



**UNIVERSITY OF NAIROBI**

**SCHOOL OF COMPUTING AND INFORMATICS**

**An Assessment of factors Influencing Mobile Phone Adoption:  
Case of Kenya's Socio-Economic Development**

BY:

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Submitted in partial fulfillment of the requirements for the degree of Msc. in  
Information Systems

## **ABSTRACT**

Using theories of technology acceptance and technology transfer, we identified factors affecting the use of mobile phones in Kenya. We used a research model to describe factors that impact mobile use and formulated a series of hypotheses about them. We then surveyed mobile phone usage in Kenya and tested on the structural model to examine our hypothesized relationships. We looked at what factors strongly influence individuals' perceptions of the usefulness and ease of use of mobile Phones.

Although extensive mobile phone adoption (high mobile phone levels per capita) may be necessary for seeding commercial and economic initiatives that depend heavily on mobile phones, such as m-commerce, it may not be sufficient. Firms conducting business in Kenya need to pay attention to the factors that explain individual mobile phones use because these factors will most likely determine the optimal market segmentation, business development and customer service strategies for leveraging m-commerce operations the region.

For government units, the understanding of such factors would also be beneficial in aiding economic planning and commerce.

From the data collected we explain how mobile phones may not just help create new jobs and new sources of revenue to the state but can also contribute to economic growth by widening markets, creating better information flow, lowering transaction costs, and becoming substitute for costly transportation that is lacking especially in rural areas.

The results of the TAM survey based on the regression model with an R square of 0.273, show that there was substantial support that the participants who found mobile phone easy to use and useful tended to adopt and use them.

## **ACKNOWLEDGEMENTS**

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I am grateful to the all mobile phone users who found the time and went out of their way to participate in this survey.

Last but by no means the least, I am grateful to my parents for the courage they have always given me to make the bold steps, without whom I would never have done this.

**DECLARATION**

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

STUDENT: C. MWASAA

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

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DATE : 28/07/10

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## **1. INTRODUCTION**

### *1.1 Background of the research*

The study examined mobile phone adoption readiness, and the effect it has on social economic development in Kenya. It is motivated by the phenomenal growth of mobile phone users since the onset of mobile telephony towards the end of last millennium. The study employed the Technology Acceptance Model (TAM) as proposed by Davis (1986) to determine the perceptions of the users about accepting and using mobile phone technology, using three constructs; perceived ease of use (PEOU), perceived usefulness (PU) and behavioral intention to adopt (BI). The mobile phone subscribers increased over 100 times, within the first four years of introduction of mobile phones, as show in the table 1 below.

	June 1999	Jun 2000	Jun 2001	Jun 2002	Jun 2003	Dec 2003
Safaricom	15,000	54,000	325,235	728,163	1,000,000	1,224,787
Celtel		60,000	259,896	458,959	600,000	729,256
TOTAL	15,000	114,000	585,131	1,325,222	1,600,000	1,954,034

*Table 1: Mobile phone Subscribers in Kenya, 1999-2003*

*Source: CCK*

More recently Telkom Kenya and Econet Wireless started rolling out their services which brought to four the number of licensed cellular mobile operators in the Country. With the additional players, competition is expected to intensify leading to a range of benefits such as reduction in cost and choice for consumers which should ultimately increase mobile penetration in the country.

The mobile subscription registered 11.9% growth between September and December 2008 compared to 5.3% recorded in the same period 2007. The growth of subscribers



was further enhanced by the roll out of mobile services by the two operators who entered the market during this period.

This is as shown in table 2 below.

Indicator	7/9/2007	7/12/2007	change	8/9/2008	8/12/2008	change
mobile subscribers	10,777,102	11,349,412	5.30%	14,503,964	16,233,833	11.90%
Mobile Penetration	28.97%	30.51%	5.30%	41.70%	43.64%	4.60%

*Table 2: Mobile Telephony Subscription (Cumulative)*

*Source: cck*

In Tables 3 and 4, below, the absolute number of connections and mobile density are shown in Africa as a whole as well as a number of African countries. Some of the more dramatic developments include a forecasted 1000 per cent increase in mobile connections in Africa between 2002 and 2008. In Kenya, the growth of mobile telephony has been even faster over 1600 per cent between 2002 and 2008, increasing from a mobile penetration rate of 2% per cent in 2002 to a forecasted 30% per cent by the first quarter of 2008.

Market	2002	2003	2004	2005	2006	2007	2008F
<b>Africa</b>	28,029,203	39,707,215	57,506,325	90,629,595	145,525,786	210,653,790	259,872,3
<b>Congo</b>	177,804	542,560	1,196,388	2,011,731	3,072,649	4,782,325	6,147,664
<b>Ethiopia</b>	31,385	60,000	132,000	223,683	343,016	528,242	815,874
<b>Kenya</b>	<b>625,604</b>	<b>1,200,682</b>	<b>2,154,596</b>	<b>3,740,970</b>	<b>5,526,018</b>	<b>8,366,857</b>	<b>10,130,22</b>
<b>Mozambique</b>	147,885	235,082	525,355	941,752	1,368,340	2,018,155	2,513,559
<b>Nigeria</b>	637,028	1,843,766	4,368,889	10,382,000	21,517,131	36,971,738	47,052,64
<b>Rwanda</b>	69,000	105,000	146,000	188,000	293,000	426,000	572,506
<b>South Africa</b>	10,660,847	13,738,042	17,895,000	23,169,913	32,435,534	38,680,922	42,259,80
<b>Tanzania</b>	455,845	854,010	1,303,765	2,252,500	3,874,175	6,223,585	8,213,914
<b>Uganda</b>	336,543	539,489	758,198	1,242,806	1,935,817	3,054,179	4,073,254
<b>Zambia</b>	123,688	191,286	360,055	592,548	1,011,469	1,787,914	2,389,747

*Table 3: Number of mobile connections in selected African countries, 2002–2008*

*Source: Wireless Intelligence 11/6/2007 F= forecast data*

According to Communication Commission of Kenya, CCK, Mobile Subscriber Penetration in Kenya is approximately 32%, with coverage seen mostly in urban areas and major highways. See Appendix 1 and 2.

<b>Market</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>
<b>Africa</b>	3.40%	4.80%	6.70%	10.40%	16.30%	23.10%	27.90%
<b>Congo</b>	0.30%	1.00%	2.20%	3.50%	5.30%	8.00%	10.00%
<b>Ethiopia</b>	0.10%	0.10%	0.20%	0.30%	0.50%	0.70%	1.00%
<b>Kenya</b>	<b>2.00%</b>	<b>3.80%</b>	<b>6.70%</b>	<b>11.50%</b>	<b>16.80%</b>	<b>25.10%</b>	<b>30.00%</b>
<b>Mozambique</b>	0.80%	1.30%	2.80%	4.90%	7.00%	10.20%	12.50%
<b>Nigeria</b>	0.50%	1.50%	3.50%	8.10%	16.40%	27.60%	34.30%
<b>Rwanda</b>	0.90%	1.30%	1.70%	2.20%	3.40%	4.80%	6.40%
<b>South Africa</b>	23.50%	29.70%	37.90%	48.00%	65.90%	77.30%	83.30%
<b>Tanzania</b>	1.30%	2.30%	3.50%	6.00%	10.10%	15.90%	20.60%
<b>Uganda</b>	1.40%	2.10%	2.90%	4.60%	6.90%	10.60%	13.60%
<b>Zambia</b>	1.20%	1.80%	3.30%	5.40%	9.10%	16.00%	21.10%

*Table 4: Mobile market penetration in selected African countries, 2002–2008*

*Source: Wireless Intelligence 11/6/2007*

As seen above, the growth of mobile telephony in Africa generally has been breathtaking and far faster than the most optimistic of projections just a few years ago. Will this growth continue? The GSMA believes that the cost of mobile networks and devices will continue to fall, extending mobile services even to people on very low incomes. Wireless Intelligence predicts the number of mobile subscriptions in Africa will grow by over 50 per cent – from 200 million to over 300 million – over the next two years.

When Mobile phones were introduced into the Kenyan in the late 1990s, the state made distinctions between landline services, international gateway facility providers and cellular phone operators. Competition was then introduced in all of them.

However, the extent of the competition that the new technologies created due to convergence was not anticipated. Technology expanded the reach of telecommunication services and provided people with more alternatives. The choice people made was no longer limited to which form costs less to obtain and use, but rather, which one was most cost-effective based on the lifestyle they maintained.

The introduction of mobile phones provided an attractive alternative where it is difficult to install fixed-line networks because it can be installed more rapidly (Hamilton, 2003). In so doing, it alleviated waiting time for potential subscribers and reduced unsatisfied demand.

In the study the Technology Acceptance Model (TAM) as proposed by Davis (1986) was employed to determine the perceptions of the mobile phone users about accepting and using mobile phones using three constructs; perceived ease of use (PEOU), perceived usefulness (PU) and behavioral intention to adopt (BI). The aim of this research was to investigate the mobile phone readiness in Kenya and its effect on social economic development.

### *1.2. Problem Statement*

Kenya just like most of Sub Saharan Africa is both technologically and economically less developed than countries in Europe and America, and that this has led to the slow adoption of information technology. (Odedra et al,1993; Onyango, 2000; Peterson, 1991). Sub-Saharan Africa, for example, as at the end 2001, had 26 million mobile-phone subscribers and a mobile phone density of 1.13 per 100 inhabitants (*International Telecommunications Union World Database, 2002*) According to the International Telecommunications Union, a teledensity of 1 is the level at which ICT begins to significantly affect a nation's social and economic development (ITU, 2002; Mbarika *et al.*, 2002). Although Sub Saharan Africa has not responded very well to information technology adoption and other modernization attempts in the past (Onyango, 2000; Peterson, 1998), governments in Africa continue to invest in information technology. Among the countries that are currently attempting to promote information technology adoption, is Kenya.

In Kenya, 80 percent of the country's population lives in the rural areas where ICT services are largely unavailable. Most of the country's rural population is engaged in subsistence farming, and women constitute the majority. Over 50 percent of Kenyans live below the poverty line and the country has a very high population of young people (56 percent) below 20 years who are disproportionately represented among the poor. About 20 percent of the Kenyan population cannot read or write skills that are important in accessing and utilizing ICTs, (Omosa and McCormick, 2004).

With such a profile, it is important that methods and strategies that will address the problem of access in rural and other underserved areas are developed. Policy makers in the communications sector are concerned with either universal service or universal access depending on the level of ICT development in their respective countries. Whereas universal service strategies adopted in developed countries focus on providing and maintaining affordable communication services to individual households, in developing countries policy makers focus on universal access, which aims at community access to publicly available communication facilities. Both policy orientations aim at service provision to a wider section of respective populations without gender, income, social status or geography based discrimination.

With the convergence of technologies in IT, telephony and broadcasting, policy makers and decision makers in the sector have to broaden the concept of universality to include both the "old" ICTs of radio, television and telephone and the "new" ICTs of computers, satellite wireless technology and the Internet. In general, a policy on universality of access is not designed to anticipate market behavior; it is rather intended to correct market failure.

With all these in mind; The Critical Influencing factors for Mobile Phones adoption and its impact on Socio-Economic Development in Kenya is still not well understood.

Few research efforts aim to understand individual mobile phone users or to study the impact of use patterns socio-economic development. Most studies with this focus are just now getting published (Agarwal & Karahanna, 2000; Mbarika *et al*, 2002b; Gefen *et al*, 2003), and their context is developed countries. No academic research has systematically

and rigorously studied the key factors to mobile phone use within developing countries using data collected directly from individual consumers.

Mobile phone and IT adoption in general is a subject of worldwide discussion as evidenced by the extensive literature examining what factors influence its adoption failure or success. Flanagan & Jacobsen (2003) say that "Despite government spending on boxes and wires, technology integration in North American classrooms has ranged from uneven at best to nonexistent in some cases" (p. 125). Research from the African perspective (Akpan, 2000; Alemna, 1999; Heeks, 2002; Jain & Mutula, 2001; Jimba, 2000; Odedra et al, 1993; Onyango, 2000; Thapisa & Birabwa, 1998; United Nations Economic Commission for Africa, 2001) and the international perspective (Baskerville & Pries-Heje, 2001; Comin & Hobjin, 2004; Karahanna & Straub, 1998; Kukafka, et al, 2003; Legris, et al, 2003; Rogers 1995; Russell, 2004) has dealt with the causes of failure to adopt and use information technology successfully.

### *1.3. Significance of the Study*

Generally, in IT many people assume that once the hardware and the software have been purchased, adoption and its effective use will follow, but this has not proven to be the case in Africa, as demonstrated in the extensive literature examining the factors that influence IT adoption failure or success.

Internationally, researchers have demonstrated that, lack of perceived usefulness, and lack of perceived ease of use of IT have led to low adoption and usage of information technology (Davis, 1989; Karahanna and Straub, 1998; Legris et al, 2003; Straub, et al, 1997; Szajna, 1996; Venkatesh and Morris, 2000). These factors have serious implications for policy implementation failure and seem to confirm the suggestion that while governments may be well-intentioned and sincere in their attempts to make technology available, this is not enough to guarantee its use (Odedra et al, 1993).

Scholars have written about the benefits of adopting new information technology in Africa, extolling the economic, social, and political benefits to be gained from its diffusion (Powell, 1992; Udo & Edoho, 2000). They have also pointed out that though IT adoption can bring economic benefits, the cost of implementing IT might not match the benefits of using it.

Investors in the mobile phone industry have already made a significant investment service provision and laying down the infrastructure. It was important to find out prior to more extensive investments, whether the mobile telephony and all the services offered is adopted by the users whom its use is intended.

Other studies have dealt with urban areas only, specifically Nairobi; the capital city. (Peter Meso, Philip Musa & Victor Mbarika)

Notwithstanding the useful contribution by the various scholars writing on IT, there have not been any empirical studies conducted to understand the dynamics behind the subscription growth rate, which has surpassed predictions; Onset of the projected growth rate was phenomenal.

This study endeavored to explore the extend on which Mobile phones have transformed businesses and lives inn Kenya , looking at the effect of M-pesa, DrumNet's SMS market prices service amongst other services. The service providers have their perception on these but we were seeking to find out how the users perceive them.

Third we looked at the challenges faced by the physically challenged and what Interface changes can be made to accommodate them.

In order to achieve the objectives of this study, questions were formulated according to the Technology Acceptance Model as shall be demonstrated.

#### *1.4. Research Objectives and Questions*

##### **Research Objectives**

- 1 To quantify how different users perceive mobile phones in terms of Ease of use, Usefulness and Reliability.

- 2 Identify the role played by mobile telephony in development in Kenya.
- 3 To quantify the social and cultural influence on mobile phone usage.
- 4 Evaluate the usage by different groups, Financing; airtime used per month, choose of Tariffs, Calling habits and the Features often used.

## **Research Questions**

This research asked the question: How has mobile phone adoption impacted on social economic development in Kenya? Given that mobile phone infrastructure, is in place in Kenya do the users intend to accept mobile phones and use to develop themselves socially and economically.

Consistent with the extended TAM constructs, the distinct hypothesis to be tested is: What are the Critical Influencing factors for Mobile Phones adoption and its impact on Socio-Economic Development in Kenya? The following were considered;

If participants

- a. adopt mobile phone use for their work/business .
- b. exhibit positive feelings about the usefulness of mobile phones
- c. exhibit positive feelings about the ease of using mobile phones

The research questions were as follows;

- What are ethnographic influences on mobile Phone adoption?
- How has mobile phone adoption impacted on social economic development in Kenya?
- What is the relationship between income levels, access to mobile phones services and spending patterns?
- What is the social and cultural influence on mobile phone usage
- What are the economic activities around mobile phones?
- What are the barriers to usage (apart from access)?



## 2: LITERATURE REVIEW

The literature reviewed in this section describes the theories of IT diffusion and adoption, the barriers to ICT diffusion and adoption, mobile phone adoption in Kenya, and effect of mobile phones on Kenya's social-economic development. But first some of the terms used are defined below.

### **a) Innovation Diffusion**

Innovation diffusion is an umbrella term used to talk about all technology diffusion, not just IT diffusion. Rogers (1995) and Barnett (1953) both call the spread of a new idea or invention innovation diffusion. According to Rogers (1995, p. 5), Diffusion "is the process by which an innovation is communicated through certain channels over time among members of a social system." Barnett defines innovation as "any thought, behavior, or thing that is new because it is qualitatively different from existing forms" (p. 7). Barnett goes on to emphasize cultural change and how a new innovation alters the cultural setting. Rogers refers to diffusion in a general sense to mean, "a planned and spontaneous spread of ideas," nonetheless, both Barnett and Rogers agree on the meaning of diffusion to refer to the spread of ideas. In this study, innovation diffusion will be used to refer to the spread of a new idea or innovation from one area to another, using the communication channels in the receiving society.

### **b. Acceptance**

Acceptance of a technology is defined as "an individual's psychological state with regard to his or her voluntary or intended use of a particular technology" (Hendrick et al., 1984). Therefore, in this research TAM is used to study the acceptance of the mobile phone technology.

### **c. Adoption**

Adoption and acceptance seem to be used interchangeably in the literature consulted. Barnett (1953) contends that if an idea grows in popularity in the same place it originated, that process is called adoption or acceptance and if it is transferred to other places across ethnic boundaries, then that is "spreading, borrowing or diffusion" (p. 291).

According to Dasgupta, et al, (2002, p. 87), information technology adoption is "defined as the decision to accept, or invest in a technology." This definition includes the word accept, which probably explains why most scholars consulted use the words acceptance and adoption interchangeably. According to Shavo & Igbaria (2003), "The terms adoption, use, consumption, and acceptance are used interchangeably. Organizational adoption looks at adoption by aggregates: viz. departments, agencies, Strategic Business Units (SBUs), or companies" The other important thing to note here is that one of the most used technology adoption models is called the technology "acceptance" model, which scholars use to examine technology "adoption", thereby underlining the fact that adoption and acceptance mean the same thing (Gefen & Straub, 1997; Venkatesh, 2000; Venkatesh & Morris, 2000).

Adoption shall be used to mean the decision to accept and use an innovation, in this case mobile phone technology.

From the above explanation, there seems to be a difference between diffusion or transfer and adoption or acceptance. Transfer or diffusion appears to be the initial stage that comes before the adoption or acceptance stage. First of all, technology has to be brought into a nation or transferred (diffused), and then individuals or users choose to adopt or accept the transferred technology. Therefore, it appears that the transfer of information technology happens at a national level, between governments involved in the transfer, and then the users and the organizations or institutions come in next to adopt and use the technology.

### **c) Information and Communication Technologies**

Generally speaking, Information and Communication Technologies (ICTs) is an umbrella term, which refers to the equipment, infrastructure, and the communication used to make information in all its different formats, accessible to users. According to Rodriguez & Wilson (2000), ICTs refer to "the set of activities which facilitate by electronic means the processing, transmission and display of information" (p. 5). Akpan (2000) approaches the definition from four perspectives, that of services, applications, and hardware, and communication. The above definitions underline four components of the definition of ICTs; namely the machinery or equipment, the infrastructure or software applications, the communication and services made available by technology.

#### **d) Information Technology**

Information Technology (IT) can be defined as a phrase that covers all forms of technology that are used to create, store and distribute information in all its formats, mostly using computers. "According to NDCC 54.59.01 Information Technology means the use of hardware, software, services, and supporting infrastructure to manage and deliver information using voice, data, and video" According to Friedman (1994), The information technology field may then be defined as the social space structured around the production, use, definition, and control of information technology. Information technology is the base technology for information systems (IS).

In summary, ICTs and IT pose a challenge in their definition because of the various meanings attached to them by different scholars. Therefore the best approach is to use a functional definition. The use of the terms, ICTs and IT, do not seem to be very different. The definition of ICTs emphasizes the communication component and includes all forms of communication equipment, while the definition of IT emphasizes the use of computers as the medium of communication more than any other form of equipment. In this discussion there will be no difference in meaning between the two terms, both ICT and IT shall be taken to mean all hardware and software infrastructure that is used for the manipulation, creation, storage and communication of information in all its formats, using the computer and other supporting equipment.

#### **e) Adopter**

In this study, an adopter is an individual who has accepted mobile telephony. According to the Merriam-Webster Dictionary Online (2006), the word adopter means "to take an opinion, policy, or practice as one's own. ADOPT implies accepting something created by another or foreign to one's nature". This definition underlines the importance of accepting an innovation that does not originate in one's place.

#### **f) Mobile phone Technology acceptance or adoption**

According to the TAM, system usage behavior is determined by the intention to use a particular system, which in turn, is determined by the perceived usefulness and perceived

ease of use of the system (Luarn and Lin, 2005). A person has accepted mobile phone technology if they are willing to use it.

### **g) Mobile phone**

A mobile phone (also known as a wireless phone, cell phone, or cellular telephone) is a long-range, electronic device used for mobile voice or data communication over a network of specialized base stations known as cell sites. In addition to the standard voice function of a mobile phone, telephone, current mobile phones may support many additional services, and accessories, such as SMS for text messaging, email, packet switching for access to the Internet, gaming, Bluetooth, infrared, camera with video recorder and MMS for sending and receiving photos and video, MP3 player, radio and GPS.

### *2.1. Theories of IT diffusion and adoption*

Diffusion and adoption theories have centered on the society and its environment, as well as the individual as a unit of analysis in order to assess the success of the diffusion. The literature on IT transfer in Africa has mostly centered on the impediments or barriers to IT diffusion at the national level. Thus, the literature on the barriers to IT transfer or diffusion in Africa has emphasized political, social, and economic barriers.

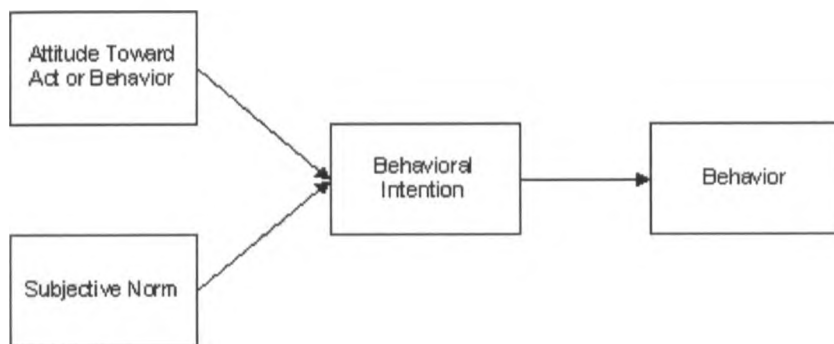
IT adoption literature covered in this chapter includes studies that explore IT diffusion internationally using innovation diffusion theories, and adoption or acceptance of IT.

### **Behavioral Intention Theory**

Research based on the individual's intention to accept or reject information technology has been conducted extensively using intention-based theories and models. Many scholars have carried out research to test behavioral intentions variables using various

theories and models. Some of the models and theories, which appear many times in the literature, include: Social Cognitive Theory by Bandura (1986); and a Theory of Cognitive Dissonance by Festinger (1957). Both these theories are grounded in the behavioral sciences. Another most cited theory, which falls under behavior intention theories, is the Theory of Reasoned Action (TRA) first proposed by Fishbein & Ajzen in 1975 (Leonard, et al, 2004).

TRA posits that one's intention to perform or not to perform an action (behavioral intention) is the immediate precursor to the actual behavior. The TRA model introduced two factors that affect behavioral intention: attitude toward the behavior and subjective norms (Leonard, et al, 2004). According to TRA (Leonard, et al, 2004), behaviors are under a person's volitional control, therefore a person's attitude towards a behavior (negative or positive) and social pressure (what is expected of them) determines the person's willingness to perform a behavior (behavioral intention).



*Figure 1: Theory of Reasoned Action*

This theory was later modified by Ajzen (1991) to become the Theory of Planned Behavior (TpB). Ajzen (1991) came to the conclusion that behavior is not always under control nor totally voluntary as posited by the Theory of Reasoned Action. Ajzen argued that sometimes behavior is influenced by perceived behavioral control. Perceived behavioral control has been defined as "the perception of how easy or difficult it would be to perform the behavior" (Leonard, et al., 2004, p. 144). Therefore, Ajzen extended the Theory of Reasoned Action into the Theory of Planned Behavior (TpB). According to Ajzen (2005), the TpB posits that human action is guided by three kinds of considerations; behavioral beliefs, (attitude towards behavior) normative beliefs

(perceived social pressure) and control beliefs (perceived behavioral control) and a combination of these considerations culminates in behavioral intention to perform a behavior. This school of thought draws its concepts from attitude and behavior research that focuses on the individual's perceived or planned behavior, which can be used to predict use or adoption of an innovation or technology (Colvin and Goh 2005).

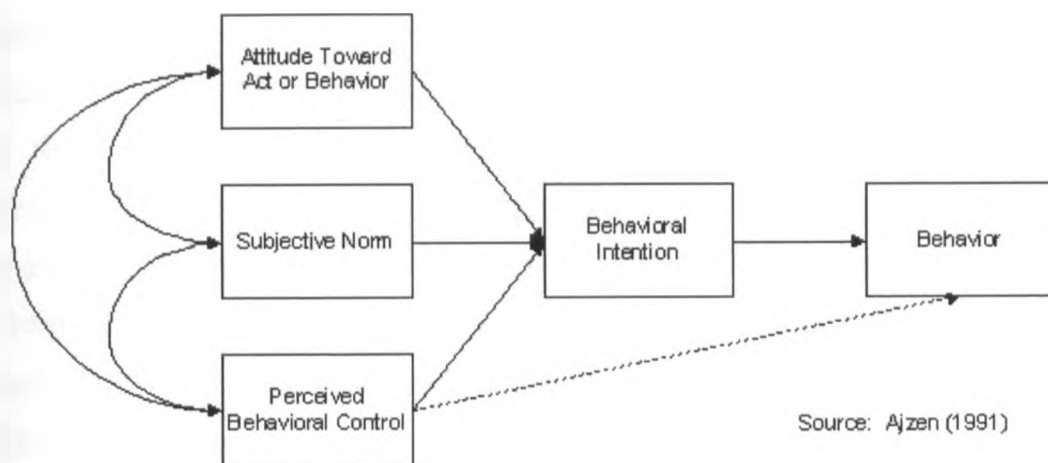


Figure 2: Theory of Planned Behavior

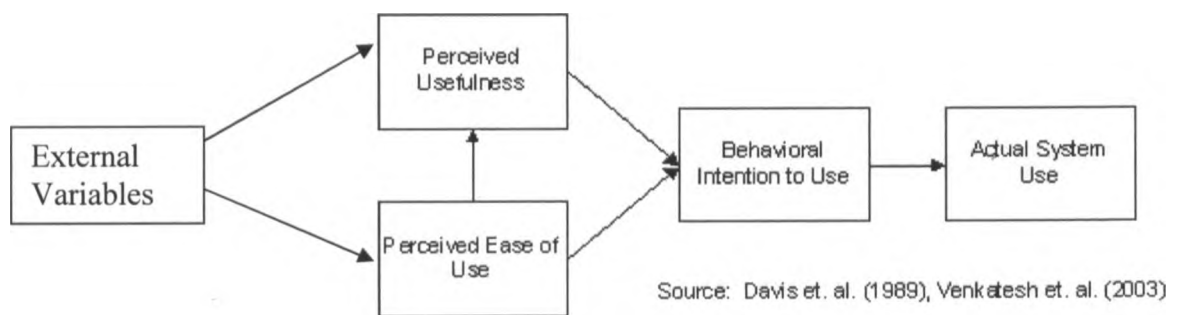
### Technology Acceptance Model

Davis (1986) adapted the TRA model by “replacing TRA’s attitudinal determinants, derived separately for each behavior, with a set of two variables, perceived ease of use (PEOU) and perceived usefulness (PERUSE)” to come up with the Technology Acceptance Model (McFarland & Hamilton, 2006). The Technology Acceptance Model (TAM) posits that the individual’s intention to use is the “single best predictor of actual system usage” (Davis & Venkatesh, 1996, p. 20). TAM has been used extensively to predict and explain the individual’s adoption of information technologies.

TAM has been validated (Colvin & Goh, 2005, Davis & Venkatesh, 2000; Legris, et al, 2003) and extended to add context to the three main constructs of PEOU, PERUSE (shortened to PU) and intention to use or behavioral intention (BI) (Dasgupta Granger, & McGarry, 2002; Dishaw & Strong, 1999; Karahanna & Straub, 1998; McFarland & Hamilton, 2006). One of the suggested extensions of TAM introduced the computer anxiety construct, both as a mediator on perceived ease of use (Hackbarth, et al, 2003)

and as an independent variable that has an influence on behavioral intention (Compeau & Higgins, 1995). Therefore, in addition to the TAM variables of perceived ease of use, perceived usefulness, and intention to adopt as first proposed by Davis (1986), scholars have introduced the computer anxiety variable to the model (Compeau & Higgins, 1995; Hackbarth, et al, 2003; McFarland & Hamilton, 2006).

The purpose of TAM is to predict and explain user acceptance of a new technology. Acceptance is hypothesized to be determined by the attitudes or beliefs the user has towards a given technology. These attitudes or beliefs are measured by looking at the perceptions of the user in relation to perceived usefulness and perceived ease of use of the technology. According to TAM, the "external variables, such as the task, user characteristics, political influences, organizational factors, and the development process, are expected to influence technology acceptance indirectly by affecting beliefs, attitudes or intentions" ( Szajna, 1996, p. 85). So, TAM looks at three constructs: the intention to adopt, perceived usefulness and perceived ease of use. Davis et al. (1989) posits that PEOU is a causal antecedent to PU. This assertion has been tested and proved by various researchers who established that PEOU has a significant effect on PU (Davis et al., 1989; Gefen & Straub, 1997; Karahanna & Straub, 1999). Figure 3 below summarizes the TAM model.



*Figure 3: Technology Acceptance Model*

According to Venkatesh (2000), perceived ease of use has been defined as a person's belief that using a particular technology does not require too much effort. He goes on to say perceived ease of use is an important factor influencing user acceptance and usage behavior of information technologies. Perceived usefulness is the extent to which a user believes that a certain technology will enhance the performance in his/her job and has thus been closely associated with motivation (Venkatesh, 2000).

The Technology Acceptance Model (TAM) has been replicated, tested and applied in most parts of the world. Researchers using this model have reported its robustness and suitability for explaining users' intentions to adopt information technology (Dasgupta, Granger & McGarry, 2002; Gefen, & Straub, 1997; Venkatesh, 2000). TAM has been tested and proven successful in predicting 40% of system use (Colvin and Goh, 2004; Legris, Ingham, & Collette, 2003). Evidence of TAM use in Africa is limited but nevertheless present (Meso, et al, 2005; Anandarajan et al, 2002). Therefore, it is very useful for predicting whether or not users intend to adopt technology.

## *2.2. ICT adoption and Diffusion*

### **ICT adoption failure in Africa**

Heeks (2002), writing on the failure of information systems in Africa, says failure can be divided into two categories, total failure and partial failure. Heeks goes on to say that total failure is when an initiative never gets implemented or it is implemented and then abandoned, and partial failure is when an initiative does not achieve the major goals or it results in undesirable outcomes. Africa is lagging behind in its efforts of achieving an information society. The literature in this field has established that sub Saharan Africa is both technologically and economically least developed and that this has led to the slow transfer and adoption of information technology (Onyango, 2000; Udo & Edoho, 2000).

The barriers to IT diffusion and adoption can be divided into two types, the first being barriers at a national level and the second being barriers at an individual and organizational level. Literature on Africa and Sub Saharan Africa has mainly covered the national level of IT diffusion, which is mostly referred to as IT transfer, and has targeted social, economic, and political barriers. This literature is discussed next.

### **Socio-cultural Barriers**

The social barriers mainly deal with access issues (sometimes referred to as the digital divide), the appropriateness of IT to African culture, Africa's lack of communication channels, and lack of IT education and training. Research has established that advanced education influences an individual's capability to use technology. Unfortunately, the



opportunity for higher education in sub-Saharan Africa remains limited: only 3% of 18- to 25-year-olds are able to attend college.

Other issues mentioned are the content of the information technology and the use of the English language, which most Africans are not familiar with, thereby creating a context that accelerates inequalities and complexity to the challenge of social inclusion (Chowdhury, 1998). Rice (2003), writing on the issue says, "the lack of the application and diffusion of ICTs in LDCs (least developed countries) is exacerbated by the fact that more than 80% of all web sites are in English, a language understood by only about 10% of the world's population" (p. 72). Also the lack of training, education, and all kinds of literacy needed for the use of IT seems to be a problem for the IT transfer process. The types of literacy involve basic reading and writing, basic computer literacy, and information literacy, which encompasses the ability to access and use information from all sources effectively. It is mentioned in the literature that three quarters of Africans in Sub Saharan Africa are illiterate, and without phone or electricity (Obijiofor, 1998; Chowdhury, 1998; Jensen, 2002). Also cited in the literature is the underutilization of existing computer resources, which is linked to illiteracy and poverty (Jensen, 2002).

Studies on cyber phobia indicate that age is a key factor in the adoption of technology, with older people tending to exhibit higher phobic levels. Consequently, these individuals tend to adopt new technologies much more slowly than younger users.

On Gender and technology studies have found that men and women adopt technology differently. Men's decisions to use technology are more strongly influenced by their perception of usefulness, while women's decisions are based more on perceptions of the technology's ease of use. Women and men differ in their perceptions of, but not their use of technology

Many studies have determined that culture has a strong contextual influence on whether and how individuals, organizations and societies use ICT. Thus technology adoption differs across cultures; the technology-adoption patterns in a given culture are influenced by the culture's beliefs, norms and values, among other cultural dimensions; and different cultures tend to prefer different technology. Therefore, we expect cultural influences on the individual to impact how the individual uses mobile phones.

Emanating from the above and associated with the social barriers to IT adoption is the issue of culture. Some scholars have expressed the fear that the culture of Africa is conservative and will therefore hinder IT adoption. These ideas have been dismissed on the grounds that Asian culture is also different from that of the West and yet IT has flourished there (Udo & Edoho, 2000). Other scholars have carried out research in some African villages and concluded that a conservative culture is not an impediment to IT adoption (Hudson, 2000).

### **Economic barriers**

Some of the barriers echoed in all the literature consulted have to do with Africa's underdevelopment, civil wars, corruption in the government and poverty. Statistics abound on the low density of telephone lines, the lack of clean water and electricity, to mention but a few (Akpan, 2000, Jensen, 2002; Oladele, 2001; Onyango, 2000). According to Odedra et al. (1993), Africa seems to be the "lost continent" of the information technologies (IT). Odedra et al go on to say that Africa is "the second largest continent and the least developed in terms of ICT".

The high costs of the ICT equipment and the equally high costs of maintenance for a people who live in poverty is a real challenge. Consequently, Africa does not have the infrastructure or the skilled manpower to accelerate IT adoption. This situation has often been described as the digital divide. The digital divide is measured by "access to technologies, access to relevant and usable content, skills in using ICTs (knowledge and experience in use)" (Kebede, 2004, p. 274).

### **Political barriers**

The political barriers deal with policy and political power, policy implementation failure, and the inadequacies of national information policies in information technology strategic planning and implementation. Chowdhury (1998), writing on information policy in Africa, has remarked upon the lack of awareness and enthusiasm of the policy makers, the absence of political and regulatory frameworks, and the lack of local networks for management. Other scholars approach the policy barrier from the economic point of view by suggesting economic empowerment through investment and trade, which should be made possible by the formulation of the right information policies (Udo & Edoho (2000).

Still other scholars emphasize the liberalization of telecommunications policy as a way of stimulating growth in IT (Hudson, 2000; Jensen, 2002).

Most of Africa is characterized by a dearth of national information policies and this has contributed immensely to the failure of information technology adoption (Berman & Tettey, 2001; Korac-Kakabadse, et al, 2000; United Nations Economic Commission for Africa, 2001; Wilson & Wong, 2003). According to United Nations Economic Commission for Africa (2001), the process for setting up ICT policies and strategies is a work in process but it is rather slow because it requires concerted effort from all parties, mainly the national government for effective leadership and direction. United Nations Economic Commission for Africa (2001) goes on to say that the few national information policies that have been formulated have been marked by their lack of comprehensiveness in terms of content and coverage. Added to the lack of policy is the well-documented crisis in Africa of poverty, which is intensified by social, political and economic problems.

Onyango (2000), summing up the magnitude of the political problems says that policy has tended to fail in Africa because there has been no thread of continuity or review process in all policy matters, instead, governments and other organs of state "lurched at fever-pitch speed from one idea to another in the implementation of these imported and unadjusted development blueprints" (p. 198). In other words, policy development in Africa has always posed problems because when blueprints and ideas from other nations are adopted without making them suitable for the culture and the situation, policy fails.

### *2.3. Mobile phones and Socio-Economic development in Kenya*

'Explosive' is the only way to describe mobile phone growth. Half the world's 6.5 billion people now use a mobile (up from two billion just two years ago). There are more than twice as many mobile owners in developing countries as in industrialized countries. Subscriber growth rates in developing countries are 25 percent per year – and double that in Africa.

More and more development workers tell stories of mobile surprises – not just who is using them, and where they are using them, but also how they are using them. Through mobiles, the first digital information and communication technologies (ICTs) have reached poor households and communities. In less than a generation, the majority of

poor people will have access to mobile phones and services. What difference will this make? Mobile ownership brings two types of benefits.

**Incremental benefits** improve what people already do – offering them faster and cheaper communication, often substituting for costly and risky journeys.

This has helped them solve a variety of problems mainly related to health and agriculture that would otherwise have been costly or difficult to address.

There is also the increasing popular money transfer service; M-pesa, DrumNet's SMS market prices service 411, produce, news, kazi,...

**Transformational benefits** offer something new – new ways to access services and support livelihoods. Evidence on this is only just emerging because it relies on a mobile's ability to be 'more than just a phone'. Jonathan Donner summarizes one area of promise: 'mbanking', which is allowing wider access to banking and other financial services.

In addition, there are **production benefits** that come not from using but from selling mobiles and related services. The best known examples is the creation of new livelihoods for people running Pay Phone mostly in urban areas, popularly known as Simu ya Jamii (Swahili for community phone)

Many others are also making a new living through activities like re-selling airtime and prepaid cards, or even selling ring tones and phone covers.

And, as with all technologies, there is hype and then there is the reality. The growth and potential impact of mobiles are phenomenal. Mobiles can be seen in action, for example, helping deliver on every one of the Millennium Development Goals– including poverty, education, equality and health.

But technology has limits. Some limits are imposed by the social context. Others are imposed by the 'physicality of development': we cannot reduce all of development into the bits and bytes that mobiles handle. Actual money must still be transacted; face-to-face meetings must still occur; and real goods and infrastructure must still be produced and used. What we expect of mobiles must therefore have limits.

In mobile policy and practice, as well as limiting expectations, we should also recognize the lessons from existing work –on telephony, on ICTs, on communications, and on

development more generally. At the project level, this means adopting good practices such as involving users and matching designs to local realities. At the policy level, lessons are urgently needed because many development actors are 'playing catch-up':

Governments – too focused on fixed-line telephony – are only just appreciating the reality of mobiles' domination of the field.

Most donors and international agencies– obsessed about rural telecentres often based on unsustainable European models – were caught unawares by the popularity of mobiles.

Only private firms have been paying attention, getting on with the business of addressing demands and needs.

Tim Kelly discusses some of the policy lessons that should be learned. Liberal policies and private business will work for the majority of mobile service delivery. But they must be combined with government intervention and regulation to ensure the poorest people are not excluded.

Development actors must also plan for the future. To date, mobiles in developing countries have been understood mainly as a means to provide connectivity: the promise of fixed-line telephony finally delivered to a mass market because mobiles have better fit (to needs, income and culture), better functions, and different corporate strategies and government policies. Mobile phones are more than just a fixed-line alternative, however. Policies and strategies must now recognize that they are also:

- Mobile – this 'communications on the move' means people can engage in development activities that previously would not have been possible. For example, although mobile phones enable state surveillance, to what extent can they also allow citizens to monitor the state
- Multi-functional – what are the opportunities, now that many of the world's poor communities have access not just to a phone but to a camera, calculator, audio player, video player, timepiece and a platform for email and Web use, all built into one device?
- Cross-functional – they bring together services that cross existing boundaries and present governments with new decisions. How, for instance, should they handle the overlap between telecommunications and financial regulation now that mobile phones allow airtime to be used as currency?

The implications of all these cannot be understood simply by generalizing from past research on other ICTs. Governments and others need to build specific knowledge about these new capabilities. We have heard about the 'information revolution' and the 'digital revolution' in development. Tempting though it may be, we should avoid talk of a 'mobile revolution'. Yet this is also more than just a 'mobile evolution' – for the next decade or more, we will continue to be surprised by the ways in which these new technologies interact with development processes.

# 3: RESEARCH DESIGN AND METHODOLOGY

## 3.1 Sample

Sample demographic information with respect to age, gender and location was taken for potential control purposes in data analysis. The ratio given to rural verses urban dwellers was 2:3, considering the high number of users in urban areas. 190 questionnaires were given to users between the age of 18 years and 50 which represented 68% of the population sampled. The female male ratio sampled was 1:1.

## 3.2. *Instrument Pre-testing and Piloting*

In July 2008, a pre test survey was administered to 30 mobile phone users representing the different target population grouping.

This was done in order to assess content, construct validity, and reliability of measures. The pre-test results revealed a positive response towards the adoption of mobile telephony. After the pre-test was administered and analyzed, the research instrument was altered by using age group instead of indicating the age. Some questions mainly the TAM questions that were previously "yes and no" questions changed to a scale with five options; strongly disagree, disagree, neutral, agree and strongly agree. This pilot study yielded results similar to those in the pre-test, which strengthens the certainty that this instrument is both valid and reliable. In addition, TAM has been used many times before, and has been found to be robust in explaining technology acceptance. The pilot instrument was adopted for the present study with a few changes. Consistent with TAM constructs, the questions remained largely the same for the TAM, except for rewording. This instrument was used to collect data from 280 mobile phone users, and 254 of the returned questionnaires were valid for use in the analysis.

The method of interview used was a semi structured face to face interview using the TAM constructs as the main structure of the interview, largely confirming the results of that questionnaire.

### *3.3. Survey*

Data were collected via a questionnaire administered to a random population. A five-point Likert-type scale with anchors from "Strongly agree" to "Strongly disagree" was used.

The participants who completed the questionnaires did so voluntarily with no reimbursement for their participation.

The research population is 254 randomly selected mobile phone users in both rural and urban areas; the sample took in to consideration different groupings in terms of social status, age, gender education background etc

The age of the participants varied from under 18; mainly considered to be the school going children and below, college students between the age of 18 to 23, working class 24 years all the way to 50 and then the over 50 who although some might be working were taken as the senior citizen.

28 participants of the population surveyed had physical disability that affects their use of mobile phones.

This population was selected because it is assumed that it represented mobile phone users across the country.

The quantitative method employed the Technology Acceptance Model (TAM) survey as proposed by Davis (1986) to determine the perceptions of the users about accepting and using the mobile phones. The questionnaire designed for this study, consistent with TAM, was used to explain and predict the behaviors of participants towards mobile phone adoption (Davis, 1989; Legris, Ingham & Collette, 2003; McFarland & Hamilton, 2006). Questions were modified by changing the name of the technology system tested from an existing pool of TAM research questions to solicit the extent of the participants' mobile phone acceptance in a survey. (In this case the mobile phone replaced any other system tested previously using TAM).

The study employed the TAM, an adaptation of the Theory of Reasoned Action (TRA) to the field of Information System. TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving



as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use. Figure 4 depicts the research model employed in the study. The external variables constructs is included in the research model as there is intention to examine antecedents to perceived usefulness and perceived ease of use.

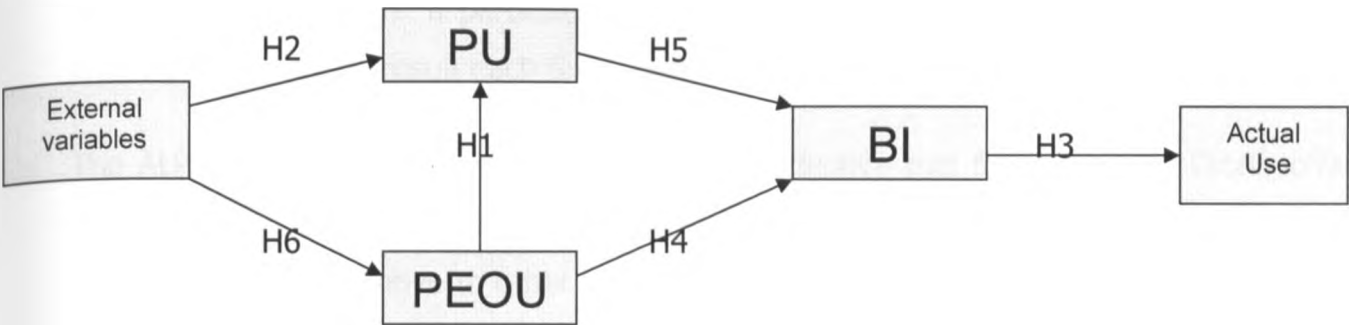


Figure 4: hypothesis testing, TAM

TRA and TAM, both of which have strong behavioral elements, assume that when someone forms an intention to act, that they will be free to act without limitation. In practice constraints such as limited ability, time, environmental or organizational limits, and unconscious habits will limit the freedom to act.

**Instrument Validity and Reliability**

**Validity**

A validated survey instrument was selected, based on TAM, to increase the reliability of the instrument. Also the Cronbach’s Alpha test was performed to test the average internal consistency of each variable of the scale used for TAM (Moore, 2004). There was no need to test for the validity of the TAM instrument because the numerous studies, as shown in the literature review, employed the TAM instrument and established its validity. This encompasses construct, convergent and divergent validity as established on the TAM (Venkatesh and Davis, 2000), therefore TAM is a valid instrument. Validity refers to the approximate and presumed causal relationships that can be generalized to and across different types of groups of people, settings, and times (Cook and Campbell, 1979).

**Reliability**

Reliability is the main strength of quantitative designs because of statistical power, which allows for several tests on the data. Before performing regression tests, the reliability test was done on the TAM variables using the Cronbach alpha reliability test, consistent with prior psychometric properties evaluated on TAM (Venkatesh and Davis, 2000). Reliability is the extent to which "a particular technique, applied repeatedly to the same object, would yield the same result each time" (Babbie, 2001, p.140).

The ALPHA option in PROC CORR provided an effective tool for measuring Cronbach's alpha, which is a numerical coefficient of reliability. Computation of alpha is based on the reliability of a test relative to other tests with same number of items, and measuring the same construct of interest (Hatcher, 1994).

Questions using Likert-type scales (1 = strongly agree; 5 = strongly disagree) were administered. Usable survey forms, totaling 254, were received and processed using the PROC FACTOR and PROC CORR procedures of SAS.

The raw variable columns were used instead of the standardized columns since the variances showed a limited spread. Output has an overall raw alpha of .77 which is good considering that .70 is the cutoff value for being acceptable.

The quantitative portion of this study tested the original TAM model only, which had PU and PEOU as independent variables, and behavioral intention to adopt (BI) as the dependent variable, as first proposed by Davis (1986).

### *3.4. Interview*

The interview participants were chosen using the purposive sample technique, to ensure that all ages, social classes, both genders and all locations were represented. Also, different populations within one sample should also be represented (for example, physically handicapped and the able). A purposive sample for the interview was appropriate for this research. Since many participants fell under the above mentioned categories, the 30 participants were randomly selected within the purposively selected

group. A random selection ensures that all participants have an equal chance of participation (Creswell, 2002).

The criteria for choosing participants included age, location (urban or rural), Social status, gender, and Physical ability that can affect mobile phone as reported in the survey.

The variables for the proposed study are based on the Technology Acceptance Model (TAM), and are used to test the technology acceptance of the subjects. If the subjects perceive Mobile phone as useful and easy to use, then they are more likely to accept Mobile phone technology. The variables and their operational definitions are as follows.

#### *Perceived ease of use (PEOU)*

Perceived ease of use has been defined as a person's belief that using a particular technology, in this case mobile telephony, does not require too much effort (Venkatesh, 2000). If the users do not believe that mobile phones are easy to use, they are not likely to adopt them.

#### *Perceived usefulness (PU)*

Perceived usefulness is the extent to which a user believes that a technology will enhance his/her job performance (Venkatesh, 2000). If the participants do not believe that mobile phones are useful to them, they are not likely to adopt them.

#### *Technology acceptance or adoption*

According to the TAM, system usage behavior is determined by the intention to use a particular system, which in turn, is determined by the perceived usefulness and perceived ease of use of the system (Luarn and Lin, 2005). A person has accepted mobile phone technology if they are willing to use it.

Consistent with the TAM constructs, the distinct hypothesis tested was: Mobile Phones adoption is influenced by several factors and it has had a high impact on Socio-Economic Development in Kenya

This hypothesis was broken down into five sub hypotheses. In accordance with TAM literature, the hypotheses to be tested were as follows:

Hypothesis 1: The degree of ease of use associated with mobile telephony as perceived by users has a positive effect the degree to which they believe that mobile phones help them to attain gains in activities (perceived usefulness).

Hypothesis 2: Mobile phone adoption has a positive influence on socio-economic development

Hypothesis 3: Behavioral intention will have a significant positive effect on actual system use.

- relationship between Social class, and the spending patterns

Hypothesis 4: The degree of ease of use, PEOU associated with the use of mobile phones as perceived by users has a positive effect their intention to use, BI.

Hypothesis 5: The degree to which users believe that mobile phones will help him or her to attain gains goals (perceived usefulness) has a positive effect on his/her intention to use.

- Economic activities around mobile phones.
- Services used

Hypothesis 6: External variables have a positive effect on perceived ease of use.

# 4: ANALYSIS AND RESULTS

## *4.1. SURVEY ANALYSIS AND RESULTS*

The purpose of the quantitative portion of this study was to use the Technology Acceptance Model (TAM) to predict and describe the participants' behavioral intention to adopt and use mobile phones. This study examined mobile phones adoption readiness. TAM was used to determine the perceptions of the participants about accepting and using mobile phones, using three constructs; perceived ease of use (PEOU), perceived usefulness (PU) and behavioral intention (BI) to adopt (Davis,1986). Altogether there were 254 randomly selected participants who responded to the survey questionnaire and 30 purposely selected interviewees.

Data were analyzed in two stages. The first stage was quantitative data analysis, using descriptive and inferential statistics. Descriptive statistics were used to describe the means and distribution while inferential statistics was used to do collinearity tests, and multiple regression tests for hypotheses testing. Data from the questionnaires were coded and analyzed to develop descriptive and inferential statistics. Demographic information was used to provide percentages, and means to describe characteristics of the population, while inferential statistics tested the TAM hypotheses, as well as provided answers for the research questions. The testing of TAM variables employed multiple regression. The next stage was qualitative data analysis using content analysis techniques to characterize and classify the participants.

### **Description of the Research Population**

#### **Demographic Information**

The purpose of the demographic data in this study is to give the reader a description of the population studied. Demographic information was collected for the age, gender, occupation, place of residence, education level, physical capability and income level variables.

The age of the participants varied from 11.8% under 18, 15.7% in the range 18-23, 25.2% in the 24-34 range, 28.3% between 34 and 50, and 18.9% for the 50 and above range. Which is a close reflection of the age distribution of mobile phone users in Kenya. Gender yielded 54.3% male and 45.6% female participants. This result is not a true picture of the gender percentage of the Kenyan population. According to the latest estimates the population 0.88 Males for every female. However the no official census has been carried out for almost 20 years these are just estimated values.

For the sake of analysis we classified the different forms of occupation given in to students; 23.6 %, white collar/ office employed; 41.7% and Blue collar/ self employed; 34.6 %.

About 59 % of the participants reside in urban areas where as 41% are rural dwellers.

7% of the participants are educated to primary level and below, 18% Secondary, 47% college and 27% University.

Only 11% of the population surveyed had physical disability that affects their use of mobile phones compared to the 89% how did not.

And as for the level of income; none 23.6%, less than Ksh10, 000; 11.8%, Ksh10, 000 to Ksh 40,000 29.1%, between Ksh40, 000 and Ksh100, 000 23.6% and 12.6% of t he populations earns over Ksh100, 000 per month.

	DEMOGRAPHICS	SAMPLE POPULATION%
Age	Under 18	11.80%
	18-23	15.70%
	24-34	25.20%
	34-50	28.30%
	Over 50	18.90%
Gender	Male	54.30%
	Female	45.60%
Occupation	Students	23.60%
	White Collar	41.70%
	Blue Collar	34.60%
Residence	Rural	41%
	Urban	59%
Education	Primary	7%
	Secondary	17%
	College	47%
	University	27%
Physical disability	Yes	11%
	No	89%
Income level	None	23.60%
	<Ksh10,000	11.80%
	Ksh10,000-40,000	29.10%
	Ksh40,000-100,000	23.60%
	>Ksh100,000	12.60%

Table 5: Demographic data

Age	Gender	Residence		Total
		Rural	Urban	
Under 18	male	8	11	19
	Female	4	7	11
18-23	male	8	12	20
	Female	6	14	20
24-34	male	13	17	30
	Female	12	22	34
34-50	male	19	22	41
	Female	12	19	31
Over 50	male	14	16	30
	Female	8	10	18
<b>Total</b>		<b>104</b>	<b>150</b>	<b>254</b>

Table 6: Residence, Sex and ages of mobile phone users

## **Descriptive Data Analysis**

The independent variables, perceived ease of use and perceived usefulness and one dependent variable (behavioral intention to adopt) were tested to find out the perceptions of the users regarding adopting and use of mobile telephony. Descriptive data on the independent variables under observation: perceived ease of use, and perceived usefulness, and the dependent variable: intention to adopt revealed positive skewness, There was also and a large standard deviation which shows that there are relatively more participants scoring toward one extreme or the other (Moore, 2004).

The next stage of analysis was performed on the three variables, perceived usefulness, perceived ease of use and intention to adopt and use mobile phones, to test the hypotheses and answer the research questions. Multiple regression was used because there was one dependent variable, intention to adopt and use, and two independent variables or predictors; perceived ease of use, and perceived usefulness.

All items were measured on a 5-point Likert scale, where 1 was strongly agree, 2; agree, 3; neutral (neither disagree nor agree), 4; disagree, and 5; strongly agree

## **Regression Tests**

The testing of the TAM to find out to which the extend participants intend to adopt and use mobile phones. The regression equation tested is  $Y = a + bX_1 + bX_2 + e$ . The result of the regression model shows an R square of 0.273. The results have largely confirmed the findings of prior research that TAM is robust in explaining the user acceptance of the system. The results indicate that overall TAM is statistically significant at R of 0.522 and adjusted R<sup>2</sup> of 0.273, with the two independent variables (PU and PEOU) accounting for 27% of the variance in the intention to adopt and use mobile phones (BI). The adjusted R<sup>2</sup> of 0.273 means that the model explains about 27% of the variance in usage intentions. The next step in the analysis was to test the hypotheses.

## **Hypotheses Testing**

Hypothesis 1 tested the degree to which the ease of use associated with mobile telephony as perceived by users has a positive effect the degree to which they believes that mobile phones help them to attain gains activities (perceived usefulness).



Hypothesis 2: tested whether mobile phone adoption has a positive influence on socio-economic development in Kenya.

Hypothesis 3 tested what significance Behavioral intention will have on actual system use.

- relationship between Social class, and the spending patterns

Hypothesis 4 tested the degree to which ease of use, PEOU associated with the use of mobile phones as perceived by users has a positive effect their intention to use, BI.

Hypothesis 5 tested the degree to which users believes that mobile phones will help him or her to attain gains goals (perceived usefulness) has a positive effect on his/her intention to use.

- Economic activities around mobile phones.
- Services used

Hypothesis 6 tested whether External variables have a positive effect on perceived usefulness and perceived ease of use.

Both PU and PEOU explain 27.3% of the variance in the intention to adopt and mobile phones, supporting Hypothesis 4 and Hypothesis 5. Both PU and PEOU have an effect on BI, which pertains to the intention to adopt and use mobile telephony.

Further evidence supporting the Hypothesis is based on the betas. The beta is the meaningful interpretive choice because it compares the relative importance of several variables in a regression model since each standard deviation increase in X should result in an X amount standard deviation in Y. The results on the beta of the individual item of the independent variables reveal a predictive power of the PU and PEOU variables as shown in Table 6 below. Each of the two independent variable items had a statistically significant effect on the intention to adopt and use (from table), indicating that each additional impact of PU, intention to adopt increases by the stated points and the same explanation goes for PEOU with supporting H4 and H5 respectively. Therefore PU and PEOU are significant determinants of intended use in this study.

Items	Standardized Coefficients Beta
<b>Perceived Usefulness</b>	
improved social life	0.084
improved business	0.277
improved my work	0.094
Mobile phone features	0.101
<b>Perceived ease of use</b>	
Learning to operate was easy	0.35
Phone menu system is clear and understandable	0.402
The services offered	0.416
The button size	-0.233
The overall phone size	-0.3
The text size on the screen	0.141
<b>Behavioral intention to use</b>	
Cant go 2 wks without phone	0.350
Always use phone to do tasks	0.218
Opt to buy another on breakdown	0.416
Use a financial burden	-0.120
stick to the inbuilt ring	-0.342
<b>External Variables</b>	
Cultural discourage the use	0.017
status encourages the use	0.112
Use enhances image	0.217
People influence choose of handset	0.232
People influence choose of tariff	0.310
Impact of political institutions	0.142
Sufficient infrastructure	0.122
Financial factors	0.159
Attitude towards using technology	0.523

*Table 7; Item statistics betas.*

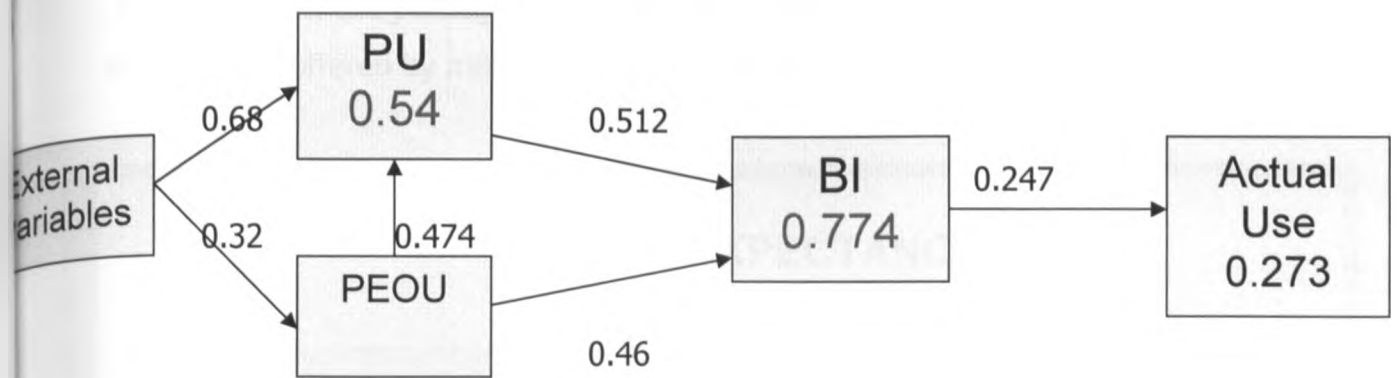


Figure 5: Model testing results

### Distinct Hypothesis and Research Questions

To conclude the hypotheses testing, consistent with the TAM constructs, the distinct hypothesis tested was; Mobile phone users will adopt and use mobile phones if they perceive them to be ease to use and useful for their day to day activities. Based on the results of the regression model with an R square of 0.273, it can be concluded that there is substantial support that the participants who found mobile phones easy to use and useful in their job, intended to adopt and use them.

### Research Questions

**Question 1** What are ethnographic influences on mobile Phone adoption?

The question on the ethnographic influences on mobile Phone adoption revealed a positive response with the majority of the younger participants reporting that they found most features and services offered by mobile phone companies easy to use. This finding was supported by the standardized regression coefficient betas for PEOU statements; "Learning to operate was easy" (.350), and "The services offered are easy to understand" (.416) indicating that each additional impact of PU, intention to adopt increases by the same amount.

However the negative betas for "button size" (-.200) and "The text size on the screen" (-.141), are very important because they signal the researcher to possible problems with mobile phone adoption.

Figure 6 below the participants' perception on the easy of use of mobile phone handsets and services offered by mobile phone companies

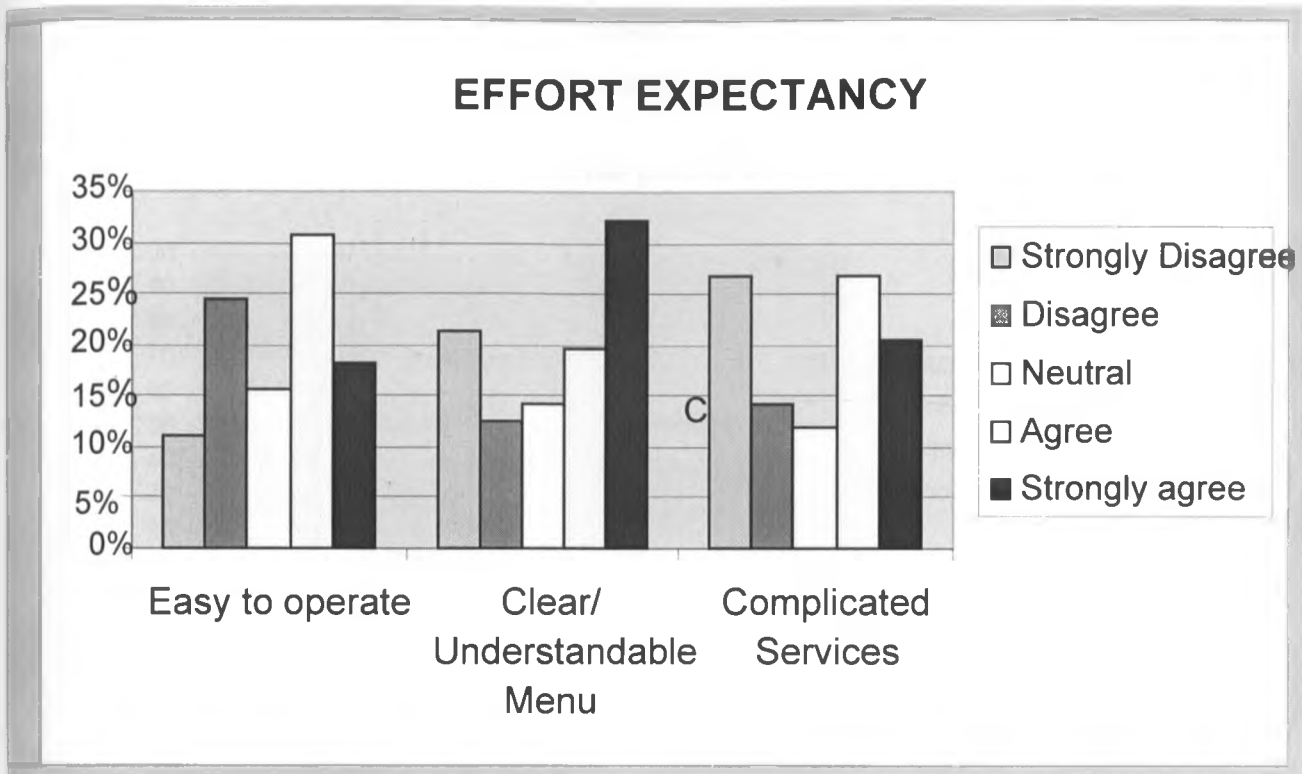


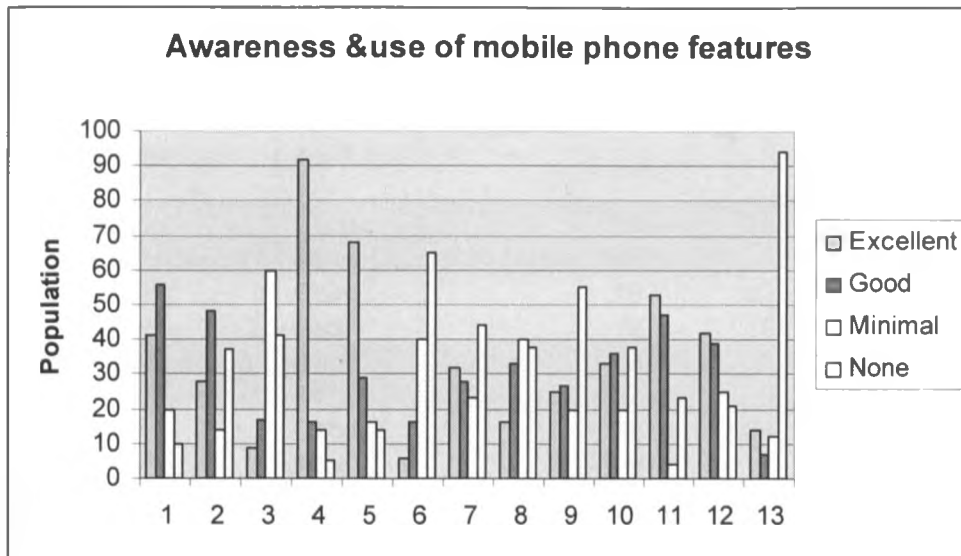
Figure 6: Effort Expectancy

A closer look at the effort expectancy reveals that men agree that learning to operate and use mobile phone handset was easy for them as compared to women while the complexity of the services offered is almost the same for both men and women as demonstrated in table 9 below.

	Gender	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Learning to operate easy	Male	31	56	20	9	22
	Female	15	19	25	19	38
Phone menu system clear/understandable	Male	53	30	12	14	29
	Female	30	19	24	19	24
Services too complicated to understand and use	Male	31	34	16	21	36
	Female	22	33	14	15	32

Table 8: Effort Expectancy on Gender

We took a look at some of the features common to all mobile phone handsets to find out useful mobile phone users find them. Whereas majority of the users were aware and made use of phone book, text messaging and direct dialing, many had multimedia messaging was. Picture messaging was also unpopular as shown in figure 10 below.



1	Direct dialing
2	Speed dialing
3	Voice dialing
4	Phonebook
5	Text messaging
6	Picture messaging
7	Camera
8	Message bank
9	Internet access
10	Bluetooth connectivity
11	Radio
12	Menu system
13	Multimedia messaging

Figure 7: Awareness and use of mobile phone features

Next we examined different ages and the level of awareness and use of mobile phone features and the result is as shown in table 11 below; the young (under 18) and the middle age (18-50), were comfortable with common mobile phone features, while for the old it was not so obvious, citing a feature as popular as text messaging were almost half were poor at, the same case applies for phone book.

Mobile phone Feature		Age				
		under 18	18-23	24-34	34-50	Over 50
Direct dialing	Good	27	38	58	69	32
	Poor	3	2	6	3	16
Speed dialing	Good	18	22	42	38	32
	Poor	12	18	22	34	16
Voice dialing	Good	8	11	18	8	7
	Poor	22	29	46	64	41
Phonebook	Good	30	34	57	63	32
	Poor	0	6	7	9	16
Text messaging	Good	27	30	53	59	25
	Poor	3	10	11	13	23
Picture messaging	Good	11	14	8	9	2
	Poor	19	26	56	63	46
Camera	Good	14	32	45	24	5
	Poor	16	8	19	48	43
Message bank	Good	9	23	38	22	6
	Poor	21	17	26	50	42
Internet access	Good	19	25	33	17	10
	Poor	11	15	31	55	38
Bluetooth connectivity	Good	21	29	41	33	14
	Poor	9	11	23	39	34
Radio	Good	22	34	60	54	30
	Poor	8	6	4	18	18
Menu system	Good	18	32	47	44	21
	Poor	12	8	17	28	27
Multimedia messaging	Good	4	10	12	13	3
	Poor	26	30	52	59	45

*Table 9: Awareness and use of mobile phone features on age*

Still on mobile phone features we looked at the effect of place of residence; rural verses urban dwellers. The difference here was not so obvious leading us to conclude that the place of residence has no effect on mobile phone features awareness and use.

Mobile phone Feature		Place of Residence	
		Rural	Urban
Direct dialing	Good	88	136
	Poor	16	14
Speed dialing	Good	56	100
	Poor	48	50
Voice dialing	Good	13	39
	Poor	91	111
Phonebook	Good	71	145
	Poor	33	5
Text messaging	Good	87	107
	Poor	17	43
Picture messaging	Good	12	32
	Poor	92	118
Camera	Good	33	87
	Poor	71	63
Message bank	Good	33	65
	Poor	71	85
Internet access	Good	28	76
	Poor	76	74
Bluetooth connectivity	Good	40	98
	Poor	64	52
Radio	Good	80	120
	Poor	24	30
Menu system	Good	64	98
	Poor	40	52
Multimedia messaging	Good	14	28
	Poor	90	122

Table 10: Awareness and use of mobile phone features on place of residence

**Question 2** How has mobile phone adoption impacted on socio economic development in Kenya?

On the participants' perceptions about the usefulness of mobile phones, most participants reported that they found mobile phones useful in their job. This finding was supported by the standardized regression coefficient betas for PU statements; improved social life (.084), improved business (0.277), improved work Accomplish tasks (0.094),

useful Mobile phone features (0.101), indicating that users agree that mobile phones are useful. The positive betas indicate the impact those PU statements have in predicting system usage or intention to adopt. Therefore it can be concluded that users reported that mobile phones are useful.

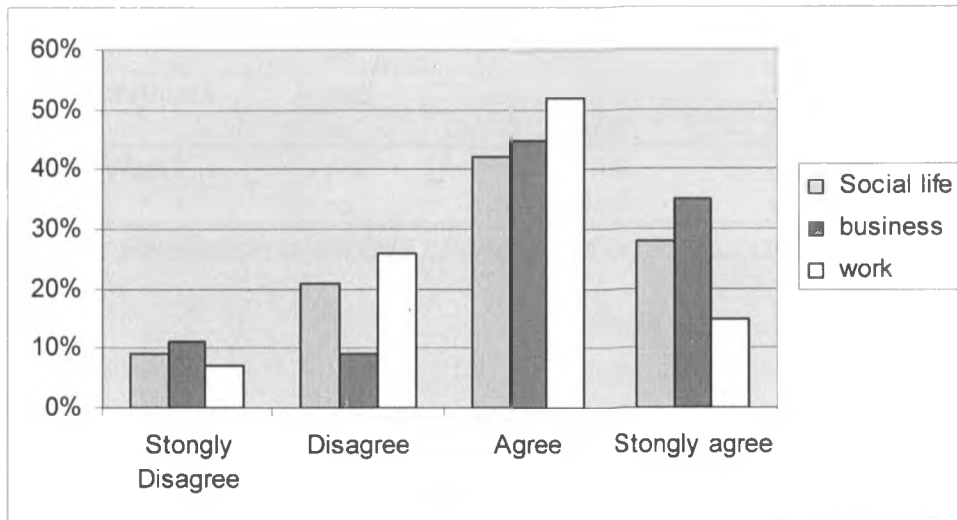


Figure 8: Perception of mobile phone adoption impact on social life, business and work

The effect of gender on shows that for women mobile telephony is more of a social tool with 33% female agreeing that it has brought improvement on social life compared to men’s 25%. While on the effect on business men agree more that it has had a positive effect on business 39% compared to women 30%.

		male	female	Total
Improved social life	yes	25%	33%	58%
	no	15%	11%	26%
Improved Business	yes	39%	30%	69%
	no	5%	3%	8%
improved Work	yes	22%	22%	44%
	no	20%	19%	39%

Table 11: Perception of mobile phone adoption impact on gender



There is a significant effect on the place of residence, the urban dwellers see mobile Phone as having improved social life, business and work more compare to their rural counterparts as shown in table 14 below.

		Rural	Urban	Total
Improved social life	yes	11%	37%	48%
	no	27%	24%	51%
Improved Business	yes	12%	30%	42%
	no	25%	13%	38%
improved Work	yes	8%	29%	37%
	no	24%	17%	41%

*Table 12: Perception of mobile phone adoption impact on Place of residence*

**Question 3** What is the relationship between social class and spending patterns?

**Question 4** What are the economic activities around mobile phones?

**Question 5** What are the barriers to usage (apart from access)?

The above questions answered the broader question; do participants intend to adopt and use mobile phones?

The question on the perceptions of the users regarding adopting mobile phones produced mixed responses. Based on the results of TAM, the majority of participants reported that they intend to adopt mobile phones

This finding was supported by the standardized regression coefficient betas for BI statements; "Cant go 2 wks without phone" (0.350), "Always use phone to do tasks" (0.218),

"Opt to buy another on breakdown" (0.416), "status encourages the use "(0.112) "Use enhances image" (0.217). However the negative betas the statements below are an indication of a possible problem with the adoption.

"Use a financial burden" (-0.120), "I stick to the inbuilt ring" (-0.342), Cultural practices discourage the use (-0.017)

Figure 9 below shows how users responded to the questions on the intention to use, while figure 10 and 11 compares users from the upper social class to those from lower social class.

### Behavioral intention to use

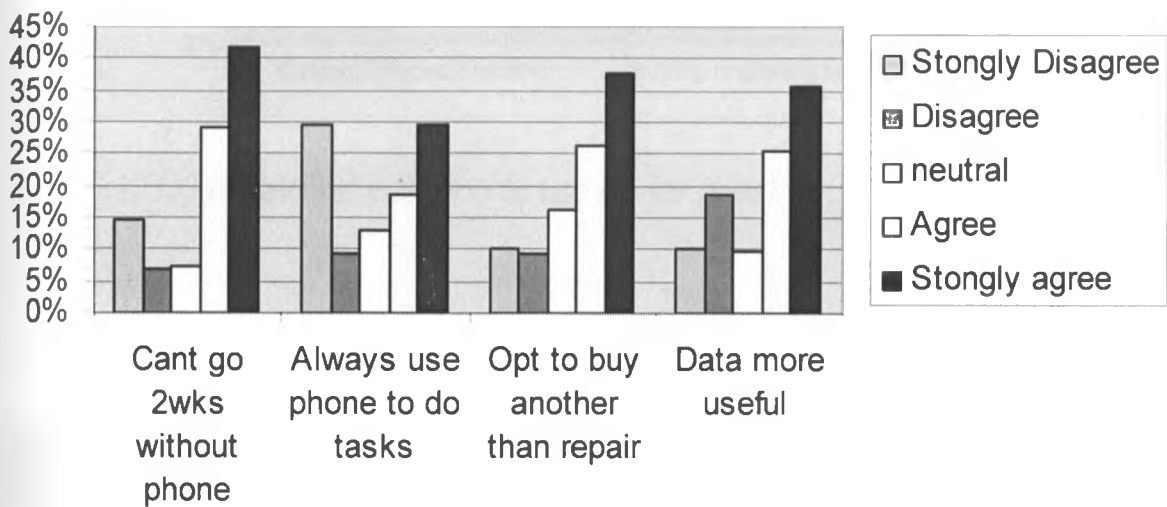


Figure 9: Behavioral intention to use

### Upper Class

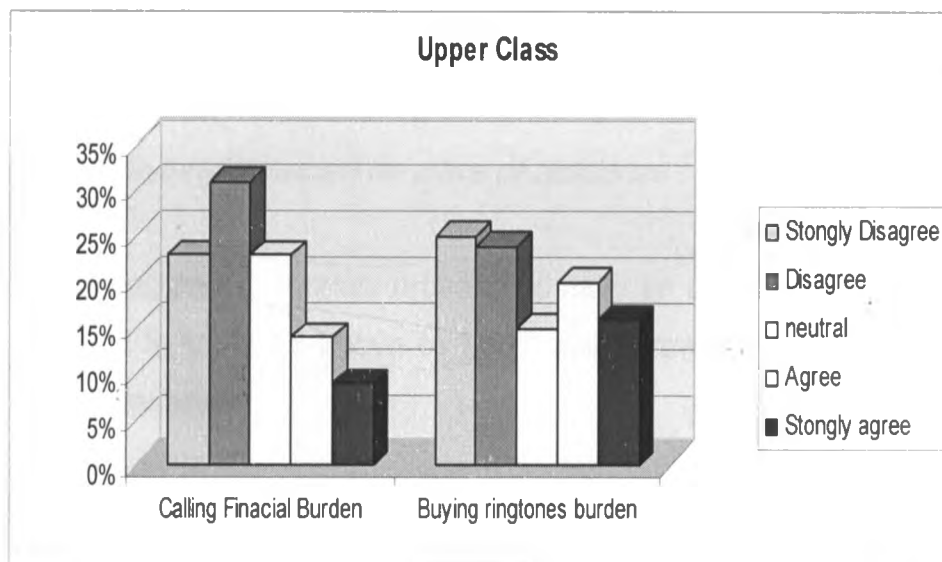


Figure 10; Behavioral intention to use (upper class)

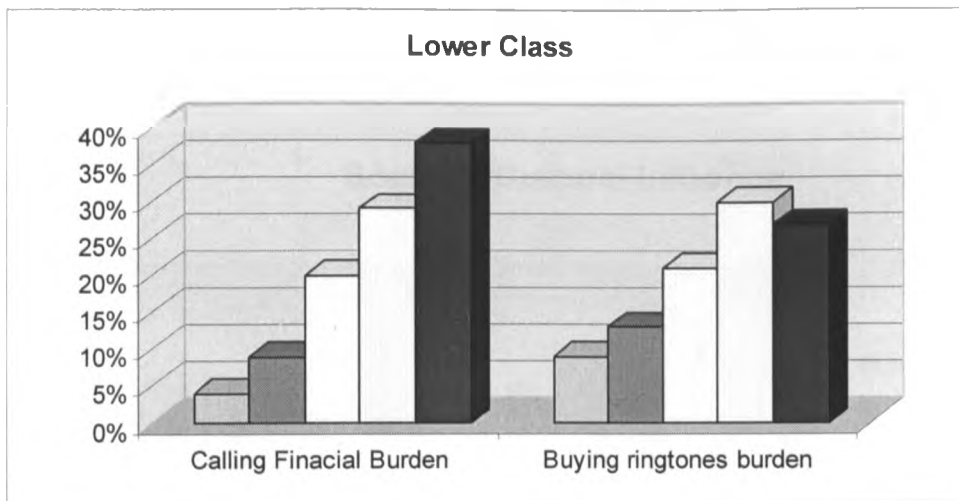


Figure 11; Behavioral intention to use (lower class)

	Place of Residence	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Can't stay over 2wks without a phone	Rural	17	29	14	12	32
	Urban	89	41	6	6	5
Always use the my mobile phone to do my tasks	Rural	16	8	18	10	52
	Urban	58	48	14	6	24
When my phone breaks down I opt to buy another	Rural	31	14	20	17	22
	Urban	63	52	24	7	5
More scared lose data in my phone than the handset	Rural	16	23	19	28	18
	Urban	72	37	17	16	8

Table 13: Behavioral intention on place of residence

The place of residence; rural or urban does have an effect on the behavioral intention to use, displayed in table 15 above to from urban areas rely more on mobile phone than those from rural areas.

More than 50% of the population agrees that cultural and social background influence mobile phone use.

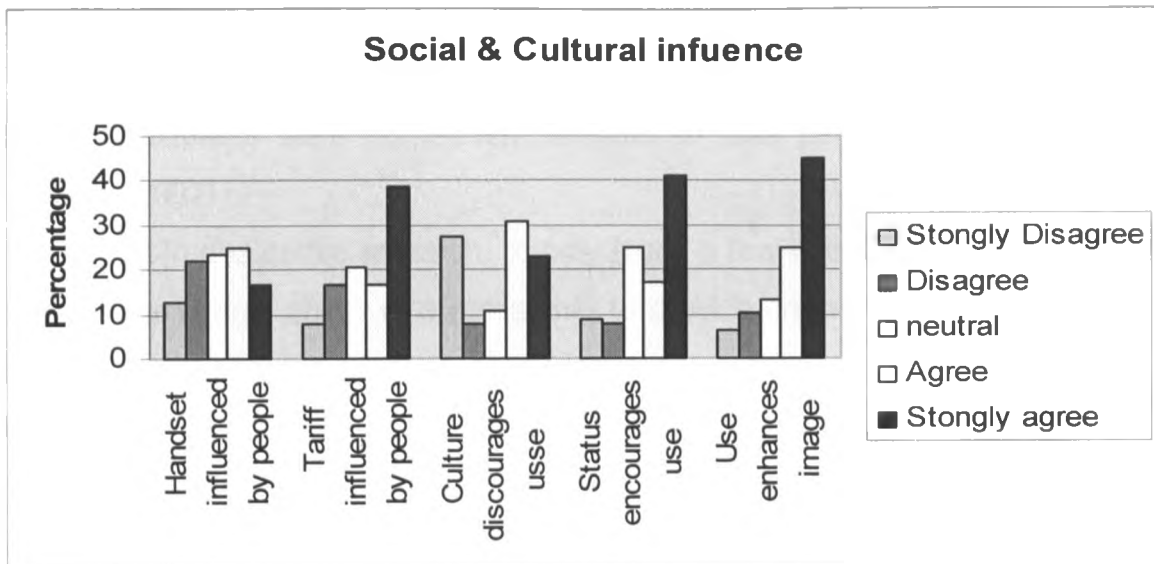


Figure 12: Social and cultural influence

## **4.2. INTERVIEW ANALYSIS AND RESULTS**

Thirty participants were purposively selected to take part in interviews. According to Creswell (2002),

It is typical in qualitative research, to only study a few individuals or a few cases. This is because the overall ability of a researcher to provide an in-depth picture diminishes with the addition of each new individual or case.

Therefore, in accordance with Creswell's statement above, thirty participants seemed to be a reasonable number for the qualitative portion of the present study. Purposive sampling was employed for this portion of the study.

### **Type of Interview Questions**

The TAM survey results confirmed the hypothesis that if users find a mobile phone easy to use and useful they are more likely to adopt it. The survey results showed that perceived ease of use (PEOU) and perceived usefulness (PU) explain 27 % of the variance in the dependent variable: intention to adopt mobile telephony (BI).

The next step was to fill in the gaps and to answer the questions raised in the survey analysis. Fredland (2000), discussing the issue, says possible reactions of the intended recipients of the technology and their desires to accept new innovations need to be examined. The main objective that was originally formulated for the qualitative part of the study was; To find the gaps created by the survey analysis

### **Objectives**

To find out users are comfortable with mobile technology

To investigate how useful the mobile telephony is to the various users

To find out if learning how to use the handset is a problem

And the questions asked in the interviews were:

Are mobile phone users comfortable with using the mobile phone hand sets? "What is your comfort zone around mobile phones? Do you feel comfortable using the various handsets in the market?"

Do users think that mobile telephony has increased their job performance? Do you find the mobile phone useful to you?

Do some users think that it is not easy to learn how to use the various features? Do you find the features easy to use or learn how to use?"

### **Question 1:**

Are mobile phone users comfortable with using the mobile phone hand sets?

The main questions the researcher asked the participants were, "What is your comfort zone around mobile phones? Do you feel comfortable using the various handsets in the market?"

In response to the questions above, seven participants reported that they were very comfortable with the use of mobile phone handsets. They described themselves as "very comfortable." Twelve participants described themselves as "comfortable", while eleven expressed some degree of discomfort. They said they were "not comfortable" and stuck mostly to just calling and receiving calls.

During the interview participants described the fear of mobile phones and technology in general using several adjectives. They used the words: ***afraid, fear, phobia, intimidation*** and ***lack of comfort***. It can be concluded that that use of these words represent a real problem among the participants.

One participant said in relation to this fear that people are afraid of new things and for a long time she did not use a mobile phone thinking it was for other people out there. Asked to elaborate she said she thought they were for the educated people and the rich. Another said "I have a phobia for technology and also I am old, you see the phobia is not about mobile phones only; it's about all the other new gadgets as well. So personally I have that phobia."

In summary, it can be concluded that according to the reports the younger generation are comfortable around mobile phones and learn how to use the features very fast, while the older are not comfortable.

Men seemed to express more comfort but for the must older the comfort level was the same.

One blind and one partially blind interviewee suggested the use software that they are currently using in computers; JAWS to enable them enjoy the full benefits of their phones. The program is able to translate any text into speech.

### **Question 2:**

Do users think that mobile telephony has increased their job performance?

In response to the interview question on the perceived usefulness of mobile phones, all participants described them as useful. The interview question that asked about the usefulness of mobile telephony was responded to positively. The question was, ""Do you find the mobile phone useful to you?"

All thirty participants reported that the mobile phone was very useful to them. Most of the adjectives used express the extent of its usefulness to them. Some of these are, "essential and necessary", "very useful" and "highly useful." Some participants expressed very strongly how useful the computer is to them. One of them responded by saying, "Oh Yes! Ah! In these times, is there anybody who can say they do not see its usefulness? I cannot leave the house without it, I feel like something is missing Using a mobile phone is not a choice." Other participants said, "Extremely, it is not a question of usefulness, it is part of my life."

### **Question 3:**

Do some users think that it is not easy to learn how to use the various features?

The responses to question 3 indicated that there were two major camps within the research group. The first camp of participants consisted of all of those who had previously reported that they are very comfortable around mobile phones and technology; they said that they find the features easy to use. The reasons given for the ease of use by the members in this camp were practice and exposure to different handsets

In the second camp were those who did not find mobile phones easy to use, all the members who were uncomfortable,

Participants in the second camp confirmed that the learning and use mobile phone features poses some challenges and prefer to stick to what is most important

One problem that surfaced during the interviews is that of lack of interest. One participant, commenting on lack of interest by themselves says, "There very many features that am not aware of after all I don't need them, so long as I can call and receive"



## 5: CONCLUSIONS AND RECOMMENDATIONS

This study examined the applicability of TAM to explaining mobile phone adoption and the impact mobile telephony has had on socio-economic development in Kenya. The model was evaluated using data collected from 254 mobile phone users across the country. Several implications can be drawn from the findings of the study. First, an important contribution of the findings of this study reveal that, in order to foster individual intention to use mobile technology, positive perception of the technology's usefulness is crucial, (PEOU and PU) 46% and 51% respectively. Intention to use the mobile technology is important but may not be equally important.

Age is a factor in mobile phone features awareness and use. It was revealed just like expected the young and more comfortable around more phone handsets, while for the elderly phones a kept strictly for the basics; communication (voice). Although this was not part of the study it would have been interesting to find out why this is so. The place of residence, rural or urban had no effect here, but had an effect on how mobile phones are perceived in terms of improving social, work and business. The urbanite felt there has been a positive effect on these from mobile telephony.

Still for many there is no doubt that mobile telephony has improved lives and is a factor in Socio-economic development. Making calling rates more affordable would go along way in encouraging more people especially the poor to adopt and use mobile telephony so would interface change for the sake of the physically handicapped.

The upper class has a high intent to use mobile phone technology, as expected. Calling is not a financial burden for the majority in the upper class as compared to the lower class but buying ring tones does not seem so popular for both social groups.

The external factors tested greatly influence perceived ease of use, at 32% but have very little influence on the perceived usefulness, 2%. These external factors included; impact on political institutions/ infrastructure, social and cultural influence.

Discomfort around new technologies is not so rampant in mobile phone use only a few displayed some level of phobia. Many though indicated that the phone is for basic

communication; voice and SMS and are not interested in the other features in the mobile phone handset.

Future research is aimed at evaluating acceptance and adoption after the introduction of other mobile phone service providers which has considerably brought down calling cost over time. It would be necessary to study a larger population which would be more representative.

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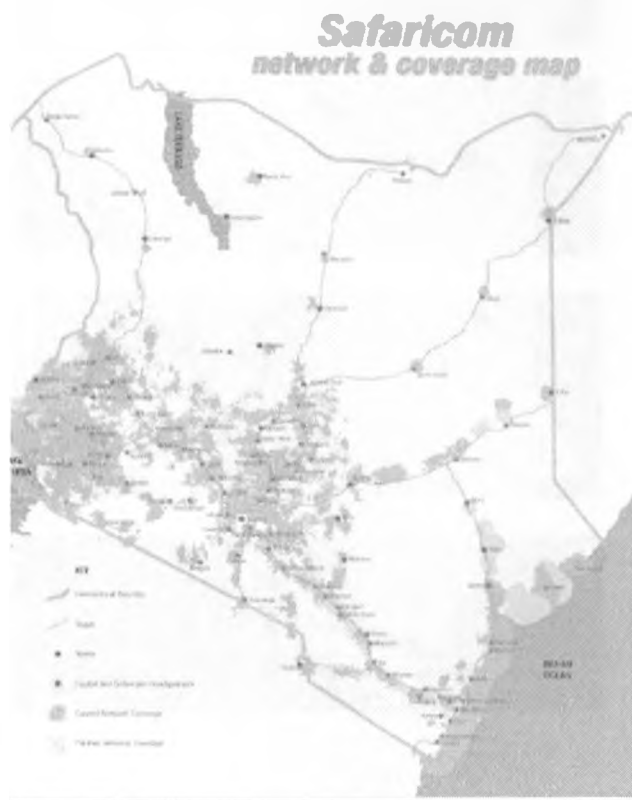
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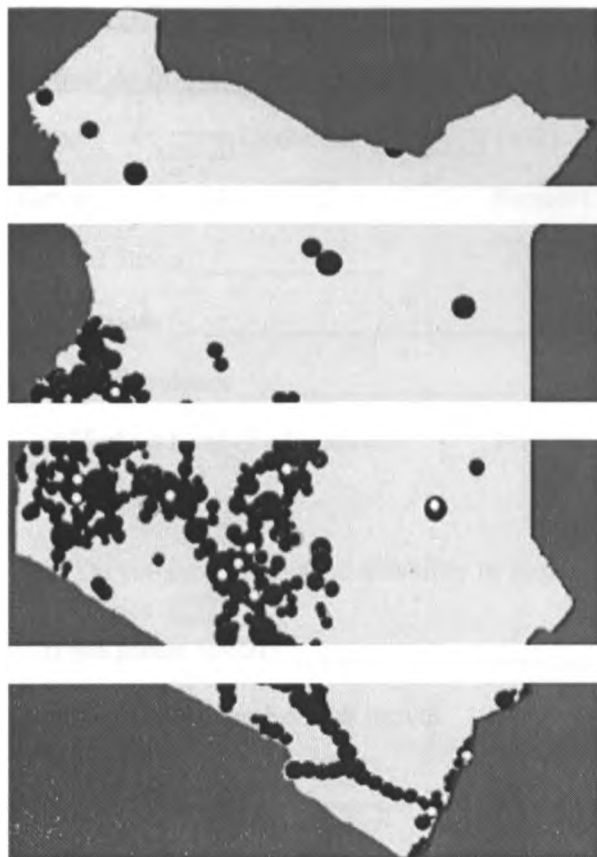


# APPENDIX

## APPENDIX 1 Safaricom network coverage:



APPENDIX 2: Celtel network coverage



APPENDIX 3: Questionnaire

**Please fill in the following information based on your current phone usage:**

**Section A: Information about you to help us group our data:**

1 Age:  Under 18  18-23  24-34  35-50  Over 50

Gender: Male  Female

Marital Status \_\_\_\_\_

Occupation: \_\_\_\_\_

Place of Residence \_\_\_\_\_ (Nairobi, Mombasa, Nakuru etc)

2. a) Highest level of education: Primary  Secondary   
College  Univer

b) Do you have a physical disability or impairment that can affect your usage of a mobile phone?

Yes  No

If yes please specify \_\_\_\_\_

c) Income level in Ksh Per month

None  Less than 10,000  10,000-40,000   
40,000-100,000  Above 100,000

3. a) What is the make and model of your current mobile phone? \_\_\_\_\_

**Section B: This section will ask questions about the features on mobile phones.**

Please indicate the level of awareness and use of each of the following features found in mobile phones

Feature            1: Excellent:                            2: Good                            3: Minimal                            4: None

Direct dialing				
Speed dialing				
Voice dialing				
Phonebook				
Text messaging				
Picture messaging				
Camera				
Message bank				
Internet access				

Bluetooth connectivity				
Radio				
Menu system				
Multimedia messaging				

**Section C: This section will ask questions about your opinions regarding the Physical usability of mobile phones.**

**PERCEPTION OF THE YOUR MOBILE PHONE:**

C1. Please rate the following:

	Too small	Just right	Too big
The button size on current mobile phones in general is:			
The overall size of current mobile phone handsets in general is:			
The text size on the screen of current mobile phones in general is:			

C2. What is more important?

Overall phone handset Size   
the weight

Button size

C3. What is preferable? (Tick one or more)

Raised buttons

Flat buttons

Touch screens

any

**Section D:**

Please indicate the level to which you agree/disagree with the following statements based on the following rankings by ticking on 1, 2, 3, 4 or 5 as per the rankings:

1: Strongly agree 2: Agree 3. Neutral 4: Disagree 5: Strongly disagree

**1: PERFORMANCE EXPECTANCY:**

	1	2	3	4	5
Using a mobile phone improved social life					
Using a mobile phone improved business					
Using a mobile phone improved my work					

**2: EFFORT EXPECTANCY**

	1	2	3	4	5
Learning to operate my current phone was easy for me					
My Phone menu system is clear and understandable					
The services offered by my service provider, it are too complicated to understand					

1: Strongly agree 2: Agree 3. Neutral 4: Disagree 5: Strongly disagree

**3: SOCIAL AND CULTURAL INFLUENCE**

	1	2	3	4	5
People who are important to me influence my choose of mobile phone handset					
People who influence my behavior influence my choose of tariff					
Cultural practices around me discourages the use of the mobile phones					
My status in society encourages the use mobile phones					
Using a mobile phone enhances my image among my peers and in the society					

**4: BEHAVIORAL INTENTION TO USE**

	1	2	3	4	5
cannot stay longer than 2 weeks without a mobile phone					
will always use the my mobile phone to do my tasks					
When my phone breaks down I opt to buy another					
am more scared lose data and information in my phone than the handset					

**5: IMPACT OF POLITICAL INSTITUTIONS/INFRASTRUCTURES**

	1	2	3	4	5
people in authority encourage mobile phone business					
there is support from the government to use mobile phones					
the network coverage is sufficient					
feel the calling rates can still be brought down					

**6: FINANCIAL FACTORS:**

	1	2	3	4	5
Using mobile phones is a financial burden to me due to high costs of calling					
stick to the inbuilt ring tones cause I find buying others an unnecessary cost					
doesn't cost me to charge my mobile phone battery					

**7: FACILITATING CONDITIONS**

1. Do you currently have more than one line? Yes No

If yes give reason why \_\_\_\_\_

2. What network are you currently on: Safaricom                      Celtel                      Telecom  
wireless

3. What is your payment plan      Post paid      Pre paid

If prepaid in what denominations do you top up your air time? \_\_\_\_\_

And how often do you top up \_\_\_\_\_

4. What tariff are you on? \_\_\_\_\_

5. Which of these services do you use, and how often?

Simu ya Jamii \_\_\_\_\_ Soko tele \_\_\_\_\_

None

### 8: ATTITUDE TOWARDS USING TECHNOLOGY

a. What services do you use?

Voice  what is the average time you spend on the phone per day \_\_\_\_\_

SMS  how many text messages do you send and receive per day \_\_\_\_\_

Data  how much time do you spend browsing on your  
phone \_\_\_\_\_

b. Which of these services do you use? Please tick

Sambaza  Sokoni

Me 2 you  DrumNet's SMS  Market prices service

Others,  please specify \_\_\_\_\_

c. Are You M-pesa registered?

Yes  When you Started using M-pesa, Did you consider security \_\_\_\_\_

d. Which phone make in your opinion is easiest to use \_\_\_\_\_?