider
6. **TRA:** Theory of Reasoned Action
7. **TAM:** Technology Acceptance Model
8. **TPB:** Theory of Planned Behavior
9. **DTPB:** Decomposed Theory of Planned Behavior
10. **TTF:** Theory of Task/ Technology Fit
11. **VAS:** Value added Services
12. **SPSS:** Statistical package for Social Scientists

List of Tables (Appendix B)

1. Table 1: Test instrument categories
2. Table 2: Sample distribution by area
3. Table 3: Sample distribution by education and Gender of the respondents
4. Table 4: Sample distribution by occupation of the respondents
5. Table 5: Sample distribution by Age of the respondents
6. Table 6: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone make and Mobile Service Provider against Age of the Respondents
7. Table 7: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone make and Mobile Service Provider against Occupation of the Respondents
8. Table 8: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone make and Mobile Service Provider against Educational level of the Respondents
9. Table 9: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone make and Mobile Service Provider against Gender of the Respondents
10. Table 10: Summary of cross tabulation between Cultural factors questions versus Age of the Respondents and Gender
11. Table 11: Summary of cross tabulation between Mood Indicators' versus Age of the Respondents and Gender
12. Respondents and Gender
13. Table 12: Summary of cross tabulation between geographical Indicators versus Age of the respondents and Gender

14. Table 13: Influence of geographical factors against occupation of the respondents
15. Table 14: Mobile commerce services against urban (Nairobi) and urban environs
16. Table 15: Cross tabulation of m-commerce infrastructure indicators against gender.
17. Table 16: Summary of cross tabulation of security indicators against occupation of respondents
18. Table 17: Summary of cross tabulation of security indicators against educational level of respondents
19. Table 18: Cross tab of security of MSP against respondent's educational levels
20. Table 19: Cross tabulation of security of mobile services against respondent's educational levels
21. Table 20: Cross tabulation of security of mobile services against Gender
22. Table 21: A cross tabulation of fair use/privacy against age of the respondents
23. Table 22: A cross tabulation of fair use/privacy against education level of the respondents
24. Table 23: Cross tabulation of mobile phone communication throughput compared to other devices against occupation of the respondents
25. Table 24: Cross tabulation of mobile phone communication throughput compared to other devices against age of the respondents
26. Table 25: A cross tabulation of mobile phone value added impact indicators on e-commerce against educational level of the respondent
27. Table 26: A cross tabulation of mobile phone value added impact indicators on e-commerce against occupation of the respondents
28. Table 27: A cross tabulation of mobile phone top-up and occupation of the respondents
29. Table 28: A cross tabulation of mobile phone top-up and educational level of the respondents
30. Table 29: A cross tabulation of mobile phone scratch card denomination used and occupation of the respondents
31. Table 30: A cross tabulation of mobile phone scratch card denomination used and educational level of the respondents
32. Table 31: A cross tabulation of mobile phone tariff and occupation of the respondents
33. Table 32: A cross tabulation of mobile phone tariff and educational level of the respondents

34. Table 33: M-commerce VAS services against education level
35. Table 34: M-commerce VAS services against age
36. Table 35: M-commerce VAS services against occupation of respondents
37. Table 36: Population Distribution by Age Group and Sex Year 2006

List of Diagrams (Appendix C)

1. Fig 1: M-commerce framework by Upkar Varchney and Ron Vetter
2. Fig 2: Value Added Services (VAS) conceptual model
3. Fig 3: Sample distribution by the age of the respondents
4. Fig 4: Type of mobile phone popularity against age of respondents
5. Fig 5: Type of phone ownership against gender of respondent
6. Fig 6: Mobile Phone ownership against age of respondents
7. Fig 7: Mobile Phone ownership against occupation of respondents
8. Fig 8: Phone ownership against education of the respondents
9. Fig 9: Popularity of Mobile service provider against age of respondents
10. Fig 10: Gender responses against age for cultural indicators
11. Fig 11: Gender responses against age for various Mood indicators
12. Fig 12a: Influence of general geographical factors by age and gender
13. Fig 12b: Influence of geographical factors by age
14. Fig 13: Geographical factors against occupation of respondents
15. Fig 14: Nairobi Urban and Nairobi Urban environs respondents against M-commerce value added services
16. Fig 15: Mobile Infrastructure security against gender of respondents
17. Fig 16: Mobile infrastructure security against occupation of respondents
18. Fig 17: Mobile infrastructure security against education of respondents
19. Fig 18: Mobile Services security level rating against occupation of respondents
20. Fig 19: Percent respondent by gender against security rating of mobile services

21. Fig 20: Fair use of content and application by MSPs and ISPs against age level of the respondents
22. Fig 21: Fair use of content and application by MSPs and ISPs against educational level of the respondents
23. Fig 22: Mobile phone throughput compared to other devices against occupation of the respondents
24. Fig 23: Mobile phone throughput compared to other devices against age of the respondents
25. Fig 24: Mobile phone value added impact indicators on e-commerce against education level of the respondents
26. Fig 25: Mobile phone value added impact indicators on e-commerce against age of the respondents
27. Fig. 26: percent response by occupation of respondent against top-up of mobile phone frequency.
28. Fig. 27: percent response by education level of respondents against top-up of mobile phone frequency
29. Fig. 28: percent response by occupation of respondents against top-up denomination of mobile phone
30. Fig 29: A cross tabulation of mobile phone scratch card denomination used and educational level of the respondents
31. Fig 30: mobile phone tariff against occupation of the respondents
32. Fig 31: Mobile phone tariff against education level of the respondents
33. Fig 32: M-commerce VAS services against education level
34. Fig 33: M- commerce vas services against education level
35. Fig 34: M-commerce VAS services against occupation level

Chapter 1: Introduction

1.1 General statement of the problem

Given the increasing high mobile phone penetration in Kenya, a current subscriber base of about 18 million by September 2009, I am tempted to assume that Mobile phone based activities are contributing significantly to traditional e-commerce in Kenya.

Mobile commerce applications have increased in the last 9 years, introducing a wide variety of mobile services from SMS to M-PESA. It is not clear however what the driving force behind this growth is and what the main contributing factors are.

Fairuse, Security, privacy and intellectual property rights are important factors in business environments. Insecure networks and applications may scare away users. Unprotected products from piracy and copyrights may discourage content and application developers and providers. M-commerce business models are new concepts in Kenya. How appropriate are existing models to the Kenyan environment? M-commerce frameworks and business models can be refined and tailored to suit different cultures and environments as observed by Smith and Reynolds (2002)

1.2 Purpose statement

The aim of this research was to carry out a case study based in Nairobi and its environs on m-commerce value added services using mobile terminals and networks and assess its impact on e-commerce with a view to:

- a. Understanding behavior, practices and attitudes of Kenyans towards the use of Mobile phones
- b. Identifying popular mobile commerce applications and value added services suitable for mobile commerce in Kenya.
- c. Developing a conceptual research model to assess the factors that influence the use mobile phones and in turn m - commerce value added services in Kenya.
- d. Identifying framework(s) suitable for mobile commerce in Kenya.

The end product was to leverage an m-commerce framework for the Kenyan environment by adopting and refining the existing m-commerce framework(s).

1.3 Significance of the study

Wireless introduces new dimensions of one-to-one, anytime-anyplace connectivity, and frees networks from location and time. The study established the extent of localization; personalization and immediacy aspects of value added service transactions and helped to identify value added services suitable for the Kenyan market.

By establishing the extent of use of wireless mobile for business transactions and the type of value added services involved, businesses will be in a better position to tailor content based on individual preferences and needs.

By identifying businesses suited to Location-based marketing, it will be easier and cheaper to push information to these targets creating a more conducive environment for business transactions. Mobile Service Providers (MSPs) should benefit from the study by identifying what factors influence the use of mobile phones, mobile phone infrastructure and m-commerce value added services.

In general, the study provided an insight into the future of m-commerce value added services in Kenya and helped leverage an m-commerce framework for the Kenyan environment.

Chapter 2: Literature Review

The M-commerce framework by Upkar Varchney and Ron Vetter (2002) depicts an open framework composed of a user plane on one hand and developer and provider plane on the other. The User plane defines multiple functional layers based on four levels namely M-commerce applications, User infrastructure, middleware and Network infrastructure. The developer and provider plane defines three levels consisting of application developer, content provider and service provider. Open frameworks prevent design and development of proprietary products and services and allow interoperability of applications from different providers and vendors. They can however be refined to suit a variety of situations and environments.

The Fit-Viability framework by Tjan (2001) proposes that M-commerce business models are unique to different environments. Fit measures the extent to which the capabilities of mobile technologies meet the requirements of the task. Viability measures the extent to which the environment or organization is ready for the application. Ting Peng et al (2004), suggests three aspects for viability assessment: economic, organizational, and societal. The success of m-commerce depends not only on the technology but also on how the technology is used.

Aaker, Kumar and Day, (1995) defines attitudes as “mental states used by individuals to structure the way they perceive their environment and guide the way they respond to it”. Several behavioral models for explaining the adoption and usage of information technology have been advanced in IS literature. The models include the Theory of Reasoned Action TRA and its extensions, Triandis’ model (1980), the Technology Acceptance Model (TAM) by Davis (1998), the Theory of Planned Behavior, and the Decomposed Theory of Planned Behavior. In all these models, beliefs and attitudes of individuals towards a certain behavior are determinants of the individual’s intention towards the adoption of that behavior. It is necessary for marketers and service developers to identify and understand consumers’ needs, want, attitudes and behavioral intentions towards innovative mobile services (Nohrial & Leetsma, 2001; Barnes, 2002)

Information age ethical issues touch individuals, professionals, groups and organizations. According to Richard Mason et al (2005), information society calls for a new social contract. “As information and information technology move to the core of our social system, our mutual contract must incorporated provisions for dealing with their effects on individuals,

organizations and the functioning of the society as a whole". Richard Mason goes ahead to identify six basic social tensions for the information age, namely: intellectual property rights, privacy, quality and accuracy of information, information justice, gate keeping (censorship, secrecy, confidentiality etc) and technological implementation. These tensions form the social and economic milieu, within which information is gathered and distributed.

Right here in Kenya, Michael Josephs, (February 2007) Safaricom CEO of one of the leading mobile cellular providers was perplexed by the peculiar behavior among Kenyans in the use of mobile phones. Smith & Reynolds (2002) further observes that mobile service developers and providers should identify those mobile service elements that will be consistent across cultures and those that will be unique to each culture.

Khalifa and Cheng (2002) study on mobile commerce adoption identifies, exposure, trial of the new devices, communication and observation as the main factors in mobile commerce adoption.

Theory of Task/Technology fit (TTF), as proposed by Goodhue and Thompson (1995) underscores the importance of matching technology innovation and diffusion to organization tasks. Fit between task characteristics and technology characteristics affect individual performance. Further studies integrated TTF with the technology acceptance model (TAM). Zigurs and Buckland (1998) applied the theory to explain the effectiveness of group support systems and identified mobility and reachability as the main characteristics for mobile technology. As a prerequisite for adoption management in organizational settings, a fit between the information technology and the tasks that the technology supports has to be achieved during the technology development process.

Palen and Salzman identify usability issues with mobile phone as a social technical system that encompasses hardware, software, and service agreements.

Clarke (2001) exploited four value propositions (Ubiquity, personalization, localization, and convenience) of m-commerce to explain the relationship between value-added services and customers. Balasubramanian et al (2002) categorized value added services into eight areas along three dimensions: location sensitive, time critical and user/provider controlled. Turban and King (2003) identifies five value added attributes: Ubiquity, convenience, instant

connectivity, personalization and localization that address three major criteria namely, location sensitive, time critical and personal.

Vitter Philipper et al (2000) define m-commerce as “e-commerce on the move”. Tang and Veijalainen (2001) imply that wireless value is likely to be a main driver for m-commerce. Bill Anckar and Davine D’Incau (2002) in their Total Wireless Channel Value framework, conclude that mobile commerce has mobile value and wireless value.

Many authors have written about the impact of information technology on organizations. Leung and Antypas, Varshney et al. identify mobile commerce as a tool that can enhance business efficiency, improved productivity, lower operational cost, increased customer satisfaction, and improved decision-making.

Beulen and Streng utilize organizational adoption and diffusion models, such as the one proposed by Kwon and Zmud and the technology acceptance model (TAM) by Davis (1989) to derive empirical evidence for the impact of mobile commerce applications on the effectiveness and efficiency of mobile workers.

McIntosh et al (2005), takes a broad look at the issues, impact and implications of mobile technology on the workforce and organizations with regard to telecommuting, mobile workers, mobile technology, productivity, mobile communications, m-commerce, mobile commerce and concludes that the environment of today's worker is evolving from one of centralization and control to one of mobility and performance. Impact basically revolve around automation of manual processes and the resulting changes of operational efficiency and from improved access to information

2.1 Theory

Behavioral models advanced by Aaker, Kumar and Day (1995); define attitudes as “mental states used by individuals to structure the way they perceive their environment and guide the way they respond to it. Adoption and usage of information technology as been explained by such theories as, Theory of Reasoned Action (TRA) and its extensions, Triandis’ model, the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and the Decomposed Theory of Planned Behavior (DTPB). Collectively, the theories agree that, beliefs and attitudes of individuals towards a certain behavior are determinants of the individual’s intention towards the adoption of that behavior. Khalifa and Cheng identify,

exposure, trial of the new devices, communication and observation as main factors in mobile commerce adoption.

The M-commerce framework by Upkar Varchney and Ron Vetter, 2002, depicts an open framework composed of a user plane on one hand and developer and provider plane on the other. The User plane defines multiple functional layers based on four levels namely M-commerce applications, User infrastructure, middleware and Network infrastructure. The developer and provider plane defines three levels consisting of application developer, content provider and service provider. Open frameworks prevent design and development of proprietary products and services and allow interoperability of applications from different providers and vendors. They can however be tailored to suit a variety of situations and environments.

The Fit-Viability framework by Tjan proposes that M-commerce business models are unique to different environments. Viability measures the extent to which the environment or organization is ready for the application. Ting Peng et al suggests three aspects for viability assessment: economic, organizational, and societal.

M-commerce impacts basically revolve around automation of manual processes and the resulting changes of operational efficiency and from improved access to information (McIntosh et al). P. Tarasewich, R.C. Nickerson, and M. Warkentin, give one impact as performance of various commerce-related tasks without regard to time and location (anytime from anywhere). Clarke (2001) exploited four value propositions (Ubiquity, personalization, localization, and convenience) of m-commerce to explain the relationship between value-added services and customers.

Richard Mason (2005) identifies six basic social tensions for the information age, namely: intellectual property rights, privacy, quality and accuracy of information, information justice, gate keeping (censorship, secrecy, confidentiality etc) and technological implementation. These tensions form the social and economic milieu, within which information is gathered and distributed.

2.2 Basic assumptions and Research hypotheses

Kenyan are generally social people with diverse cultures deeply rooted in cultural beliefs, practices and attitudes. They maintain close family and community ties and have a practice for sharing what they have at the family and community levels. They cherish informal

gatherings and sharing of information. This prompts me to make hypotheses **H1, H2 and H3** to test behaviour and attitudes of Kenyans towards use of mobile phones.

H1: The lifestyle of Kenyan people is deeply rooted in cultural beliefs, practices and attitudes that to some extent have influenced the adoption and use of mobile phones.

H2: The social nature and informal lifestyle of Kenyans and their close family ties influence the way they use mobile phones.

H31: A person's mood influences the use mobile phones.

H32: Geographical factors influence the use mobile phones.

Culturally, Kenyans are very poor information documenters. They have for ages relied on oral history to pass information from one generation to another. Some of this information has been treated and surrounded in secrecy and confidentiality within some class of people in the communities. Technologists are despised people in society and technology is treated in awe and fear. This practice has not spared our technology at the individual and leadership levels. Government has not created conducive environment to facilitate faster adoption and assimilation of m-commerce in Kenya. From this, I propose hypotheses **H41** and **H42** to test the appropriateness of existing m-commerce frameworks with regard to ethical issues in the Kenyan context.

H41: Security is an important concern to users and it influences the use of m-commerce infrastructure.

H42: Fairuse, privacy and intellectual property rights are important concerns to application developers, content providers and service providers and they influence the use of mobile infrastructure.

M-commerce has added mobile and wireless value to transactions irrespective of time and place. This is more so in rural areas where communication infrastructure is poor. This has resulted in better performance and efficiency in the delivery of services. Hypotheses **H5** has been proposed to test impact of m-commerce.

H5: Use of mobile phones has created mobile commerce services that have added mobile and wireless value to traditional e-commerce resulting in better services.

2.3 Research Model

Different authors have advanced m-commerce frameworks. A framework for m-commerce suggested by Upkar Varchney and Ron Vetter (2002) in fig 1 is an open and most general framework that allows interoperability of m-commerce applications and products from

different providers and vendors and also provides a developer and provider plane to address the different needs and roles of application developers, content providers and service providers. Upkar Varchney and Ron Vetter m-commerce framework can be refined and tailored to depict unique local considerations for the Kenyan environment.

Acceptance of technology starts with beliefs and attitudes (TAM) that lead to adoption and usage. Exposure, trial, observation and communication have been identified (Khalifa and Cheng) as the key factors of adoption. Adoption leads to Usability that Palen and Salzman identifies with hardware/software and service agreements. Hardware/software technology on one hand is realized through architectures and platforms that are modeled to give rise to frameworks. Business applications on the other hand are effected through business models. Properly developed frameworks and business models within a particular technology provide e-commerce services. Addition of mobile value and wireless value to e-commerce results in m-commerce value added services. The m-commerce conceptual research model is shown in fig.2.

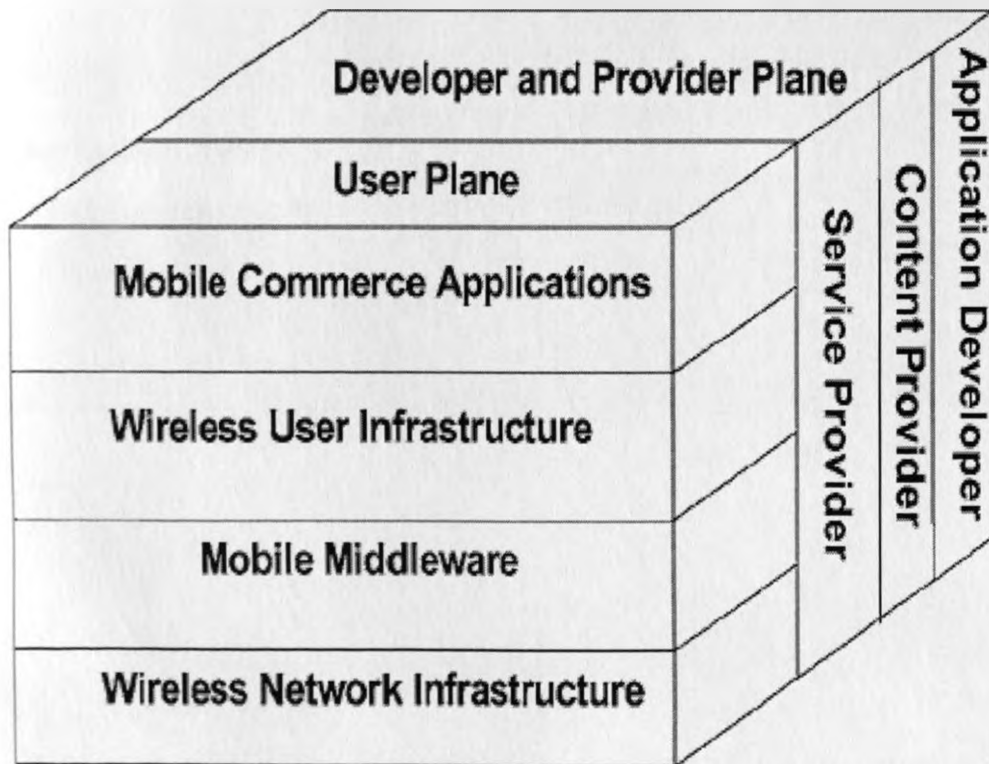


Fig.1: M-commerce framework by Upkar Varchney and Ron Vetter

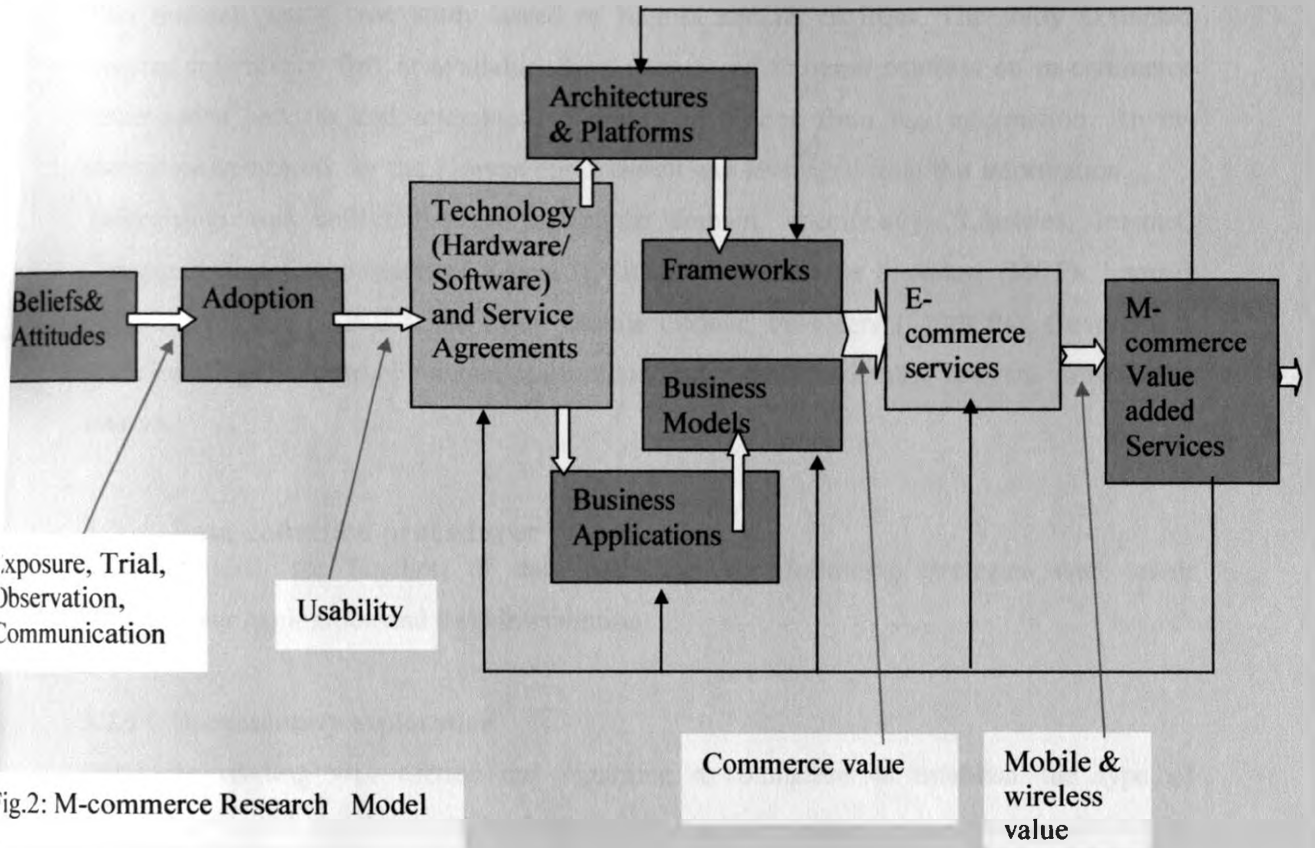


Fig.2: M-commerce Research Model

Chapter 3: Methodology

3.1 Research design

This research was a case study based in Nairobi and its environs. The study examined existing information that is available from unique and extreme contexts on m-commerce value added services and attempted to draw conclusions from this information. An m-commerce framework for the Kenyan environment was leveraged from this information.

Information was collected from the public domain, specifically:- Libraries, Internet, Communication Commission of Kenya (CCK), Mobile Cellular Providers (MCPs, Internet Service providers (ISPs), Local Loop Mobile Cellular Providers (LLMCPs), Government agencies, Organizations, Financial institutions, Individuals and other relevant information sources.

3.2 Data collection procedures

To accomplish the function of data collection, the following strategies were used: documentary exploration and field intervention.

3.2.1 Documentary exploration

Extensive reading was carried out regarding m-commerce to establish the type of technologies used, the sectors using them and the kind of business transactions carried out by the sectors using these technologies. Documented information on m-commerce in Kenya and elsewhere was carefully studied. Available relevant literature on theory and practice was consulted on the areas of m-commerce.

The following research instruments were used: Readings, Personal interviews, Observation, Telephone Interviews, Written /self administered questionnaires and Written/researcher administered questionnaires

Data collection procedure revolved around informed consent, personal visits, interviews, questionnaire administration, e-mail and telephone/cell phone contacts. Questionnaires and observation instruments were designed at this stage.

3.2.2 Design of the test Instrument

Seven categories on which to sample from the domain were identified. For each category, statements (test questions) were developed and classified for reliability (content validity, internal consistency) by peers. A questionnaire was eventually designed that consisted of 53 statements that captured perceptions from users, MSP/ISP and related stakeholders. The time

taken to respond to the questionnaire was about 15 minutes. Most questions in both questionnaires were measured on a 5-point Likert scale while others carried a Yes or No answer. The amount of writing the respondents did to response to the questionnaire was kept to a minimum.

The different instrument categories and their respective test statements are shown in table 1. A Pilot survey was carried out in November/December 2007 and questions refined to rid them of ambiguity. Questionnaires for the final survey were administered between February and May 2008; some self-administered and others research assistant administered.

3.2.3 Sampling

Specific data was collected using the survey method. A combination of stratified sampling and Purposive sampling (criterion sampling) was used in the survey. The source of data was chosen on the basis that the sample have the characteristics of the population and on the basis of convenience and availability. Participants were selected on the basis of those who met the criteria of the study.

Communication Commission of Kenya (CCK) was consulted. Three MCPs were consulted namely: Safaricom, Zain and Telkom Wireless. Two ISPs were consulted namely Access Kenya, and KENET. One LLMCP namely Flashcom was consulted. Selected IT managers in Government agencies, organizations, and financial institutions were consulted. Individuals and other relevant information sources were consulted and interviews conducted as found necessary.

CCK, MCPs, ISPs and LLMCPs were the prime sources of data in the sense that licensing, connectivity, services and transactions are conducted through them respectively. Sample size with respect to government agencies, organizations, financial institutions and individuals was chosen on the basis of the services provided.

3.2.4 Field Intervention

3.2.4.1 Field visits

Prime sources of information (CCK, MCPs, ISPs and LLMCPs) were visited from which other information sources to administer questionnaires were identified.

Interviews and observations were conducted at this stage. Consenting individuals and IT managers in identified organizations were interviewed. Observations were made on the types

of wireless mobile technologies used where necessary. Questionnaires were administered and responses collected at this stage

3.4.2.2 Questionnaire Administration

Procedure for questionnaire administration was conducted as follows:

Nairobi was divided into two main blocks, namely: City Centre Block and City environs block. The city block represents a high density of mobile phones and high level of activity transaction whilst the city environs block represents more less a rural setting with low concentration of mobile phones and less activity.

Within the City centre block, CBD (Central Business District), Industrial Area, and a Residential Estate were visited. Among the city environs block, Ongata Rongai, Ruiru and Athi River townships were visited. The assumption here is that a representative sample of mobile users in the city and its environs was available within these sample groups.

3.3 Response rate

According to the Kenya Bureau of Statistics, Kenya (2009) the estimated current population ratio of Nairobi to its environs is 20:1 (Nairobi -3,500,000: Ruiru- 107,000: Rongai - 38,000: Athi River-30,000), it was difficult to realize this ratio on the ground in terms of the required number of questionnaires. Time factor and expense were other limitations considered. Stratified and purposive sampling was preferred to random sampling. For this reason, the ratio was scaled down to 4:1. A total of 400 questionnaires were produced (CBD/residential/industrial area 320 and city environs 80) and administered to the sampled categories of respondents. Two hundred and eighty eight (288) questionnaires were returned registering an overall response rate of 72% as indicated in table 2. This response rate is good for generalization of the study findings. The returned questionnaires were coded and analyzed.

3.4 Data analysis

Raw data was cleaned before any data analysis was done. This was necessary to avoid using incoherent data that by and large could have led to drawing wrong conclusions and making wrong inferences. Raw data was analyzed using SPSS 12 for windows. The analysis was supplemented by using other packages like Microsoft Excel.

Variables of various groups of interest were cross tabulated against the background data as appropriate and summary tables generated together with their respective Pearson's chi

Square, Asymptotic significance and Cramer's V where applicable. Bar charts of the summary tables were generated where necessary and conclusions drawn from the, statistical tests and bar charts.

A correlation can differ in degree or strength of the relationship. The Pearson Chi Square and asymptotic significance were used to establish the extent to which two or more variables are related among a single group and Cramer's V was used to further establish the strengths of the relationships.

The expected typical values for the statistical tests were as follows:

- Pearson Chi Square relationship- a value of asymptotic significance of 0.05 or above indicates that a relationship exists between the groups under test.
- The Cramer's V is scaled such that a value of one (1) indicates a very strong relationship while a value of Zero (0) indicates no relationship at all. The strength can be anywhere between 0 and (+,-) 1.
- A relationship infers that there is a correlation between the variables but does not mean that one caused the other.

The top line data from the analysis is captured in tables 1-35 in appendix B

Chapter 4: Results and findings

4.1 Background data

This chapter focuses on the findings of the study undertaken through the examination of overall data on selected variables.

4.1.1 Demographic profile of the respondents

The demographic profile of the respondents is captured in tables 2 to 5.

Table 2: Sample distribution by area

	Frequency	Percent (%)
CBD	124	43.1
Residential Area	93	32.3
City environs	71	24.6
Total	288	100.0

The data of Table 2 reveal that majority (43.1%) of the respondents were sampled from the CBD as 32.3% of them were sampled from the residential estates, while about 24.6% of the respondents were sampled from the city environs namely, Rongai, Athi River and Ruiru.

Table 3: Sample distribution by education and gender of the respondents

Education Level	Gender		Total
	Male	Female	
Primary	9(5.1%)	0	9(3.1%)
Secondary	75(43.6%)	53(46.2%)	128(44.6%)
College	58(33.3%)	35(30.8%)	93(32.3%)
University	22(12.8%)	13(11.5%)	35(12.3%)
Not Stated	9(5.1%)	13(11.5%)	22(7.7%)
Total	173(60.0%)	115(40.0%)	288(100.0%)

Table 4: Sample distribution by occupation of the respondents

	Respondents	Percent
Student	36	12.3
Business Person	155	53.9
Professional (Employee)	97	33.8
Total	288	100.0

From table 3, 33.3% of the male respondents have college level education while 12.8% of them have university level of education. Of all the respondents, 60% were male while about 40% were female. Around 12.3% of the respondents indicated that they are University graduates as 32.3% of the respondents have college level of education. Additionally, 44.6% of the respondents are form four school leavers and 3.1% of the respondents have primary

school level of education. Approximately 12% of the respondents were students, as 53.8% of the respondents were business people and 33.8% were professionals (employees). These figures are captured in table 4.

Almost half (43.1%) of the respondents were aged 26-35 years as 29.2% of the respondents were between 36-45 years of age. About 16.9 % of the respondents were 16-25 years of age and 3.1% of the respondents revealed that they were over the age of 55 years as shown in table 5.

Table 5: Sample distribution by age of the respondents

Age (Years)	Respondents	Percent (%)
16-25	49	16.9
26-35	124	43.1
36-45	84	29.2
46-55	22	7.7
>55	9	3.1
Total	288	100.0

4.2 General Network information

4.2.1 Mobile phone ownership

Mobile phone ownership against age, occupation, education and gender are captured in tables 6 to 9. Similar data is sketched in figures 4 to 9.

Respondents were asked about their ownership of mobile phones. 87.7% of the respondents owned mobile phones. Half (50.8%) of the respondents own Nokia mobile phones while 24.6% of the respondents own Motorola phones. On the other hand, 15.4% of the respondents have Samsung handsets whereas 3.1% of the respondents own Siemens. Additionally, 1.6% of the respondents’ phones are Ericsson, Alcatel or Sony as shown in table 6 and figure 4.

A further cross tabulation indicate that male prefer Nokia phones than their female counterparts as shown in fig.5. The age group 25 to 45 years owns the majority of mobile phones with the age group 36-45 years leading followed closely by the age group 26 to 35 years. This is sketched in fig. 6.

Students own the majority of mobile phone (35.6%) followed by business people (27.1%) and employees claim 23.7%. This is captured in table 7 and sketched in fig 7.

University level of education respondents are the majority owners of mobile phones (40.0%) followed closely by college level education respondents at 30.8%. It is observed that the more

the level of education the more likely a person may own a mobile phone. This information is captured in table 8 and fig.8.

Nearly 80.0% of the respondents are Safaricom subscribers as 15.4% of the respondents' Mobile Service Provider (MSP) is Zain. Telkom subscribers were represented by 4.6% of the respondents. This is captured in table 9 and sketched in fig.9.

4.2 Culture against age and gender of the respondents

Table 10: Summary of cross tabulation between Cultural factors versus Age of the Respondents and Gender

Cultural Factor	Gender	Age of the Respondents (Years)					(Totals	Pearson's Chi (χ^2)		Cramer's V
		16-25	26-35	36-45	46-55	Over 55		χ^2	A.S	
General culture	Male	10.0%	17.5%	25.0%	2.5%	0.0%	55.0%	7.761	.623	.621
	Female	5.0%	15.0%	30.0%	.0%	0.0%	50.0%	3.200	.362	.504
Social Status	Male	21.4%	33.3%	33.3%	4.8%	2.4%	95.2%	9.670	.725	.343
	Female	6.7%	13.3%	46.7%	6.7%	0.0%	73.4%	7.229	.650	.601
Cultural beliefs	Male	10.0%	23.4%	30.0%	0.0%	0.0%	63.4%	37.57	.200	.560
	Female	6.7%	13.3%	46.7%	6.7%	0.0%	73.4%	11.62	.635	.508
Close Family Ties	Male	23.3%	30.2%	34.9%	7.0%	2.3%	97.7%	6.955	.541	.280
	Female	10.5%	26.3%	57.9%	5.3%	0.0%	100%	5.873	.118	.556
Peer Pressure	Male	18.6%	25.6%	30.2%	2.3%	2.4%	79.0%	8.640	.733	.259
	Female	10.0%	15.0%	45.0%	5.0%	0.0%	75.0%	6.028	.420	.388

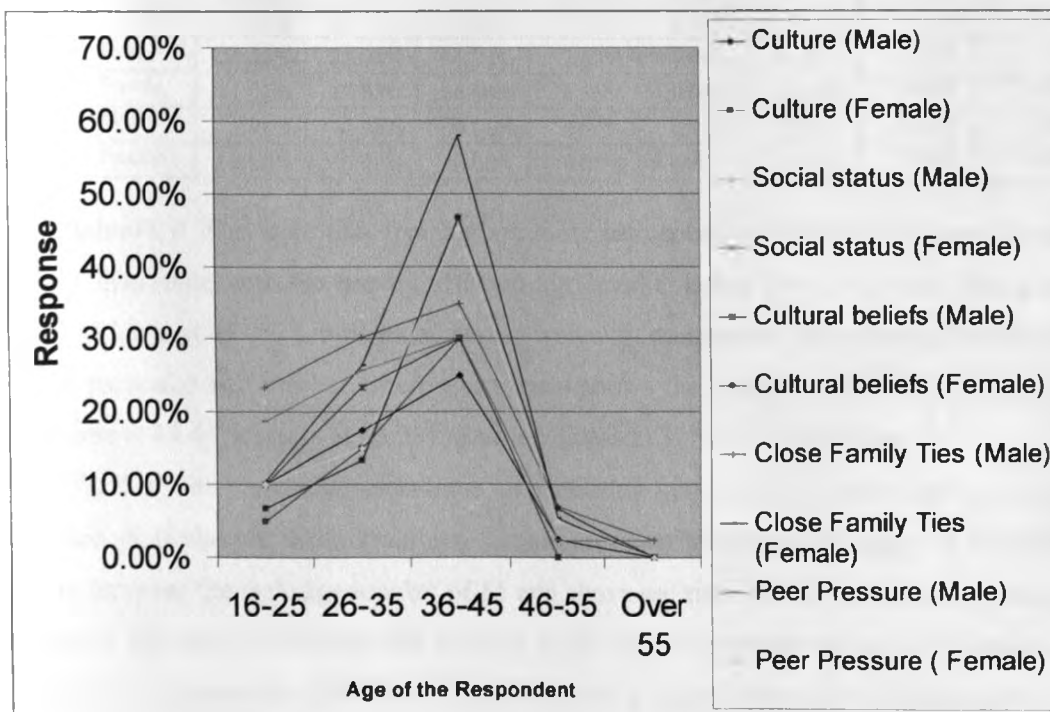


Fig 10: Gender responses against age for various cultural indicators.

55% male and 50% female accept that culture influences them to use mobile phones. The age bracket mostly influenced by culture in the use of mobile phones is 36 to 45 years with female showing higher percentages than male in that age bracket; this is closely followed by the age bracket 25 to 35 years. This is captured in table 10 and sketched in fig.10.

Close family ties are the highest indicator for the age bracket with female showing 57.9% and male 34.9%. A close family tie is a strong indicator of social-cultural cohesiveness.

4.4 Mood and Use of mobile Phone

Table 11: Summary of cross tabulation between Mood Indicators' versus Age of the Respondents and Gender

Mood	Gender	Age of the Respondents (Years)					Totals	Pearson's Chi (χ^2)		Cramer's V
		16-25	26-35	36-45	46-55	Over 55		χ^2	A.S.	
General Mood	Male	18.4%	28.9%	34.2%	2.6%	2.6%	86.8%	3.030	.553	.282
	Female	10.0%	20.0%	45.0%	10.0%	0.0%	85.0%	2.353	.502	.343
Mood (Stress)	Male	5.41%	10.81%	16.22%	0.00%	0.00%	32.43%	11.262	.793	.276
	Female	0.00%	16.67%	33.33%	5.56%	0.00%	55.56%	19.308	.081	.598
Mood (Loneliness)	Male	18.92%	27.03%	27.03%	0.00%	0.00%	72.97%	12.012	.445	.329
	Female	24.80%	38.79%	32.91%	0.00%	0.00%	96.50%	5.159	.820	.318
Mood (Excitement)	Male	21.62%	29.73%	35.14%	2.70%	2.70%	91.89%	3.773	.877	.226
	Female	11.76%	23.53%	47.06%	11.76%	0.00%	94.12%	4.317	.634	.356
Mood (Happiness)	Male	23.68%	23.68%	34.21%	2.63%	0.00%	84.21%	22.391	.330	.443
	Female	11.11%	27.78%	44.44%	5.56%	0.00%	88.89%	4.856	.562	.367
Mood (Anger)	Male	2.78%	2.78%	0.00%	0.00%	2.78%	8.33%	29.367	.220	.452
	Female	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.280	.296	.450

From table11 it is evident that females are more influenced by mood in the use of mobile phones than male with the mostly affected age bracket being 36 to 45 years. The general mood which is at 45.0% compares relatively well with other mood indicators across the board at this particular age bracket where excitement shows the highest at 47.06 %, followed by happiness at 44.44%, stress at 33.33% and loneliness at 32.91% in that order.

From fig11 all the mood indicators have an increasing trend with respect to age up to age 45 and then drop sharply. Both male and female are least influenced by anger to use mobile phone, however the male age bracket of 55 and above are significantly influenced by anger.

Pearson's Chi square indicates that there is a relationship between the mood indicators and age since the asymptotic significance for all of them is greater than 0.05. The strengths of the

relationships for all indicators are relatively weak therefore none of the indicators singly can be used as a measure of mood influencing use of mobile phone but a combination of all the mood indicators.

Between the age group 26 to 45 the loneliness mood indicator is almost constant, a very peculiar indication indeed that calls for further research.

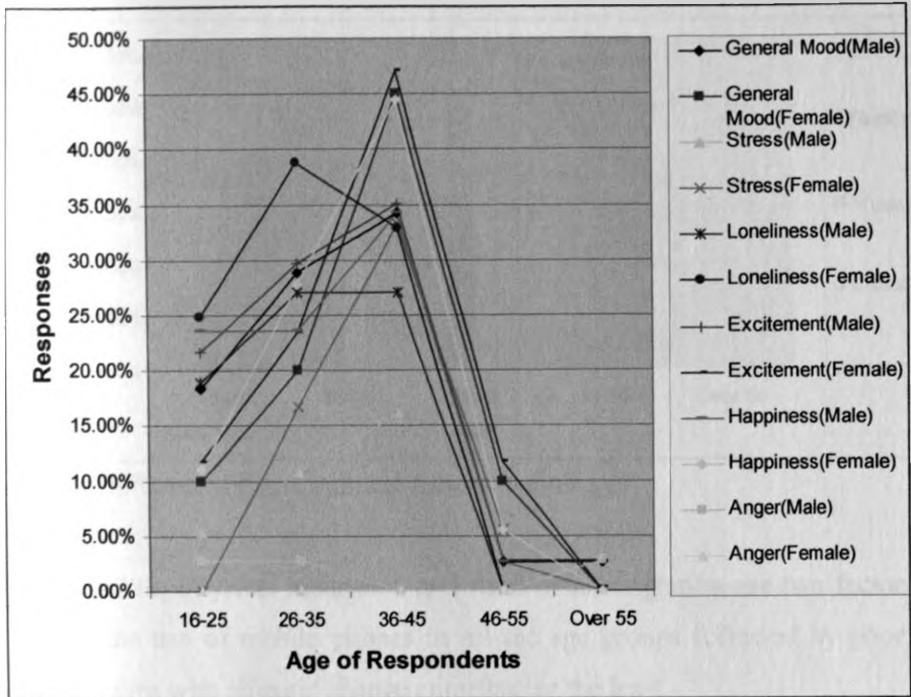


Fig. 11: Gender responses against age for various Mood indicators

4.5 Geographical factors against age, gender and occupation

Table 12: Summary of cross tabulation between geographical Indicators against Age of the Respondents and Gender

Geographical factors	Gender	Age of the Respondents (Years)					R (Totals)	Pearson's Chi (χ^2)		Cramé r's V
		16-25	26-35	36-45	46-55	Over 55		χ^2	A.S	
General Geographical factor	Male	22.5%	30.0%	37.5%	2.5%	0.0%	92.5%	19.49	.10	.398
	Female	11.1%	16.7%	50.0%	5.6%	0.0%	83.3%	2.52	.472	.374
Rural Urban migration	Male	23.2%	32.6%	32.5%	4.6%	0%	93.0%	36.09	.12	5.29
	Female	4.8%	23.8%	57.2%	9.5%	0.0%	95.2%	13.563	.075	.568
Physical separation	Male	25.0%	25.0%	40.0%	2.5%	0.0%	92.5%	49.32	.11	.641
	Female	11.8%	23.5%	53.0%	5.9%	0.0%	94.2%	9.11	.168	.518
Climatic change (wet & dry)	Male	12.8%	23.1%	33.3%	2.6%	0.00%	71.8%	12.255	.425	.324
	Female	11.8%	17.7%	41.1%	0.0%	0.0%	70.6%	4.851	.847	.308
Poor communication Infrastructure	Male	22.5%	20.0%	34.50%	2.5%	2.5%	82.5%	9.560	.889	.244
	Female	5.9%	23.5%	42.1%	0.0%	0.0%	70.6%	11.58	.238	.477

From fig 12b, general geographical factors have an increasing influence in the use of mobile phones from the age of 16 to 45 years. Beyond this age, the effect falls. The age group mostly affected by general geographical factors in the use of mobile phone is 36 to 45 years (with the female claiming 50% and the male 37.2%) closely followed by the age groups 26 to 35 and 16 to 25 in that order respectively.

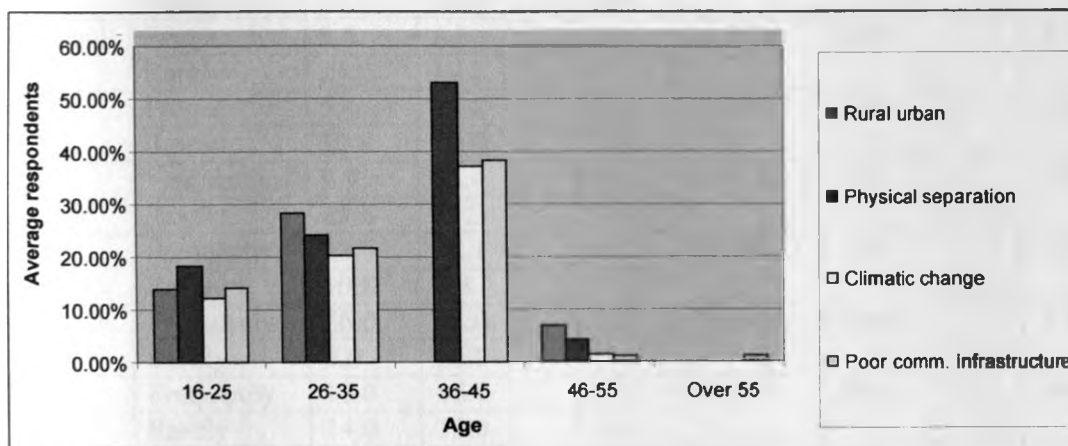


Fig 12b: Influence of geographical factors against age

From fig 12b, Physical separation and rural urban migration are two factors that contribute most to the use of mobile phones in all the age groups followed by poor communication infrastructure with climatic change contributing the least.

Students are one category of respondents that is affected by physical separation most compared to business people or employees, otherwise the geographical factors of rural urban migration, physical separation climatic change and poor communication infrastructure affect businessmen and employees equally well. All the groups exhibit the same degree of effect for rural urban migration. This is illustrated in fig. 13.

4.6 Mobile Commerce Value Added Services in Urban and Urban Environs

Urban environs have a higher response rate in the use of value added services than Urban for all the value added services except for sending money where Urban is higher at 9.5% than Urban environs at 2.1%. From the low response rates of less than 50%, all value added services are not very popular. Majority of the respondents rarely use them. This data is captured in table 14 and illustrated in fig 14.

Entertainment is the most popular value added service followed by information services and transaction services respectively. In the entertainment service, music is the most popular with

64.0% followed by games at 62.0% and then ring tones at 61.7%.

Table 14: Mobile commerce services against urban (Nairobi) and urban environs

Mobile Commerce Services	Frequency	Urban %	Urban Environs %	Total	Pearson's Chi	Asymptotic Significance	Cramer's V
Transaction Reservation	Frequently	10.6	10.6	21.2	22.957	.912	.366
	Rarely	35.2	8.7	43.9			
Transaction Buy Ticket	Frequently	4.0	12.0	6.0	13.322	.772	.298
	Rarely	34.0	50.0	84.0			
Transaction Send Money	Frequently	9.5	2.1	30.6	21.532	.607	.322
	Rarely	23.0	19.2	42.2			
Info Services News	Frequently	5.4	21.8	27.2	30.695	.163	.374
	Rarely	30.8	20.0	50.8			
Info Services Check Bill	Frequently	9.9	25.4	35.3	33.575	.093	.408
	Rarely	25.6	31.3	56.9			
Entertainment Ring tones	Frequently	23.6	38.1	61.7	26.393	.334	.346
	Rarely	10.8	7.3	19.1			
Entertainment Games	Frequently	26.0	36.0	62.0	35.149	.066	.419
	Rarely	2.0	16.0	18.0			
Entertainment Music	Frequently	18.0	46.0	64.0	39.544	.024	.445
	Rarely	14.0	12.0	26.0			

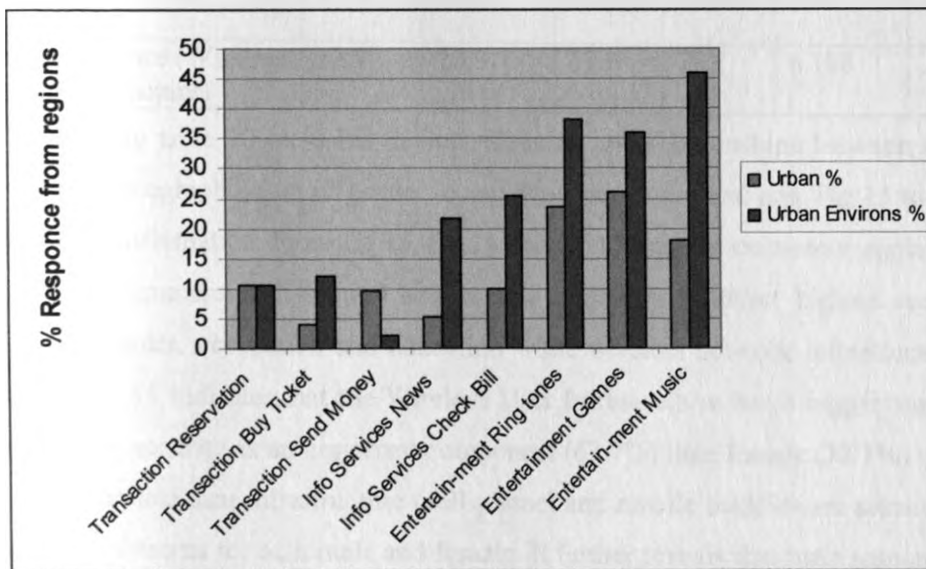


Fig 14: Nairobi Urban and Nairobi Urban environs respondents against M-commerce value added services

A general observation is that m-commerce services are more popular in urban environs than the urban centres themselves. Within the information services checking bill is the most popular at 35.3% followed by news at 27.2%. In the transaction services the most popular service is sending money at 30.6% followed by reservation at 21.2% and then buying tickets at 16.0%. This is illustrated in fig. 14.

The Pearson's chi square asymptotic significance for all the m-commerce value added services is greater than 0.05 except for entertainment (music) an indication of a relationship in the use of VAS services in urban and urban environs ie where a VAS service is being used there is a likelihood of other VAS services being used as well. The strength of the relationship however is weak as indicated by the low values of Cramer's V.

4.7 Security Concern in Mobile Commerce Infrastructure

Table 16: Summary of cross tabulation of security indicators against occupation of Respondents

Variable	Student %	Business persons %	Employees %	Total %	Pearson's Chi	Asymptotic Significance	Cramer's V
Security importance (m-commerce application)	38.6	31.6	29.8	100.0	-	-	-
Security importance (wireless user infrastructure)	37.3	32.2	30.5	100.0	2.118	.34	.189
Security importance (Mobile middle ware)	37.3	32.2	30.5	100.0	.445	.80	.087
Security importance (Wireless Network Infrastructure)	23.7	20.3	27.1	71.1	6.188	.18	.229

Table 15 to table 20 inclusive depicts variation and relationships between security factors against demographic data of gender, occupation, education and age. Fig 15 to fig 19 conveys the same information. From fig.15, fig.16 and fig.17, mobile commerce application, wireless user infrastructure (cell phone) and mobile middleware attract highest security concerns against gender, occupation and education while wireless network infrastructure attracts the least. Fig. 15 indicates that the Wireless User Infrastructure has a bigger variation showing male view security as an important component (67.7%) than female (32.3%) with the mobile phone wireless user infrastructure (cell phone) and mobile middleware attracting the highest security concerns for both male and female. It further reveals that male respondents are more concerned about the mobile infrastructure security more than the female. Students are more conscious of mobile commerce infrastructure security more than business persons with employees showing the least concern. Mobile commerce applications attract the highest security concerns relative to all other mobile commerce infrastructure indicators and the type of mobile application has more concerns with the students. This is captured in fig. 16.

However both male and female agree that security of all indicators is significantly important since all their Pearson's asymptotic significance for chi is greater than .05. From figure 17

and fig 18 it is clear that there is a correlation between mobile infrastructure security and the security features of the wireless user infrastructure (cell phone). From fig 15 and fig 19, males show more concern in both m-commerce infrastructure security and mobile phone security features more than females.

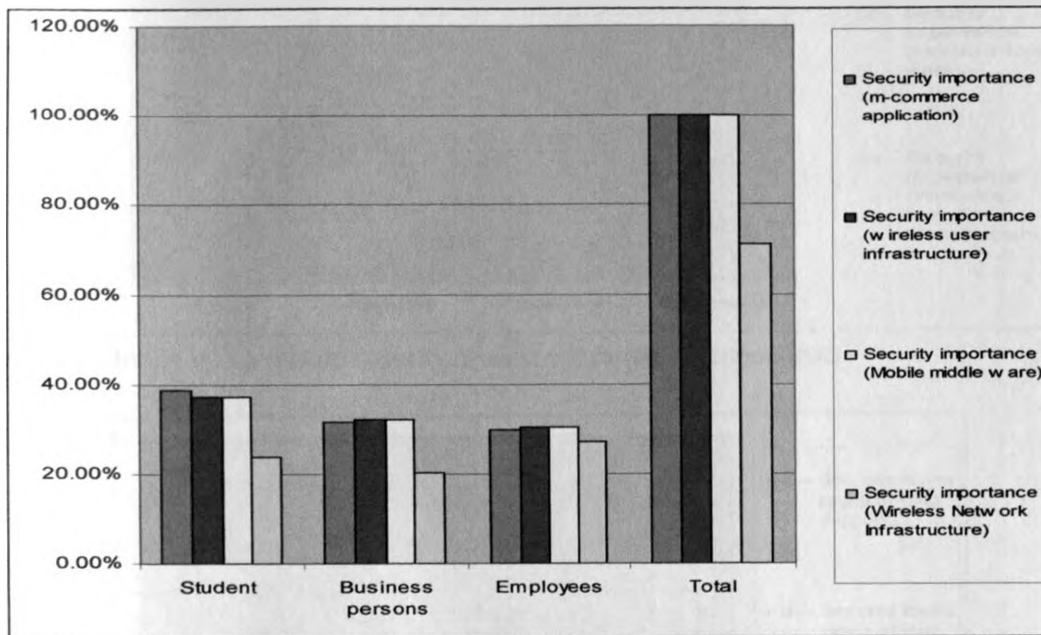


Fig 16: Mobile infrastructure security against occupation respondents

Fig. 17 indicates that the security concern rises linearly as the level of education increases for the entire m-commerce infrastructure indicators with college and university level education registering the highest concerns. The more the education level, the more the security concerns of the m-commerce infrastructure. The Pearson's asymptotic significance of greater than .05 further confirms that there is a relationship between the m-commerce infrastructure indicators and level of education though this relationship is weak denoting that none of the indicators alone contributes to the effect but a combination of all of them.

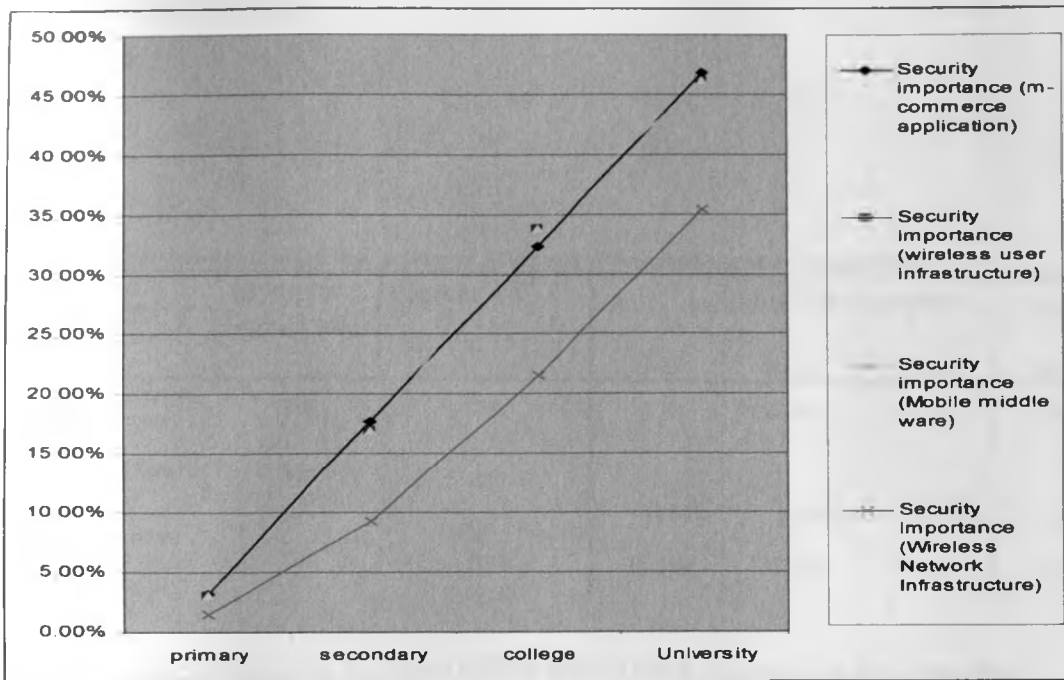


Fig 17: Mobile infrastructure security against education of respondents

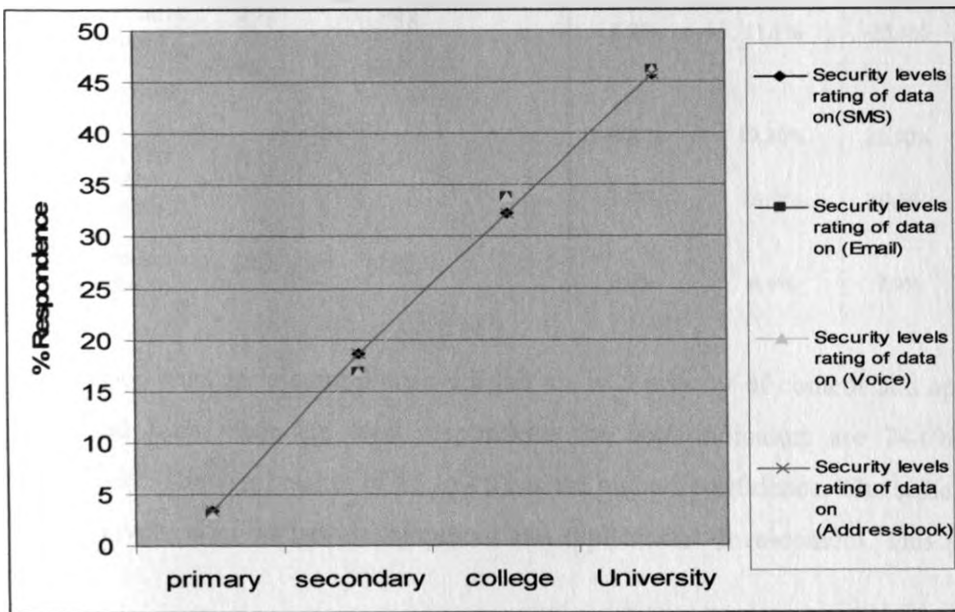


Fig 18: Mobile Services security level rating against education of respondents

4.8 Ethical issues vs. Content Providers/Application Developers

Tables 21 and table 22 depict the variation and relationships of fair use/privacy of content and application against age and education level of the respondents. This is further illustrated in figures 20 and 21.

Table 21: A cross tabulation of fair use/ privacy of MSPs and ISPs against age of the respondents

	Asymptotic Significance	Cramer's V	Age of the Respondents				Total
			16-25	26-35	36-45	46-55	
Fair use of Content from developers	.312	.271	14.3%	22.3%	31.7%	6.4%	74.6%
Fair use of Applications from developers	.390	.255	11.50%	21.50%	31.50%	3.10%	67.60%
What extent does MSP and ISP Honor customer's privacy?	.100	.720	15.3%	32.2%	44.1%	6.8%	98.3%

Table 22: A cross tabulation of fair use/ privacy of MSPs and ISPs against education level of the respondents

	A.S	Cramer's V	Educational Level				Total
			Primary	Secondary	College	University	
Fair use of Content from developers	.878	.188	3.2%	11.1%	25.4%	34.9%	74.6%
Fair use of Applications from developers	.400	.220	4.00%	13.10%	21.50%	35.10%	73.70 %
What extent does MSP and ISP Honors customer privacy?	.453	.321	3.4%	16.9%	30.5%	47.5%	98.3%
Respects intellectual property rights	.902	.182	0.0%	6.4%	7.9%	11.1%	25.4%

Most respondents have confidence with fair use and privacy of content and applications by MSPs and ISPs since the total respondents for both indicators are 74.6% and 67.6% respectively. The age bracket of 26 to 45 has the highest confidence. The same age group is the one involved in content development and applications development. This is captured in fig.20.

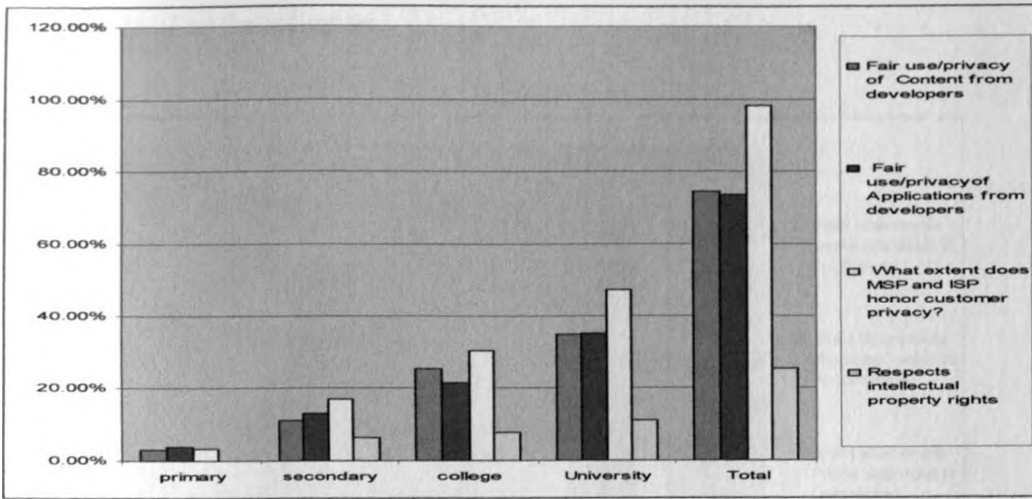


Fig. 21: Fair use of content and application by MSP and ISPs against educational level of the respondents

From figure 21 it is clear that privacy and intellectual property rights have a direct relationship with level of education. The trend from the figure is indicative of increase with education also all Pearson's Chi square asymptotic significances are greater than 0.05 which means there is a relationship between privacy and educational levels.

4.9 Mobile Commerce Value added Impact on E- Commerce

Tables 23 to 32 inclusive underscore the mobile-commerce value and the impact it has added on e-commerce. Fig 22 to fig 31 illustrates this. People of all age groups and occupations agree that mobile phones have enabled them to accomplish more compared to other communication devices.

Table 23: A cross tabulation of mobile phone throughput compared to other devices against occupation of the respondents

		Occupation of the respondents			Total
		Student	Business persons	Employees	
How much are you able to accomplish with mobile phone compared to other devices	Much	27.3%	25.5%	29.1%	81.8%
	Little	10.9%	3.6%	1.8%	16.4%
	Same	.0%	1.8%	.0%	1.8%

meaning that none of the individual indicators contributes to the e-commerce alone but a combination of all the indicators.

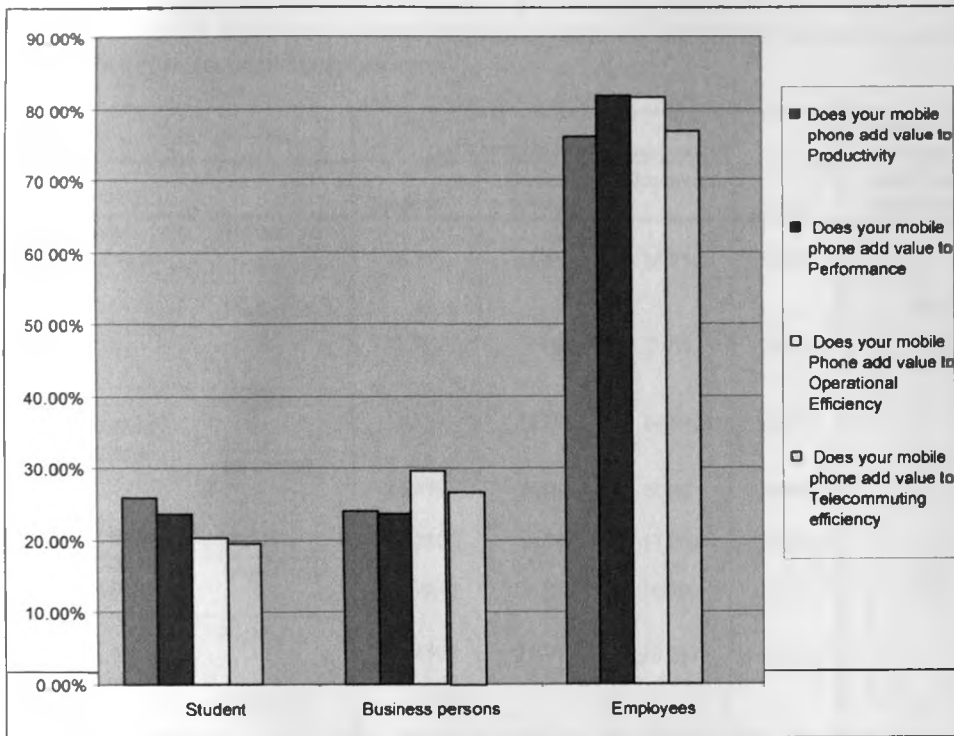


Fig 25: Mobile phone value added impact indicators on e-commerce against occupation of the respondents.

4.10 General mobile top up considerations

Tables 27 to 32 inclusive indicate top up characteristics of respondents against occupation and education level. This is further illustrated in figures 26 to 31.

Table27: A cross tabulation of mobile phone top-up and occupation of the respondents.

		Occupation of the Respondents			Total	Asymptotic Significance	Cramer's V
		Student	Business persons	Employees			
Top up frequency							
How often do you top up your phone?	Daily	8.6%	19.0%	12.1%	39.7%	.043	.335
	Weekly	22.4%	12.1%	17.2%	51.7%		
	Fortnightly	6.9%	.0%	.0%	6.9%		
	Monthly	.0%	1.7%	.0%	1.7%		
	Totals	37.9%	32.8%	29.3%	100.0%		

Students, business persons and employees all agree that mobile phones have enabled them to accomplish more than other communication devices with professionals (employees) contributing 29.1%, students 27.3% and businessmen 25.5%. The amount of accomplishment

Table 26: A cross tabulation of mobile phone value added impact indicators on e-commerce against occupation of the respondents

		Occupation of the respondent				Pearson's chi Square asymptotic significance	Cramer's V
		Student	Business persons	Employees	Total		
Does your mobile phone add value to Productivity	Highest	16.7%	18.5%	16.7%	51.9%	.742	.180
	Moderately	9.3%	7.4%	7.4%	24.1%		
Does your mobile phone add value to Performance	Highest	18.2%	18.2%	14.5%	50.9%	.424	.233
	Moderately	16.4%	5.5%	9.1%	30.9%		
Does your mobile phone add value to Operational efficiency	Highest	22.2%	16.7%	13.0%	51.9%	.204	.281
	Moderately	9.3%	3.7%	16.7%	29.6%		
Does your mobile phone add value to Telecommuting efficiency	Highest	21.4%	10.7%	19.6%	51.8%	.627	.198
	Moderately	8.9%	8.9%	7.1%	25.0%		

has a linear increase from the age group 16 to 25 year to age group 36 to 45 years and drops in the age group 46 to 55 years.

From figure 25 all mobile phone value added impact indicators (productivity, performance, operational efficiency and telecommuting efficiency) exhibit an increase with all categories of occupation. Performance and operational efficiency indicators have the highest impact. Employees contribute the highest in all indicators hence this is the social class that is driving the mobile commerce sector.

From figure 24 the same impact indicators predominate within education level of the respondent's category. It is further observed that telecommuting efficiency is another factor that has considerably picked up within the educational level category.

From tables 24 and 25, it is observed that the Pearson's Chi Square asymptotic significance for all the indicators is greater than 0.05 which is a clear indication that there is a relationship between performance, operational efficiency, telecommuting and productivity. The relationship however is weak because of the low values of Cramer's V for all the indicators

Daily and weekly top ups are the most popular top up frequencies in both the education and occupation categories (fig 26 and fig 27). However students prefer weekly top up more than daily top up unlike business persons who prefer daily top up more than weekly top up. Only students and business persons top up fortnightly and monthly respectively. College and

Table 30: A cross tabulation of mobile phone scratch card denomination used and educational level of the respondent

		Educational Level					Asymp totic Signifi cance	Cramer's V
		Primary	Secondary	College	Universit y	Total		
Which denomination of scratch card do you frequently use?	Ksh.50/60	1.6%	4.8%	11.1%	25.4%	42.9	.267	.243
	Ksh.100	.0%	9.5%	20.6%	12.7%	42.9		
	Ksh.250/300	1.6%	3.2%	1.6%	4.8%	11.1		
	Ksh.500	.0%	.0%	1.6%	1.6%	3.2		
	Total	3.2%	17.5%	34.9%	44.4%	100.0		

University level students are the majority who top up their phones weekly and use the 50/60 and 100 top up scratch cards (fig 26). The low top up denominations of Ksh.50/60 and Ksh. 100 are the most popular top up denominations within education level and occupation respondent categories (fig 28 and fig 29). Prepaid tariff is the most popular tariff with college and university students as the majority users and business persons predominate in the post paid tariff (fig. 30). The prepaid tariff usage increases linearly with the level of education rising from zero with primary education to 45% with university education (fig 31).

Top up frequency has no relationship with the occupation of the respondents; however it has a correlation with the level of education

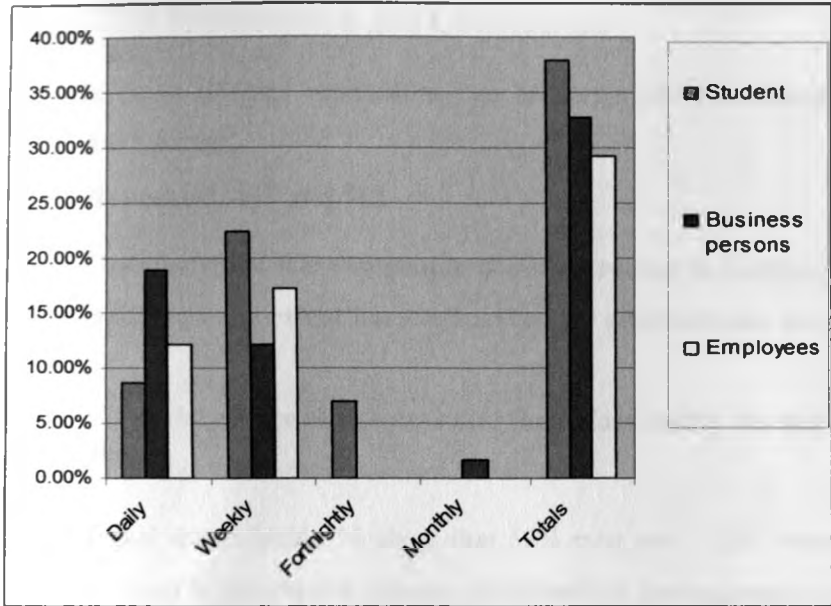


Fig. 26: Occupation of respondent against top-up frequency of mobile phone

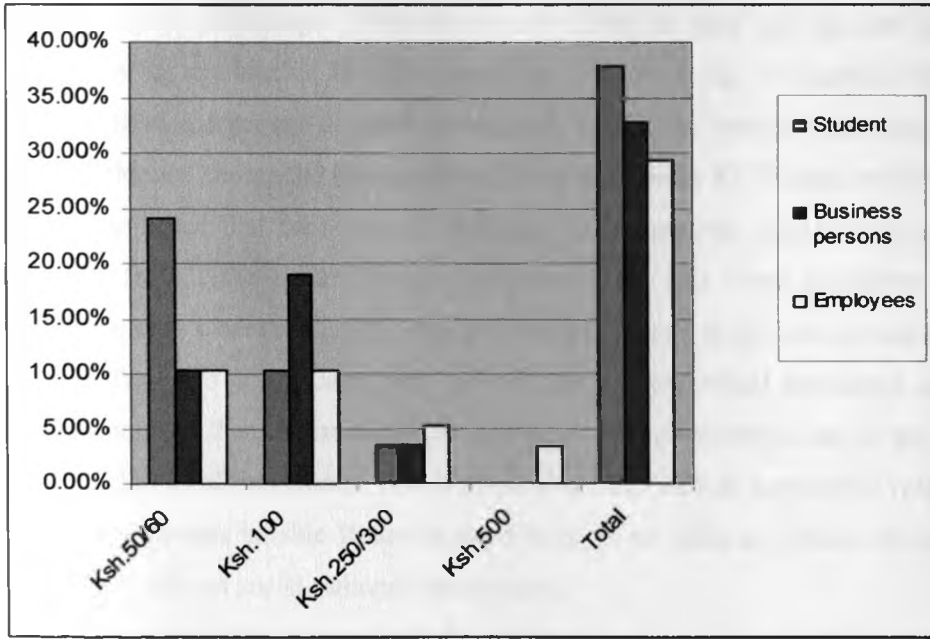


Fig 28: Response by occupation of respondent against top-up denomination of mobile phone

CHAPTER 5: Discussion and Conclusions

From the result findings conclusions can be drawn and the stipulated hypotheses can be accepted or rejected.

5.1 Hypothesis H1 and H2

H1: The lifestyle of Kenyan people is deeply rooted in cultural beliefs, practices and attitudes that to some extent have influenced the adoption and use of mobile phones.

H2: The social nature of Kenyans and their close family ties has influenced the use of mobile phones

The statistical data of table 10 show that 55% men and 50% women accept that culture influences them to use mobile phones. About half of the respondents revealed that they are influenced by their community general culture to use their mobile phones. The age bracket mostly influenced by culture in the use of mobile phones is 36 to 45 years with female showing higher percentage (30%) than male (25%) in this age bracket; this is closely followed by the age bracket 25 to 35 years. This is shown in fig. 10. Cultural beliefs influence the communication actions of about 63.4% male and 73.4% female. Close family ties has the highest influence among the indicators with male registering 97.7% and female 100%.

It is further noted that the value of Pearson's Chi asymptotic significance is much greater than 0.05 for all the cultural factor indicators. This is a clear indication that a strong relationship exists between gender, age and cultural factors in the use of mobile phones. The value of Cramer's V indicates that the strengths of individual indicators are reasonable. However none of them individually can show culture contributes to use of mobile phone but a combination of all indicators. This is also a proof that culture constitutes various indicators where the indicators in table 10 are amongst them. In the Kenyan context, close family ties is a strong indicator of social-cultural cohesiveness.

It is further noted that Cultural beliefs against age above the age bracket of 55 years are observed to be decreasing instead of increasing. Older people are more conscious about cultural values more than young people. Further investigation is required in this age group.

From this analysis it is clear that there is a relationship between use of mobile phone and general culture, social status, cultural beliefs close family ties and peer pressure. Therefore hypotheses **H1 and H2** hold and can be accepted.

5.2 Hypothesis H31

H31: A person's mood influences the use of mobile phone

From table 11 it is evident that females are more influenced by mood in the use of mobile phones than their male counterparts with the mostly affected age bracket being 36 to 45 years. The percentage score for general mood compares relatively well with other mood indicators across the board at this particular age bracket. Excitement as a mood indicator has the highest influence (35,14% male, 47.06% female) on the use off mobile phones followed by happiness (34.21% male, 44.44 female), stress (16.22% male, 33.33% female) and loneliness (27.03% male, 32.91% female) in that order. Both male and female are least influenced by anger to use mobile phone, however the male age bracket of 55 and above are significantly influenced by anger in the use of mobile phones. All the mood indicators tend to increase with age up to the age 45 years and then drop sharply above this age. This trend is show in fig.11.

Pearson's Chi Square indicates that there is a relationship between the mood indicators and age since the asymptotic significance for all of the indicators is greater than 0.05. The strengths of the relationships for all indicators are relatively weak therefore none of the indicators singly can be used as a measure of mood influencing use of mobile phone but a combination of all the indicators.

Between the age group 26 to 45 the loneliness mood indicator is almost constant, a very peculiar phenomenon indeed that calls for further research.

It can be concluded that general mood, stress, loneliness, excitement, happiness and anger influence the use of mobile phones. Therefore hypotheses H31 hold and it can be accepted.

5.3 Hypothesis H32

H32: Geographical factors influence the use of mobile phone

From fig 12a, general geographical factors have an increasing effect in the use of mobile phones from the age of 16 to 45 years. Beyond this age, the effect falls. The age group mostly affected by general geographical factors in the use of mobile phone is 36 to 45 years (with the female claiming 50% and the male 37.2%) closely followed by the age groups 26 to 35 and 16 to 25 in that order respectively. Female are least affected by geographical factors in the use of mobile phones in the age groups 16 to 35 years (Less mobility for women at these ages) and the trend reverses in the age groups 36 to 55years.

From fig 12b, Physical separation and rural urban migration are two factors that contribute most to the use of mobile phones in all the age groups followed by poor communication infrastructure with climatic change contributing the least.

Students are most affected by geographical factors (37.0%) than employees (27.8%) and business persons (24.1%). Physical separation (39.6%) is a geographical factor that affects students most, followed by employees at 26.5%. Rural urban migration is the next most important geographical factor that affects students and employees respectively. Business persons is the category least affected by geographical factors compared to students and employees. This data is captured in table 12 and figures 12 and 13.

The asymptotic significance of the general geographical factors in the use of mobile phones is 0.10 0 and 0.07 for age and occupation respondents respectively indicating that a relationship exists between general geographical factors and the use of mobile phone. The Cramer's V is .398 and .309 respectively indicating that the strength of the relationship is a weak one. The individual geographical indicators all register an asymptotic significance of greater than 0.05; therefore all have relationships with the use of mobile phones. Their Cramer's V values show that the strengths are weak and hence none of them can be used alone as final indicator but a combination of all the indicators.

It can be concluded that Geographical factors namely: general geographical factor, physical separation, urban migration, climatic change and poor communication infrastructure influence the use of mobile phones. Hence the hypothesis H32 hold and can be accepted..

5.4 Hypothesis H41

H41: Security is an important concern to users and it influences the use of m-commerce infrastructure.

Mobile commerce application, wireless user infrastructure and mobile middleware show highest security concerns against gender, occupation and education while wireless network infrastructure attracts the least concern (figures 15, 16 and 17). Wireless User Infrastructure has a higher variation with the male viewing security as an important component (67.7%) than female (32.3%) (Fig15). Students are more conscious of mobile commerce infrastructure security more than business persons and employees (fig 16). Mobile commerce applications attract the highest security concerns relative to all other mobile commerce infrastructure indicators. University and college level education respondents have the highest concerns for mobile commerce infrastructure security. From figures 17 and 18 it is clear that there is a

correlation between mobile infrastructure security and the security features of the wireless user infrastructure (cell phone).

From the data of tables 15, 16, 17 the Pearson's chi asymptotic significance are all greater than 0.05 hence there is relationship between infrastructure security indicators and gender, occupation and educational levels of the respondents. The relationship is not very strong since their Cramer's V values are all low.

It can be concluded that security is an important concern to users and it influences the use of mobile commerce infrastructure, therefore H41 hypothesis hold and it can be accepted.

5.5 Hypothesis H42

H42: Fair use, Privacy and intellectual property rights are important concerns to application developers, content providers and service providers and they influence the use of mobile infrastructure.

Majority of the people interviewed have confidence with fair use and privacy of content and application by MSPs and ISPs since the total respondents for both indicators are 74.6% and 67.6% respectively. A linear relationship is observed between fair use/privacy in the age bracket 16 to 45 years with the age bracket of 36 to 45 exhibiting the highest confidence and falls abruptly in the age group 46 to 55 years. Customer privacy by MSPs and ISPs is ranked highest followed closely by fairuse/privacy of applications from developers with content developers ranked lowest. Fairuse/privacy gains prominence with age except for the age group above 45 years. The age group 25 to 45 years is most likely involved in content and application development. This is plotted in fig 20. From the plot of figure 21, it is evident that fairuse/privacy and intellectual property rights have a linear relationship with level of education. The higher the level of education, the greater the awareness of fairuse/privacy and intellectual property rights of content and applications.

The Pearson's Chi square asymptotic significances for this data (tables 21 and 22) are greater than 0.05 indicating that there is a relationship between fairuse/privacy, intellectual property rights with the level of education and age.

It can be concluded that privacy and intellectual property rights are important concerns to application developers, content providers and service providers and they influence the use of mobile infrastructure. Therefore hypothesis H42 holds and it can be accepted.

5.6 Hypothesis H5

H5: Use of mobile phones has created mobile commerce services that have added mobile and wireless value to traditional e-commerce resulting in better services.

Students, business persons and employees all agree that mobile phones have enabled them to accomplish more than other communication devices with professionals (employees) contributing 29.1%, students 27.3% and businessmen 25.5%. The amount of accomplishment has a linear increase from the age group 16 to 25 years to age group 36 to 45 years and drops in the age group 46 to 55 years (figs 22 and 23)

Daily and weekly top ups are the most popular top up patterns with the majority in the prepaid tariff and using low denomination (Ksh 100 and less) top up scratch cards. This is an indication of very frequent use of mobile phones in transactions (figs 26 to 30)

From figure 25 and table 23 All Mobile phone value added impact indicators (productivity, performance, operational efficiency and telecommuting efficiency) are observed to increase with levels of occupation from students through business persons to employees. Performance and operational efficiency indicators have the highest impact. Employees register the highest impact in all indicators. From figure 24 the same impact indicators predominate within education level of the respondent's. It is further observed that telecommuting efficiency is another factor that has considerably picked up within the educational level category.

Data of tables 24 and 25 indicate that Pearson's Chi asymptotic significance is above the threshold value of 0.05, an indication of a relationship between mobile commerce added value and the individual indicators. However the Clamer's V for the individual indicators is weak signifying that none of the indicators alone has the impact to add value to e-commerce but it is a combination of all the indicators that contribute to this impact.

It can be concluded that mobile commerce has added value to e-commerce through better productivity, performance, operational efficiency and telecommuting efficiency. These benefits have been achieved as a result of mobile and wireless value introduced by the mobile phone. Therefore **H5** holds and it can be accepted.

In societies where classes exist, one's class is determined largely by occupation, level of education or qualifications, wealth and family background (Thompson, William; Joseph Hickey (2005). From figures 33 to 35, post secondary respondents (college and university level education) are the majority players in m-commerce activities. These are the people in

productive employment. Business persons and employees feature prominently in the occupation category with students stealing the show in entertainment m-commerce service. The age groups 26 to 45 years drive the m-commerce industry with the age group 16 to 25 year featuring strongly in entertainment services. It can be concluded that m-commerce activities are driven by people of post secondary level education and basically business persons and employees within the age group 26 to 45 years.

5.7 General Conclusions

From the study findings it can also be concluded that:

- Safaricom is the preferred network.
- All the respondents owned mobile phones with Nokia being the preferred model followed by Motorola. More men owned mobile phones compared to women. Women prefer Nokia phones compared to their male counterparts who prefer Motorola phones
- Storage memory, power and communication functionality are the most limiting features in the use of mobile phone.
- About 83.3% are prepaid subscribers while about 50% use denomination of Ksh.100 and below to reload their mobile phones.
- Internet based search engines host most e-mail addresses and that most people use personal computers with a small proportion using laptops and mobile phones for Web access.
- Of the contents searched 90% is always foreign based with only 10% being locally developed. 70% of 16-25 age group searches for entertainment while 64% of 26-35 age group searches for educational material.
- Location identification via phone and cheaper calling rates were additional services suggested by users to MSPs.
- The social lifestyle and cultural practices influence the use of mobile phones with age group 36 to 45 years mostly affected. Men are more likely to be influenced by culture than women
- Among m-commerce applications, Mobile marketing is most popular among users followed by mobile advertising and mobile entertainment in that order. The least important application is Mobile Distance Learning.
- Among mobile services, data messaging services leads followed by entertainment services, information services and transactional services in that order
- SMS is the most frequently used mobile service followed by entertainment services

(music, games, and ring tones); check a/c balance and sending money in that order.

- Operability, personalization, convenience and instant connectivity to the target are the main features that make mobile phones popular and suitable for m-commerce.
- The nature of business conducted by most people through mobile phones is service provision.
- M-commerce activities are driven by people of post secondary level education and basically business persons and employees within the age group 26 to 45 years.

5.7 Achievements

Behavioral models mentioned earlier stipulate that beliefs and attitudes of individuals towards a certain behavior are determinants of the individual's intention towards the adoption of that behavior. The study revealed that cultural beliefs and practices influence use of mobile phones. Community culture and cultural beliefs influence the use of mobile phones within age group 36 to 45 years mostly affected. Men are more likely to be influenced by cultural factors than women.

It was also evident that the social lifestyle of Kenyans and their close family ties influence the use of mobile phones. Social status, close family ties, and peer pressure influence use of mobile phones. The social class that controls e-commerce are people of post secondary level education and basically business persons and employees within the age group 26 to 45 years. Men are more likely to be influenced by these factors than women.

Fit-Viability framework by Tjan proposes that M-commerce business models are unique to different environments and they are to a great extent influenced by culture. Geographical factors like rural/town migration, family separation, rural/town technological divide and poor communication infrastructure (roads etc) influence use of mobile phones. All age groups across the board are influenced by geographical factors in the use of mobile phones. Physical separation and rural urban migration contributes the most influence in the use of mobile phones.

A person's mood influences the use of mobile phones. Mood factors like stress; loneliness, excitement and happiness have a tendency to increase the rate at which people use their mobile phones. Anger on the other hand has a negative influence on the rate at which people use their mobile phones. Women are more likely to be influenced by moods in using their

mobile phones than men.

Fair use, security, privacy and intellectual property rights are important concerns to users, application developers, content providers and service providers and they influence the use of mobile commerce infrastructure. However, no registration is in place to address these ethical tensions from information point of view.

M-commerce has added value to traditional e-commerce by improving performance, efficiency, productivity and telecommuting as a result of the inherent mobile and wireless value in mobile phones.

5.8 Refinement of Upkar Varchney and Ron Vetter m-commerce framework

From these findings, the m-commerce open framework of Upkar Varchney and Ron Vetter can be refined to introduce factors that are unique to the Kenya environment. In the user plane cultural factors (cultural beliefs and attitudes), social factors (Social status, close family ties, peer pressure), mood factors (stress; loneliness, excitement, happiness and anger), and geographical factors (physical separation, rural/urban migration, climatic change and poor communication infrastructure) are additional factors that can be introduced in this plane. Security is implied in this plane and need not be introduced in the framework; however social security (fear of use of mobile technology related services) has been identified as a factor that influences use of mobile phones. In the developer/provider plane fair use, privacy and intellectual property rights were identified as main factors that influence mobile commerce; however these factors are implied in the plane and need not be introduced in the framework. Fig 32 is a refined m-commerce framework for the Kenyan environment.

The study has identified the most popular m-commerce applications and VAS. Among m-commerce applications, Mobile marketing is leading followed by mobile advertising and mobile entertainment in that order. The least important application is Mobile Distance Learning. Among value added services, data messaging services leads followed by entertainment services, information services and transactional services in that order. M-commerce has been found to have a positive impact on e-commerce. Operability, personalization, convenience and instant connectivity to the target are the main features that have been identified to favour m-commerce over traditional e-commerce. Mobile phones have added mobile value and wireless value to e-commerce applications resulting in the

improvement of productivity, performance, operational efficiency and telecommuting efficiency. Performance and operational efficiency topped the list, whilst productivity and telecommuting efficiency followed closely as factors that cell phones add to m-commerce over e-commerce.

Among m-commerce services, entertainment is the most highly sought m-commerce service followed by information services and transactional services in that order.

Music followed by check a/c balance, games, ring tones, check bills and send money are the most popular m-commerce services in that order.

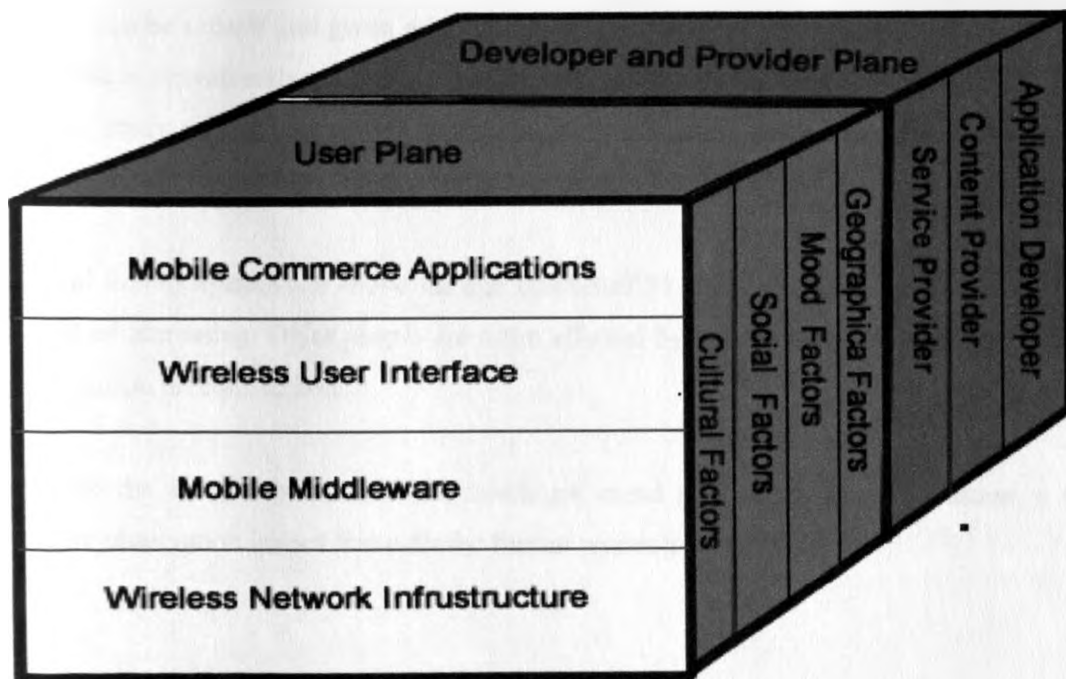


Fig. 32 M-commerce framework for the Kenyan environment

5.10 Limitations of the study

One limitation of this study was in the collection of data. MSPs, ISPs and ICT managers were difficult people to penetrate. They were not willing to release some classified information about their organizations that could have helped this study to register better results. Their future projections in terms of technology and value added services, were not forthcoming. All they could volunteer is the common knowledge in their websites.

Questionnaire administration was another area that was not conducted satisfactorily. During the analysis stage, a lot of data was ignored after the cleaning process because it was not well captured.

The number of questionnaires administered to the CBD was inadequate. Because of financial and time constraints, only 400 samples were taken. About 1600 samples (ratio of 20:1 – CBD: city environs) could have produced better results.

5.11 Recommendations for further work

M-commerce is an industry in its infancy in Kenya. It has a lot to offer to the economy of this nation. However, to tap its full potential, existing m-commerce frameworks and business models can be refined and given a local flavour if sustainable growth especially in the rural areas that is conveniently reachable through mobile phone technology is to be realized.

Further study can investigate the appropriateness of existing m-commerce business models in the Kenyan context and suggest appropriate models for rural areas.

Cultural beliefs against age above the age bracket of 55 years are observed to be decreasing instead of increasing. Older people are more affected by culture than young people. Further investigation is required here.

Between the age group 26 to 45 the loneliness mood indicator is almost constant, a very peculiar observation indeed that calls for further research

References and Bibliography

1. Jerry Hausman (2004); Economic Wireless Point of Sale payment in China. <http://e-business.mit.edu>
2. Melody M. Tsang, Shu-Chun Ho, and Ting-Peng Liang: Consumer Attitudes Toward Mobile Advertising: An Empirical Study. *International Journal of Electronic Commerce*, Volume 8, Number 3, spring 2004, pp. 65.
3. Gribbins, Michele L.; King, Ruth C (2004); Electronic Retailing strategies: A case study of Small Businesses in the Gifts and collectables Industry: <http://taylorandfrancis.metapress.com/link.asp?id=fwg8fqvu1vdfrc9>
4. Frank Coyle; The wireless Web. <http://www.awprofessional.com/articles/article.asp?p=167918&seqNum=3&rl=1>
5. Judith Gebauer and Michael J. Shaw: Success Factors and Impacts of Mobile Business Applications: Results from a Mobile e-Procurement Study *International Journal of Electronic Commerce*, Volume 8, Number 3, Spring 2004, pp. 19.
6. Melody M. Tsang, Shu-Chun Ho, and Ting-Peng Liang Consumer Attitudes Toward Mobile Advertising: An Empirical Study *International Journal of Electronic Commerce*, Volume 8, Number 3, Spring 2004, pp. 65.
7. Nikolaos A. Mylonopoulos and Georgios I. Introduction to the Special Issue: Mobile Business: Technological Pluralism, Social Assimilation, and Growth *International Journal of Electronic Commerce*, Volume 8, Number 1, Fall 2003, pp. 5.
8. The next retail revolution will be on a screen near you, *The Banker* Published: 06 June, 2005 Page 122.
9. Mobile retail Money Transfer within Kenya
10. Ting-Peng Liang and Chih-Ping Wei Introduction to the Special Issue: Mobile Commerce Applications *International Journal of Electronic Commerce*, Volume 8, Number 3, Spring 2004, pp. 7.
11. Sunny Bindra (2008); Top three peculiarities among Kenyans: Sunday Nation, Sunny Day column June 15, 2008, p35
12. Diane Coyle; Mobile growth 'fastest in Africa'. <http://news.bbc.co.uk/2/hi/business/4331863.stm>
13. University of Athens: Mobile E-Commerce and Location-Based Services: Technology and Requirements. <http://www.itpapers.com/search.aspx?>
14. Nokia: Connecting Mobile Consumers and Merchants <http://www.itpapers.com/whitepaper.aspx?>
15. Interforum: M-Commerce: E-Business Without Boundaries <http://www.itpapers.com/whitepaper.aspx>
16. Kevin Gillick and Randy Vanderhoof, Mobile E-Commerce "Market place enablers and Inhibitors. A White Paper for the Smart Card Forum
17. P. Tarasewich, R.C. Nickerson, and M. Warkentin, Issues in Mobile Commerce Communications of the Association for Information Systems (Volume 8, 2002) 41-64
18. John Mylonakis, Can mobile services facilitate commerce? Findings from the Greek telecommunications market *International Journal of Mobile Communication* 2004 – Vol. 2, No.2 pp.188-198
19. Smith, A. M. & Reynolds N.L. 2002. Measuring cross –Cultural Service Quality: A Framework for Assessment. *International Marketing review*, Volume 19, No.5, pp. 450-481.

20. Samia Massoud, Omprakash K. Gupta: Consumer perception and attitude toward mobile communication *International Journal of Mobile Communications 2003 - Vol. 1, No.4 pp. 390 - 408*
21. P. K. Kannan, Ai-Mei Chang, Andrew B. Whinston, 2001: Wireless Commerce: Marketing Issues and Possibilities – IEEE 2001
22. Adela S.M. Lau, 2003: A study on direction of development of business to customer m-commerce: International Journal of Mobile Communications (IJMC), Vol. 1, No. 1/2, 2003
23. Szu-Yuan Sun, Teresa L. Ju, Chao-Fan Su, 2006, A study of consumer value-added services in mobile commerce: focusing on domestic cellular phone companies in Taiwan, China *International Journal of Mobile Communications (IJMC), Vol. 4, No. 4, 2006*
24. Ioanna D. Constantiou, Jan Damsgaard, Lars Knutsen, 2006: Exploring perceptions and use of mobile services: user differences in an advancing market. International Journal of Mobile Communications (IJMC), Vol. 4, No. 3, 2006
25. Stefan Figge et. al, 2005, Earning M-oney - A Situation Based Approach for Mobile Business Models
26. Peter Tarasewich et al, 2002, Issues in mobile e-commerce
27. Samtani Anil, Leow Tze Ting, Lim Hoon Moe, Goh Po Gin Jonathan, 2003: Overcoming barriers to the successful adoption of mobile commerce in Singapore. International Journal of Mobile Communications (IJMC), Vol. 1, No. 1/2, 2003
28. John P. Baron, John C. McIntosh, 2005: Mobile commerce's impact on today's workforce: issues, impacts and implications. International Journal of Mobile Communications 2005 - Vol. 3, No.2 pp. 99 - 113
29. Yufei Yuan, Jason J. Zhang,2003], Towards an appropriate business model for m-commerce. International Journal of Mobile Communications 2003 - Vol. 1, No.1/2 pp. 35-56
30. Kannan, P.K. Chang, A.-M. Whinston, A.B, 2001. Wireless commerce: marketing issues and possibilities. System Sciences, 2001. Proceedings of the 34th Annual Hawaii International Conference
31. Adam Vrechopoulos, Ioanna Constantiou, Ioannis Sideris, Georgios Doukidis, Nikos Mylonopoulos, 2003. The critical role of consumer behaviour research in mobile commerce. International Journal of Mobile Communications 2003 - Vol. 1, No.3 pp. 239 - 340
32. Jiang Yu, Kim Hua Tan, 2005, The evolution of China's mobile telecommunications industry: past, present and future. International Journal of Mobile Communications 2005 - Vol. 3, No.2 pp. 114 - 126
33. UPKAR VARSHNEY, RON VETTER, 2005, Mobile Commerce: Framework, Applications and Networking Support, Mobile Networks and Applications 7, 185–198, 2002
34. Tang J.and Veijalainen J, 2001, “Using Agents to Improve security and Conviniene in Mobile E-commerce”. Proceedings of the 34th Hawaii International conference on System Sciences. IEEE Computer Science Press. Los Alamitos.
35. Clarke I. III., 2001, Emerging Value Propositions for M-commerce. Journal of Business Strategies. Vol.18, No. 2, 2001, 133-148.
36. McIntosh J.C and Baron J. P, 2005, Mobile Commerce’s Impact on Today’s Workforce issues, impacts and implications. International Journal of Mobile Communications. Vol. 3, No. 2, 2005, 99-113.
37. Bill Anckar and Davide D’Incau, 2002.Value Added Services in Mobile Commerce: An Analytical Framework and Empirical Findings from a National Consumer Survey. Proceeding of the 35th. Hawaii International conference on System Sciences-2002.

38. Nohria, N. & Leetsma, 2001. A moving Target. : The mobile commerce customer. MTI Sloan Management Review, Vol.42, no. 4, pp 104
39. Barnes S. 2002, The Mobile commerce Value Chain: Analysis and future developments. International Journal of Information Management, vol.2, no.2 pp.91-108.
40. Goodhue D.L. & Thompson R. L.1995, Task technology Fit and Individual Performance. MIS Quarterly, 19, 2(1995) 213-236.
41. Zigurs I. & BucklandB. K. A Theory of task/technology fit and group support systems effectiveness. MIS Quarterly, 22, 3 (1998).313-334.
42. Khalifa & Cheng (2002), Adoption of mobile phone role of exposure. Proceedings of the 35th. Hawaii international conference on System Sciences – 2002.
43. Triandis C. H. Values, Attitudes and Interpersonal Behaviour; Nebraska symposium on Motivation 1979: Beliefs attitudes and Values, University of Nebraska Press, Lincoln, NE, pp 159-295, 1980.
44. Turban E. and King D, (2003), Introduction to E-commerce. Upper Saddle River, NJ: Prentice Hall, 2003
45. Vittet-Philippe, P. and Navarro, J.M. (2000), "Mobile EBusiness (M-Commerce): State of Play and Implications for European Enterprise Policy". *European Commission Enterprise Directorate-General E-Business Report*, No 3, December 6. www.ncits.org/tc_home/v3htm/v301008.pdf
46. Balasubramanian, S. Petersson, RA and Jarvenpaa, S. L, Exploring the implications of M-commerce for markets and marketing. *Academy of Marketing Science*, Vol. 30
47. Kenya National Bureau of Statistics – Kenya population distribution by age group and sex year 2006, <http://www.cbs.go.ke>, July 2007
48. Mairura Omwenga (2008), Urban growth and sprawl - Case study of Nairobi Kenya. World Urban Forum 4, 03-09 November 2008 Nanjing China. <http://www.isocarp.org/fileadmin/data/network/WUF4-MOmwenga.pdf> July 2009
49. Thompson, William; Joseph Hickey (2005). *Society in Focus.* Boston, MA: Pearson. ISBN 0-205-41365-X.
50. Richard O. Mason, Florence M. Mason, Mary J. Culnan (2005), Ethics of Information Management; Sage Series in Business Management, Sage publications.

APPENDIX A: M-Commerce Assessment Questionnaire – User Perceptions

A: GENERAL DEMOGRAPHIC DATA

1. **Research Assistant**..... **Date:**

Region/Area of Respondent							
Nairobi City		City Environs					
CBD		Ruiru		Kiambu		Rongai	Athi River
Industrial Area		Firm/Institution/Company/Individual..... Location/Building..... Address: Cell phone: Email: Website:					
Residential Estate							
.....							
Slum Estate							
.....							

2. Indicate your gender, education level and occupation.

Gender		Education Level				Occupation		
Male	Female	Primary School	High School	College	University	Student	Business Person	Professional (Employee)

3. Indicate your age bracket.

16 -25	26-35	36-45	46-55	Over 56

B:..... GENERAL NETWORK INFORMATION

4. Do you own a mobile phone? Yes () No ()

5. If your answer is yes to question 4, what is the make of your cell phone?

Nokia	Motorola	Siemens	Ericsson	Alcatel	Samsung	Sony	Others (.....)

6. Who is your Mobile Service Provider (MSP)? **Safaricom** () **CelTel** () **Telkon** (), **others** () Please specify

7. Are services provided by your MSP meeting **all** your needs? Yes (), No (), Don't know ()

8. List any additional **service** you would like included in your mobile by your MSP.
.....

9. Who hosts your e-mail address?

International company e.g. Yahoo	Corporate / Institutional network	Both International company and corporate n/w	Local Internet Service Provider (ISP)	No e-mail address

10. If your answer to question 11 is Local ISP, name the ISP.
(.....)

11. What terminal(s) do you use to access the web?

	(PC)	Laptop	Cell	PDA	Smart	Vehicle	Others
--	------	--------	------	-----	-------	---------	--------

	Personal computer	computer	phone	(personal Digital Assistant)	phone	mounted phone	(specify)
Chosen							
Not chosen							

12. How well do the following statements apply to mobile service providers including, Safaricom, Celtel, Telkom Wireless, and Flashcom? Rate in the scale of 1-5 (1- Applies Totally, 5-Does not apply)

Statements	Safaricom	Celtel	Telkom
Cares about its customers	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Helps people and businesses realize their potential	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Gives customers control over privacy of their information	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Makes charitable and social contributions in Kenya	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Prices its products fairly in Kenya	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Respects the intellectual property rights of individuals	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Has access to too much of consumers personal information	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5
Does not provide security for its network	1. 2. 3. 4. 5	1. 2. 3. 4. 5	1. 2. 3. 4. 5

13. Which of the following technology related public service issues do you think is most important in Kenya? Rate in the scale of 1-5 (1-Very important, 5- Not important)

Improving computer security (Protection from viruses & other malicious attacks)	1. 2. 3. 4. 5
Improving data privacy (Protection from inappropriate or malicious use of personal information)	1. 2. 3. 4. 5
Using technology to improve economic and social welfare and businesses	1. 2. 3. 4. 5

14. What is the frequency of failure of your mobile service provider's network?

Daily	Once per week	Once per two weeks	Once per month	Hardly fails

C: M-COMMERCE APPLICATIONS AND VALUE ADDED SERVICES

15. What nature of content do you frequently search for in the Internet?

Educational	Entertainment	Business	Others (.....)
-------------	---------------	----------	----------------

16. Is the content you frequently search for local or foreign?

Local () foreign ()

17. How often do you use your mobile phone to access a) mobile services b) mobile commerce value added services listed below? Rate in the scale 1-5 (1-very frequently, 5 – Never)

M-phone services	1 - Very frequently	Frequently	Occasionally	Rarely	5- Never
Data messaging services					
SMS					
EDGE					
GPRS					
Voice services					
Voice					
Voice mail					
VOIP					
Security services					
Car track 911					
M-Commerce VAS Services					
Transactional services					
Reservation					
Buy ticket					
Send money					
Information services					
News (Getit411)					
Check a/c balance					
Check bill					
Entertainment					
Ring tones					
Games					
Music					

18. Has mobile commerce in your opinion extended or added value to the current e-commerce applications? Yes () No ()
19. If your answer is yes to question 18, how do you rate contribution of m-commerce to the following class of mobile applications? Rate in the scale 1-5 in order of importance (1- most important, 5-Least important)

Application	Most Important
Mobile Finance	
Mobile Advertising	
Mobile Marketing	
Mobile Inventory	
Mobile Entertainment	
Mobile Office	
Mobile Distance Learning	

20. To what extent do you agree that a mobile phone embraces the following value added service factors over other communication devices? Rate in the scale 1-5 (1-Strongly agree, 5- strongly disagree)

Service factors	1- Strongly Agree	Agree	Undecided	Disagree	5- Strongly disagree

Ubiquity: Available at any location at anytime					
Personalization: Allows for preparation of personalized information					
Localization: Tailored to provide location specific information and products					
Convenience: Ability to create time and place utility					
Instant connectivity: Easily connected to the target					
Operability: Easy to use and operate					
Affordability: Cheap and affordable					
Security: Protection from intrusion					
Privacy: Right to determine what should be communicated to others.					

D: INDIVIDUAL'S ATTITUDE TOWARDS USE OF MOBILE PHONES

21. Does your state of mood influence the rate at which you use your mobile phone?
Yes () No ()

22. a) If your answer is yes to question 21, to what extent do the following mood factors contribute to use of your mobile phone? Rate in the scale of 1-5 (1-very frequently, 5-never)

Mood factor	1- Very frequently	Frequently	Occasionally	Rarely	5- Never
Stress					
Loneliness					
Excitement					
Happiness					
Anger					
Impatience					

b) To what extent does incentive related advertising within mobile phone related industry influence use of your mobile phone? Very much (), to some extent (), Not at all ()

23. Are you influenced by geographical factors to use the mobile phone? Yes () No ()

24. If your answer is yes to question 23, to what extent do you agree that the following geographical factors influence you to use a mobile phone? Rate in the scale of 1-5 (1-strongly agree, 5-strongly disagree)

Geographical factors	1.Strongly Agree	Agree	Undecided	Disagree	Strongly disagree
Physical separation					
Climatic Change-wet & dry seasons					
Poor communication infrastructure					

25. Are you influenced by your community culture to use the mobile phone?
Yes () No ()

26. If your answer is yes to questions 26, to what extent do you agree that the following cultural factors influence you to use a mobile phone? Rate in the scale of 1-5 (1-strongly agree, 5-strongly disagree)

Cultural factors	1. Strongly agree	Agree	Undecided	Disagree	5.Strongly disagree
Social status					
Cultural beliefs					
Close family ties					
Rural/town migration					
Peer pressure					

27. Have you ever used the mobile phone to combat crime? Yes () No ()
28. If you answer is yes to question 27, what is your most memorable act in combating crime using the mobile phone? Rate the statements in order of importance 1-5 (1-most memorable, 5-least memorable)

	1	2	3	4	5
Report criminal activities to the police					
Alert my neighbor & friends of looming danger					
Get information of persons in distress and move to their help					

29. List acts that you consider irresponsible in the use of your mobile phone.
- a)
- b)

30. At what time of the day do you use your mobile phone most?

Morning	Afternoon	Evening	Night

E: M-COMMERCE FRAMEWORK

31. To what extent do you agree that security consideration is an important issue to users in the following m-commerce areas? Rate in the scale of 1-5 (1- strongly agree, 5-strongly disagree)

M-commerce field	1.Strongly agree	Agree	Undecided	Disagree	5.Strongly disagree
Mobile commerce applications					
Wireless user infrastructure					
Mobile middleware					
Wireless network infrastructure					

32. To what extent do you agree that content developers and application developer's work is subjected to fair use/privacy by MSPs and ISPs? Rate in the scale of 1-5 (1-strongly agree, 5-strongly disagree)

Developer field	1.Strongly agree	Agree	Undecided	Disagree	5.Strongly disagree

Content Developer					
Application Developer					

33. To what extent do you agree that MSPs and ISPs honor customer's privacy? Rate in the scale of 1-5 (1-strongly agree, 5-strongly disagree)

1.Strongly agree	Agree	Undecided	Disagree	5.Strongly disagree

F: WIRELESS USER INFRASTRUCTURE

34. What types of mobile device (s) do you own?

Mobile phone	
PDA (Personal digital Assistant)	
Smart phone	
Hand held computer	
Laptop computer	
Vehicle mounted phone	
Others (specify)	

35. How frequently do you use the mobile device you own? Rate in the scale of 1-5 (1-very frequently, 5- Never)

	1. Very frequently	Frequently	Occasionally	Rarely	5. Never
Device					

36. Tick against features your mobile phone has and indicate whether you make use of them.

Feature	Feature available			Make use of feature	
	Yes	No	Don't know	Yes	No
Blue tooth					
GPRS (General packet radio service)					
MMS (multimedia services)					
Digital camera					
High resolution color display					
Internal memory					

37. Indicate security features your mobile device has.

Security feature	Yes	No
Keypad lock		
SIM lock		
Passwords		
Call barring		
Biometric (Thumb print, retinal scan)		

Voice recognition		
-------------------	--	--

38. Are security features provided for in your mobile device adequate? Yes (), No ()
39. If your answer is no to question 39, what additional security features would you like included in order of importance?
- i)
- ii)
- iii)

40. How do you rate the level of security provided for the following types of data by your MSP/ISP? Rate in the scale of 1-5 (1-very good, 5 very poor)

Type of data	1. Very good	Good	Fair	Poor	5. Very Poor
SMS					
Email					
Voice					
Address Book					
Others (specify)					
.....					

41. To what extent do you agree that the following features limit your usage of the mobile device?

Rate in the scale of 1-5 (1-strongly agree, 5- strongly disagree)

Feature	1.Strongly agree	Agree	Undecided	Disagree	5. Strongly disagree
Storage memory					
Processing power					
Screen size					
Communication functionalities					

42. What do you consider as the most limiting feature in using your mobile phone?
.....

G: IMPACT AND IMPLICATION OF MOBILE TECHNOLOGY ON E-COMMERCE

43. How often do you top up your mobile phone?

Daily	Weekly	Fortnightly	Monthly

44. What scratch card denomination do you frequently use to top up your mobile phone?

Ksh.50/60	Ksh 100	Ksh. 250/300	Ksh 500	Ksh1000	>Ksh1000

45. If your occupation in question 2 is businessperson, what nature of business do you operate?

Hawking	Technical (Jua kali)	Service provision	Retail shopping	Wholesale shopping	Industrial

46. Are you a prepaid or a postpaid subscriber? Prepaid () postpaid ()
47. On average, how much do you spend on topping up your mobile phone per month?

Subscriber category	KSH.
Prepaid	
Post paid	

48. Would you have saved if you used other methods of communication to mobile phone? Yes (), No ().
49. On average how many mobile phone transactions do you make or receive per day?

None	1-3	4- 7	7-10	>10

50. Do you consider current mobile phone tariffs and charges fair? Yes () No ()
51. How much more are you able to accomplish through the mobile phone compared to using other devices? Much (), little (), same ()
52. Does your mobile phone add value with respect to the following factors? Rate in order of importance 1-4 (1- highest value added, 4- Least value added)

Factors	Highest value added
Productivity	
Performance	
Operational efficiency	
Telecommuting efficiency	

53. How do you rate revenue sharing between Mobile service providers and content developers/application developers? Good (), Fair (), Unfair ()

APPENDIX B: Tables of Result Findings

Table 1: Test instrument categories

Category	Test statements (questions)
General demographic data	3
General Network information	11
M-commerce applications and value added services	6
Individual attitudes towards use of mobile phones	9
M-commerce framework/security & privacy	3
Wireless user infrastructure	9
Impact and implication of m-commerce on e-commerce.	11

Table 2: Sample distribution by area

	Frequency	Percent
CBD Residential Area	124	43.1
City environs	93	32.3
Total	71	24.6
	288	100.0

Table 3: Sample distribution by education and gender of the respondents

Education Level	GENDER		Total
	Male	Female	
Primary	9(5.1%)	0	9(3.1%)
Secondary	75(43.6%)	53(46.2%)	128(44.6%)
College	58(33.3%)	35(30.8%)	93(32.3%)
University	22(12.8%)	13(11.5%)	35(12.3%)
Not Stated	9(5.1%)	13(11.5%)	22(7.7%)
Total	173(60.0%)	115(40.0%)	288(100.0%)

Table 4: Sample distribution by occupation of the respondents

	Respondents	Percent
Student	36	12.3
Business Person	155	53.9
Professional (Employee)	97	33.8
Total	288	100.0

Table 5: Sample distribution by age of the respondents

Age (Years)	Respondents	Percent (%)
16-25	49	16.9
26-35	124	43.1
36-45	84	29.2
46-55	22	7.7
>55	9	3.1
Total	288	100.0

Table 6: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone Make and Mobile Service Provider against Age of the Respondents

		Age of the Respondents					Total
		16-25	26-35	36-45	46-55	over 56	
Do you own a mobile phone?	Yes	16.9%	20.0%	43.1%	6.2%	1.5%	87.7%
	No	1.5%	9.2%	.0%	1.5%	.0%	12.3%
	Nokia	9.2%	13.8%	20.0%	6.2%	1.5%	50.8%
	Motorola	6.2%	3.1%	15.4%	.0%	.0%	24.6%
	Siemens	.0%	.0%	3.1%	.0%	.0%	3.1%
	Erickson	1.5%	.0%	.0%	.0%	.0%	1.5%
	Arcatel	.0%	1.5%	.0%	.0%	.0%	1.5%
	Samsung	1.5%	7.7%	4.6%	1.5%	.0%	15.4%
	Sony	.0%	1.5%	.0%	.0%	.0%	1.5%
	Others	.0%	1.5%	.0%	.0%	.0%	1.5%
	Mobile service Provider	Safaricom	15.4%	24.6%	30.8%	7.7%	1.5%
Celtel		3.1%	3.1%	9.2%	.0%	.0%	15.4%
Telkom		.0%	1.5%	3.1%	.0%	.0%	4.6%
Totals		18.5%	29.2%	43.1%	7.7%	1.5%	100.0

Table 7: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone Make and Mobile Service Provider against Occupation of the Respondents

		Occupation			Totals
		Students	Business person	Employees	
Do you own a mobile phone?	Yes	35.6%	27.1%	23.7%	86.4
	No	1.7%	5.1%	6.8%	13.6
What make is your mobile?	Nokia	13.6%	16.9%	18.6%	49.2
	Motorola	15.3%	5.1%	5.1%	25.4

Mobile service Provider	Siemens	.0%	3.4%	.0%	3.4
	Erickson	1.7%	.0%	.0%	1.7
	Arcatel	.0%	.0%	1.7%	1.7
	Samsung	6.8%	5.1%	3.4%	15.3
	Sony	.0%	.0%	1.7%	1.7
	Others	.0%	1.7%	.0%	1.7
	Safaricom	32.2%	23.7%	22.0%	78.0
	Celtel	5.1%	6.8%	5.1%	16.9
	Telkom	.0%	1.7%	3.4%	5.1
	Totals	37.3%	32.2%	30.5%	100.0

Table 8: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone Make and Mobile Service Provider against Educational level of the Respondents

		Educational Level				Total	
		Primary	Secondary	College	University		
Do you own a mobile phone?	Yes	3.1%	13.8%	30.8%	40.0%	87.7	
	No	.0%	3.1%	3.1%	6.2%	12.3	
What make is your mobile?	Nokia	3.1%	12.3%	9.2%	26.2%	50.8	
	Motorola	.0%	3.1%	10.8%	10.8%	24.6	
	Siemens	.0%	.0%	1.5%	1.5%	3.1	
	Erickson	.0%	.0%	1.5%	.0%	1.5	
	Arcatel	.0%	.0%	1.5%	.0%	1.5	
	Samsung	.0%	1.5%	7.7%	6.2%	15.4	
	Sony	.0%	.0%	.0%	1.5%	1.5	
	Others	.0%	.0%	1.5%	.0%	1.5	
	Mobile service Provider	Safaricom	3.1%	12.3%	27.7%	36.9%	80.0
		Celtel	.0%	4.6%	4.6%	6.2%	15.4
Telkom		.0%	.0%	1.5%	3.1%	4.6	
Totals		3.1%	16.9%	33.8%	46.2%	100.0	

Table 9: Summary of Cross tabulation of Mobile Phone Ownership, Mobile Phone Make and Mobile Service Provider against Gender of the Respondents

		Gender		Total
		Male	Female	
Do you own a	Yes	60.0%	27.7%	87.7

mobile phone?	No	7.7%	4.6%	12.3
What make is your mobile?	Nokia	27.7%	23.1%	50.8
	Motorola	20.0%	4.6%	24.6
	Siemens	3.1%	.0%	3.1
	Erickson	.0%	1.5%	1.5
	Arcatel	1.5%	.0%	1.5
	Samsung	12.3%	3.1%	15.4
	Sony	1.5%	.0%	1.5
	Others	1.5%	.0%	1.5
	Mobile service Provider	Safaricom	49.2%	30.8%
Celtel		13.8%	1.5%	15.4
Telkom		4.6%	.0%	4.6
Totals		67.7%	32.3%	100.0

Table 10: Summary of cross tabulation between Cultural factors versus Age of the Respondents and Gender

Cultural Factor	Gender	Age of the Respondents (Years)					Response (Totals)	Pearson's Chi (χ^2)		Cramer's V
		16-25	26-35	36-45	46-55	Over 55		χ^2	Assym. Significance	
General culture	Male	10.0%	17.5%	25.0%	2.5%	0.0%	55.0%	7.761	.623	.621
	Female	5.0%	15.0%	30.0%	.0%	0.0%	50.0%	3.200	.362	.504
Social Status	Male	21.4%	33.3%	33.3%	4.8%	2.4%	95.2%	9.670	.725	.343
	Female	6.7%	13.3%	46.7%	6.7%	0.0%	73.4%	7.229	.650	.601
Cultural beliefs	Male	10.0%	23.4%	30.0%	0.0%	0.0%	63.4%	37.57	.200	.560
	Female	6.7%	13.3%	46.7%	6.7%	0.0%	73.4%	11.62	.635	.508
Close Family Ties	Male	23.3%	30.2%	34.9%	7.0%	2.3%	97.7%	6.955	.541	.280
	Female	10.5%	26.3%	57.9%	5.3%	0.0%	100%	5.873	.118	.556
Peer Pressure	Male	18.6%	25.6%	30.2%	2.3%	2.4%	79.0%	8.640	.733	.259
	Female	10.0%	15.0%	45.0%	5.0%	0.0%	75.0%	6.028	.420	.388

Table 11: Summary of cross tabulation between Mood Indicators' versus Age of the Respondents and Gender

Mood	Gender	Age of the Respondents (Years)					Response (Totals)	Pearson's Chi (χ^2)		Cramer's V
		16-25	26-35	36-45	46-55	Over 55		χ^2	Asym. Significance	

General Mood	Male	18.4%	28.9%	34.2%	2.6%	2.6%	86.8%	3.030	.553	.282
	Female	10.0%	20.0%	45.0%	10.0%	0.0%	85.0%	2.353	.502	.343
Mood (Stress)	Male	5.41%	10.81%	16.22%	0.00%	0.00%	32.43%	11.262	.793	.276
	Female	0.00%	16.67%	33.33%	5.56%	0.00%	55.56%	19.308	.081	.598
Mood (Loneliness)	Male	18.92%	27.03%	27.03%	0.00%	0.00%	72.97%	12.012	.445	.329
	Female	24.80%	38.79%	32.91%	0.00%	0.00%	96.50%	5.159	.820	.318
Mood (Excitement)	Male	21.62%	29.73%	35.14%	2.70%	2.70%	91.89%	3.773	.877	.226
	Female	11.76%	23.53%	47.06%	11.76%	0.00%	94.12%	4.317	.634	.356
Mood (Happiness)	Male	23.68%	23.68%	34.21%	2.63%	0.00%	84.21%	22.391	.330	.443
	Female	11.11%	27.78%	44.44%	5.56%	0.00%	88.89%	4.856	.562	.367
Mood (Anger)	Male	2.78%	2.78%	0.00%	0.00%	2.78%	8.33%	29.367	.220	.452
	Female	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.280	.296	.450

Table 12: Summary of cross tabulation between geographical Indicators against Age of the Respondents and Gender

Geographical factors	Gender	Age of the Respondents (Years)					Response (Totals)	Pearson's Chi (χ^2)		Cramer's V
		16-25	26-35	36-45	46-55	Over 55		χ^2	Asym. Significance	
General Geographical factor	Male	22.5%	30.0%	37.5%	2.5%	0.0%	92.5%	19.49	.10	.398
	Female	11.1%	16.7%	50.0%	5.6%	0.0%	83.3%	2.52	.472	.374
Rural Urban migration	Male	23.2%	32.6%	32.5%	4.6%	0%	93.0%	36.09	.12	5.29
	Female	4.8%	23.8%	57.2%	9.5%	0.0%	95.2%	13.563	.075	.568
Physical separation	Male	25.0%	25.0%	40.0%	2.5%	0.0%	92.5%	49.32	.11	.641
	Female	11.8%	23.5%	53.0%	5.9%	0.0%	94.2%	9.11	.168	.518
Climatic change (wet & dry)	Male	12.8%	23.1%	33.3%	2.6%	0.00%	71.8%	12.255	.425	.324
	Female	11.8%	17.7%	41.1%	0.0%	0.0%	70.6%	4.851	.847	.308
Poor communication Infrastructure	Male	22.5%	20.0%	34.50%	2.5%	2.5%	82.5%	9.560	.889	.244
	Female	5.9%	23.5%	42.1%	0.0%	0.0%	70.6%	11.58	.238	.477

Table 13: Influence of geographical factors against occupation of the respondents

Geographical factors	Occupation				Totals	Pearson's Chi (χ^2)		Cramer's V
	Student	Business persons	Employees	χ^2		Asym. Significance		
Are you influenced by geographical factors to use mobile phone?	37.0%	24.1%	27.8%	88.9%	5.162	.070	.309	
Rural urban migration	34.4	31.1	27.6	93.1	6.171	.404	.231	
If yes (Physical Separation)	39.6%	26.4%	26.5%	92.5%	8.82	.184	.288	
If yes (Climate change-wet and dry seasons)	32.7%	23.1%	21.1%	76.9%	4.57	.600	.210	
Poor communication infrastructure	26.4%	26.4%	24.6%	77.4%	6.77	.562	.253	

Table 14: Mobile commerce services against urban (Nairobi) and urban environs

Mobile Commerce Services	Frequency	Urban %	Urban Environs %	Total	Pearson's Chi	Asymptotic Significance	Cramer's V
Transaction Reservation	Frequently	10.6	10.6	21.2	22.957	.912	.366
	Rarely	35.2	8.7	43.9			
Transaction Buy Ticket	Frequently	4.0	12.0	6.0	13.322	.772	.298
	Rarely	34.0	50.0	84.0			
Transaction Send Money	Frequently	9.5	2.1	30.6	21.532	.607	.322
	Rarely	23.0	19.2	42.2			
Info Services News	Frequently	5.4	21.8	27.2	30.695	.163	.374
	Rarely	30.8	20.0	50.8			
Info Services Check Bill	Frequently	9.9	25.4	35.3	33.575	.093	.408
	Rarely	25.6	31.3	56.9			
Entertainment Ring tones	Frequently	23.6	38.1	61.7	26.393	.334	.346
	Rarely	10.8	7.3	19.1			
Entertainment Games	Frequently	26.0	36.0	62.0	35.149	.066	.419
	Rarely	2.0	16.0	18.0			
Entertainment Music	Frequently	18.0	46.0	64.0	39.544	.024	.445
	Rarely	14.0	12.0	26.0			

Table 15: Cross tabulation of m-commerce infrastructure indicators against gender.

Variable	Male	Female	Totals	Pearson's Chi	Asymptotic Significance	Cramer's V
Security importance (m-commerce application)	66.1%	33.9%	100%	-	-	-
Security importance (wireless user infrastructure)	67.7%	32.3%	100%	.027	.870	.220
Security importance (Mobile middle ware)	67.7%	32.3%	100%	1.396	.237	.147
Security importance (Wireless Network Infrastructure)	43.1%	24.6%	67.7%	2.93	.231	.212

Table 16: summary of cross tabulation of security indicators against occupation of respondents

Variable	Student %	Business persons %	Employees %	Total %	Pearson's Chi	Asymptotic Significance	Cramer's V
Security importance (m-	38.6	31.6	29.8	100.0	-	-	-

commerce application)							
Security importance (wireless user infrastructure)	37.3	32.2	30.5	100.0	2.118	.34	.189
Security importance (Mobile middle ware)	37.3	32.2	30.5	100.0	.445	.80	.087
Security importance (Wireless Network Infrastructure)	23.7	20.3	27.1	71.1	6.188	.18	.229

Table 17: Summary of cross tabulation of security indicators against education level of the respondents

Variable	Student %	Business persons %	Emplo yees %	Total %	Pearson' s Chi	Asymptoti c Significan ce	Cramer' s V
Security importance (m-commerce application)	38.6	31.6	29.8	100.0	-	-	-
Security importance (wireless user infrastructure)	37.3	32.2	30.5	100.0	2.118	.34	.189
Security importance (Mobile middle ware)	37.3	32.2	30.5	100.0	.445	.80	.087
Security importance (Wireless Network Infrastructure)	23.7	20.3	27.1	71.1	6.188	.18	.229

Table 18: Cross tab of security of MSP against respondent's educational levels

Variable	Educational level					Asym ptotic Signifi cance	Crame r's V
	Primary	Secondary	College	Univer sity	Total		
(Safaricom) Does not provide security to their network	1.7%	1.7%	5.1%	5.1%	13.6%	.600	.240
(Safaricom) Respects intellectual property rights	0.0%	6.4%	7.9%	11.1%	25.4%	.902	.182
(Safaricom) Control over privacy	0.0%	9.4%	11.0%	17.2%	37.5%	.244	.279
Improving computer security	3.2%	15.9%	38.5%	41.2%	88.9%	.974	.154
Improving data privacy	3.2%	16.1%	22.5%	35.5%	77.5%	.811	.168

Table 19: Cross tabulation of security of mobile services against respondent's educational levels

Variable	Educational level	Asym	Crame
----------	-------------------	------	-------

	Primary	Secondary	College	University	Total	ptotic Significance	r's V
Security levels rating of data on (SMS)	3.4%	18.6%	32.2%	45.8%	100%	.294	.251
Security levels rating of data on (Email)	3.1%	16.9%	33.8%	46.2%	100%	.571	.176
Security levels rating of data on (Voice)	3.1%	16.9%	33.8%	46.2%	100%	.824	.118
Security levels rating of data on (Address book)	3.4%	18.6%	32.2%	45.8%	100%	.294	.251

Table 20: Cross tabulation of security of mobile services against Gender

Variable	Gender		Total	Asymptotic Significance	Cramer's V
	Male	Female			
Security levels rating of data on (SMS)	64.4%	35.6%	100%	.307	.133
Security levels rating of data on (Email)	67.7%	32.3%	100%	.368	.112
Security levels rating of data on (Voice)	67.7%	32.3%	100%	.384	.108
Security levels rating of data on (Address book)	64.4%	35.6%	100%	.307	.133

Table 21: A cross tabulation of fair use/ privacy of MSPs and ISPs against age of the respondents

	Asymptotic Significance	Cramer's V	Age of the Respondents				Total
			16-25	26-35	36-45	46-55	
Fair use of Content from developers	.312	.271	14.3%	22.3%	31.7%	6.4%	74.6%
Fair use of Applications from developers	.390	.255	11.50%	21.50%	31.50%	3.10%	67.60%
What extent does MSP and ISP Honor customers privacy?	.100	.720	15.3%	32.2%	44.1%	6.8%	98.3%

Table 22: A cross tabulation of fair use/ privacy of MSPs and ISPs against education level of the respondents

	Asymptotic Significance	Cramer's V	Educational Level				Total
			Primary	Secondary	College	University	
Fair use of Content from developers	.878	.188	3.2%	11.1%	25.4%	34.9%	74.6%
Fair use of Applications from developers	.400	.220	4.00%	13.10%	21.50%	35.10%	73.70 %
What extent does MSP and ISP Honors customer privacy?	.453	.321	3.4%	16.9%	30.5%	47.5%	98.3%
Respects intellectual property rights	.902	.182	0.0%	6.4%	7.9%	11.1%	25.4%

Table 23: A cross tabulation of mobile phone throughput compared to other devices against occupation of the respondents

		Occupation of the respondents			Total
		Student	Business persons	Employees	
How much are you able to accomplish with mobile phone compared to other devices	Much	27.3%	25.5%	29.1%	81.8%
	Little	10.9%	3.6%	1.8%	16.4%
	Same	.0%	1.8%	.0%	1.8%

Table 24: A cross tabulation of mobile phone throughput compared to other devices against age of the respondents.

		Age of the Respondents				Total
		16-25	26-35	36-45	46-55	
How much are you able to accomplish with mobile phone compared to other devices	Much	15.0%	25.0%	38.3%	5.0%	83.3%
	Little	3.3%	5.0%	5.0%	1.7%	15.0%
	Same	.0%	.0%	1.7%	.0%	1.7%

Table 25: A cross tabulation of mobile phone value added impact indicators on e-commerce against educational level of the respondent

Indicators		Educational Level				Total	Pearson's chi Square A.S	Cramer's V
		Primary	Secondary	College	University			
Does your mobile phone	Highest	.0%	10.2%	13.6%	23.7%	47.5%	.123	.281

add value to Productivity	Moderately	1.7%	.0%	10.2%	13.6%	25.4%		
Does your mobile phone add value to Performance	Highest	1.7%	10.0%	21.7%	18.3%	51.7		
	Moderately	1.7%	3.3%	8.3%	16.7%	30.0%	.719	.186
Does your mobile phone add value to Operational efficiency	Highest	1.7%	8.5%	11.9%	28.8%	50.8%		
	Moderately	1.7%	6.8%	13.6%	10.2%	32.2%	.666	.195
Does your mobile phone add value to Telecommuting efficiency	Highest	1.6%	11.5%	14.8%	21.3%	49.2%		
	Moderately	.0%	6.6%	6.6%	13.1%	26.2%	.395	.228
Rate revenue sharing between MSP and content developers	Good	1.6%	3.2%	3.2%	7.9%	15.9%	.352	.230

Table 26: A cross tabulation of mobile phone value added impact indicators on e-commerce against occupation of the respondents

		Occupation of the respondent				Pearson's chi Square asymptotic significance	Cramer's V
		Student	Business persons	Employees	Total		
Does your mobile phone add value to Productivity	Highest	16.7%	18.5%	16.7%	51.9%	.742	.180
	Moderately	9.3%	7.4%	7.4%	24.1%		
Does your mobile phone add value to Performance	Highest	18.2%	18.2%	14.5%	50.9%	.424	.233
	Moderately	16.4%	5.5%	9.1%	30.9%		
Does your mobile phone add value to Operational efficiency	Highest	22.2%	16.7%	13.0%	51.9%	.204	.281
	Moderately	9.3%	3.7%	16.7%	29.6%		
Does your mobile phone add value to Telecommuting efficiency	Highest	21.4%	10.7%	19.6%	51.8%	.627	.198
	Moderately	8.9%	8.9%	7.1%	25.0%		
Rate revenue sharing between MSP and content developers	Good	5.2%	0%	10.3%	15.5%	.061	.278

Table 27: A cross tabulation of mobile phone top-up and occupation of the respondents.

		Occupation of the Respondents				Asymptotic Significance	Cramer's V
		Student	Business persons	Employees	Total		
How often do you	Daily	8.6%	19.0%	12.1%	39.7%	.043	.335

top up your phone?	Weekly	22.4%	12.1%	17.2%	51.7%		
	Fortnightly	6.9%	.0%	.0%	6.9%		
	Monthly	.0%	1.7%	.0%	1.7%		
	Totals	37.9%	32.8%	29.3%	100.0%		

Table28: A cross tabulation of mobile phone top-up and educational level of the respondents

		Educational Level					Asymp totic Signifi cance	Cramer's V
		Primary	Secondary	College	Universit y	Total		
How often do you top up your phone?	Daily	1.6%	12.7%	12.7%	12.7%	39.7%	.070	.290
	Weekly	.0%	4.8%	19.0%	28.6%	52.4%		
	Fortnightly	1.6%	.0%	1.6%	3.2%	6.3%		
	Monthly	.0%	.0%	1.6%	.0%	1.6%		
	Total	3.2%	17.5%	34.9%	44.4%	100.0%		

Table29: A cross tabulation of mobile phone scratch card denomination used and occupation of the respondent

		Occupation of the respondent				Asympto tic Significa nce	Cramer's V
		Student	Business persons	Employees	Total		
Which denomination of scratch card do you frequently use?	Ksh.50/60	24.1%	10.3%	10.3%	44.8%	.094	.305
	Ksh.100	10.3%	19.0%	10.3%	39.7%		
	Ksh.250/300	3.4%	3.4%	5.2%	12.1%		
	Ksh.500	.0%	.0%	3.4%	3.4%		
	Total	37.9%	32.8%	29.3%	100.0%		

Table 30: A cross tabulation of mobile phone scratch card denomination used and educational level of the respondent

		Educational Level					Asymp totic Signifi cance	Cramer's V
		Primary	Secondary	College	Universit y	Total		
Ksh.50/60		1.6%	4.8%	11.1%	25.4%	42.9	.267	.243

Which denomination of scratch card do you frequently use?	Ksh.100	.0%	9.5%	20.6%	12.7%	42.9	
	Ksh.250/300	1.6%	3.2%	1.6%	4.8%	11.1	
	Ksh.500	.0%	.0%	1.6%	1.6%	3.2	
	Total	3.2%	17.5%	34.9%	44.4%	100.0	

Table31: A cross tabulation of mobile phone tariff and occupation of the respondent

		Occupation of the respondent				Asymptotic Significance	Cramer's V
		Student	Business persons	Employees	Total		
What is your tariff? (Prepaid or Postpaid)	Prepaid	33.9%	30.4%	28.6%	92.9%	.866	.072
	Post paid	1.6%	8.6%	3.8%	15.0%		
	Total	37.5%	32.1%	30.4%	100.0%		

Table 32: A cross tabulation of mobile phone tariff and educational level of the respondent

		Educational Level					Asymptotic Significance	Cramer's V
		Primary	Secondary	College	University	Total		
What is your tariff? (Prepaid or Postpaid)	Prepaid	.0%	16.4%	27.9%	44.3%	88.5%	.022	.535
	Post paid	3.3%	1.6%	4.9%	1.6%	11.5%		
	Total	3.3%	18.0%	32.8%	45.9%	100.0%		

Table33: M-commerce VAS services against education level

Variable	Education level					Asymptotic Significance	Cramer's V
	Primary (%)	Secondary (%)	College (%)	University (%)	Total (%)		
Transactional services (Reservation)	0.0	0.0	1.8	0.0	1.8	.401	.235
Transactional services (Buy Ticket)	0.0	0.0	2.0	0.0	2.0	.738	.188
Transactional services (Send Money)	0.0	9.6	11.5	9.6	30.8	.099	.359
Information Services (News Getit411)	0.0	9.1	5.4	12.8	27.2	.271	.296
Information Services (Check a/c balance)	0.0	9.8	19.6	33.3	62.7	.669	.239

Information Services (Check bill)	0.0	9.8	15.7	9.8	35.3	.028	.411
Entertainment (Ring Tones)	3.6	14.5	23.6	20.0	61.8	.560	.254
Entertainment (Games)	0.0	12.0	24.0	26.0	62.0	.807	.213
Entertainment (Music)	0.0	14.0	20.0	30.0	64.0	.896	.188

Table34: M-commerce VAS services against age of the respondents

			Age of the Respondents					Total
			16-25	26-35	36-45	46-55	over 56	
Transactional services (Reservation)	.819	.210	0.0	1.8	0.0	0.0	0.0	1.8
Transactional services (Buy Ticket)	.960	.181	0.0	0.0	2.0	0.0	0.0	2.0
Transactional services (Send Money)	.427	.281	3.8	13.5	9.6	3.8	0.0	30.8
Information Services (News Getit411)	.890	.208	3.6	12.8	11.0	0.0	0.0	27.2
Information Services (Check a/c balance)	.615	.260	9.8	19.6	29.4	3.9	0.0	62.7
Information Services (Check bill)	.387	.288	5.9	17.7	9.8	2.0	0.0	35.3
Entertainment(Ring Tones)	.035	.354	18.1	12.8	30.9	0.0	0.0	61.8
Entertainment(Games)	.122	.337	16.0	12.0	28.0	6.0	0.0	62.0
Entertainment(Music)	.105	.342	14.0	14.0	28.0	6.0	2.0	64.0

Table 35: M-commerce VAS services against Occupation of the respondents

Variable	Occupation				Asymptotic Significance	Cramer's V
	Student (%)	Business Person (%)	Employee (%)	Total (%)		
Transactional services (Reservation)	0.0	0.0	1.9	1.9	.084	.327
Transactional services (Buy Ticket)	0.0	0.0	2.1	2.1	.072	.347
Transactional services (Send Money)	6.0	14.0	12.0	32.0	.218	.327
Information Services (News Getit411)	8.6	6.0	14.0	28.0	.247	.320
Information Services (Check a/c balance)	18.4	26.5	20.4	65.3	.299	.312
Information Services (Check bill)	6.1	10.2	20.4	36.7	.073	.383
Entertainment(Ring Tones)	26.0	16.0	16.0	58.0	.402	.289
Entertainment(Games)	23.0	16.7	20.9	60.6	.209	.337
Entertainment(Music)	27.1	16.7	20.9	64.6	.413	.292

Table 36: Population Distribution by Age Group and Sex Year 2007

Age (Years)	Male (millions)	Female (millions)
0-4	3,145,322	3,136,841
5-9	2,547,415	2,565,218
10-14	2,083,428	2,105,228
15-19	2,008,961	2,041,107
20-24	1,873,930	1,924,195
25-29	1,448,223	1,591,500
30-34	1,121,272	1,261,258
35-39	834,887	912,996
40-44	653,748	714,195
45-49	493,580	548,056
50-54	396,287	431,281
55-59	318,620	348,319
60-64	253,425	289,816
65-69	194,947	228,697
70-74	136,925	165,583
75+	174,193	198,293
Total	17,695,163	18,453,583

Source: (Facts and figures 2007. Published by the Kenya National Bureau of Statistics)

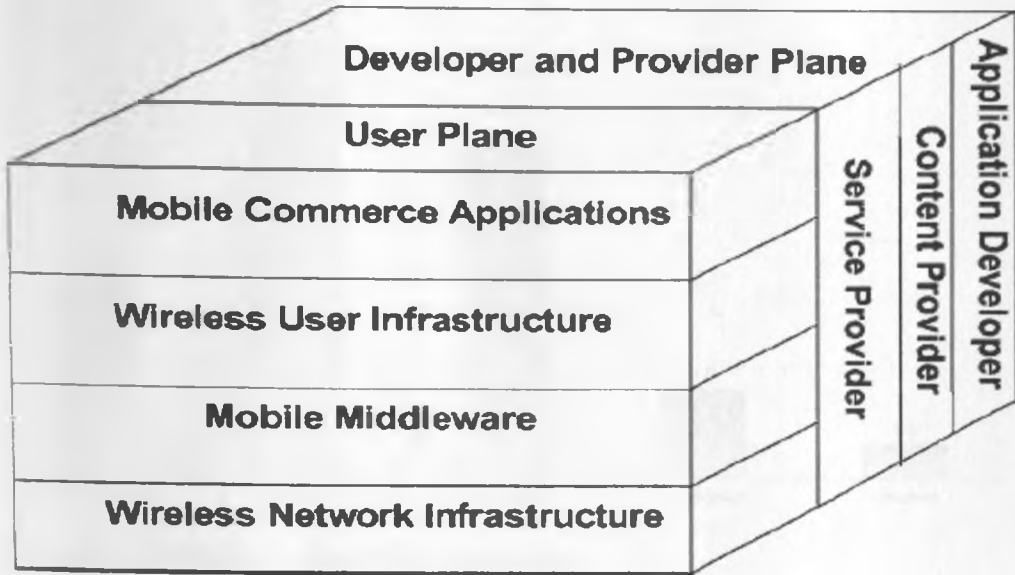


Fig.1: M-commerce framework by Upkar Varchney and Ron Vetter

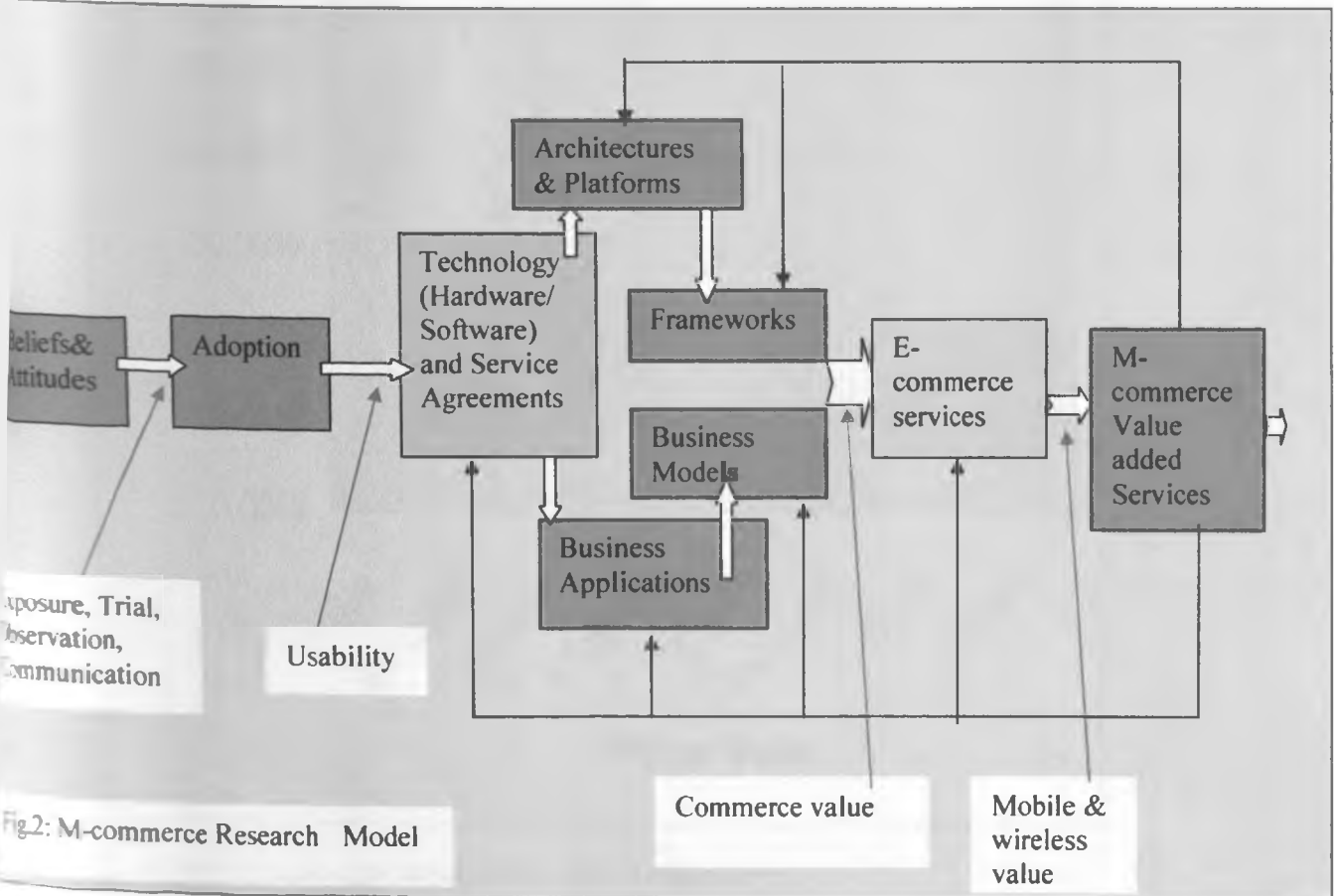


Fig.2: M-commerce Research Model

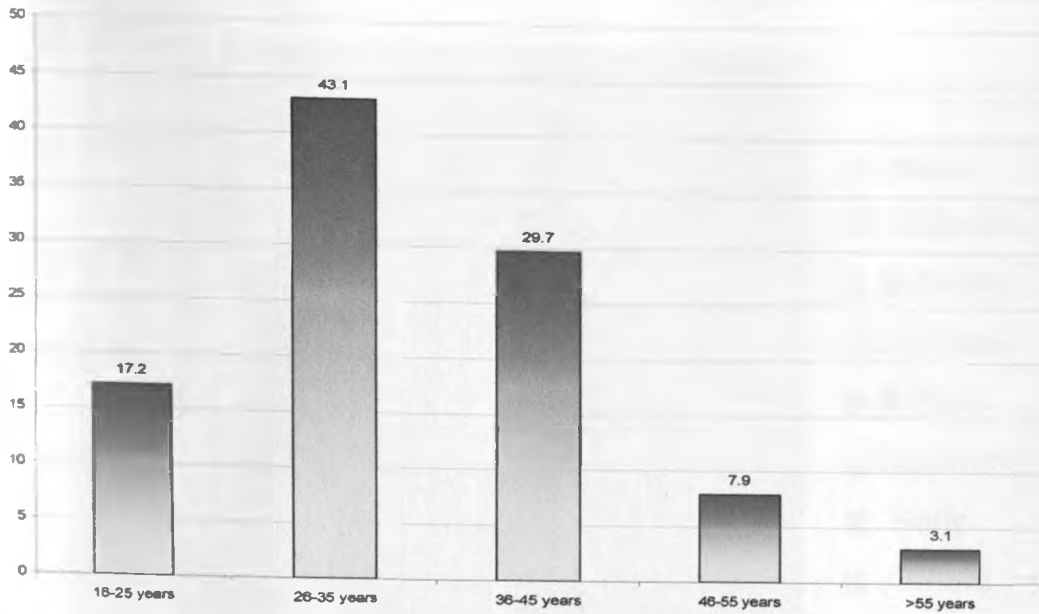


Fig 3: Sample distribution by age of the respondents

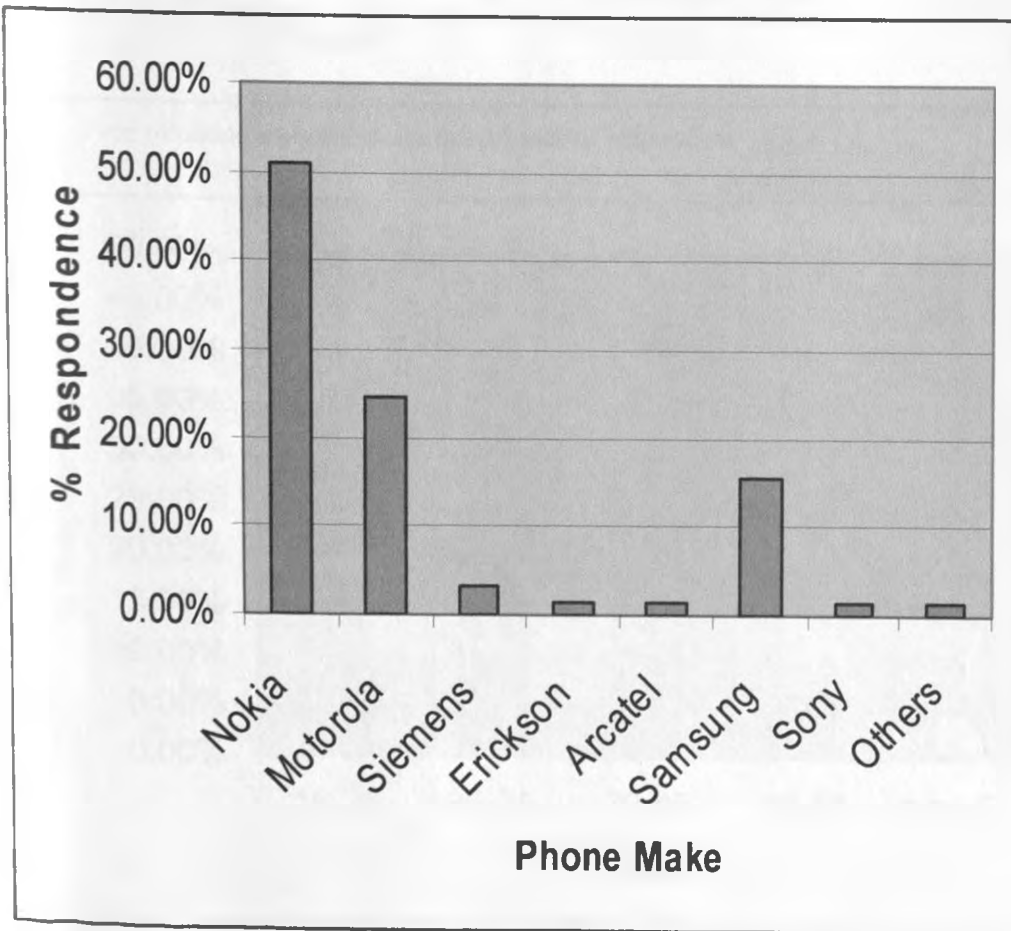


Fig 4: Type of mobile phone popularity against respondents

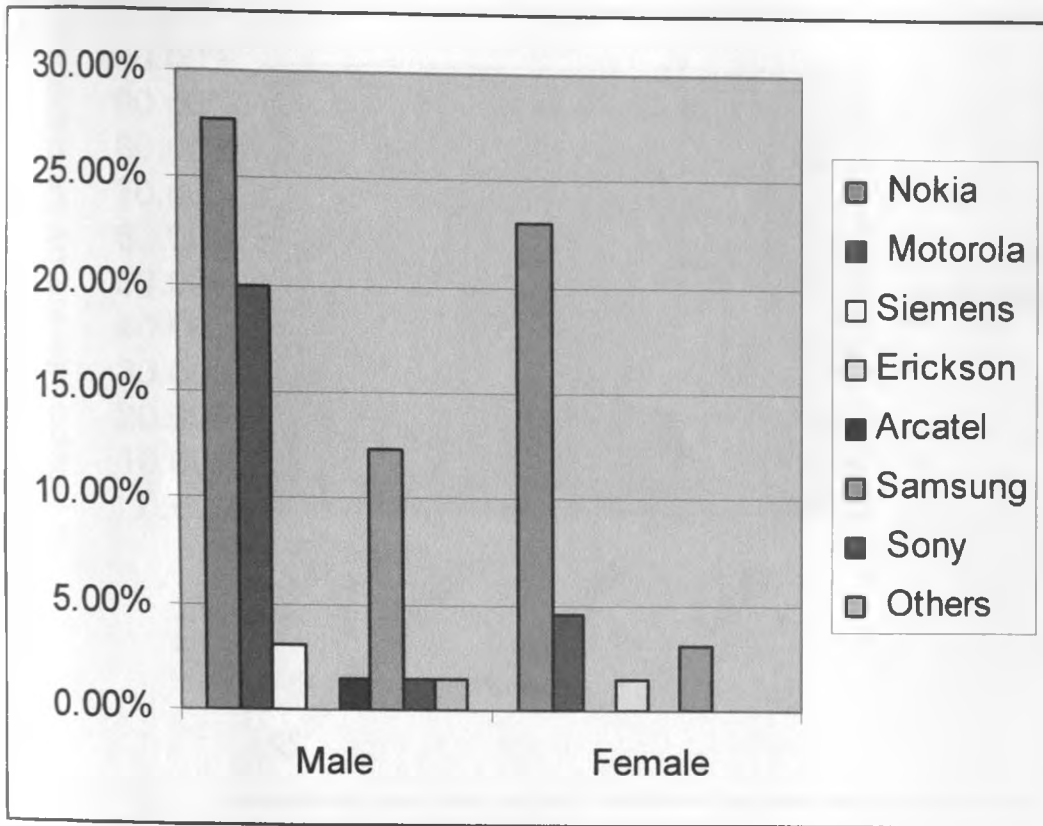


Fig 5: Type of phone ownership against gender of respondent

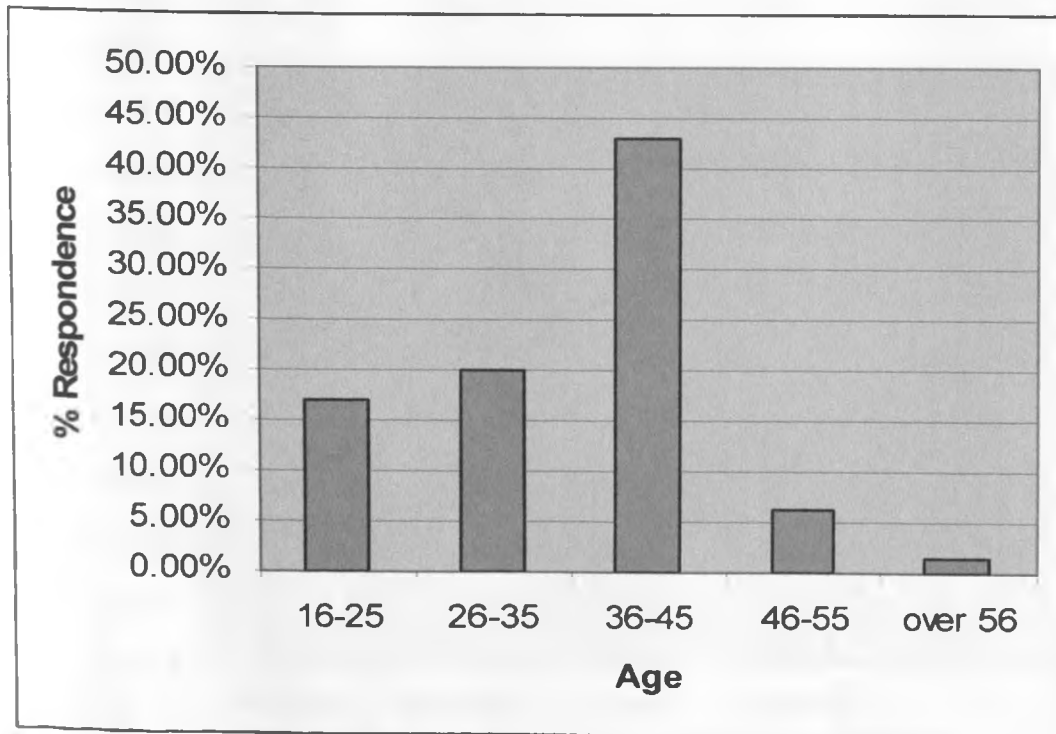


Fig 6: Mobile Phone ownership against age of respondents

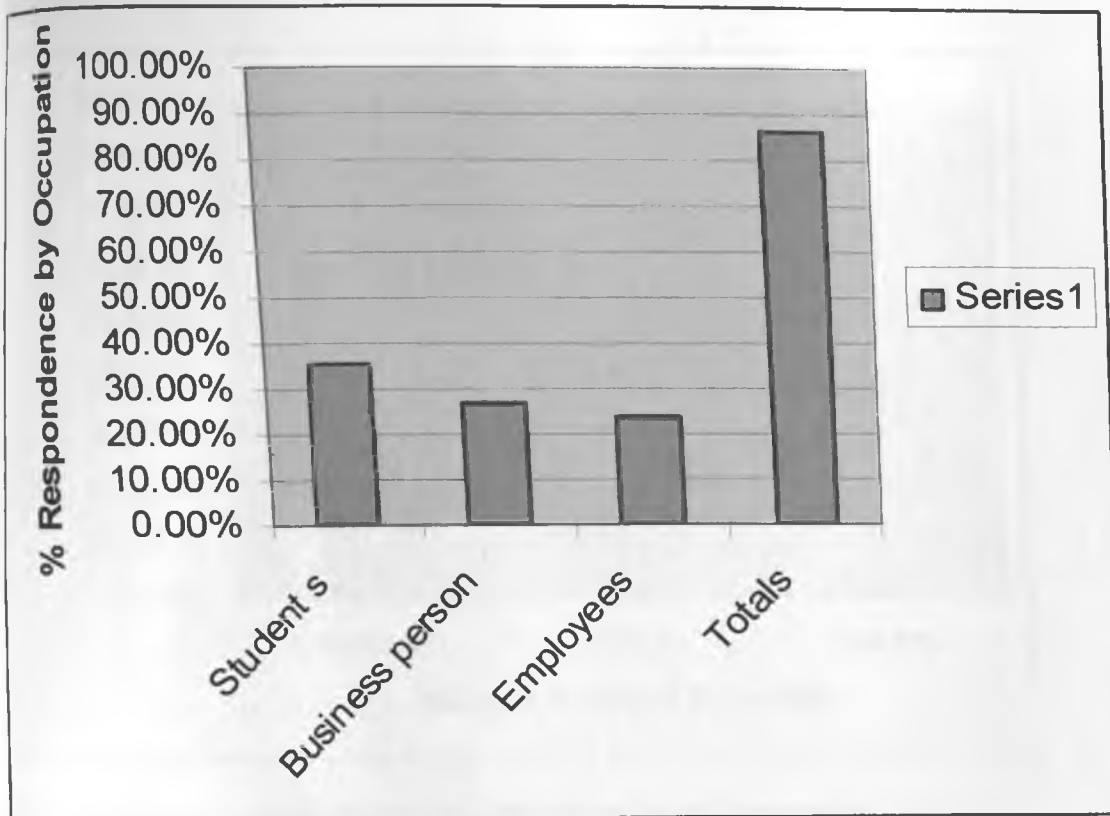


Fig 7: Phone ownership against occupation of the respondents

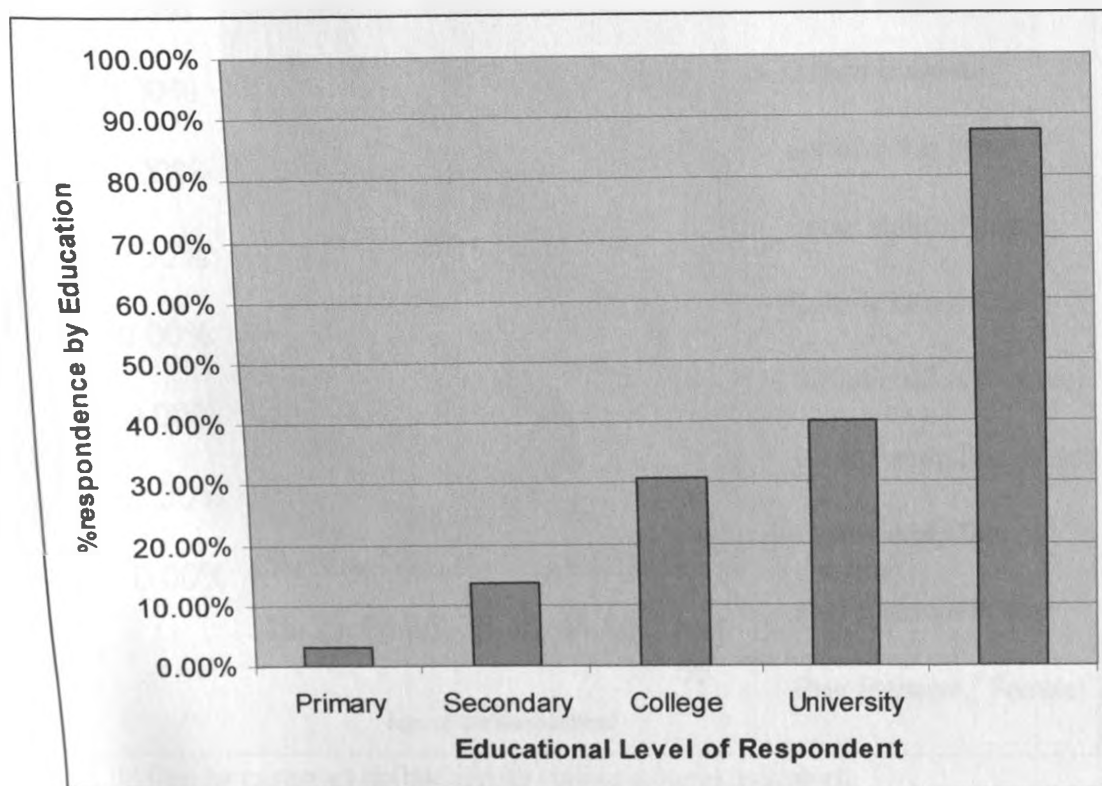


Fig 8: Phone ownership against education level of the respondents

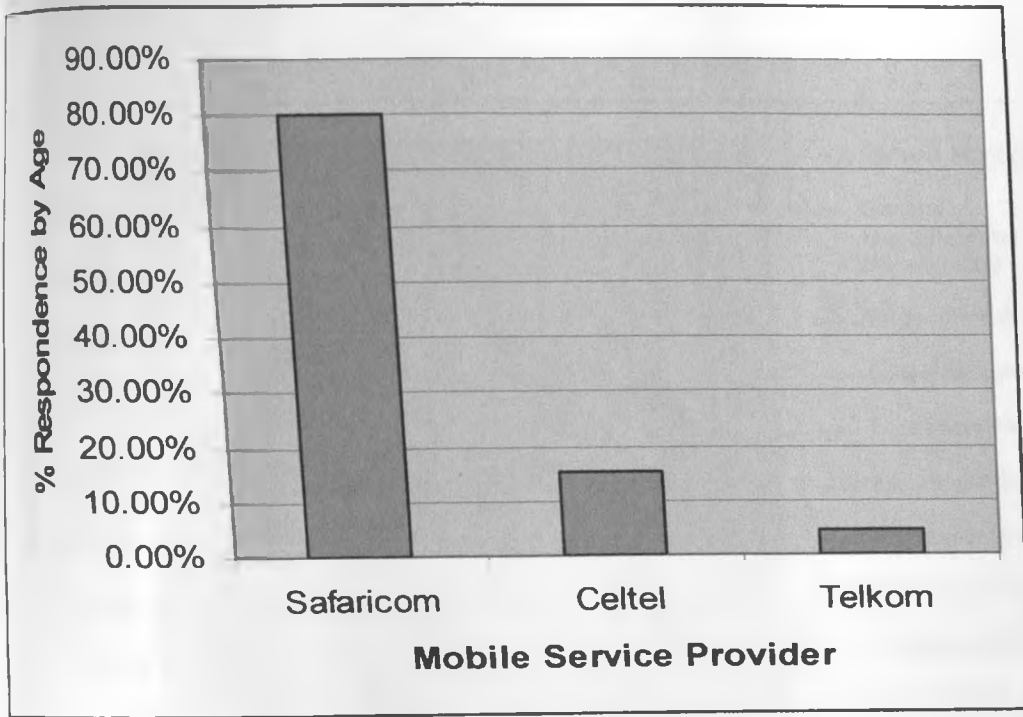


Fig 9: Popularity of Mobile service provider against age of respondents

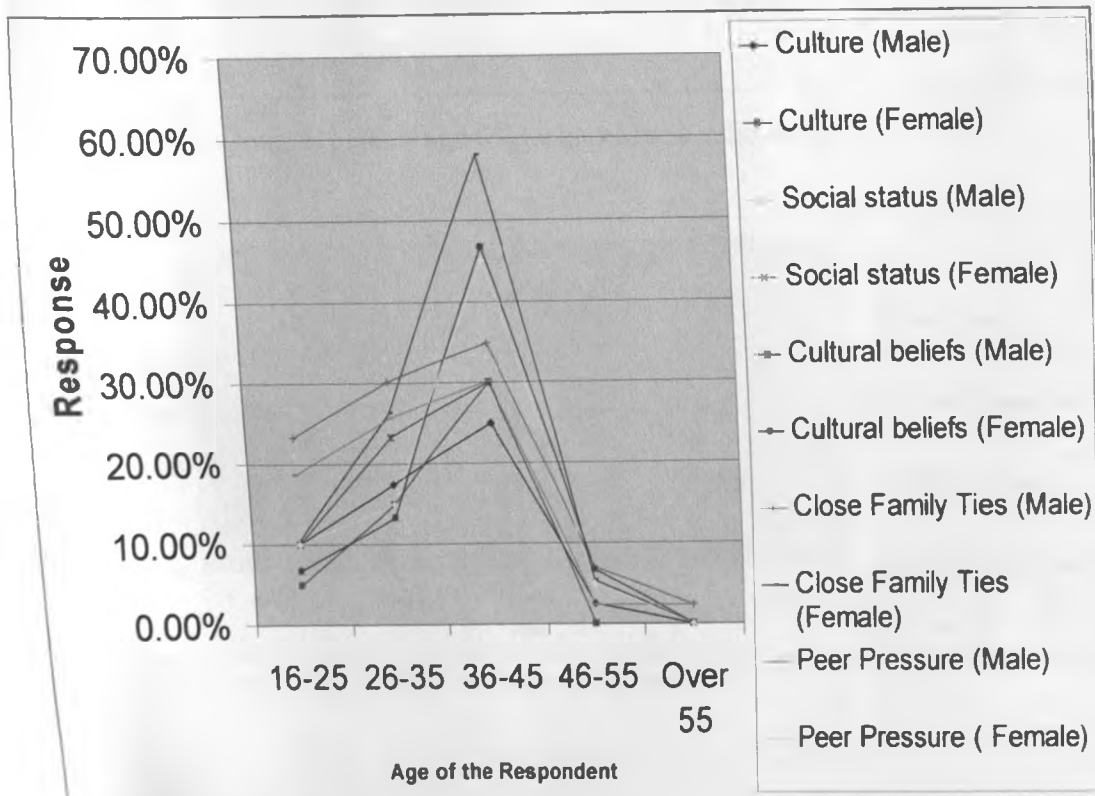


Fig 10: Gender responses against age for various cultural indicators.

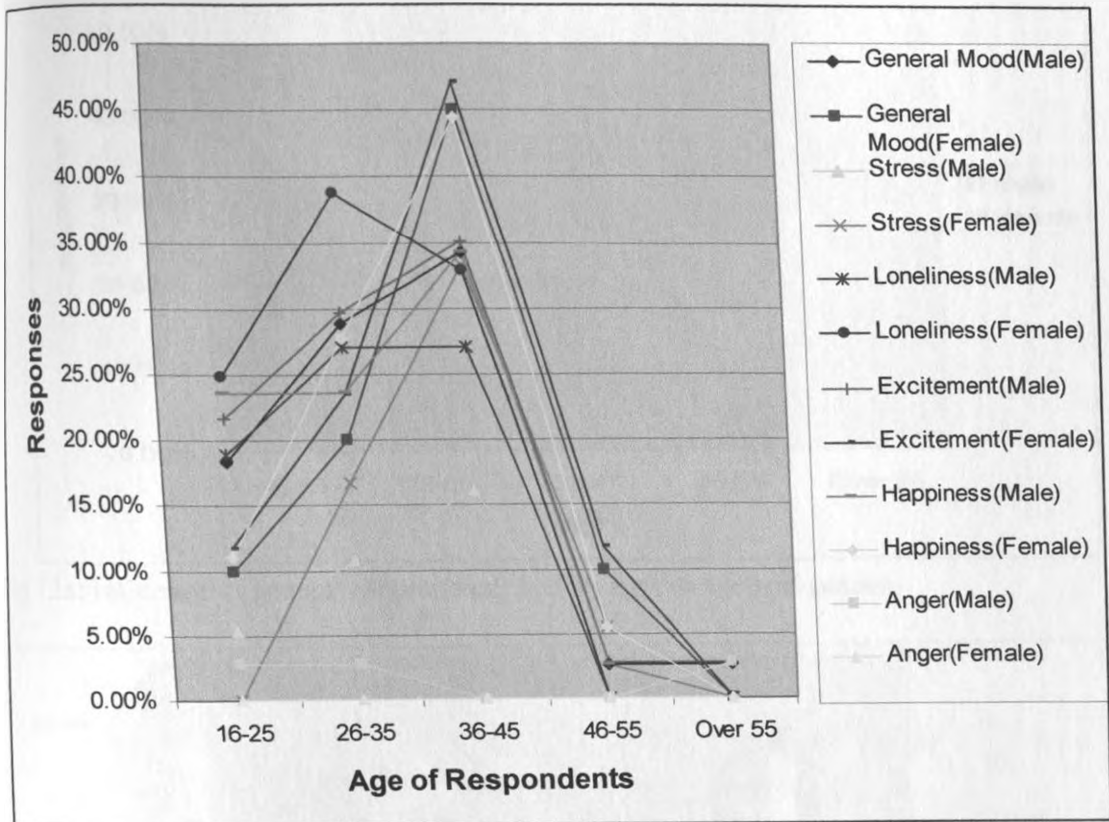


Fig. 11: Gender responses against age for various Mood indicators

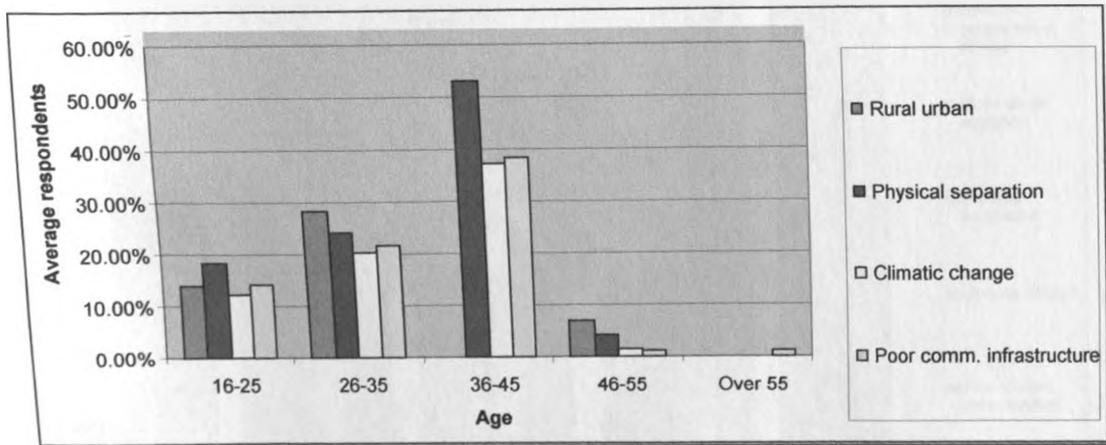


Fig 12b: Influence of geographical factors against age

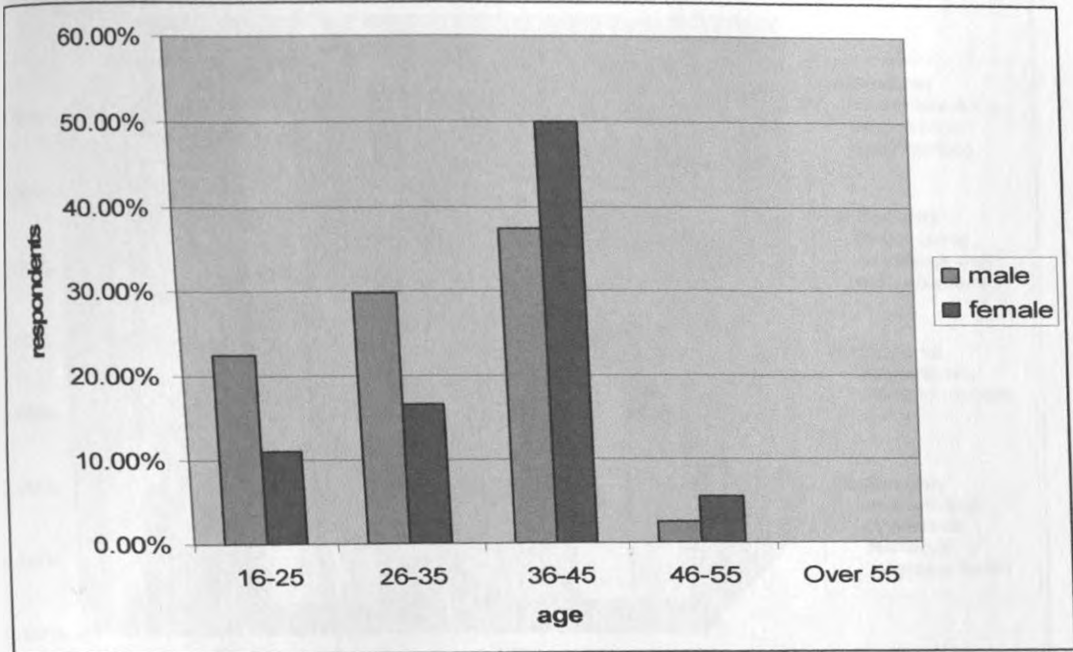


Fig 12a: Influence of general geographical factors against age and gender

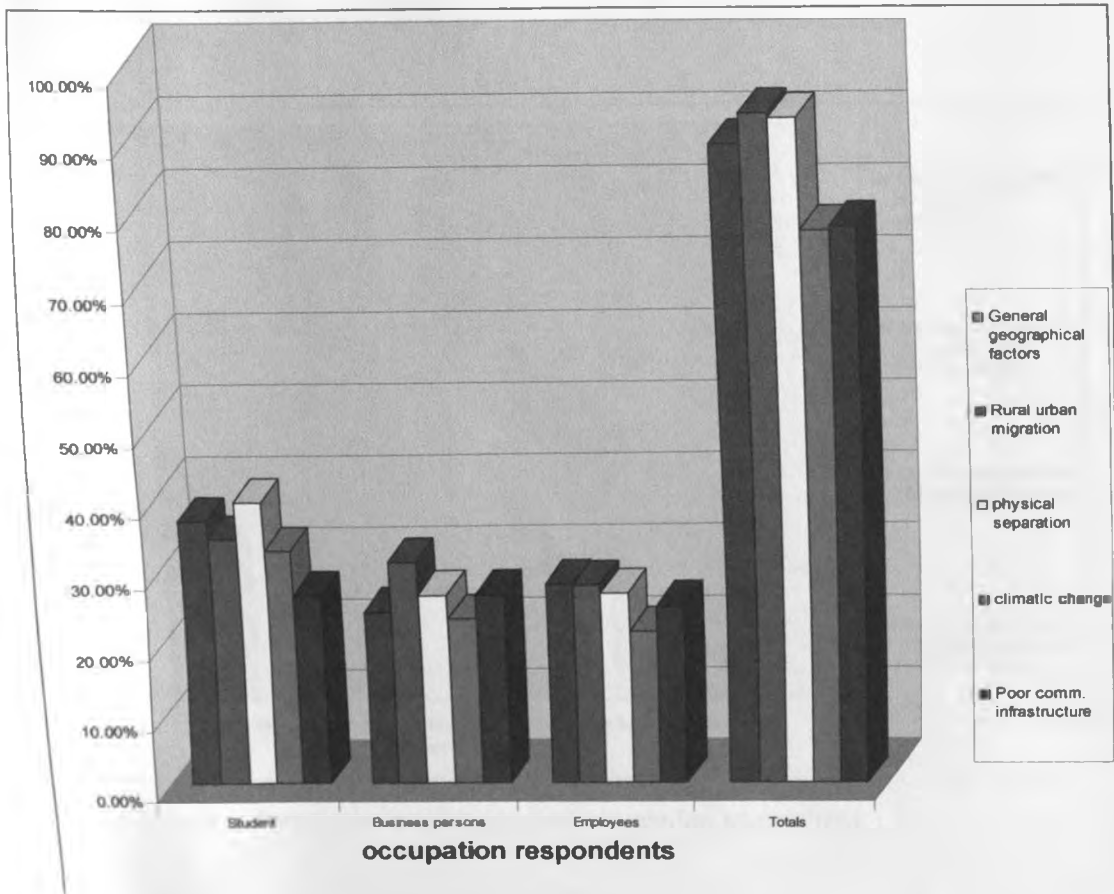


Fig 13 Geographical factors against occupation of respondents

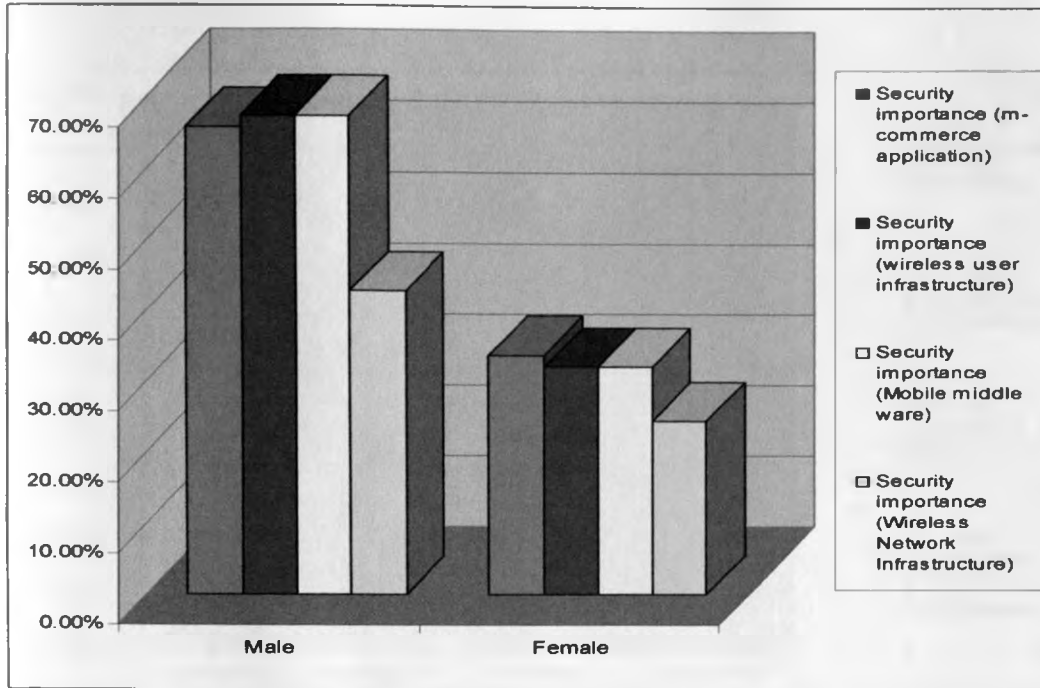


Fig 15: Mobile Infrastructure security against gender respondents

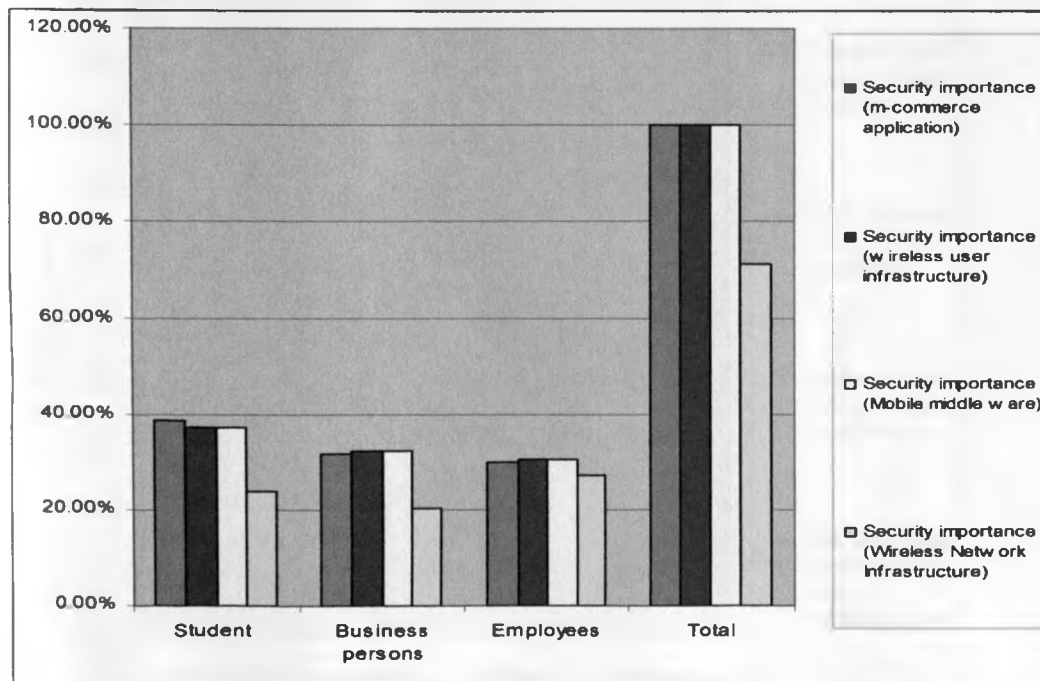


Fig 16: Mobile infrastructure security against occupation respondents

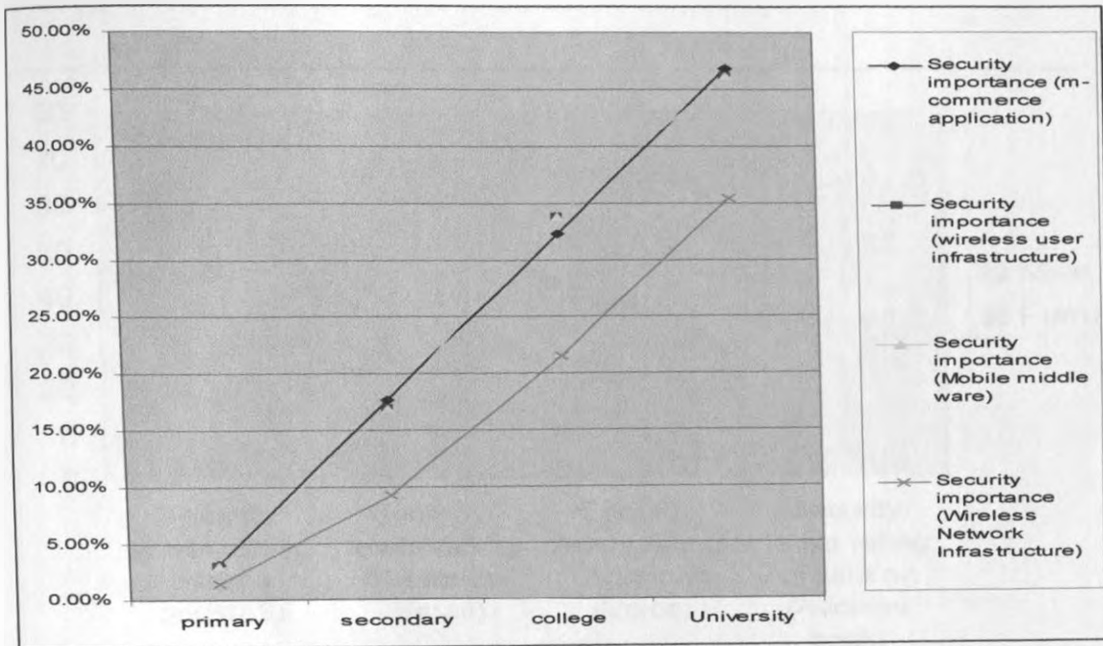


Fig 17: Mobile infrastructure security against education of respondents

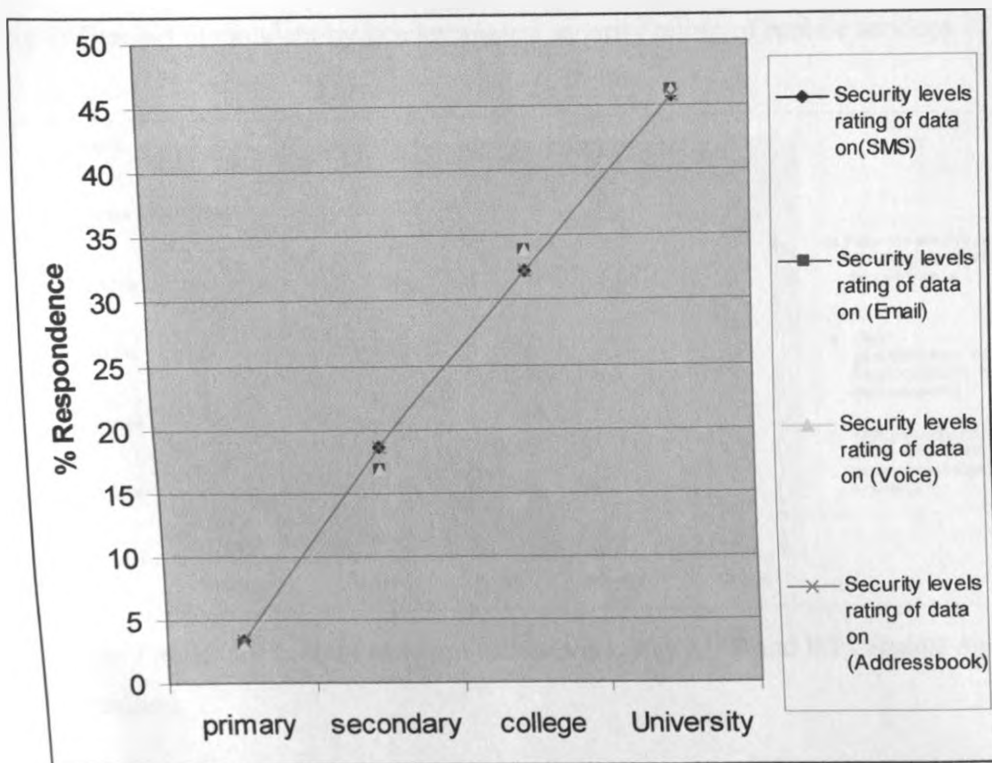


Fig 18: Mobile Services security level rating against education of respondents

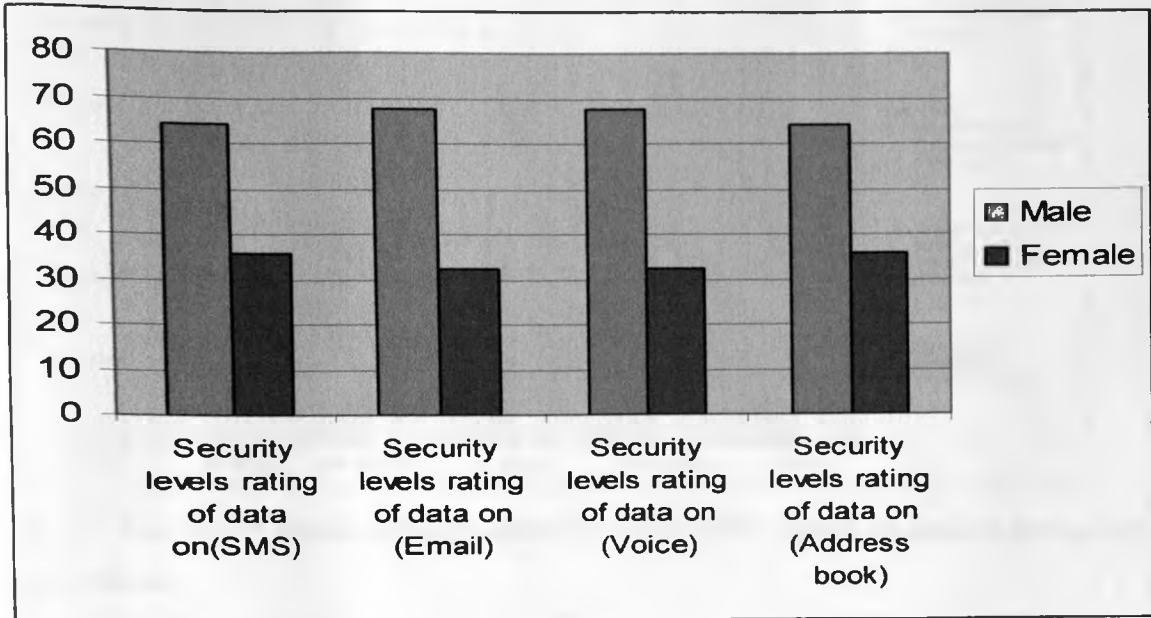


Fig 19 Percent respondent by gender against security rating of mobile services

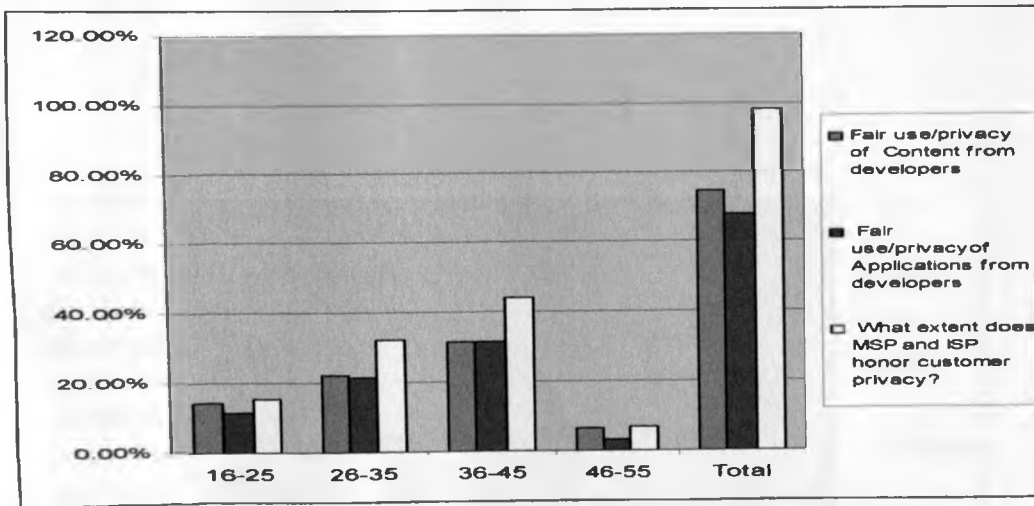


Fig. 20: Fair use of content and application/privacy by MSP and ISPs against age of the respondents

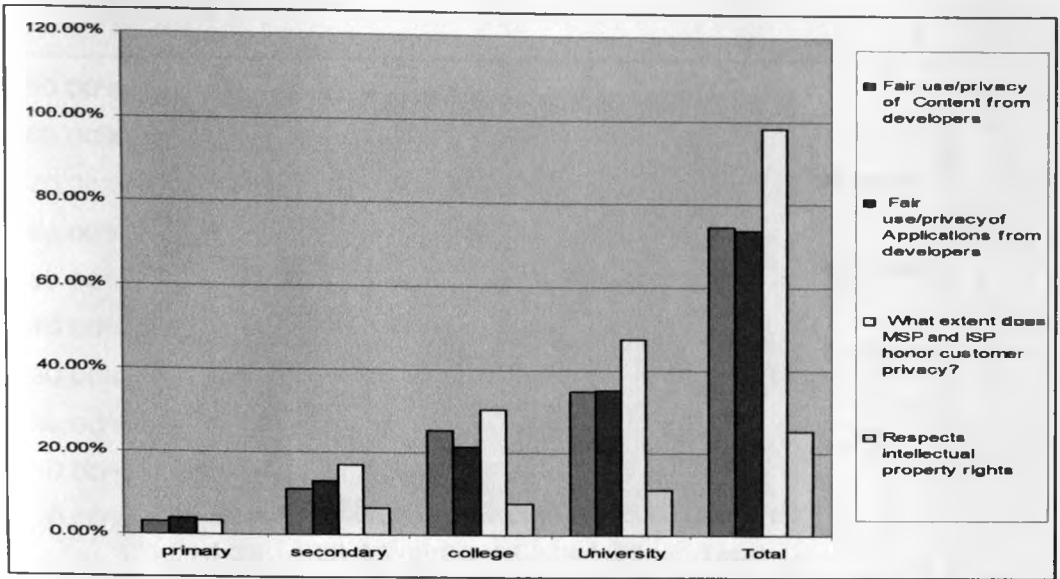


Fig. 21: Fair use of content and application by MSP and ISPs against educational level of the respondents

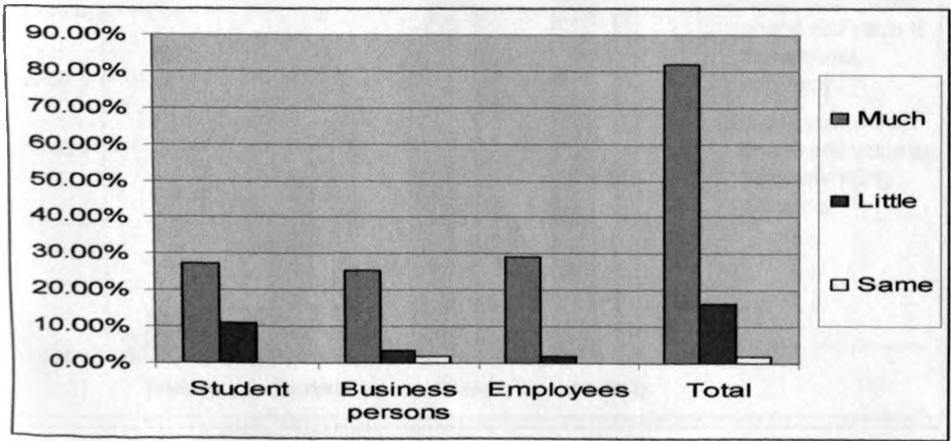


Fig 22: Mobile phone throughput compared to other devices against occupation of respondents.

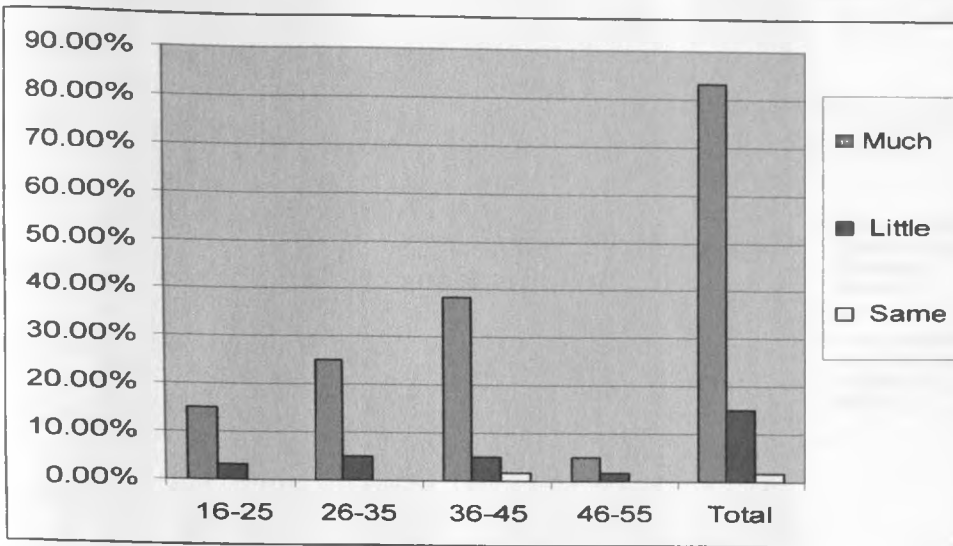


Fig 23: Mobile phone throughput compared to other devices against age of respondent

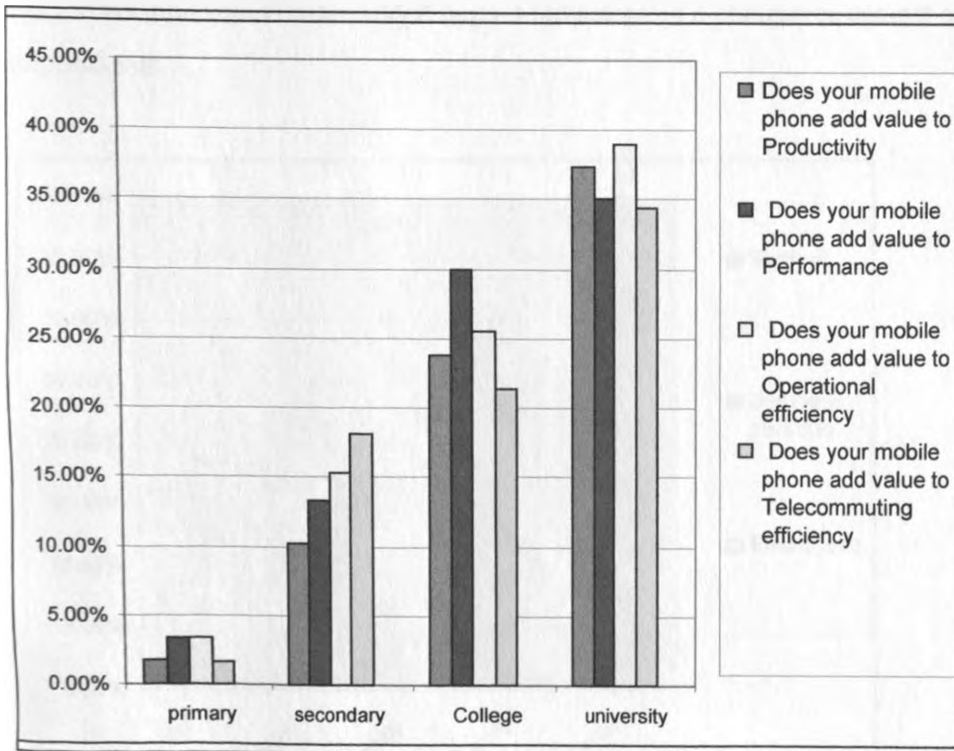


Fig 24: Mobile phone value added impact indicators on e-commerce against education level of the respondents

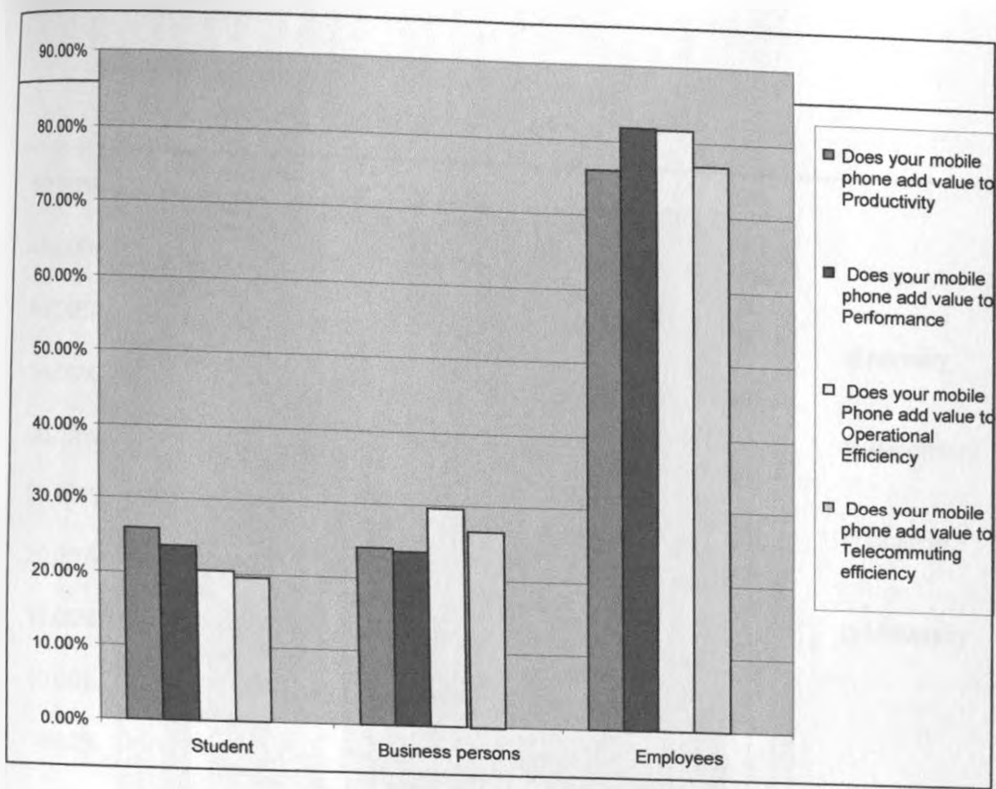


Fig 25: Mobile phone value added impact indicators on e-commerce against occupation of respondents

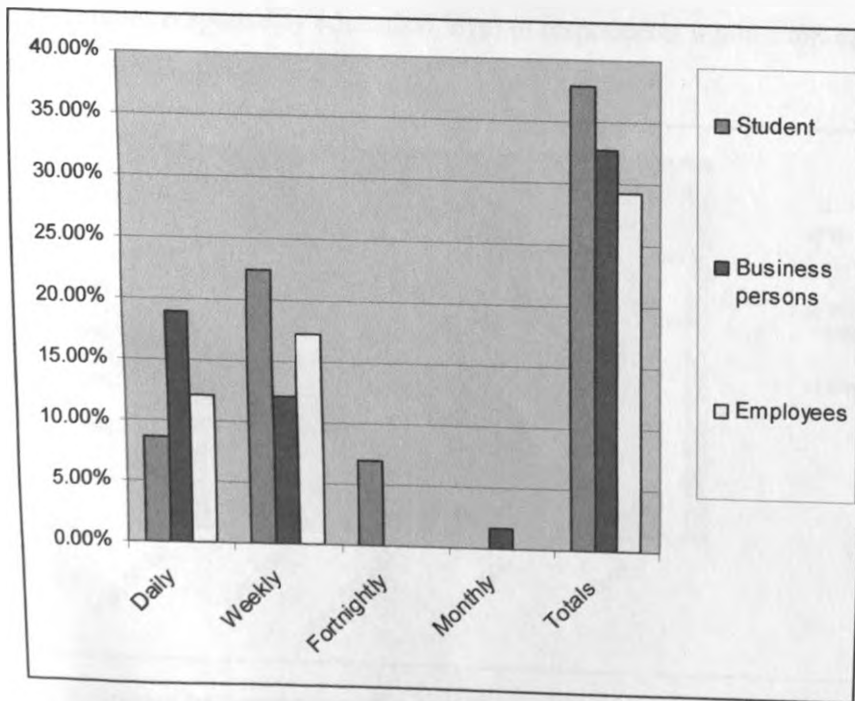


Fig. 26: percent response by occupation of respondent against top-up of mobile phone frequency

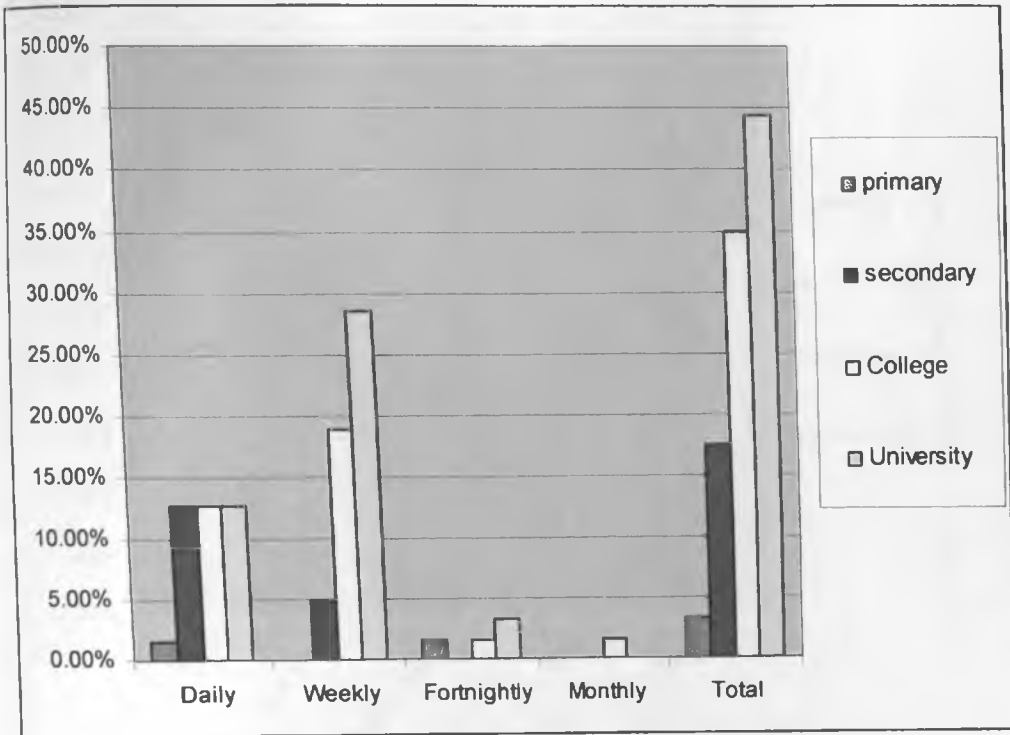


Fig. 27: percent response by education level of respondents against top-up of mobile phone frequency

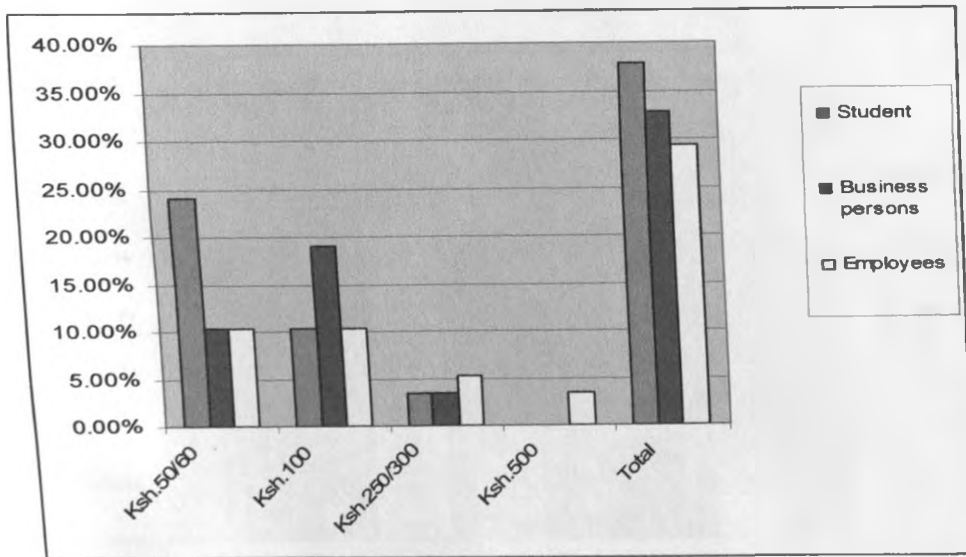


Fig 28 Response by occupation of respondent against top-up denomination of mobile phone

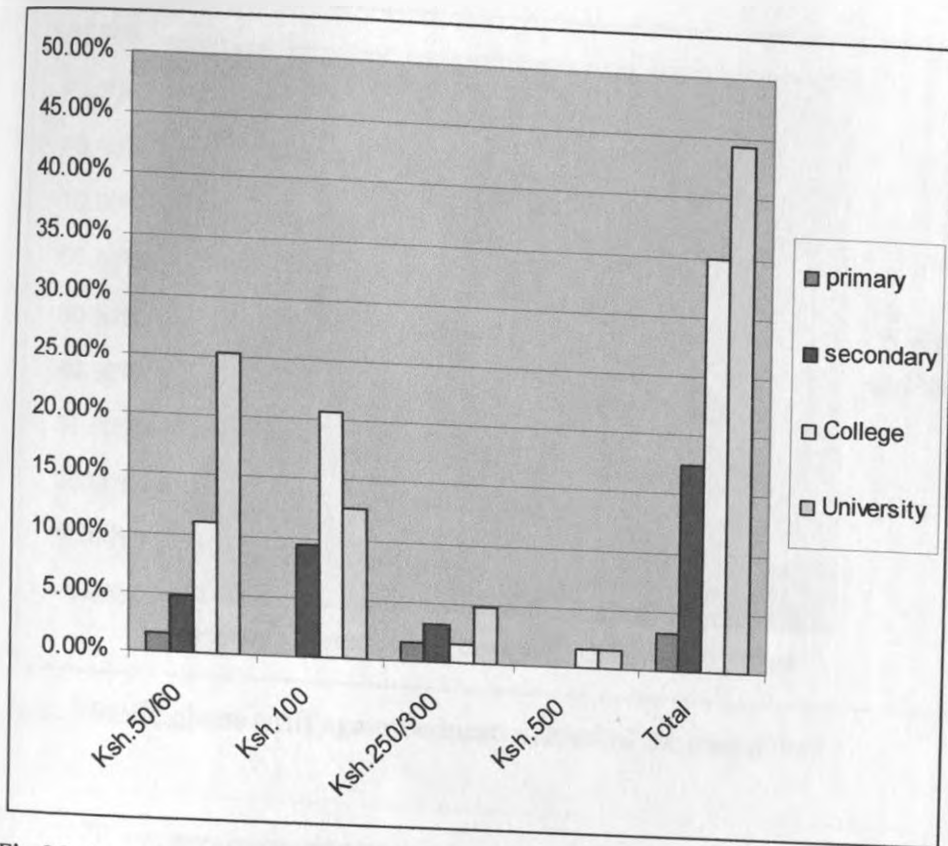


Fig 29. A cross tabulation of mobile phone scratch card denomination used and educational level of the respondent

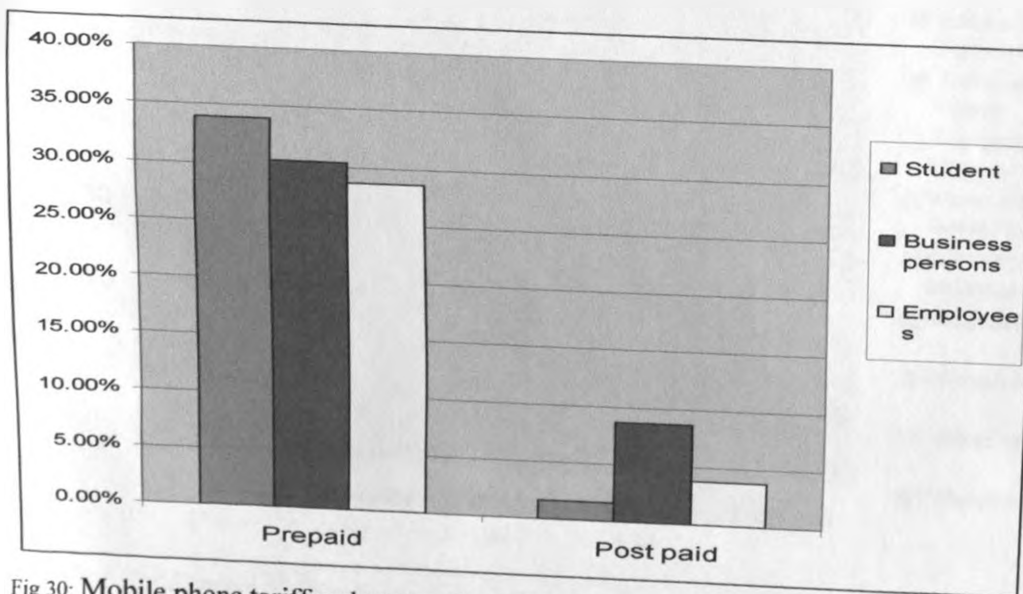


Fig 30: Mobile phone tariff and occupation of the respondents

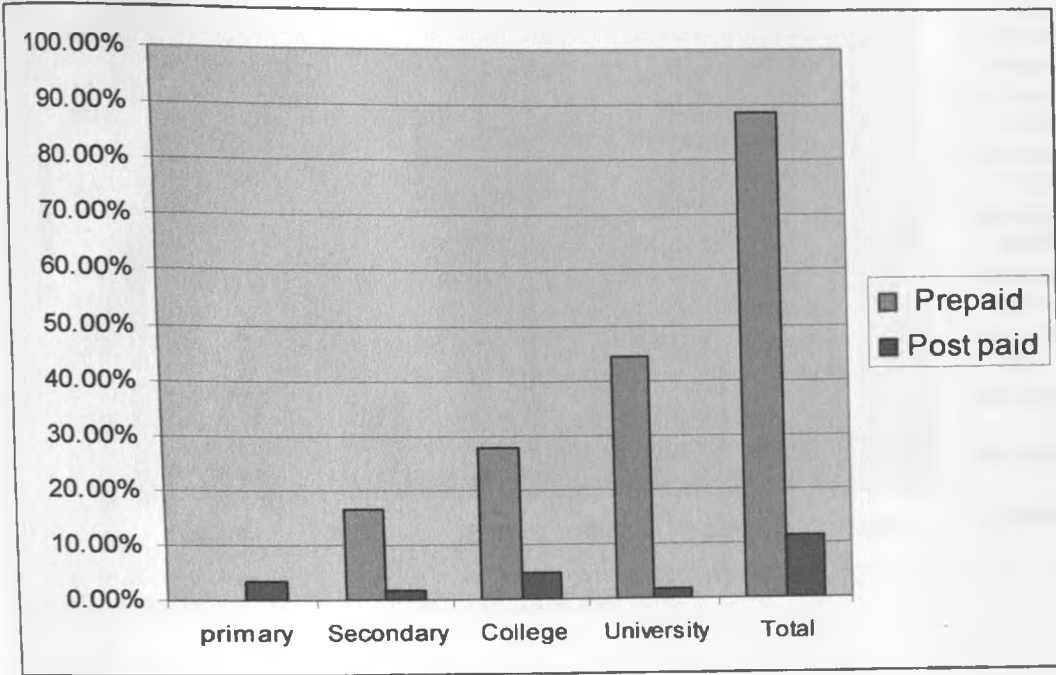


Fig 31: Mobile phone tariff against education level of the respondent

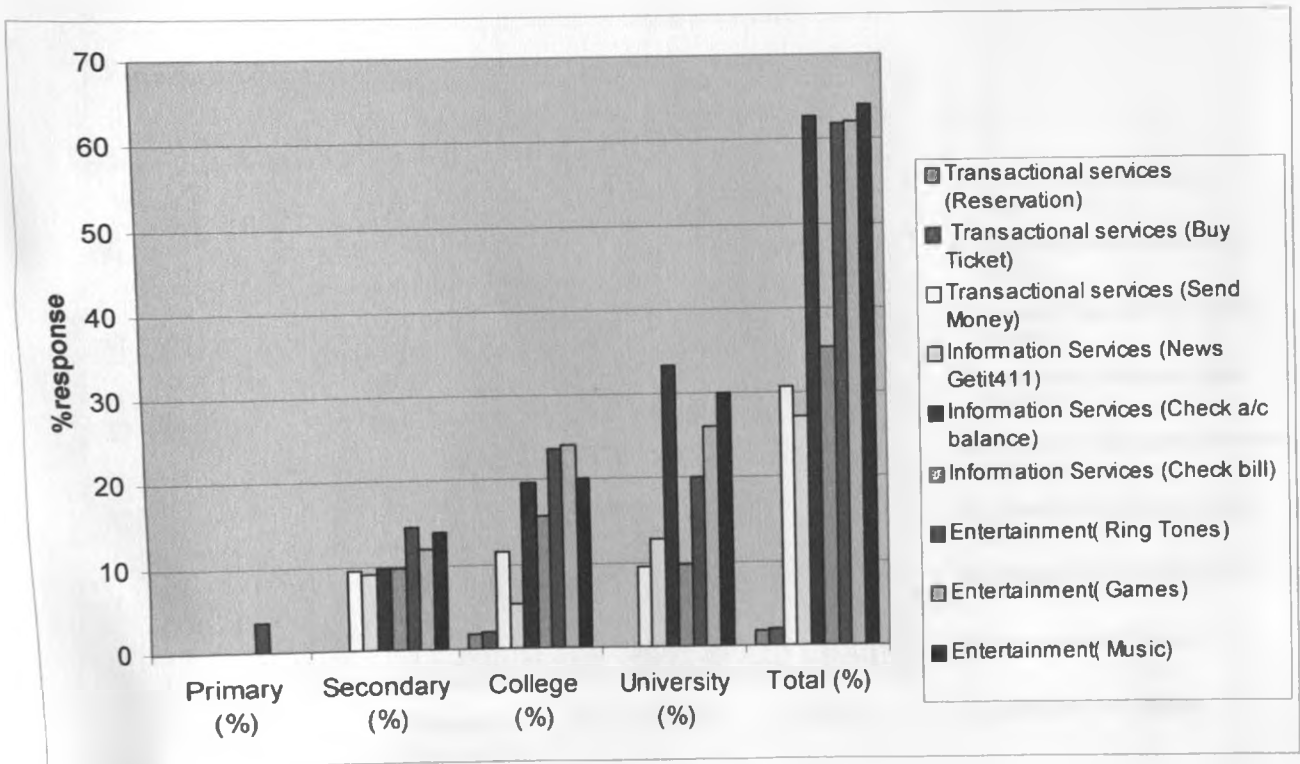


Fig 32: M-commerce VAS services against education level

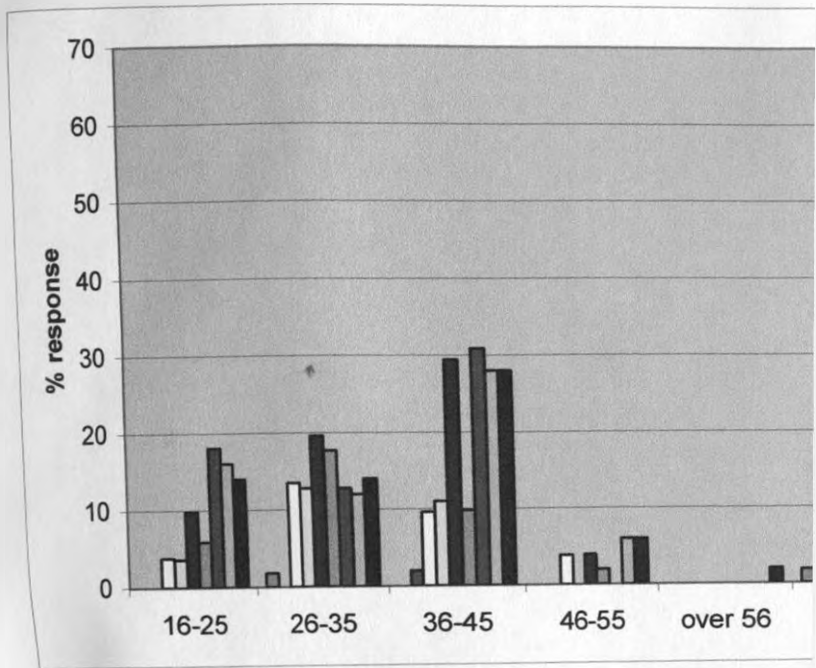


Fig 33: M-commerce VAS services against age level

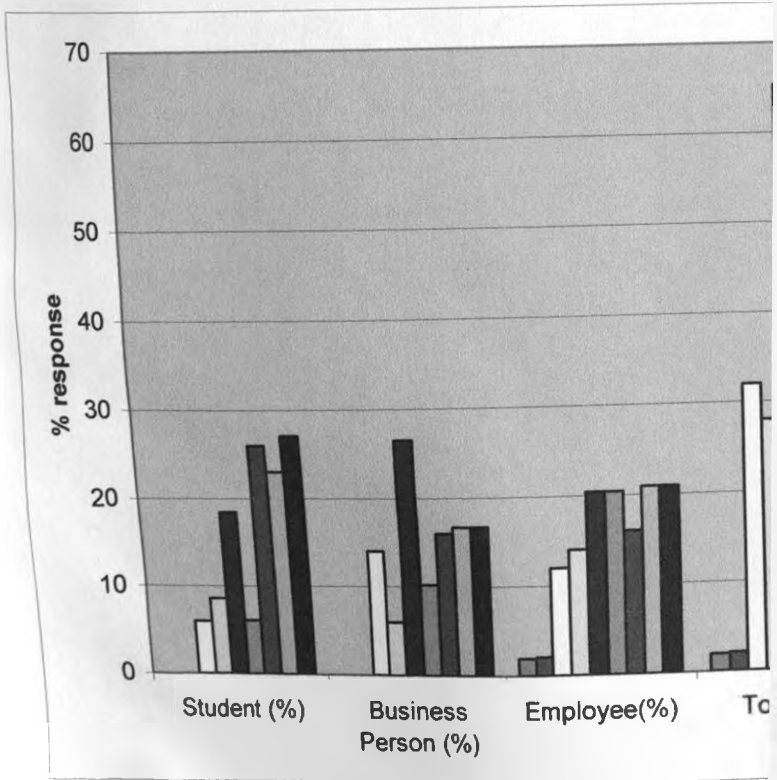


Fig 34: M-commerce VAS services against occupation level