

Cybersecurity in the Kenyan Context

Mwende Njiraini

Tutor: DiploFoundation

Presented at the 23rd Annual FIRST Conference held in Vienna Austria, 12-17 June
2011



www.MagicalKenya.com

Kenya...where is that?



Welcome to Magical Kenya

A great sporting nation...

Investment Destination



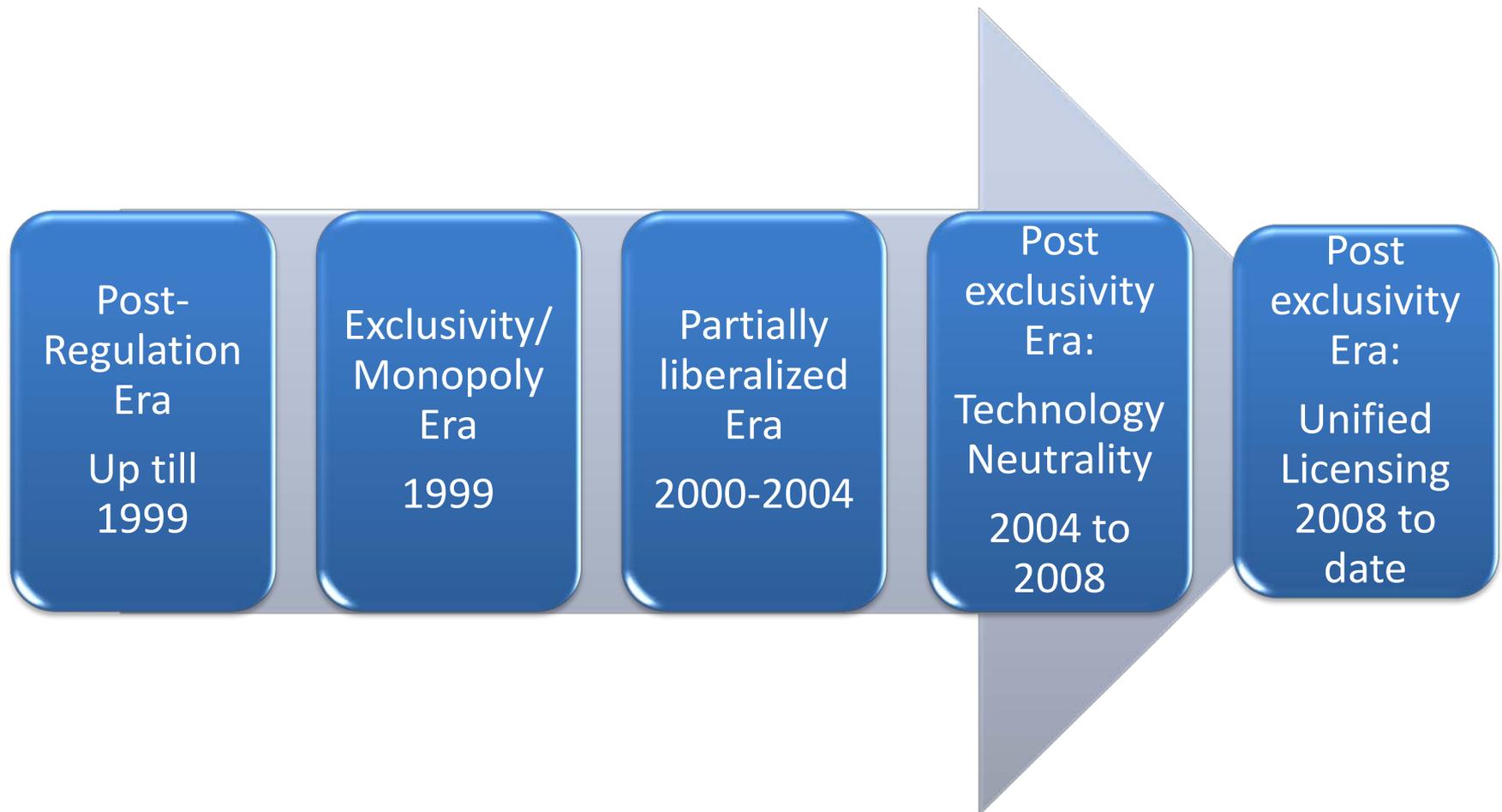
Wafula, P. (2011) Global firms pitch camp in Nairobi to tap new markets. Available at: <http://www.businessdailyafrica.com/Corporate+News/Global+firms+pitch+camp+in+Nairobi+to+tap+new+markets/-/539550/1152018/-/3aaqb3z/-/index.html> [Accessed June 2011]

Changing Landscape

- A. Regulatory Reform
- B. Entrepreneurship and Innovation
- C. Infrastructure
- D. Mobile Subscription
- E. Mobile-X services
- F. Now the bad and ugly!

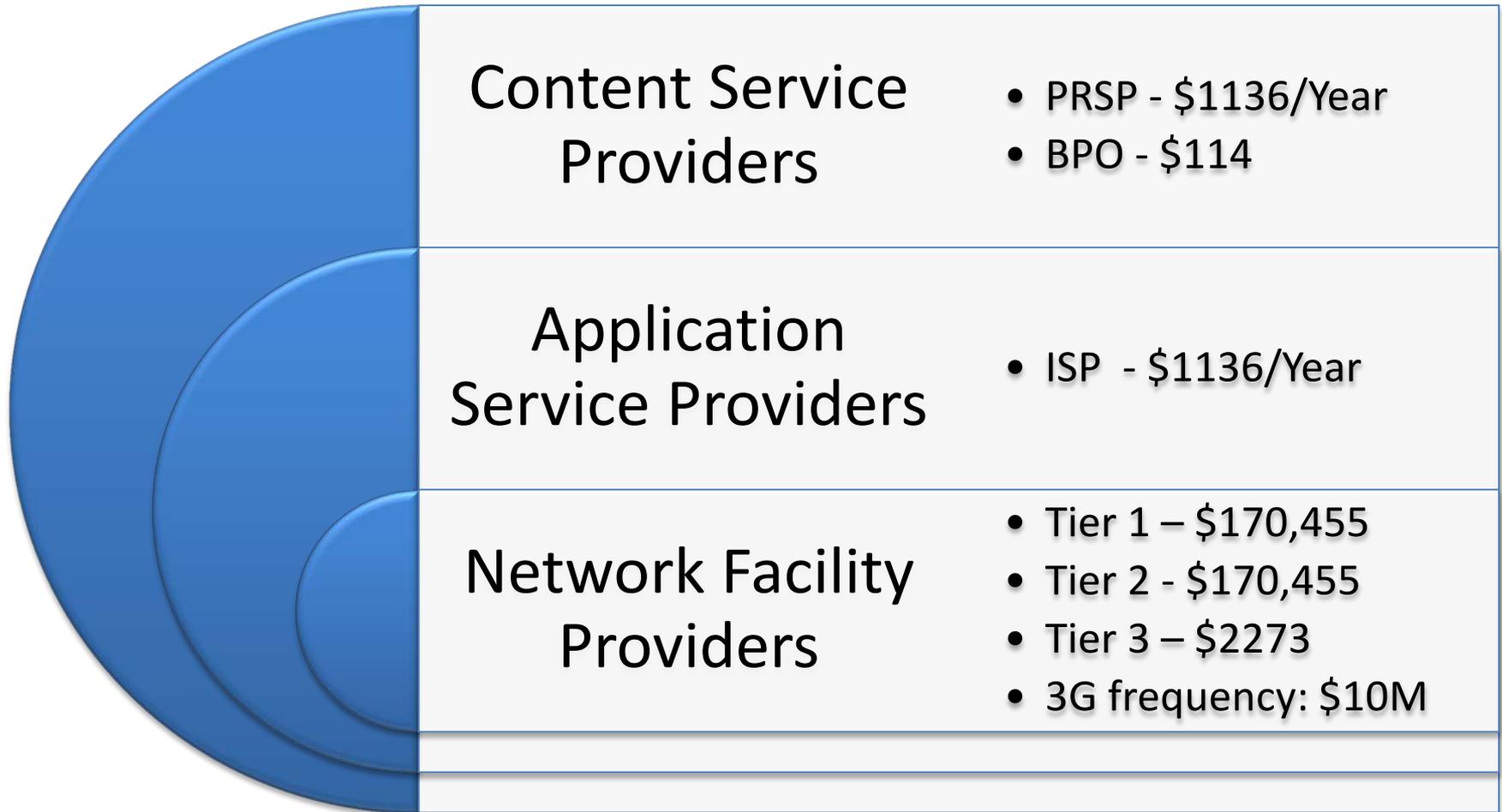
Mobile marvels Available at http://www.economist.com/node/14483896?story_id=14483896 [Accessed 5th June 2011]

A. Regulatory Reform



Source: Ndemo, S and Njiraini, M. (2009) Enabling NGN Regulatory Ecosystem for a Developing Country: Kenya Available at http://www.itu.int/ITU-D/tech/events/2009/RDF_AFR/Presentations/Session6/RDF09_AFR_Presentation_MNjiraini.pdf [Accessed June 2011]

A. Unified Licensing Framework



\$1 = KSHS 88

Source: Ndemo, S and Njiraini, M. (2009) Enabling NGN Regulatory Ecosystem for a Developing Country: Kenya Available at http://www.itu.int/ITU-D/tech/events/2009/RDF_AFR/Presentations/Session6/RDF09_AFR_Presentation_MNjiraini.pdf [Accessed June 2011]

B.1. Entrepreneurship

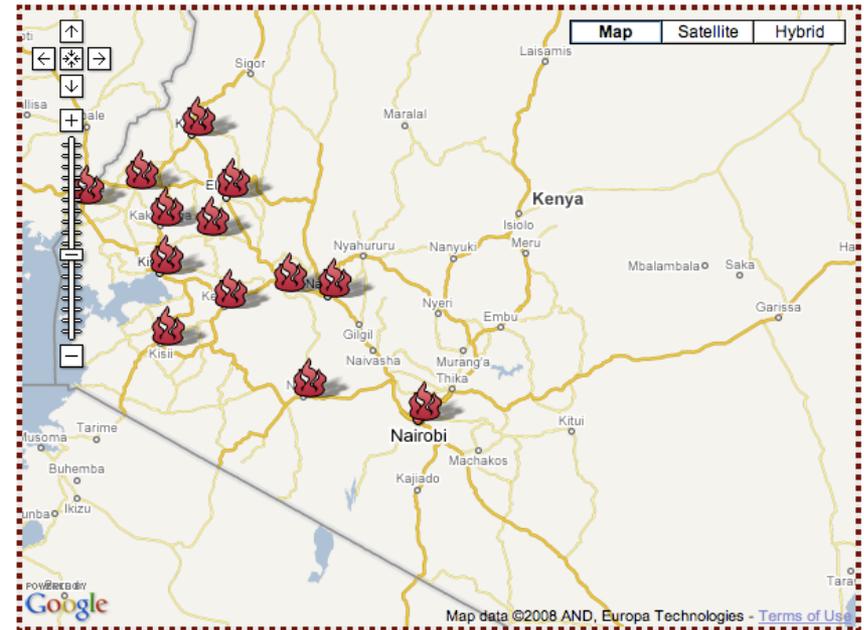
- *IHub
 - Nairobi's Innovation Hub
 - Open space for tech-prenuers



Source: www.ihub.co.ke

B.1. Entrepreneurship

- ‘Ushahidi’: Crowd sourced data to create a visual map of crisis in real time
 - Political crisis: Post-election violence 2008 Kenya
 - Disasters: Haiti, Chile and Japan



Source: Macharia K. (2011) Kenyans shine at Business Leadership Forum Business Daily 11 May P1

B.2. Innovation

- Mobile phone car-tracking system
- Bicycle Mobile Phone Charger
- Mobile Grain Moisture Meter
- Mobile Tea Maker
- Mobile Home Security System

Source: Wangari, F. (2011) *Big Dreams for Humble Local Inventions Saturday Nation P.17*

OUR SMS

The car owner, through SMS, can log-in to a track platform, which provides realtime access to information three critical elements:

ings with the vehicle which can be helpful especially when reviewing past cases," added Mr Kenani. Other reports available on a tracking platform include fuel, parking and driving reports as well as alarm record reports that come in handy when a vehicle is driven recklessly, crossing geographical fences or has over-stayed at a parking bay.

While new age vehicle tracking is indeed convenient to clients, tracking companies have to dig deep into their

1
The technology allows information on speed of motor vehicle at any given time. Speed limits can be adjusted to owners discretion

2
Fuel level monitoring can be assessed within tracking range of this technology

3
The tracking company can be alerted in case of emergency

have opened up business opportunities to both domestic and foreign track companies. Eurosfield Maptrack Limited is among the new entrants in the business, having set up shop locally late last year. It is the Kenyan branch of

C.1. Submarine Cable: EASSy



- Capacity:
 - 640GB
- Ownership:
 - 92% share: WOICC (14 African Telcos)
 - 8%: International Telcos
- Objectives:
 - Non-discriminatory Open Access
 - Cost-based pricing policy

C.2. Submarine Cable: TEAMS



- Capacity:
 - 640GB
- Ownership:
 - PPP
 - Kenya Govt and Etisalat UAE
- Objective:
 - Non-discriminatory Open Access
 - Vision 2030

Source Kemei, C. (2007) A Brief on the East Africa Submarine Cable System (TEAMS) Project. Available at: http://www.itu.int/ITU-D/partners/Events/2007/Nairobi_4-5June07/Presentations/4-4_teams-pppf.pdf

C.3. Submarine Cable: SEACOM



- Capacity:
 - 1.28TB
- Ownership:
 - Private funding
 - 77% African owned
- Objective:
 - Capacity for 2010 FIFA World Cup in South Africa

Source: <http://www.seacom.mu/network>

C.4 Terrestrial Cable

National Fibre Optic Network



Fibre Optic Network



C.5 Electricity

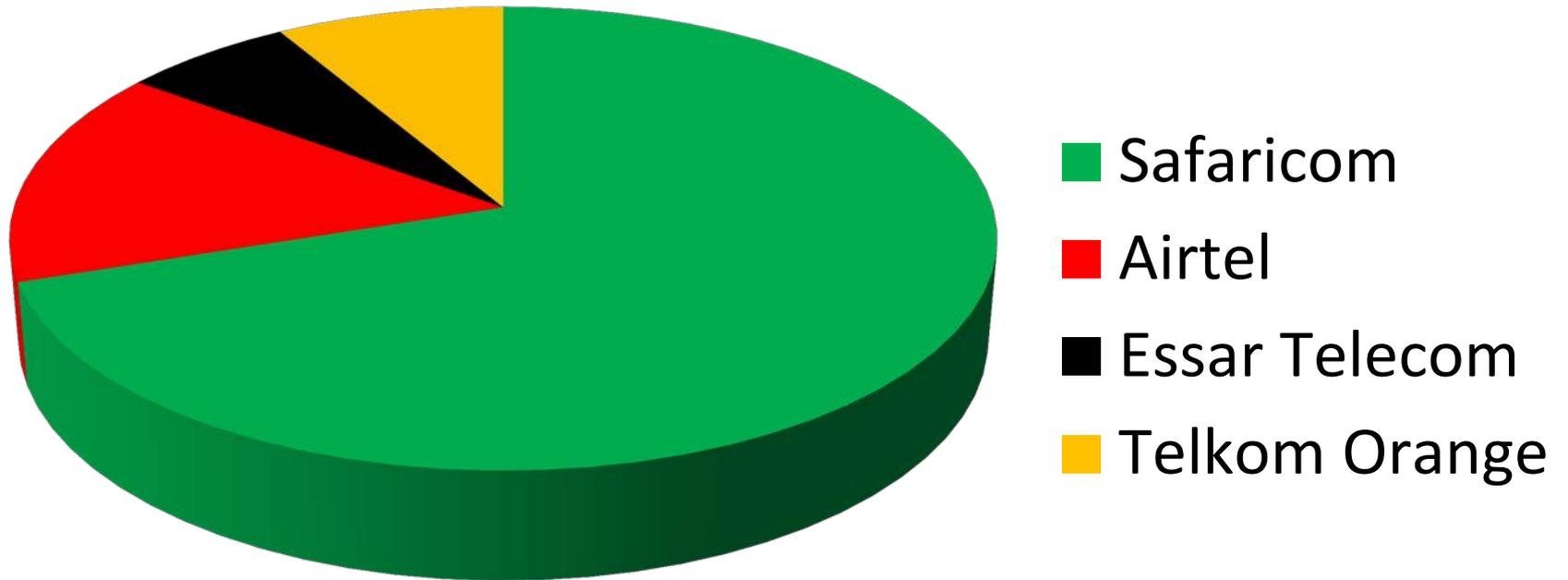


Green energy sources:

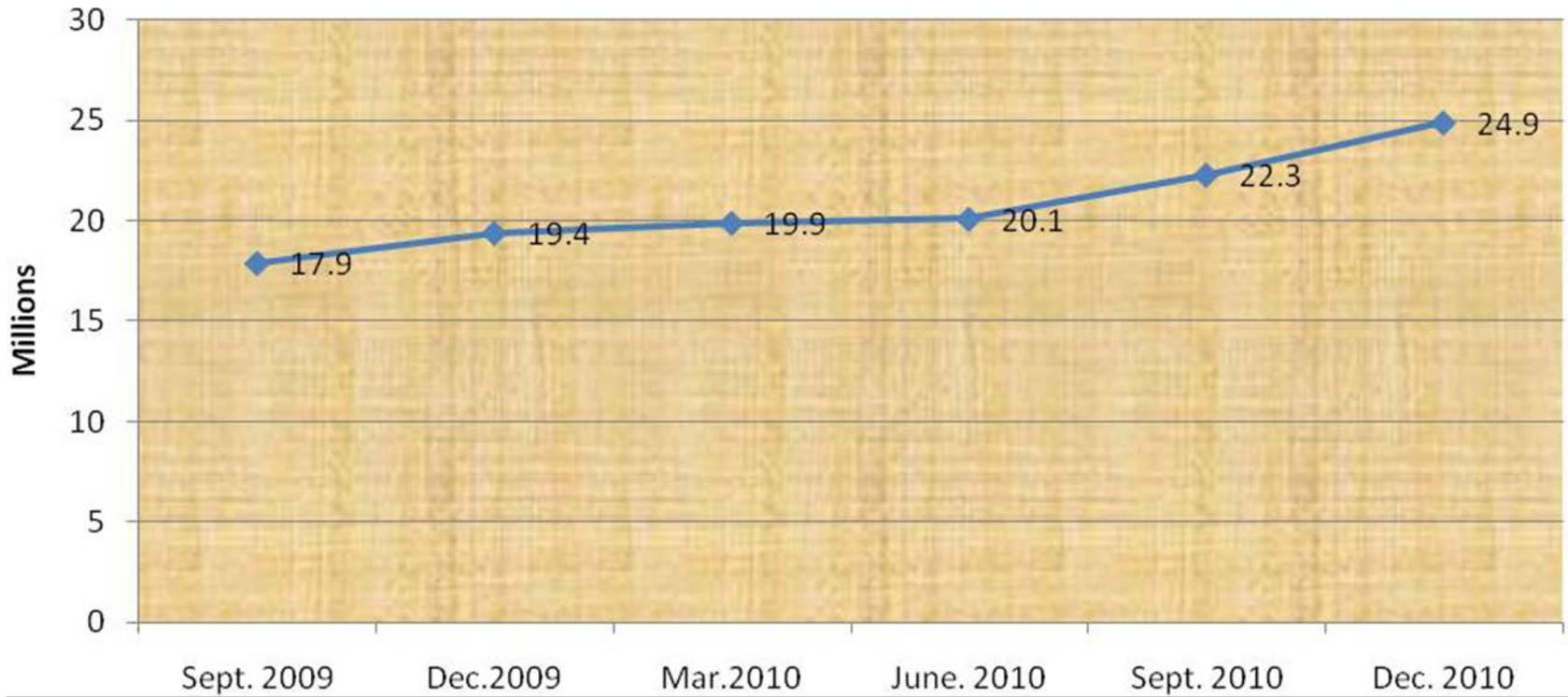
1. Hydro
2. Thermo
3. Solar
4. Wind

Source: <http://www.kplc.co.ke/>

D.1. Mobile Market Share



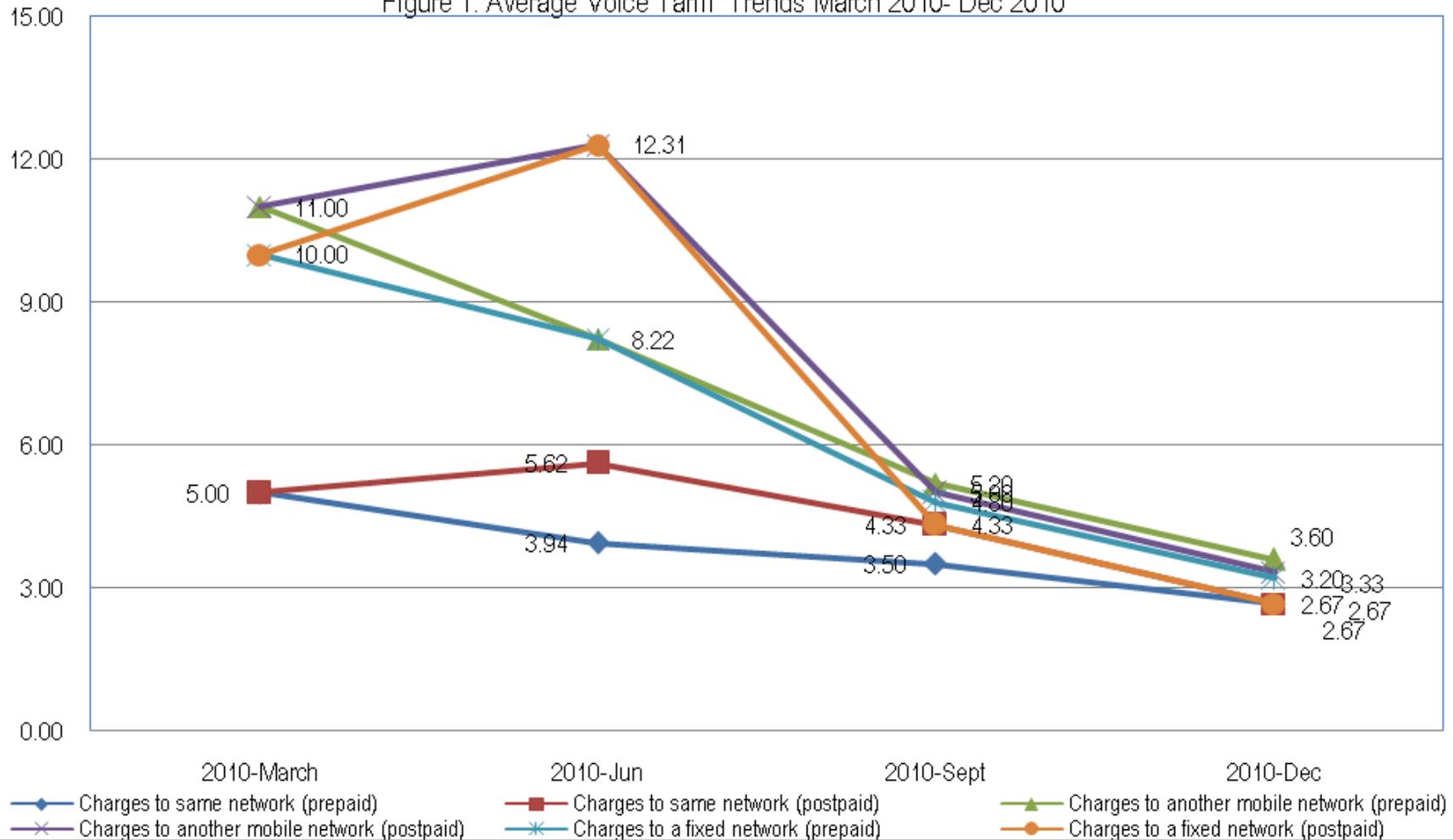
D.2. Mobile Subscription



Source: CCK (2011) Quarterly Sector Statistics Report, 2nd Quarter, Oct-Dec 2010-11 Available at:
http://www.cck.go.ke/resc/statistics/SECTOR_STATISTICS_REPORT_Q2_2010-11_x2x_x3x_x2x.pdf [Accessed June 2011]

D.4. Mobile Voice Tariffs

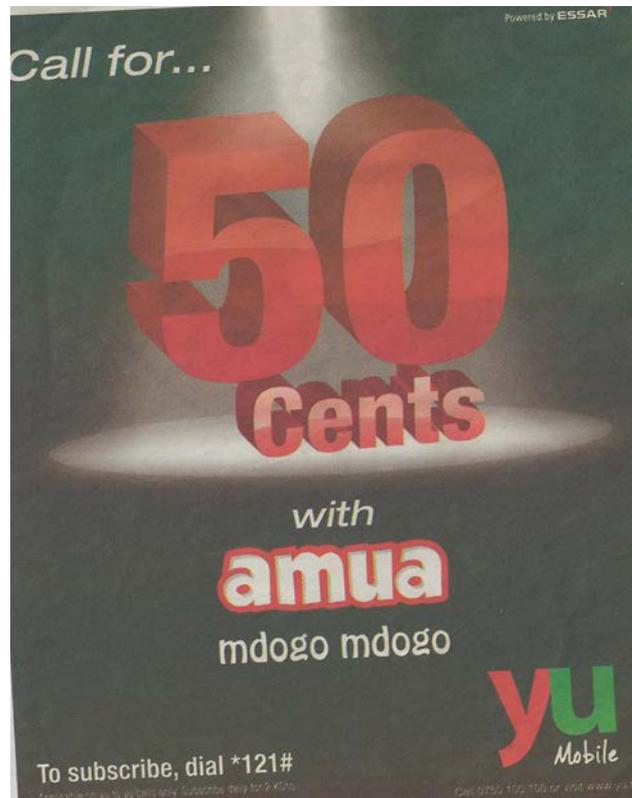
Figure 1: Average Voice Tariff Trends March 2010- Dec 2010



Source: CCK (2011) Quarterly Sector Statistics Report, 2nd Quarter, Oct-Dec 2010-11 Available at: http://www.cck.go.ke/resc/statistics/SECTOR_STATISTICS_REPORT_Q2_2010-11_x2x_x3x_x2x.pdf [Accessed June 2011]

D.4.1. Mobile Voice Tariffs

YU: On-net \$0.01 per min



Airtel: On/off-net \$0.02 per min



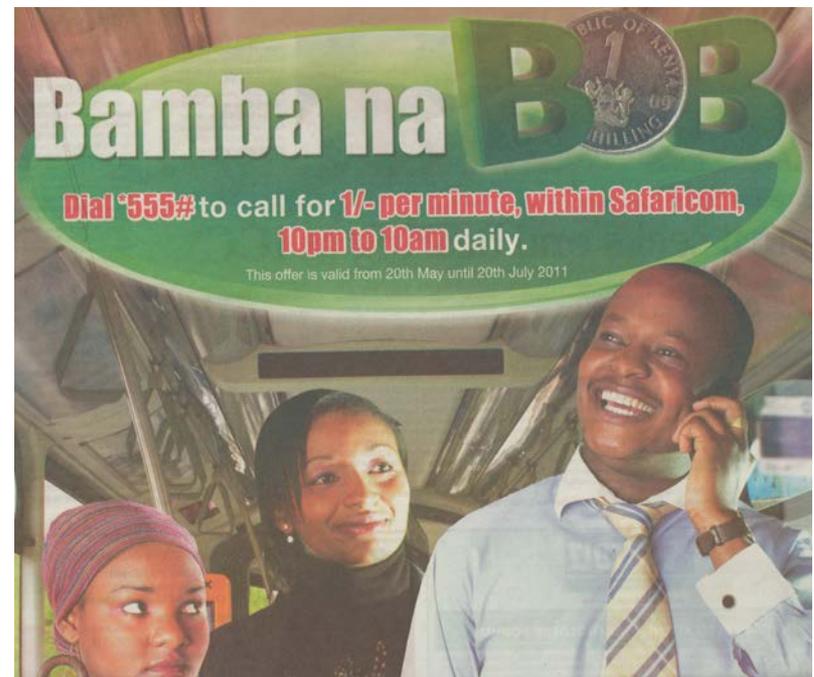
\$1 = KSHS 88

D.4.2. Mobile Voice Tariffs

Orange: On-net: \$0.02 Per Min



Safaricom: On-net: \$0.02 Per Min



\$1 = KSHS 88

D.5.1. Mobile Internet: Unlimited Facebook and Twitter SMS

Telkom Kenya: 50MB for \$0.57 per Week

An advertisement for Orange mobile internet. On the right, a woman in a yellow shirt is smiling while looking at her smartphone. The background is dark. On the left, the text 'keep chatting' is written in a large, orange, lowercase font. Below it, in a smaller white font, it says 'Enjoy Facebook, Twitter and other websites with 50MB of internet on your phone for only Ksh 50 per week.' There are three bullet points in orange text: 'To surf on your phone, send a blank SMS to "1234"', 'To subscribe, dial *5000#', and 'Available for prepaid customers only'. Below the bullet points, it says 'Join us without changing your number' in orange. At the bottom left, in small white text, it says 'For more information, call customer care on 100 or 020 222 1000. Terms and conditions apply.' and 'www.orange.co.ke'. In the bottom right corner, there is an orange square with the word 'orange' in white lowercase letters.

keep chatting

Enjoy Facebook, Twitter and other websites with 50MB of internet on your phone for only Ksh 50 per week.

- To surf on your phone, send a blank SMS to "1234"
- To subscribe, dial *5000#
- Available for prepaid customers only

Join us without changing your number

For more information, call customer care on 100 or 020 222 1000. Terms and conditions apply.

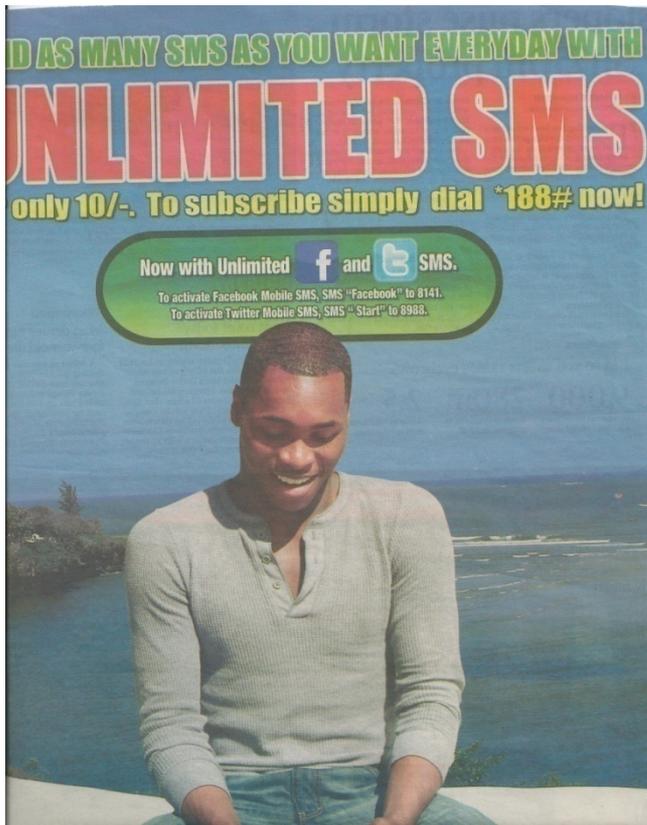
www.orange.co.ke

orange

\$1 = KSHS 88

D.5.2. Mobile Internet: Unlimited Facebook and Twitter SMS

Safaricom: \$ 0.11/Day



Airtel: \$ 0.01/SMS



\$1 = KSHS 88

D.6. Low Denomination and Advanced Credit

- Lowest denomination Credit: \$0.06
- Advance Credit
 - Okoa Jahazi \$0.06
 - Kopa Credo \$0.06

CREDIT ADVANCE OF UP TO 100/-

MALIZA STORI!

WITH THE IMPROVED OKOA JAHAZI

Dial *131#

- Choose from Okoa Jahazi options of 10/-, 20/-, 50/-, & 100/-.
- With Okoa Jahazi credit you can now browse the Internet, make calls and send SMS to any local network.
- You can now enjoy the Okoa Jahazi service if you have been a Safaricom customer for at least 6 months.
- Okoa Jahazi credit is available daily, and as many times as you need it, but after previous credit advanced has been repaid.

Okoa Jahazi

Terms and conditions apply
www.safaricom.co.ke

Niko na **Safaricom**

E. MOBILE-X Services

1. M-Money
2. M-Banking
3. M-Health
4. M-Insurance
5. M-Learning
6. M-Working

E.1. M-Money

- Financial inclusion:
 - Unbanked population
 - 32.7% of bankable population excluded from formal and informal financial services

E.1.1. M-Money Tariffs

Transaction Type

				
Deposit Cash	Free	Free	Free	Free
Send money to Registered User	\$0.34	\$0.28	\$0.11	\$0.06
Send money to Unregistered users	\$0.34	N/A	\$0.85	\$0.28
Registered User Cash Withdrawal	\$0.34	\$0.28	\$0.11	\$0.17
Unregistered User Cash Withdrawal	\$0.45	\$0.45	0	\$0.17
ATM Withdrawal Charges	\$0.45	N/A	\$0.34	\$0.45

Sources: www.orange.co.ke; www.yu.co.ke; www.safaricom.co.ke; www.africa.airtel.com/kenya/

E.1.2. M-Money Applications



Receive money from abroad through **M-PESA** at no extra charge.

Tell your friends and family abroad to send you money using the new M-PESA International Money Transfer Service. Simply ask the sender to transfer money as usual through participating Western Union agent locations, giving your Safaricom number as the recipient address. The service is available through Western Union in the countries below.

M-PESA services are available to Safaricom subscribers only.

AMERICAN SAMOA	NIGER
BAHRAIN	NORTHERN MARIANA ISLANDS
BELGIUM	NORWAY
BENIN	OMAN
BOTSWANA	PAKISTAN
BURKINA FASO	QATAR
CAMEROON	RUSSIA
CANADA	

The advertisement features a woman smiling while holding a mobile phone. A large red arrow points from the list of countries towards her phone, symbolizing the flow of money.

- Diaspora Remittances
 - total \$71.58 million in March 2011
 - 9% sent via mobile

Sources:

Irungu, G. (2011) Global Recovery lifts Diaspora Remittances
Business Daily: Money and Markets 18 May P.

Ng'etich, J. (2011) Kenya Missing the Point on Remittances
Saturday Nation: 7 May

E.1.3. M-Money: Utility Payments

Utility Payments: Pay-Tv



**Pay DStv
subscription via
M-PESA**

It's easy. Simply;

- 1: Switch on your decoder
- 2: Access your M-PESA menu on your phone
- 3: Select Pay Bill option
- 4: Enter Business no: **444 900**
- 5: Enter your DStv Account or Smartcard No
- 6: Enter amount payable*
- 7: Enter your Safaricom M-PESA Pin
- 8: Confirm your payment amount, A/C no &

School Fees : M-Karo



M-Karo, the hassle free way to pay school fees.

M-Karo lets you pay your child's school fees directly from your Co-op account through your mobile phone. You can pay through M-Banking by dialling *667# and following the simple steps. If you are not registered with M-Banking, you can pay through M-Pesa by selecting the PayBill option and following the easy steps. You will receive a confirmation SMS, which is a receipt of payment.

M-Pesa customers will additionally receive a message from Co-op Bank confirming the payment. Use M-Karo to pay fees more conveniently. For more information, visit your nearest branch or call to us on 020 277 6000, 0729 277 600 or 0736 690 101 or SMS 2020.
Email: customerservice@co-opbank.co.ke
Website: www.co-opbank.co.ke



E.2.1. M-Banking

Family Bank: Pesa Pap!



Post Bank: Pata Cash

An advertisement for PataCash mobile banking. It shows a hand holding a smartphone displaying the PataCash app interface. The screen shows "PataCASH Carry your bank with you" and "Deposit or withdraw your money with PataCash from Postbank." Below the phone, the text reads: "Accessing your money is as easy as *PataCash". It also includes instructions for deposit and withdrawal, and a list of services available through the app. The Postbank logo and M-PESA logo are at the bottom.

www.postbank.co.ke

4:46 PM

PataCASH
Carry your bank with you

Deposit
or
withdraw
your money with
PataCash from Postbank.

Accessing your money is as easy as ***PataCash**

PataCash allows you to deposit or withdraw money to or from a Postbank account through M-PESA. As a Postbank customer you get to instantly access and transfer your money quickly through your mobile phone with PataCash wherever you are. So when you want it quick, secure, and easy, just PataCash today!

To Deposit: Select "Pay Bill option", enter Postbank business number 200999 and follow instructions.
To Withdraw: Type *498#, press call button and follow instructions.

*Other services available through *498# include : Balance enquiry, Account to Account money transfer, Airtime purchases, Mini-statements and Alerts.*

PataCash, carry your bank with you.

POSTBANK **M-PESA**

*Visit a Postbank branch near you and register for this service today.
Postbank Head Office: CDRI, C/O 289/900/103-2200118 Fax: 020-24899910 (In: 1011) www.postbank.co.ke
Postbank Help Desk: Tel: +254 020 280333/041/550246/224888/076 918 999/074 836 233, info@postbank.co.ke

E.2.2. M-Banking

Equity Bank: Iko Pesa

Orange Money
now available at all Equity agent outlets **countrywide**

iko pesa pia at:

- Orange Shops
- Orange Money agents
- Mobicom shops
- Equity branches
- Equity ATMs

Customer Care :
1434 or 020222 1434

Cooperative Bank: Shangilia!

SHANGILIA!
You can now download M-PESA to your Co-op account!

It's easy. Go to M-PESA Pay Bill option in your phone, enter business number 400200 and follow the simple instructions.

CO-OPERATIVE BANK
BANK OF KENYA
Use me you

For more information visit any of our branches or contact our call center on 277 6000, 0729 277 600 or 0736 690 101.

E.2.2. M-Banking

Safari Pre-pay Visa Card

M-Kesho



M-KESHO
M-PESA EQUITY ACCOUNT

E.3. M-Health

- Healthcare challenges: Poor landlines, few hospital beds and health workers
- HIV/AIDs: Monitor prescriptions
- Fight counterfeit drugs: SMS drug code
- M-health sector valued at \$60B
- Example: Telkom Kenya: Orange Healthcare



Source:

Business Daily: Digital Digest: Telecoms Companies focus on health to woo Internet users 7 April 2011 P.16

*Business Daily: Africa Health Targets Continents's 624 million mobile phone users
AFP 6 April 2011 P.29*

E.4. M-Insurance



- Kilimo Salama: Insurance cover for farmers
- Trust:
 - Agro-dealers sell insurance policies: camera phone
 - Telephone helpline
 - SMS Rainfall data sent every 15 minutes
- Weather index payout via mobile money

Source: Rosenberg T. (2011) Crop Insurance via cell phone takes root in Kenya Business Daily 23 May P.16
Kilimo Salama Available at <http://kilimosalama.wordpress.com/> [Accessed June 2011]

E.5. M-PENSION

- 14,000 Pensioners Retirement benefits of Teleposta Pension Scheme
- Cut transaction costs by \$34,091 annually
- Total disbursement of \$568,182 annually
- 23,000 Equity Bank agency outlets
- Waiver Orange Money transaction costs
- Free SIM card

Source: Okuttah, M. (2011) Pensioners to be paid via cellphone Business Daily P.9



The advertisement features the Orange Money logo at the top left, consisting of two arrows pointing towards each other. Below it, the text "iko pesa cross network any time, any place" is displayed in orange and white. To the right of this text are two circular icons: a yellow sun with a smiling face and a blue circle with a white crescent moon and star. Below these icons, a list of available outlets is provided: Orange Shops, Orange Money agents, Mobicom shops, Equity branches, Equity agents, and Equity ATMs. The central image shows a smiling woman in a white patterned shirt and a floral skirt, holding up a stack of banknotes. At the bottom left, there is an icon of a traditional wooden house and a cow. The text "Powered by EQUITY" is located at the bottom left, and the "orange" logo is at the bottom right. Small text at the bottom left of the ad reads "sign up at any Orange or Equity outlet today" and "Customer Care : 1434 or 020 222 1434".

\$1 = KSHS 88

E.6. M-Learning

- International Leadership University:
 - Interactive, video clips of lessons, take tests
 - \$97 Android phones
 - Great time/money saving: Nairobi Traffic

Source: Karambu, I. (2011) Attaining University Degree is now a Smartphone Away Business Daily: Digital Business 26 May

\$1 = KSHS 88

Powered by ANDROID.

IDEOS™
with Google

Get it all. Go Android.
High Speed 3G Internet • Over 60,000 Android Applications

8,499/-

Including 600MB FREE DATA & 1,000/- FREE AIRTIME

To activate the free 600MBs that comes with your IDEOS, send a text with the phone's IMEI number to 440

HUAWEI

Terms and conditions apply. www.safaricom.co.ke

SafaricomShop

E.7. M-Working



F. Now the Bad and the Ugly!



Source: Business Daily 8 April 2011

F.1. Cybercrime: Legislative Definition

- Kenya Information and Communications Act, 2009: Part VIA—Electronic Transactions
 - Publishing of obscene information in electronic form
 - Publication for fraudulent purpose
 - Unauthorized access to protected systems
 - Re-programming of mobile telephone

Source: <http://www.cck.go.ke/regulations/downloads/Kenya-Information-Communications-Act-Final.pdf>

F.2. Technical Security Threats

- Spamming: Unsolicited Premium Services
- Sabotage for off-net calls
- Apps malware and spyware
- DDoS attacks and Man-in-the-middle

F.2.1. Technical Security Solutions

- User Education
- Enactment of Privacy and Data Protection Legislation
- Police and department of defence Training:
 - Certified Ethical Hacker (CEH)
 - Computer Hacking Forensic Investigator (CHFI)
 - EC council Certified Security Analyst (ECSA)

Source: Obura, F. (2011)KEMU to Fight Cybercrime

F.3. Social Crime

- Political Incitement: Post election Violence 2008-2009
- Offensive text Penalty 90 days imprisonment or fine of \$340
- Extortion, abductions: Ransom of up to \$11,000

Sources:

Daily Nation Woman Denies Sending Abusive Text Messages 2 October 2009

The Standard: Scams: Be alert to mobile phone fraudsters 21 March 2011

Wambugu, S. (2011) To stay safe, don't take Facebook at Face Value Sunday Nation P. 32

F.3. Social Crime

- Sending back ‘Stray’ mobile money
- Mobile money Agency Scams
- SMS lottery Scam: \$0.78/SMS for \$3million prize money



Sources:

Bonyo, J. Letiwa, P. (2011) Daily Nation Mobile money transfer conmen on the loose Business Daily

Lottery Firms Lock Horns with KRA over Promotions

<http://www.90millionin90days.com/>

\$1 = KSHS 88

F.3.1. Social Crime Solutions

- User education
- Enforcement of Kenya Information and Communications Act, 2009
- Child Helpline: 116 Toll Free Short code
- Banking Fraud Investigation Unit
- SIM Registration

Source: Daily Nation Fighting the Cyberspace Intruders 26 April 2011

<http://www.youtube.com/watch?v=i9Ux-5PGTAw>



F.4. M-Banking Security Threats

- M-banking utilizes USSD transactions: Built-in encryption and AAA protocols
- Hackers target mobile banking solutions
- Data storage and integrity

Sources:

Mbuthia, M. (2001) Mobile Banking and Security Risks Daily Nation 1 March

Shahonya, E (2011) Watch out for mobile phones apps malware Daily Nation: Smart Business 29 March, p. 15

F.4.1. M-Banking Security Solutions

- Customer Registration
 - Over the counter registration process – ‘know your customer’ checks
 - Mobile banking registration at ATM
- Continuous review and audit of:
 - Back office operating procedures
 - Information security policy

Source: Daily Nation Mobile Banking and Security Risks March 1, 2011 M. Mbutia

F.5. Electricity Infrastructure Vandalism

- Transformer vandalism:
 - Oil : Engine oil, cosmetics, ointment for burns
 - Copper windings: ornaments
- Economic Cost: \$ 23m annually
- Lost opportunity: Connect 2,800 rural homes annually

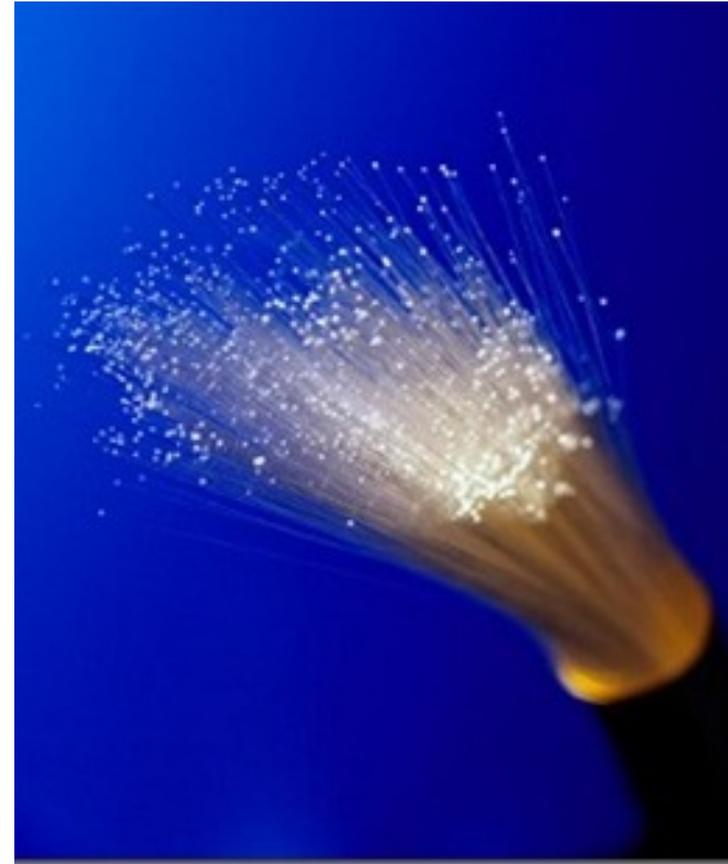


Source: Daily Nation 9 March 2011: Advertising Feature War Against Vandalism: Major Drawback to Progress

F.5. Telecommunication Infrastructure

Vandalism

- Fibre Optic cable cuts:
Ignorance and Sabotage
- Copper wire cuts:
ornaments and Jua kali
industry
- High tension power
cables with fibre cores:
Jua Kali industry



Source: <http://www.tectrendafrica.com/2011/03/11/sabotaged-fibre-cables-in-kenya/>

F.5.1 Infrastructure Vandalism Solutions

- Government ban on cooper exports
- Public policing: 'Mulika Mwizi'
- Lobbying for establishment of Utility police



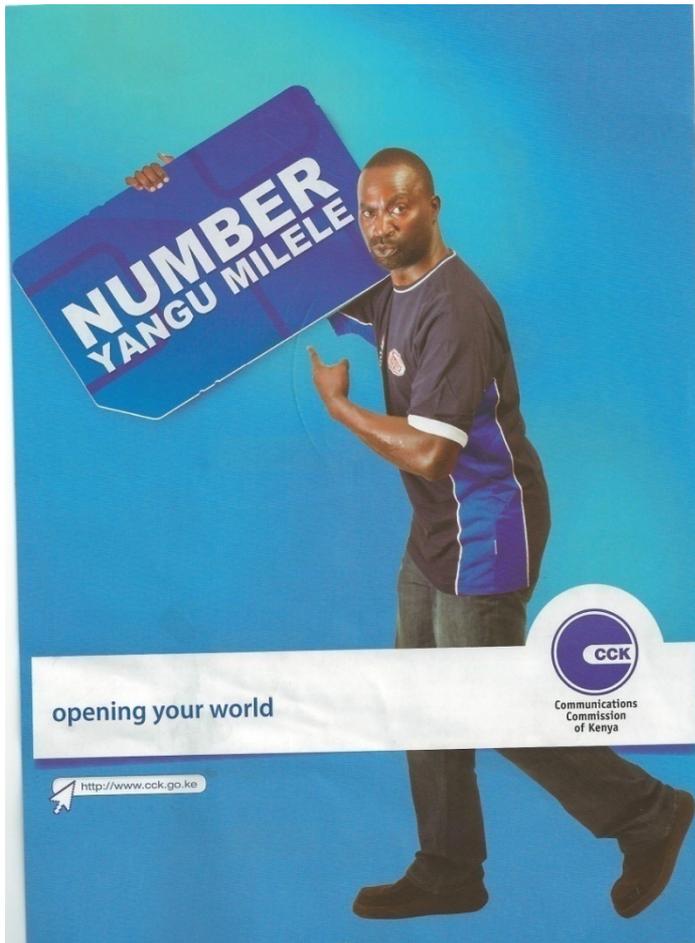
Source: Daily Nation 9 March 2011: Advertising Feature War Against Vandalism: Major Drawback to Progress

G.1. Challenges: System Maintenance and Upgrades



- Difficult to carry out seamless upgrades and maintenance without disruption of social and economic activities

G.2. Challenges: Mobile Number Portability



- Harmonizing tariffs for off-net money transfer across all networks
- Network agnostic solution: Smartcard

Source; Mutegi, M. (2011) Infosys Technology latches on to Kenya's unbanked population Business Daily: May 26

H. Challenges

- **Regulatory Risk:** 2 sectors – 2 Regulators
 - Financial – Central Bank of Kenya
 - Telecommunications – Communications Commission of Kenya
- **Legislation:**
 - Classification of privately owned infrastructure as Protected Systems

Sources:

Wagacha, M. (2011) *Kenya's Mobile Banking Success Suffers High Level of Regulatory Risk Business Daily* 28 April P. 14

Kenya Information and Communications Act, 2009 Section 83Q Available at: <http://www.cck.go.ke/regulations/downloads/Kenya-Information-Communications-Act-Final.pdf> [Accessed June 2011]

Cybercriminal?

Who is Cyber criminal in Kenya?

Watch: [http://www.youtube.com/watch?v=i9Ux-5PGTAw&feature=mfu in order&list=UL](http://www.youtube.com/watch?v=i9Ux-5PGTAw&feature=mfu_in_order&list=UL)

Conclusion

Cybersecurity can only be effectively implemented by understanding the context of cybercrime in any one country