



**THE**  
**Regulator**

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Quarterly Magazine of the Tanzania Communications Regulatory Authority

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October - December, 2016



# FINANCIAL INCLUSION

TV white  
spaces

**PROTECTING CHILDREN FROM UNSUITABLE CONTENT**

## TCRA VISION, MISSION, STRATEGIC GOAL AND CORE VALUES



### OUR VISION

To be a world-class Communications Regulator creating a level playing field among Communication Service Providers, and promoting environmentally friendly, accessible and affordable services to consumers.

### OUR MISSION

To develop an effective and efficient communications regulatory framework, promote efficiency among the Communications Services Providers, and protect consumer interests with an objective of contributing to socio-economic and technological development in the United Republic of Tanzania.

### OUR QUALITY POLICY

Tanzania Communications Regulatory Authority (TCRA) is committed to enhancing the welfare of Tanzanians through provision of effective and efficient regulatory services that ensures Universal Access to Communication Services, through Quality Management System in all processes needed in our areas of jurisdiction. TCRA continuously improves and reviews her Quality objectives regularly and communicates the policy within the organization.

### STRATEGIC GOAL

To enhance the welfare of Tanzanians through effective and efficient regulatory framework that ensures universal access to communications.

### STRATEGIC OBJECTIVES

- ❖ To enhance TCRA capacity, staff competences in regulation, research and related fields;
- ❖ To promote efficient, reliable and affordable communications infrastructure and applications;
- ❖ To promote efficient communication services and increase access to ICTs in underserved and unserved areas;
- ❖ To protect interests of consumers and enhance awareness of their rights and obligations;
- ❖ To monitor performance of regulated services and enforce compliance to legislations, regulations and standards; and
- ❖ To coordinate implementation of regional and international sector commitments.

### QUALITY MANAGEMENT SYSTEM

TCRA is ISO 9001:2008 Certified.

### QUALITY POLICY

Tanzania Communications Regulatory Authority (TCRA) is committed to enhancing the welfare of Tanzanians through provision of effective and efficient regulatory services that ensure Universal Access to Communication Services through Quality Management System in all processes needed in our areas of jurisdiction. TCRA continuously improves and reviews her Quality objectives regularly and communicates the policy within the organization.

### QUALITY OBJECTIVE

- ❖ To maintain an effective Quality Management System complying with International Standard ISO 9001:2008;
- ❖ To achieve and maintain a level of quality which enhances the TCRA reputation with stakeholders;
- ❖ To ensure compliance with relevant statutory and regulatory requirements;
- ❖ To endeavour, at all times to maximize stakeholder satisfaction with our services.

The quality objectives are measurable and reviewed against performance goals at each Management review meeting.

**The Regulator** is published quarterly by the Tanzania Communications Regulatory Authority (TCRA), an independent Government agency established under the Tanzania Communications Regulatory Authority Act No. 12 of 2003 to regulate the electronic and postal sectors in Tanzania.

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## Letter from the Editor

Dr. E. Manasseh, Member, IEEE

IT gives me great pleasure to welcome reviewers and readers of the Regulator to this edition of the quarterly Newsletter of the Tanzania Communications Regulatory Authority (TCRA).

The objective of the Regulator is to identify emerging developments in information and communication technologies (ICTs) and, in particular, areas in need of international standards to aid the healthy development of the Information Society. It aims at rapid dissemination of original, cutting-edge ideas and timely, significant contributions in the theory and applications of communications.

The scope of this Newsletter covers all aspects of ICTs.

This open-minded stance towards the scope of the newsletter has enabled engagement of a broader pool of stakeholders from academia, industry, other regulatory agencies and research institutions. Through this publication, we intend to bring together their wide range of views.

The Regulator recognises contributions from the academia and industry; they are particularly important for the healthy and longevity of our Newsletter. Industry and academia are savvy to emerging technology and are uniquely placed to spearhead innovation. In fact, academia play a key role in attracting innovative minds to ICT development.

ICT impacts all facets of life, and it is uniquely positioned to solve a wide array of 'social challenges' by enabling transformation and interpretation of information in a broad variety of disciplines. In fact, ICT is

core in addressing critical societal challenges in various areas, including transportation, entertainment, education, healthcare, energy systems, sustainability, defence and security.

To this end we are promoting ICT to address society's critical problems, and your input is critical and most welcome.

The success and reputation of the Regulator is a reflection of the outstanding work by our reviewers and authors who are dedicated to share best quality articles.

In this edition, a total of seven articles are presented. I sincerely hope that each one of these will provide some significant stimulation to a reasonable segment of our readers. I am aware that, it is important to have a good balance of different type of articles within the publication.

I thank all our submitting authors, who have toiled in the production of their work, and have chosen the Regulator as the Newsletter they would like to share their ideas. Sadly, due to limited publication 'space', less than 50% of submissions have been accepted for inclusion in this edition. Inevitably, many of those submitting will be disappointed by rejection. Those whose work has been accepted should be proud of their achievement!

Finally, I would like to thank the readers, and hope that they will find the Regulator a welcome companion. I appeal to them to send their comments to us to enable us to improve the Newsletter.

At this historic moment, as we witness the emergence of new technologies enabling various services and applications, please join our efforts to enable and shape this new trend. The work and fun have just begun.

# ICTs Strategic Resource for Development

**I**N this era, Information and Communications Technology (ICT) has become a strategic resource and the foundation of most economic activity both at individual and institutional levels. In recognition of the transformative power of ICTs, the Government of the United Republic of Tanzania aspires to spearhead the digital propagation and improvements that will make Tanzania the Internet Communication and Technology hub for East Africa and beyond. Most of the network operators in the country have already demonstrated this. This makes the mobile phone companies to be strategically positioned at the global level by being on the World map through providing the first true 4G LTE broadband service in this continent. The Tanzania Communications Regulatory Authority (TCRA) strategic goal is stated clearly as

“To effectively regulate electronic and postal communications services, promote efficiency among service providers and protect consumer interests with an objective of contributing to development in the United Republic of Tanzania”. The goal also consequently aims at upgrading living standards of the people in the country namely;

“To enhance the welfare of Tanzanians through effective regulation that promotes innovation and ensures universal access to secure, quality and affordable communication services”.

It is with this in mind that TCRA, and indeed the Government, welcomes the investment by telecommunication companies and other service providers in the development of the country's Internet Communication and Technology infrastructure by deploying the 4G LTE network, which is the most advanced telecommunications technologies and standards available anywhere in the world, and which provides unparalleled speed, reliability, quality and ease of use.

In this regard, TCRA appeals to all investors and service providers in the country's ICT sector to observe optimum quality in the delivery of services and offer clients services that have value for money or affordable tariff charges to clients. Since the liberalization of the communications sector

in the 1990s, the Government has put in-place favourable trade investment policies with an objective of speeding up and deepening the adoption of ICT in Tanzania. On the other hand, TCRA is committed to its corporate positioning statement of ‘Creating a Level Playing Field’.

To realize speedy development in the ICT sector, the Government will require the support of the private sector players as demonstrated by most of the Communications Operators in their endeavour to widen connectivity and ensure universal access to ICT services throughout the country.

I wish to underline this issue of universal access because, as an Authority, we are concerned that despite heavy investment in the Internet Communication and Technology infrastructure, there still exists some wide range of “digital divide” in the accessibility to internet services in some parts of the country. While we cherish the unprecedented growth of voice services, access to high-speed internet or reliable data services still remains low; yet the demand and benefits are immense.

There has been substantial growth in the broadband and internet services users in the country in the recent past with currently over 16 million users country-wide. The sector is yet to realize its full potential amid numerous opportunities that are yet to be tapped. This prevailing scenario is not only a challenge but also an appeal to us, as a country to take full advantage of ICTs for socio-economic development of the people.

In this era of the knowledge economy, this solution comes in handy for local and international companies doing business in Tanzania, giving them access to very high internet speeds, and enabling them to make quick turn-around decisions. I urge them to take advantage of the 4G LTE network now available that massively boosts any activity involving real time transfer of large amounts of data, as well as putting in place innovative products like live streaming of high definition video and television that reduce time wastage.

Indeed, a safe and secure e-environment is paramount in

extracting maximum benefits in the use of Internet Communication and Technology. Secure Internet Communication and Technology systems and services are important in facilitating the uptake of ICT services, and in deepening E-Commerce and other E-Services.

As we are all aware, e-services are critical in increasing business efficiency. The potential benefits of ICTs cannot be drawn without addressing the question of network, system and service quality. Besides the fact that users will not get value for money in the usage of poor quality ICT services, efficient utilization of services under such an environment would not be possible. TCRA acknowledges the need to make ICT networks critical national infrastructure and will continue to review policy and legislative frameworks to ensure that the security of networks receives appropriate focus and attention.

As a regulator, TCRA is implementing a converged licencing framework which takes full advantage of the advances in the ICT sector in Tanzania. The framework, which is technological and service neutral, has led to the uptake of many services.

The number of mobile phone subscribers and internet users has increased. There were 40 million SIM cards in the market by September 2016 and internet users currently exceed 16 million.

Besides the traditional voice and short messages, mobile phones enable subscribers to transact on-line. The mobile money services offered by the mobile phone companies have enabled many Tanzania to send and receive money, to pay for services and goods and to carry our banking transactions on their mobile phones.

The amount of money passing through mobile networks has surpassed the volumes passing through banks. This has compelled the latter to adopt mobile money platforms as part of their services.

The United Republic of Tanzania through TCRA is determined to co-operate with stakeholders in its endeavour of



**Eng. JAMES M. KILABA**  
Director General TCRA

ICTs investment propagation in the African Continent in general and in the United Republic of Tanzania in particular.

Regulation of the liberalised Telecommunication sector has brought in more operators and triggered greater competition that has brought in innovativeness in the delivery of services, hence more earnings for the operators and enabled consumers to have a wider range of choice for service, with lowered tariff charges.

Improvement of the quality of services has also been manifested in this form of business environment that places the Continent in a better position of capacity building of Information, Communication Technologies Development, thus conforms to Capacity Africa's clear objective of its establishment.

As I have already noted, wire-less national wide network expansion will go a long way in assisting the government's efforts to facilitate the transformation of people's lives in Tanzania and steer our country towards a digital economy as envisaged by the Government.

I assure all service providers in the country that as a regulator of the communication sector, TCRA will accord a level playing field to all service providers, protect consumers' rights and ensure that efficient quality services are provided for the sustainable development of the country.

# Children and Broadcasting Content

By **ROLF KIBAJA**

**S**OME of the radio and television stations have failed to consider the rights of protecting children from unsuitable content. Different complaints concerning unethical broadcasting content are normally sent to the Content Committee of the Tanzania Communications Regulatory Authority whereby necessary actions have been taken to solve all issues related to content matters. I made an analysis on the Content Committee rulings which were delivered from July 2015 to February 2016 and observed that 10 broadcasting stations were punished by the Content Committee after breaching the Broadcasting Services (Content) Regulations, 2005 whereby five of them failed to protect children from unsuitable content and violence.

The protection of children from being exposed to unsuitable broadcasting content depends more on the ethics that govern a particular society. Babor (2006) defines ethics as a systematic way of establishing standards or norms of human conduct and determine whether that human conduct is good or bad and right or wrong. Broadcasters in Tanzania are governed by different Regulations and Licensing conditions which are part of the normative ethics that deal with what people and institutions in a society ought to do and how they should conduct themselves. Through these Regulations, producers and presenters are guided on how they can come with good programmes acceptable to the society.

Before embarking on the reasons for the failure by some of the broadcasters to meet these norms and standards to, it is important to raise attention to the concept of Afriethics. This concept was explained by Francis Kasoma which emphasizes the practice of journalism according to the ethical tenets of the society of origin of the Journalists. Kasoma (1996) suggests that journalism can have African ethical roots and still maintain its global validity and appeal (p.95). He calls for the kind of journalism that is grounded in traditional African values. Based on the Afriethics perspective, it is important for journalists to understand the nature and values of a particular society when preparing different programmes in order to bring peace and harmony to the society. For example, those issues which target adults should not necessarily be exposed to children who are likely to be distracted and exposed to the practice of bad behaviors.

Radio presenters have entered into problems by failing to comply with the Broadcasting Services (Content) Regu-



lations, 2005 and licensing conditions because of several reasons. One of these is the failure to have a good selection of topics for discussion by both the presenters and the audience when conducting interactive live programmes. Beaman (2006) explains that a listener may not have an interest in a particular topic or subject, but if the story is told well they will become fascinated and involved. (p.112). Most of the radio and television presenters fail to have a proper selection of topics that reflect our values and standards when attempting to solve various challenges facing our society. When issues to be discussed in the programme are not well selected presenters will end up preparing cheap programmes with discussions on love affairs and adult topics for the sake of attaining cheap public attention. Such kind of topics are most of the time likely to affect children because of lacking good taste and decency.

The time allocated for different programmes is another challenge facing most of the producers and presenters of radio and television stations. The producers might have a good topic which aims at informing and educating an adult age group in different issues like reproductive health and marriage relationship, but which fails to consider the

appropriate time that will protect children from being exposed to such kind of education.

One of the Content Committee rulings which was delivered on 29th February, 2016 shows that a certain presenter of one radio station in Shinyanga region decided to prepare and broadcast a programme with discussion about women sexual business at Kahama District; showing its advantages and challenges. This programme focused on women sexual relationship in Kahama but the presenter failed to consider the appropriate time that protects children from the negative influence and bad behaviours. It was extremely unethical since the presenter decided to broadcast that programme during morning hours between 9.00 am and 11.00 am on 10th January, 2016 when a large number of audience was considered to be children. Such a kind of topic could be allowed during night hours to meet the targeted audience who are the adults.

Failure to have good preparation of the programmes affects most broadcasting stations. This can always be observed when presenters decide to broadcast a certain programme without having scripts and research on the topic to be discussed. In some of the cases radio presenters and producers have failed to comply with Regulations and licensing conditions as a result of the failure to have enough researched issues and proper selections of questions and the right respondents. When the segments of the programmes are not well organised and the script, as prepared by the presenters, is not followed, presenters may be tempted to engage in street talk and jokes from the social media that indirectly may lead to the discussion on issues with bad taste.

It is very important for the broadcasting stations to have a mechanism of filtering music videos according to the age group. There has been a problem of some of the television producers who fail to distinguish and categorize videos which are not suitable for children. Children have been affected by some of the music videos which show a scene of violence and sexual behaviors.

On 18th February, 2016 all television stations were required by TCRA to observe watershed in their music programmes whereby all videos which depict or contain scenes of violence, sexually explicit conduct or offensive language intended for adult audiences were required not be transmitted from 0530 hrs to 2100 hrs when a substantial number of children are likely to be part of the audience. Therefore, the selection of video according to the age group and allocation of proper time will keep children safe.

In the news and current affairs programme some of the children are represented as victims and their rights to privacy and dignity are ignored. Special care needs to be taken to stories which feature children as part of the problem or being affected by a certain social incident. The names and pictures of a parent and child should not be exposed to protect the children. It has sometimes become meaningless to see a presenter hiding the name of a child who is

a victim and exposes the real name of the parents, friends, teacher and neighbours.

The use of social media as a source of information integrated with the mainstream media without a proper management can be another source of noncompliance with the regulations. The use of social media such as Whatsapp, Twitter, YouTube, Facebook, Instagram and the like as a source of information and feedback should be taken with special care to make sure that all information is confirmed to be true from a reliable source and balanced without interference to the privacy of children.

The way forward for these challenges is to make sure that all broadcasting stations take measures of building the capacity of their producers and presenters. They should require them to read and understand the Broadcasting Services (Content) Regulations, 2005 and Licensing conditions which contain several provisions that guide on how to prepare good programmes.

Both producers and presenters are required to conduct research on each topic to be discussed in order to be well informed and provide the right information to the public. On the other hand parents are required to play their role by allowing children to watch programmes at the appropriate time under their guidance.

By using the Electronic Programme Guide (EPG) in the digital decoders, a parent can select all unwanted channels and named as adult content, then put a password that will enable the channel to be unlocked for an adult to watch. Furthermore, there is a need for broadcasters to air those films that have undergone rating and approved by the Tanzania Film Board in order to protect children from unsuitable content that can affect their physical, mental and moral development.

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# THE Regulator

## Call for articles for the next issue

QUARTELY MAGAZINE OF TANZANIA COMMUNICATIONS REGULATORY AUTHORITY

The Regulator is a Communications magazine focused on the advancement of the communications sector in Tanzania. The publication aims at bringing together industry professionals, academia and other stakeholders to share ideas and challenges in the development of ICT and Postal communications.

The Magazine includes technical and non-technical articles in the Sector.

The Editor Invites contributions in all areas of Electronic and Postal Communications. The scope of potential topics include, but are not limited to:

- ❖ Recent Advances in Communications Technology
- ❖ Mobile Payments and Financial Inclusions
- ❖ Enabling Communications Technologies for Smart Cities and Villages
- ❖ Audience attitudes to TV and radio
- ❖ The future of digital terrestrial TV and mobile broadband
- ❖ Quality of the regulated Communications services
- ❖ Cybersecurity
- ❖ Issues on Mobile and Internet services
- ❖ Consumer protection issues
- ❖ The Economy of Broadband Communications
- ❖ Big Data Analytics and Internet of Things (IoT)
- ❖ Over-the-Top Content Services and Media Systems
- ❖ The Future of Television
- ❖ Consumer use of digital communications
- ❖ The importance of communications services and affordability
- ❖ The leverage of video on demand in the community
- ❖ Development of GIS and its impact on National Addressing and Postcode System.

### Submission of articles:

Prospective authors are invited to submit full-length articles, font size 12, single-spacing, up to four pages of A4 size for content including figures and possible references.

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### IMPORTANT DATES

Paper submission: 3 January 2017

Hard deadline: 3 January 2017

Notification of acceptance: 19 January 2017

Final camera-ready paper due: 9 February 2017

Submit your article by email to: [regulator.magazine@tcra.go.tz](mailto:regulator.magazine@tcra.go.tz);

Or by post or physically to The Editor, Regulator Magazine, Tanzania Communications Regulatory Authority, Mawasiliano Towers, 20 Sam Nujoma Road, P. O. Box 474, 14414 Dar es Salaam.

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Kwa agizo la:



## Mobile Payments and Financial Inclusion in Tanzania: Challenges and Opportunities

By **DAN SORA TANDASI<sup>1</sup>**

### Background

**W**ITH a GDP of USD 48.06 billion (Worldbank, 2014), inflation rate of 6.5 percent and unemployment rate of 10.3 percent (National Bureau of Statistics, 2014) Tanzania has achieved both social and economic milestones. Inflation has been single digit over the past four years and it averaged 7.47 percent from 1999 to 2016 ([www.tradingeconomics.com](http://www.tradingeconomics.com)). There have been infrastructural development, financial markets progress and emergence of new non-traditional sectors such as the ICT sector and the real estate sector.

The financial sector, as mentioned above, has been growing tremendously. The number of banks and other financial services has increased to at least 50. These institutions have played a big role in intermediating funds between savers and lenders. However the proportion of Tanzanian population using or having banking services which is considered as *formal financial service* remained relatively low (14 percent) when compared to other countries within these region such as Kenya (29 percent), South Africa (75 percent), Uganda (21 percent) and Rwanda (23 percent), (Finscope Survey, 2013).

The survey cited above found that more than 55 percent of the population was financially included but this was largely contributed by the increased use of mobile payments platforms such as Mpesa, Tigopesa, Airtel Money and Z-Pesa of which individuals with access to mobile phones transfer money and make payments. They found these new platforms as best alternatives to traditional banking services which seem relatively less affordable with bank branches located far from people's residence particularly those living in rural areas.

The objectives of this article is to provide a brief analysis of challenges and opportunities that mobile payments facilities deployed by both banks and Mobile Networks Op-

erators (MNOs) have as a conduit for enhancing financial inclusion in Tanzania

The increase in financial inclusion that is highly contributed by mobile payments provides various opportunities but the same carries with it several challenges which are explained in this article in detail.

### Challenges Associated with Mobile Payments and Why that Could Hamper Financial Inclusion.

Firstly, increased financial crimes conducted through mobile platforms is a big challenge where infamous tactics such as SIM-swapping and call diverts have perpetuated more financial crimes pursued through MNO platforms to banks. This challenge could lead to people losing confidence in the services provided and negatively affect financial inclusion.

**The survey cited above found that more than 55 percent of the population was financially included but this was largely contributed by the increased use of mobile payments platforms such as Mpesa, Tigopesa, Airtel Money and Z-Pesa of which individuals with access to mobile phones transfer money and make payments.**

Secondly, mobile payments face less Know Your Customer (KYC) requirements as compared to other financial services, banking services in particular. It would have been ideal to enforce same more detailed KYC requirements for mobile payments transactions in order to help protect MNO's and banks customers.

Thirdly, there are less financially educated customers. Popular as mobile payments platforms have become, they still serve a population which is less financially educated. There is a dire demand to enhance public financial education which will equip them with formidable skills, enabling them to make good decisions when conducting different transactions.

Fourthly, there are paramount changes in the ICT. This has culminated from paramount investment and innovation in technology in the world. It has brought about challenges as much as they have brought several opportunities. The public's pace to cope with new technological changes and the risk associated with them is limited.

Moreover, service providers are faced with multiple regulatory frameworks where the customers bear the whole cost burden. On one hand banks which have arrange-



## Mobile Payments and Financial Inclusion

ments with MNO's on providing some of mobile financial services are regulated by the central bank and on the other hand the MNO's are solely regulated by the Tanzania Communications Regulatory Authority TCRA.

The challenges that arise out of the situation is having two players providing related services while facing two different regulators. The cost incurred for harmonizing may be passed over to the final consumer of services – eventually hurting financial inclusion especially through banks.

Furthermore, tax evasion could be facilitated by culprits especially when they make payments and conduct remittances fraudulently. This will provide difficulties in tracing the source of funds and this may end up discouraging consumers from trusting both financial institutions and MNOs and possible negative implications could involve less confidence in the banks which would induce panic in the economy and disparagingly hurt the economy.

Again there is limited transparency of MNO's financial performance information. In this regard MNO'S who provide mobile payment facilities are not required by the law to publish their periodic financial information; neither are they required to provide their tariff guides depicting charges and fees they pursue on every transactions. This information is crucial to their stakeholders, customers included, and it would have been wise to publish this infor-

mation to enhance consumers' awareness and have them make informed decisions.

### Opportunities that Mobile Payments Provide for Financial Inclusion

Firstly, facilitating further growth of SMEs through easy of transfer of funds as capital, payments of services offered, as payments for services offered and as payment for purchases made. All these benefits could be enjoyed in a more affordable and reliable way and in return boost financial inclusion in Tanzania.

Secondly, the development of mobile payments and its role to financial inclusion will stimulate creation of jobs opportunities. These opportunities could be in terms of direct employment (through mobile outlets) or indirect employment opportunities as a result of the investment multiplier effect that would come thereof.

Thirdly, the strengthening of mobile payments usage will enhance utilization of technology in solving everyday economic challenges. This is an opportunity for improving people's livelihood, expecting that when people's livelihood goes up their demand for financial facilities surges up as well.

Fourthly, banks could easily reach out to untapped market by utilizing mobile facilities in terms of both for com-

munications and through mobile financial transactions, reducing costs of establishing fully fledged traditional banks' branches. This would in return provide banks and other financial institutions more resources for investing in technological investment expanding their customers base through mobile transactions.

Fifthly, policy makers could use data of individuals utilizing mobile financial services as indicators for tracking the demand for banking/financial services in the economy. This would prove to be fruitful in both policy making and management enhanced financial inclusion.

Moreover, reduction of a cashless economy is another possible opportunity through utilization of mobile payments. When transactions are done electronically they reduce transactions conducted by using cash and emphasize usage of technology in transactions. This will end up reducing cash theft and robbery which have recently been on the rise.

Furthermore, further utilization of mobile payments would yield more financially included individuals may enhance provision of social services as money will easily be transferred to targeted populations. Also, with easily and affordable financial services, provision of social services (water, education, transport infrastructures, power and health) could be improved. These improved social infrastructures could in return stimulate further demand for financial services and boost financial inclusion.

Again, ICT requires stable power supply; hence as more people acquire phones there will be an opportunity for improving both ICT and physical infrastructures that will

support the availability and development of mobile payments and financial inclusion at large.

There is also an opportunity to have cross border trade enhanced if the government and stakeholders develop the ICT infrastructure that will enable conducting of cross-border e-transactions through mobile payments platforms. This will eventually boost financial inclusion in the country.

### Recommendations and Way Forward

There is a need to enhance the policy framework, so that we have a system which is innovation and business oriented – policies that will support use of mobile platforms to enhance financial inclusion. Current policies are good and need to be effectively adjusted and implemented.

Moreover, legal arrangements have to be protective of technological innovations and customers welfare against all sorts of cyber crimes carried through mobile payments platforms. Current laws such as the Cyber Crimes Act of 2015 need to be seriously adhered to. Relevant adjustments have to be made on other related laws.

Furthermore, there needs to be both a committed and focused political leadership towards implementing policies and enforcing laws. Without a formidable leadership the business environment that entails policy, legal and regulatory frameworks will not work.

Also, the government and other stakeholders have to support development of ICT by supporting new innovations, updating the current technological set ups and providing training for people who will use the technology.

Finally there is a very significant need for cooperation among stakeholders for effective implementation of policies, effective regulatory compliance and experience and information sharing among stakeholders, especially on risk associated issues.

Cooperation among stakeholders' such as the ongoing platform of the Tanzania Banker Association (TBA) Mobile Operators Association (MOAT) and TCRA has to be supported as an initiative designed to enhance efficiency and sustainability in mobile payments and financial inclusion at large.

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# Online Banking and e-payments

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## Introduction

**A**TENTION is drawn from the subject, "Inefficient online banking and e-payments rob the banks!" The main agenda of commercial banks is to collect as much as possible the money from individuals and companies, and trade with the money to make profit. One of the indicators of a well performing bank is the increase in cash deposits.

Online banking and e-payments are such methods that allow the bank account holders to use their money while the money is at the bank. The methods discourage use of cash transactions. There are many advantages of using online banking and e-payment systems. The advantages can be grouped in two categories: advantage for customers and advantages for banks.

On the customers' side, the advantages are many. To mention a few: first, it is much safer to use a debit or credit card than walking around with cash because of theft or loss of the money. Second, e-payments reduce the trouble of queuing for drawing cash at the ATMs or bank counters. Third, the customers will not keep the excess money with them, so it encourages saving. Fourth, it is better for the money to stay at the bank because at least it will earn a little interest with time.

On the banks' side, it is always advantageous if the customers leave the money in their accounts. Huge and frequent drawings are not always healthy to the banks. This is why fixed deposits (FDR) earn more interest than saving accounts because a customer ensures the bank that his/her money will not be drawn for a particular time, in which the bank can trade with the money to make profit.

## Robbing the Banks!

In the developing countries like Tanzania, cash transaction is common than electronic. Many reasons can be given. Mentioning a few: first, the fear of technology; second, digital divided; third, lack of electronic facilities for performing the e-payments; fourth, ignorance; fifth, lack of transparency of the banks; sixth, less emphasis on advertising and public education on e-payments; and seventh, it is expensive to transact electronically because of high bank charges. The scope of this article is limited to bank charges.

I met an old friend who lived abroad for many years. He has a bank account abroad and another one in Tanzania. We discussed many issues including living expenses in Tanzania. When we talked about the banks, and the charges applied, he lamented, "It is cheaper and more convenient to use my European debit card to buy a bottle of drinking water in Tanzania, than to use my Tanzania account for the same purpose. This is because I will end-up paying about 700 TZS as bank charges per transaction. If I use my Tanzania debit card 10 times a day, that would mean spending extra 7,000 TZS as bank charges. If I use my European debit card I buy my bottle of water with no bank charges"! If this fellow is right, what would be the cost of using the bank-based e-payments per month?

The statement from my friend hit me, and I started wondering whether the bank charges per electronic transaction increase profit or loss for the banks? (i.e. if the charges jeopardize the mission of accumulating more cash from the customers). And, what if one bank allows her customers to use all e-payments and online banking transaction for free, what would be the consequence? Will this bank lose the competitive edge over the others? Then, I tried to compare between Tanzania banks and European banks:

- i. ATM drawing in Tanzania is charged an average of 700 TZS per drawing; in most European countries there are no charges for ATM drawing.
- ii. In Tanzania, payments using debit cards are charged about 700 TZS per transaction while in Europe no charges apply for any transaction at the pay points.

Now, let us see the real situation for e-payments in Tanzania. Assume the bank charges an average of 700 TZS per ATM drawing and it allows a maximum of 1,000,000 TZS drawing per day. This means that, if one decides to use an



ATM to draw 1,000,000 TZS, which he will make at least 3 drawings, the charges will be 2,100 TZS. In some banks, drawing 5,000,000 TZS or less over the counter is charged around 2,100 TZS! Then, why shouldn't one perform one transaction over the counter and draw more than 1,000,000 TZS to minimize the drawing costs (bank charges)?

The point of minimizing ATM charges or per transaction charges may sound weak when looking at fat accounts. But, what is an average income of a Tanzanian? According to World Bank, Gross National Income (GNI) per capital is \$1,045.00 or less which means, spending 700 TZS (\$ 0.32) per transaction for an average Tanzanian is a bit on the higher side.

Why should one use his/her debit card for regular purchases if each transaction is charged? This question may lead the bank customers to draw more money than they want and continue with cash transaction for free. If this scenario is applied to the majority of the banks' customers, to me, it is like "robbing the banks" because people stay with their money (use cash transactions) instead of leaving it with the bank (use electronic transactions). And, if so much money is in people's pockets, not at the bank, what is the impact to the banks and the country economy at large?

It is justifiable for the banks to charge fees for services they offer; otherwise they will quit the business. However, they should be more tactical to choose which services to be

charged otherwise the "banks robbing" will continue.

## What Can Be Done?

There is no doubt that the dominance of cash transactions is discouraged in any civilized society. It is true that electronic transactions increase the efficiency of tax collection and add financial control. For example, in the fraudulent transaction event, it is easier for the authorities to track electronic transaction than cash transactions. It is safer for the people when they carry only a little amount of money. Many lives have been lost in Tanzania because bandits hunt down and kill people for money. But, are there feasible options? To what extent can Tanzania efficiently use online banking and e-payments?

Let's see the current situation: first, there are not enough electronic pay points. Second, most of vendors are not forced (by law) to use e-payment systems, which on one side reduce the cost and risk of handling bulk cash. Third, banks are not regulated on what they should charge from their customers. Is this the time that the government should regulate some of the bank charges for the benefits of the people and national economy?

I look at the "robbing the banks" scenario like people decide to keep their money at home and therefore limiting the banks to use it for trading and national development. I bet the friend who was lamenting high charges does the same, keeping his money close to him! He makes huge drawings



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and spends the money from home. Why should he not spend his money from the bank instead? From this article we extract three main reasons: high bank charges, lack of enough facilities for e-payments, and vendors not being regulated in terms of what form of transactions to be used along with the cash transaction.

## Conclusion

It is difficult to teach the commercial banks what to do, but it is possible to advise them to devise the payment systems that will automatically encourage their customers to opt for e-payments, like a “water fall”, i.e. the system that people will easily adopt with a lot of convenience. The *water fall* phenomenon describes the behavior that any things subjected to a running stream will easily flow down the stream with a lot of convenience than working against it. An efficient social-economical system should have this property. For example, one of the systems that has *water fall phenomenon* is mobile payment systems, M-Pesa, Tigo-Pesa, Airtel-money, etc. The system is convenient, easy to learn, adopt and use at a very low cost. Will the mobile payment systems innovation also *rob the banks*?

Mobile payments have leaped yet to another level. The money deposited there can be used for payments of various bills and buy goods at some pay points electronically. Yes, they can even be used as an ATM, in that one can draw cash from the agents at every other shop in the streets. Even more, the money earns some interest and many bonuses for their customers. It is more convenient to transfer the money across the county via mobile payment systems because of many outlets close to the consumers. Yes, it is not for free of course, but the method of payment is so fluidly (*water fall phenomenon*). Should the banks think smarter in Africa?

Now, Tanzania is in the third world, where governments are blamed for everything. If at all the government should be responsible, and it is supposed to subsidize the pay points which are integrated with Electronic Fiscal Devices (EFDs). Will this subsidy and government efforts encourage the banks to allow the buyers at any business outlet to use their debit cards ‘for free’. What will this mean for the banks? This means that the money for purchases will be at a certain bank and the vendors will receive the money electronically to their bank accounts and the tax will be collected more efficiently. Anyhow, whether the government gives the subsidy or the business firms are subjected to certain regulations, or any other improvised method,



the use of e-payments will benefit all the three parties involved, the banks, individuals, and the nation at large.

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## About the Author



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# National Addressing and Postcode System as an Economic Enabler

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## 1. Background

**A**CCORDING to World Bank data of 2016<sup>1</sup>, Tanzania is categorized as a low-income economy with a Gross National Income (GNI) per capital \$1,045.00 or less. However, in the economic blueprint “Vision 2025”, Tanzania is focusing on transforming its economy to a middle-income country by 2025. This struggle requires the country to revamp socio-economical systems, infrastructures, governance and the rule of law.

Towards achieving the vision 2025, Tanzania is mobilizing its machineries in tax collection, preventing and combating corruption, improving social services (health, education, water, security, etc.), improving infrastructures (roads, railways, airports, sea ports, power plants, ICT, etc.), and promoting industrialization and agriculture. Together with all these huge undertakings, the government is indispensably focusing at establishing and effecting national addressing and postcode system. The main reasons for establishing the addressing and postcode system is to facilitate communication, enhance operation of socio-economical systems, and serve the Tanzania population with social services with an improved efficiency.

In 1874, the United Nation (UN) established the Universal Postal Union (UPU) to ensure a universal network of up-to-date products and services<sup>2</sup>. The UPU has a role to set the rules for international mail exchanges, makes recommendations to stimulate growth in mail, parcel and financial services volumes and to improve quality of service for customers<sup>2</sup>. In the past ten years, through the Tanzania Communication Regulatory Authority (TCRA), Tanzania has done many efforts towards establishing the national addressing and postcode system according to the UPU international addressing standard S42<sup>3</sup>. The project is multi-sector.

To date, TCRA has published the postcodes for the whole country<sup>7</sup>. Nonetheless, the process of labeling streets and buildings countrywide is underway. Tanzania Posts Corporation (TPC), using the postcodes and street addresses

available, launched the *door-to-door* delivery service early 2016. With this service, the TPC team will be able to deliver letters and parcels at the door of the given home addresses. The implementation of door-to-door delivery service has started with three regions: Dar es Salaam, Arusha and Dodoma, rolling to cover the whole county in the near future.

## 1. Rationale

There are many reasons for Tanzania to invest in the national addressing and postcode system. In this article, the focus is on how the system can be an economic enabler. Specifically, four areas are discussed: revenues (tax, penalties, etc.) collection and administration, national security (combat and reduction of crime), fight against corruption and enhancing e-payments.

## Revenues collection and administration

### i. Tax

In tax collection and administration, addresses and postcodes are the key information by which the authorities use to identify the taxpayers in terms of individuals, companies and premises. For instance, if the addressing database is up-to-date, the tax authorities may acquire important information for tracking the taxpayers and contact them electronically or physically.



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The system may be designed in such a way that the tax databases (in the tax authorities such as TRA), where the taxpayers are identified by TIN, is integrated to an addressing database (under another authority such as TCRA), where addresses of all people are stored.

The tax databases should contain information about individuals, companies, businesses, etc., and the addressing database should contain information about all residents' physical addresses.

From the tax databases, the authorities are able to estimate the amounts of tax and even predict tax evasion attempts if any. For example, an individual X with a Taxpayer Identification Number (TIN), has his/her credentials and income (salary or business) records well captured in the tax databases; and the addresses are well captured in the addressing database. The two databases should be able to verify records of the person X and enable the authorities to easily contact the person for tax collection or any other responsibility.

It is recommended that all residents of Tanzania (citizens and foreigners) to be registered in the tax databases and be identified by their TIN numbers. The records should be permanently stored from child birth or from the date of immigration. Furthermore, all residents should be recorded in terms of addresses and postcodes. Thereafter, all the residents' information should be updated annually by filling a specific form that will indicate the amounts of tax each individual is supposed to pay and change of physical address. For example, employed residents should be able to state at least their PAYE (pay as you earn) tax from their salary and the tax payable from other incomes. If a person is not employed or is not eligible for tax, it will be stated so. This practice will instil the sense and culture of responsibility for paying tax and it may increase efficiency in tax collection.

In case of an incident such as security issues or tax evasion, the authorities may use the records in the addressing database to trace the suspect (this may add an advantage to the national security matters).

## ii. Traffic offences

Let's see another example of traffic offences and collection of the penalties applied thereof, which should be part of the government revenue. Suppose the database for driving licenses (under tax authorities such as TRA) has names of all license owners; and, the licensing database is integrated with the addressing database (under another

authority such as TCRA). And, the two databases are integrated with the traffic database (under another authority such as Police), which receives information uploaded from speed cameras placed by the roads all over the country.

As soon as the over-speeding motor vehicle picture and registration number are captured, and uploaded to the traffic database, the database will query the addressing database to seek the physical address of the offender and send an SMS or email to the motor vehicle owner that "your vehicle is over-speeding and the penalty is TZS 30,000.00". Then, the licensing database will also be updated with the penalty, which should be visible and cleared when the license is renewed.

Since a vehicle can be driven by anybody, the reliable and permanent records should be the vehicles owners' records that were captured during motor vehicle registration. Therefore, the owner of the vehicle should be responsible for his/her actions or should be able to identify the driver concerned with that particular incident and take the necessary measures. Because the physical addresses of the vehicles' owners are known, the authorities may trace and find the offenders and put them to task if they don't comply with the penalties.

## Economic benefits of technological intervention on enforcing traffic laws

There are direct and indirect benefits. The performance audit report on the management of traffic inspections and speed limits in Tanzania issued by the national audit office<sup>4</sup> reveals that, "During the period between 2000 and 2008, the total number of road crashes increased by 42 percent (from approximately 14,500 to 20,600). The number of injuries went up 27 percent and the number of people killed increased by 67 percent. This is 30 to 40 times higher than in most Western European countries"<sup>4</sup>. The increase of the figures in the report indicates that the existing mechanisms for controlling the traffic offences are not effective enough. So, the intervention of technology is necessary. Although it is difficult to precisely predict the impact to the economy, the deaths and loss of properties due to road accidents have a devastating impact.

Together with controlling road accidents, several more advantages of using national addressing and postcode system over the traffic cases can be realized. Mentioning a few: first, the traffic laws will equally apply to all of the road users. The road users, despite their ranks and position in the society will have the same fear of breaking the laws because they will be exposed by the system. On



the other hand, the few arrogant persons, that are ready to break the laws because the penalties are peanuts to them, they will also be ordered because there will be no individuals at the roads to take the bribe, but the hidden cameras. Furthermore, the penalties may be enforced differently depending on the level of income of the offenders (i.e. the offenders will feel an equivalent pinch of the penalty).

Second, if the vehicle owners are not cooperating, the penalty may be made to increase for certain amounts depending on the time delayed, and the bill may wait until the identified individuals pay for renewal of driving license or motor vehicle license yearly. Since the addresses and postcodes are available from the database, the bills may be physically delivered to the vehicle owners beforehand. Third, the suggested technological intervention works round the clock, 24/7 despite weather or darkness. In the current situation, traffic police officers are able to manually follow-up on speed limits using the handheld cameras between 06.00 AM to 12.00 PM. Fourth, the government may reduce the number of traffic police officers or redirect the manpower to other areas of economical benefit instead of the officers standing on the roads the whole day. Fifth, the technological intervention will not only increase performance in controlling accidents and the collection of government revenues, but also it will control corruption to a large extent. Similar methods may be improvised and

applied in other economical areas countrywide.

## National security

Looking at the national security issues, and asking a few questions, like how the nation can really ensure security of its people who are untraceable? i.e. the people who don't have easy located physical addresses. How can the government respond to catastrophes, and reach its people in an efficient manner? The two questions are very important to be carefully addressed because national security has a huge impact to the national economy. One of the factors that encourage internal and foreign investors is the assurance of the security of lives and properties.

## E-commerce

In the modern world and globalization, e-commerce is a powerful driver for economical development. A country without a strong e-commerce architecture and infrastructure is prone to many risks including financial losses and unnecessary expenditures to its citizens. For example, if the addressing and postcodes are well done, it is easier for the Tanzanians to make online purchases from all over the world and the items could be delivered at the door. In the current situation, the door-to-door delivery is limited into few areas of Tanzania. Therefore, a person will incur

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more cost to receive his/her purchased items; the main reason being that the courier services are limited only to the identifiable public offices and few other places within the urban area. However, from March 2016 Tanzania will begin to enjoy the fruits of national addressing and post-code, hoping that the pace will be good enough to cover the whole country in few years to come.

Looking at e-payments, the lack of proper national addressing undermines the door-to-door delivery services and also affects the e-payments for the local business. Why should a person be encouraged to pay electronically while he/she must be physically present at the shop? Why should he/she use e-payment if the delivery services cannot reach him/her? E-payments are however possible and practiced but at few a pay points especially in the major cities and towns.

There are many economical reasons for encouraging e-payments. Apart from reducing the risks associated with theft and losses of hard-cash, e-payments facilitate tax collection. For instance, if all goods and services vendors will be practically using the pay points integrated with EFDs (Electronic Fiscal Devices), the tax authority would increase their efficiency in tax collection and significantly reduce the window for tax evasion and corruption<sup>5</sup>. Similar example is evident for the TRA strategy of connecting automated EFDs on fuel selling pumps at all gas stations countrywide<sup>6</sup>.

## 2. Challenges

Many challenges face the implementation and efficient use of addressing and postcode system. Majority of the Tanzania land is not surveyed and officially allocated or leased to its owners. The pace of individual developments such as building houses and infrastructures is ahead of the urban and rural planning and development authorities. Many settlements are in squatters and are poorly planned, therefore making difficult to allocate the addresses and even difficult to use them. Many streets are not standardized, which render them useless when delivering social services such as fire rescue, etc.

Many residential houses are temporary and yet changing. For example, in big cities and towns, it may happen that one person buys ten small houses (already allocated with numbers) and build one large building, therefore calling upon updating the buildings' numbers often. This phenomenon is evident in Dar es Salaam because of rapidly growing real estate industry.

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The Minister for Works, Transport and Communications, Professor Makame Mbarawa being briefed on the function of the Computer Emergencies Response Team (CERT), Connie Francis.

# Tanzania in the ITU cybersecurity index of 2014

By LEONARD J. MSELLE, SALEHE I. MRUTU and RAISI RAMADHANI

## 1. Introduction

THE ITU cybersecurity index is an instrument which shows the "national cyber security commitment" for each country in the world. Rooted in the ITU's Global Cybersecurity Agenda (GCA), the GCI looks at the level of commitment in five areas: *legal measures, technical measures, organizational measures, capacity building, and cooperation*. The result is a country-level index and global rank-

ing of cybersecurity readiness. The GCI does not seek to determine the efficacy or success of a particular measure, but simply the existence of national structures in place to implement and promote cybersecurity.

The ITU cybersecurity index of 2014, ranks Tanzania 22<sup>nd</sup>. Globally, Uganda is ranked 10<sup>th</sup>, Rwanda 11<sup>th</sup>. and Kenya 15<sup>th</sup>. (ABI Research-ITU, 2014). Region wise (Africa), Uganda is ranked 2<sup>nd</sup>, Rwanda 3<sup>rd</sup>, Kenya 4<sup>th</sup> and Tanzania 11<sup>th</sup>. It can be seen that Uganda, Rwanda and Kenya are ranked as "high" globally and very high regionally while Tanzania is ranked "low" globally and moderate regionally which distinguishes Tanzania from the rest of the



Inside the  
Tanzania Police  
Force CallCentre

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countries in the region.

The Country-level surveys, complemented by in-depth qualitative research, were sent out to all ITU member states. Information was collected on *laws, regulations, CERTs and CIRTs, policies, national strategies, standards, certifications, professional training, awareness raising, and cooperative partnerships*.

The aim of the GCI is to provide a snapshot of where countries stand in their cybersecurity engagements at the national level. The vision, as seen by ABI Research and the ITU, is to promote cybersecurity awareness and the important role governments have to play in integrating appropriate mechanisms to both support and promote this crucial discipline. Safeguarding the integrity of cyberspace must involve the development of cybersecurity.

A ranking system reveals shortcomings and motivates

states to intensify their efforts in cybersecurity. It is only through comparison that the real value of a nation's cybersecurity capability can truly be weighed. This approach could be taken by the Regulator TCRA

precisely among banks in order to stimulate cybersecurity drive among these important institutions. Similarly if a ranking system does not take into account all factors that contribute into the final result it may end up portraying a wrong picture. This is the case of the 2014 ITU index with regards to Tanzania.

### 2. How accurate is the 2014 ITU Index?

Much as this index might have arrived at right conclusions, a closer scrutiny finds elements that are missed for the part of Tanzania. By missing out the content of the study conducted by UDOM CIVE Cyber Security Research Team, the Index leaves out some key facts about Tanzania's cybersecurity readiness (TCRA Report, 2014). Among the outcomes reported in the TCRA Report, 2014 which do not feature in the ITU survey, include;

- ❖ existence of a coordinated national cyber security group that includes (academia, banking sector, police force and the military- JWTZ). There is no other country in Africa that has such formation.
- ❖ release of a national report on "the national cyber security posture" which provides the current status of affairs and provides a road-map for moving forward. This is unique instrument which cannot be found in other countries.
- ❖ proposal and execution of two cyber security fronts

in the nation. Except for Rwanda, there is no any other country in Africa with an explicit two-tiered cybersecurity strategy

- ❖ recalibration of university curricular (specifically the University of Dodoma) to start offering degree programs in cybersecurity at both masters and undergraduate levels. There is no other university in the region that has had such a comprehensive cybersecurity agenda in tertiary education.
- ❖ launching of UDOM CERT portal by 2014, which is the only academic CERT portal available in the region. This was followed by the national CERT portal which by 2014 was the only electronic cybersecurity instrument in the region.

Capacity building is intrinsic to the first three measures (legal, technical, and organizational). Understanding the technology, risks, and the implications can help to develop better legislation, policies, strategies, and organization as to the various roles and responsibilities.

Cybersecurity is a relatively new area, being not much older than the internet itself. This area of study is most often tackled from a technological perspective, yet there are numerous socio-economic and political implications that have applicability in this area. Human and institutional capacity building is necessary to enhance knowledge and know-how across sectors to apply the most appropriate solutions and promote the development of the most competent professionals.

A capacity building framework for promoting cybersecurity should include awareness raising and the availability of resources. Capacity building can be measured based on the existence and number of research and development, education, and training programs, certified professionals, and public-sector agencies. Again, this is an area which the report does not seem to have put into account since it totally exclude university curricula.

### 3. Reasons for shortcomings of the Index

Among the major reasons that such Indexes lack important facts about cybersecurity readiness in various countries are methodological. Most of these surveys rely on flimsy data that may only be available in areas (constituencies) where the survey perceives it can access leaving

away some areas (constituencies) which are very crucial such as universities. Universities are the constituencies where most human resource of any country is formed. Yet, the Index did not provide sufficient attention on university curricula, leave alone including all universities in the study.

### 4. Recommendations

By measuring the level of cybersecurity preparedness in various areas, the index was aimed at allowing states to assess where they are on a scale of development, where they need to make further improvements, and how far they are from implementing an acceptable level of cybersecurity. The establishment of a national computer incident response team (CIRT), computer emergency response

team (CERT), or computer security incident response team (CSIRT) provides the capabilities to identify, defend, respond, and manage cyber threats and enhance cybersecurity in the nation state.

This ability needs to be coupled with the gathering of the nation state's own intelligence instead of relying on secondary reporting of security incidents, whether from a CIRT's constituencies or other sources. However, the ITU index in question does not seem to have taken into account the advent of TZ-CERT which was launched in 2014. Missing out some important component will surely lead into an inaccurate ranking and sense making.

It is recommended that the results of such surveys should be passed over to all CERT constituencies for validation before they are released as final reports, in order to enable them to capture the most salient features of cybersecurity readiness.

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**Capacity building is intrinsic to the first three measures (legal, technical, and organizational). Understanding the technology, risks, and the implications can help to develop better legislation, policies, strategies, and organization as to the various roles and responsibilities.**

# “Using Mobile Phones to Measure the Performance of Mobile Networks”

CHRISTINE MWASE, FATUMA SIMBA  
and KHADIJA MKOCHA

**M**OBILE phone adoption was one of the fastest of any technological service in history [1]. Since the introduction of mobile services in Tanzania, mobile subscriptions quickly surpassed fixed ones as shown in Figure 1, contributing significantly to the increase in the number of voice and data users in the country. The penetration of voice services reached 79% in 2015, 99.6% of which came from mobile subscriptions. This is up from 61% in 2013, 50% in 2010 and 10% in 2005. Penetration of internet services, which stood at 12% in 2011 has also been on the rise, doubling from 17% in 2012 to 34% in 2015 [2], 99.3% of which came through a mobile service.



It is clear that the days when the mobile phone was considered a luxury for the occasional phone call are long gone. Today, the mobile phone is not only the predominant mode of communication globally, it has also assumed several other roles. For some, it is the alarm clock that wakes them up and reminds them of important meetings, the diary that they plan and log their days on, the bank that they use for their financial transactions and utility bill payments and the calculator for their daily computations.

For others it is the camera they create and store memories with, the information portal through which they get technical advice and market information, their alert system for breaking news, as well as their radio and their torch. The list of roles goes on and on, not forgetting the means by which many communicate for business, with family and friends, and during emergencies.

It is undeniable that users are increasingly becoming more

dependent on mobile phones for the core functions of their daily lives, and as the mobile phone becomes more of a necessity than a luxury, the availability and reliability of mobile networks and services becomes increasingly important.

There has been a notable increase in the quantity and quality of mobile operators, users and services in the country. It is still however debatable as to whether the Quality of Service (QoS) and Quality of Experience (QoE) delivered is satisfying users' increasing demands and expectations, and increasing at a pace that propels national development, given the global shift to a digital world.

Independent tests have shown significant differences in QoS between different mobile operators in Tanzania [3] and there have even been accounts of dissatisfaction aired publicly [4], [5].

Furthermore, with the shift to an increasingly networked world come new applications and services such as the expected trend toward smart cities and villages.

These reinforce the need for more purposeful quality control of mobile networks in the country and the need to increase the minimum service level offered to users as a right in the universal service e.g. to entitle every person in Tanzania access to a functioning telephone and 1 Mbps broadband subscription at their home or place of business.

It is of course in the interest of regulators, service providers and users alike that mobile operators deliver satisfactory QoS and QoE to all users. This is a rather difficult task given the nature of the wireless channel, and thus requires regular performance monitoring. This is where in-context measurements come in. In-context measurements aid network operators in planning, optimising and troubleshooting their networks. With in-context measurements, content providers also benefit by optimising their application decisions, as do regulators who are able to validate service provisions and evaluate the ubiquity of access, and users who can compare the services of different providers.

Traditionally, users have relied on the signal strength bars on their mobile phone screens to gauge the expected QoS, while network providers have conducted drive tests, coverage modelling and network-side passive analysis to capture the performance of the networks that they offer. As useful as these approaches have been, network-based monitoring does not provide context inclusive user side



measurements, coverage modelling does not emulate reality precisely and drive tests are too expensive and time consuming to be performed at precise depths throughout the entire country on a regular basis. Indoor locations, rough terrain and seasons with heavy rains for instance are often omitted during drive tests.

Such omissions can prove expensive, especially when disaster strikes. To address some of these limitations, some have turned to the power of the mobile phone and the power of the crowd for help with the task of measuring the performance of networks [6]. Smartphones with location sensing capabilities act as measurement sensors and the crowd of users going about their daily activities allows for the collection of continual real-time spatiotemporal data over a greater coverage area with much fewer resources.

Imagine every mobile phone in Tanzania being equipped with the ability to collect and report measurements from the network it is connected to, without disturbing the user. Now imagine that all of this data is compiled and presented in your format of choice. How beneficial would it be to users, operators, researchers and regulators?

With the large data sets that can be collected through crowdsourcing and the increasingly sophisticated analytical tools, it is possible to have a more granular level of insight into what mobile users for instance are experiencing as well as to correlate data to identify gaps, violations, and the like.

Regulators have begun to combine operators' submissions, their own field measurements and crowd sourced data in their work [7]-[9] to provide open and transparent infor-

mation to consumers about their mobile services, to encourage competition and thus improvements by mobile service providers and to provide additional data for fact-based decision making. Operators are also making use of crowd sourced performance results in marketing their services above their competitors [10], [11].

With the regulators and operators being more informed about the actual customer experience, they will be able to ensure the delivery of the best possible customer experience.

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# Development of TV White Space Technology

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## Abstract

**W**HITE spaces is the name given to parts of spectrum that are unused in a particular location and at a particular time. TV white spaces (TVWSs) exist between the spectrum primarily used for digital terrestrial TV broadcasting, that is, 470 MHz to 694 MHz. Spectrum in the TV frequency band is prime for various applications because it can travel longer distances and more easily through walls than the spectrum bands mainly used by other wireless technologies, such as Bluetooth and Wi-Fi.

Among the proposed applications that can be enabled by the TVWS technology includes the rural broadband deployments, Machine to Machine (M2M) communications and Hot-spot coverage.

This article presents information on the recent development of TVWS technology and assess the availability of the TVWS for telecommunication services in Tanzania. The article also provides a concise description on issues related to technical, regulatory and business aspects of TVWS implementation. Opportunities as well as challenges associated with the utilization of TVWS spectrum are succinctly discussed.

## I. INTRODUCTION

TV white space (TVWS) network is a promising paradigm for meeting the increased demand for high speed data connectivity [1]–[3]. Majority of people in Africa, especially in rural and underserved areas, are not connected to the Internet due to unavailability of broadband infrastructures [4], [5]. This is attributed by the cost of providing Internet connectivity, which might not be affordable to the low income societies in rural areas. The unlicensed TVWS can bridge this digital divide gap as it can be used to provide long-range Internet services to the areas that have no access to mobile broadband services at a reasonable price [5].

Radio spectrum is a scarce resource [1], [2], [4], [6]–[12]. Since the demand for spectrum is increasing and frequency bands (below 1GHz) are becoming more congested, it is important to explore various techniques that enhances spectrum sharing [1]. TV white space network is a promising paradigm of dynamic spectrum sharing, and can effectively improve spectrum utilization and alleviate spectrum scarcity [1], [2], [4], [7]–[11].

The main challenge in using TVWS lies on how to achieve a reliable approach for detecting presence of licensed users in order to ensure that harmful interference to television signals and other incumbent services does not occur [2], [3], [13]. The use geolocation database is one of the proposed and currently adopted solution in the deployment of the TVWS Networks [1], [2], [4], [6], [9], [10]. Geolocation databases are capable of providing information on the availability of TVWSs to white space devices (WSDs). These databases identify locations, frequencies and times where WSDs will not affect licensed (primary) users and apply rules, set by the regulator, which put limits on the power levels they can operate at. To avoid interference, geolocation databases communicate with the WSDs devices to give them technical constraints they must operate within [14]–[16].

Apart from the issue of interference between the licensed and unlicensed users, business modeling for TVWS network is very important for wide commercialisation of this promising technology [2], [7], [9], [11].

Properly designed trading mechanisms is required to ensure that total network profit is realized [11].

In the literature, various business models for creating incentives for the database operator in TV white space networks have been proposed (see [1], [2], [9]–[11] and the references therein). However, the practical application of these models have not been realised. The success of TVWS networks will depend on a proper business models that provide incentives for all parties involved

[9], that is, manufacturers of equipment (vendor) mainly focusing on selling their products, wireless Internet service providers, focusing on providing connectivity, White Spaces Database Providers, consumers and the regulator.

This article focuses on the current development of TV white space (TVWS) technology and the assess the availability of the TVWS for Telecommunications applications in Tanzania. A succinct description related to the minimum requirements for operating the TVWS Networks are provided. The opportunities and challenges

associated with the use of TVWS spectrum are briefly discussed.

## II. TECHNICAL REQUIREMENTS FOR TVWS

Most of the studies on TV white spaces recommends geolocation databases to be the sole source of spectrum information for White Space Devices (WSDs). Geo-location databases protect TV band incumbents by keeping track of TV transmitters and their protected service areas based on their location, transmission parameters and sophisticated propagation models.

Most of the adopted technical requirements, allow white space devices (WSDs) to operate at power levels high enough to offer substantial broadband coverage while protecting the licensed users (broadcasters) from harmful interference [14].

This is done through the use of geolocation database and reliable propagation modeling. Utilization of TVWS requires Dynamic Spectrum Access (DSA) technology [17]. DSA is an umbrella term describing a set of technologies and techniques enabling radiocommunication devices to opportunistically transmit signals on the available radio spectrum [14], [17]. The essence of DSA technology is to identify unused and underused white spaces and share it with the secondary users without interfering the licensed/primary users.

Technical requirements for the TVWS requires regular revision, to capture rapid development in communication technology, which focus on effective and appropriate use of the spectrum [15], [16]. Technologies with a potential to improve the efficient utilization of spectrum includes compression, smart antennas, spectrum sharing techniques, etc. In addition, revision is needed to cope with the changes to the available spectrum for WSDs.

It should be noted that, any device that intends to use White Space channels for communication is deemed to be a WSDs.

### A. TV WhiteSpaces Database

To deploy a TVWS network requires geolocation and database access mechanism. White space databases (WSDBs) are often referred to as geolocation databases to emphasize the importance of geographical information in controlling the the utilization of the TVWS Spectrum.

Geolocation database is considered as an essential piece of infrastructure. White space devices (WSDs) may only operate in the UHF band in accordance with operational parameters provided by a WSDB, which is operated by the regulator or authorized database operators qualified by the Authority. The database is responsible for providing the permitted operational parameters from which WSDs may operate. The algorithm describing how WSDBs communicate will be provided in the network diagram.

### B. Minimum requirements for operation

The requirements focus on effective and appropriate use of the radio spectrum, especially maximising spectrum utilisation and avoiding harmful interference. The requirements therefore stipulate the necessary equipment parameters for the licence exemption of WSDs in the 470 MHz to 694 MHz band. Table I contain the relevant equipment parameters. These constitute the minimum requirements for the use of WSDs in the 470 MHz to 694 MHz band within the URT.



TABLE I TECHNICAL REQUIREMENTS FOR THE USE OF TVWS

S/N	Minimum Requirements for the use	Details
1	Frequency band (s)	470 MHz to 694 MHz
2	Radiocommunication service	Mobile services or fixed services
3	Application	Terrestrial radio applications capable of providing electronic communications services)
4	Channeling	Specified by a designated white space database
5	Modulation / Occupied bandwidth	Not specified
6	Direction/Separation	Not specified
7	Maximum Transmit Power / Power Density	Specified by a Designated white space database; in all cases subject to a maximum limit of 36 dBm/(8 MHz)
8	Channel access and occupation rules	Specified by a Designated white space database
9	Authorization Regime	License Exempt
10	Additional essential requirements	Not applicable

The specified minimum requirements are applied to achieve the desired level of compatibility of WSDs operating in the 470 MHz to 694 MHz band with other radiocommunication services in the band and adjacent to the band, whilst promoting enterprise, innovation and competition.

## III. POTENTIAL OF TVWS APPLICATIONS

Some potential TVWS applications includes rural broadband, hot-spot coverage and M2M communications.

### A. Rural Broadband

Due to favourable radio propagation characteristics for radio frequency (RF) below 1 GHz, TVWS provides a communications environment for affordable wireless broadband services to rural and under-served areas, particularly in a country like Tanzania, which has large geographical area and is sparsely populated. Trials in some African countries have demonstrated the potential of TVWS technology to bridge digital divide and provide affordable access to the Internet to serve billions of people that are yet to be connected [5].

# TV White Space Technology

## B. Hot-spot Coverage

TVWS could be used to provide fixed or mobile communications in hot-spots. This is similar to WiFi hotspots for use in public areas.

## C. Machine to Machine Communications

TVWS could be used to provide low data rate connections between sensors and devices used for the purpose of control, or remote monitoring. This can help resolve connectivity challenges to enable evolving Internet of Things (IoT) or M2M communications. As such communications would demand tens of billions of telecommunications connections by wireless means the long-range, low power and low cost characteristics of TVWS devices may be prominent for meeting the challenges and demand of IoT in this regard. The IoT refers to the network of physical objects with unique identifiers and the ability to communicate with others over the Internet or a similar wide area network in order to collect and exchange data. M2M communications is considered as an integral part of the IoT.

## IV. REGULATORY FRAMEWORK FOR TVWS

There is no developed international frameworks and regulatory regimes for TVWS. Each country has to deal with its own challenges that the TVWS policies and implementation may impose. Some countries have developed the TVWS regulatory framework, which is tailor made to their specific environment. Other countries consider TVWS as a testing ground to see the feasibility of spectrum sharing in other bands. The Dynamic Spectrum Alliance (DSA) Limited, have proposed rules for accessing TVWS and can be used to establish regulatory framework for provision of TVWS services [14].

In the United States, the Federal Communications Commission (FCC) has adopted a licence-exempt regulatory framework and a certification scheme for TVWS devices since 2010. The first commercial TVWS application was launched in April 2013. The United Kingdom has carried out several consultations and trials on TVWS applications. In 2011, Office of Communications (Ofcom) in the UK, issued a statement which concluded that TVWS could be used without license provided that they complied with some specified technical requirements.

In 2013, Ofcom put forward a framework of TVWS technology and specified the technical details for implementing the technology. Ofcom made regulations on 18 December 2015 which enable licence exempt use of white space devices in the 470 - 790 MHz band. The regulation came into force on 31 December 2015.

Singapore has also been active in conducting TVWS trials since 2009. While some pilot projects were carried out in the industry, the Infocomm Development Authority (IDA) of the Singapore conducted a consultation on the proposed framework for TVWS in 2013. A license-exempt regulatory framework has been adopted by IDA in 2014. Regulatory framework and TVWS databases proposed by IDA accommodates both FCC and Ofcom approaches. This provides operators and consumers with additional flexibility on the issues related to emission limit restrictions.

Unlike the USA, UK and Singapore, where designated qualified

private companies are certified to operate the TVWS database, the South Korea government monopolize its Authority to develop and manage the TVWS database.

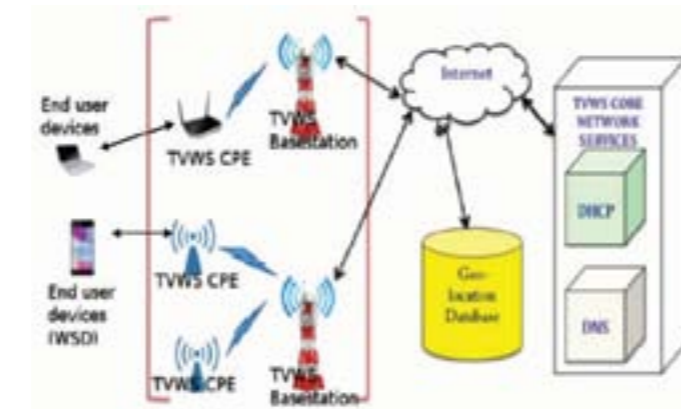
In Africa, some countries have proposed TVWS regulations. Malawi Communications Regulatory Authority (MACRA) proposed TVWS regulations. However, the Dynamic Spectrum Alliance Limited proposed that MACRA should make modest adjustment to the proposed technical rules operating TVWS in Malawi.

## V. TVWS NETWORK

### A. Utilization of TV channels in Tanzania

Assessment of TV UHF band shows that in the 470-694 MHz in Tanzania, a major portion is unutilized. 9 channels (8 MHz bandwidth per channel) in the 470-694 MHz band are assigned for provision of Digital Terrestrial TV (DTT) services to three MUX Operators in each service area, which is equivalent to 72 MHz.

Fig. 1. Block diagram of a TVWS Network



### B. Availability of TVWS in Tanzania

Out of the available channels (21-48), a few channels have been assigned and there are still available channels that can be used for TVWS in each service area. A TV channel is considered locally available for TVWS if the corresponding signal power receivable at that particular location is less than or equal to a pre-set threshold level specified by the regulator. However, if the lower/upper adjacent channel(s) is/are intended for TV reception in the same area, such TV channel(s) will be considered as unavailable to TVWS in that area in order to prevent radio interference to normal TV.

In Tanzania three multiplexer operators are assigned the spectrum in this band, 3 channels for each MUX Operator, equivalent to (72 MHz). It is estimated that more than 16 channels (128 MHz) are available, which suggests that a significant amount of TVWS spectrum can be made available on a license-exempt basis. The available spectrum for TVWS, is more than the available 80 MHz in the 2.4 GHz band used for WiFi and TVWS spectrum is relatively clean compared to the congested 2.4 GHz and 5 GHz bands. It should be noted that, proper coordination of the band at the borders with neighbouring countries, is essential to maxi-

mize availability of TVWS channels and resolve any interference issues.

## VI. CHALLENGES OF WHITE SPACE SPECTRUM APPLICATIONS

White Space spectrum has some limitations, arising from the need to avoid interference with existing services like broadcast. Avoiding interference is a complex and dynamic process. The challenge is not only to find empty frequencies but also to refer back to an online database to see if things have changed. Thus, some White Space radios have a GPS inbuilt in it in addition to the radio functionality [18].

TVWS technology is still at earlier stage of development as TVWS consumer devices have yet to appear in the mass market. The commercial viability of TVWS operations is still largely unknown.

## VII. CONCLUSION

Information on the development of TV white space (TVWS) technology and the assessment conducted on the availability of the TVWS for Telecommunication applications in Tanzania are provided. The technical requirements for operating the TVWS Networks are discussed. TV White Space technology can be used to bridge the digital divide, by providing internet connectivity in rural areas. In addition, TVWS networks can be deployed in M2M communications, and hot spots at campuses or other institutions. Issues related to regulatory framework, technical and business model still remains to be a major concern on deployment of TVWS technology. Business modeling is critical for the practical commercialization of TVWS networks. Thus, there is a need to establish regulatory decisions that may shape the business landscape.

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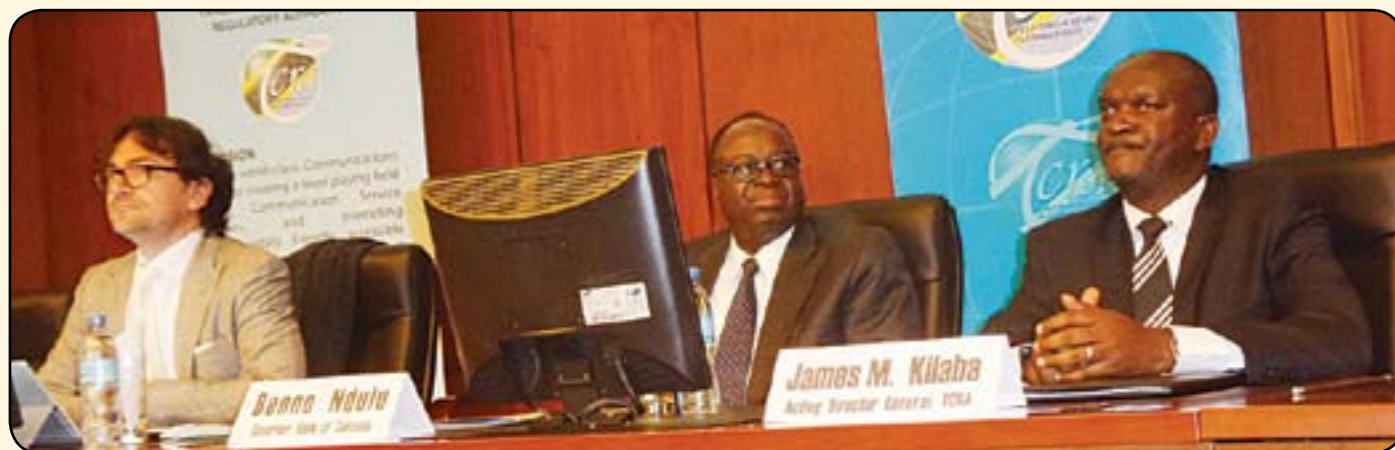
President John Pombe Magufuli shaking hands with the TCRA Director General, Eng. James Kilaba at a recent function in Dar es Salaam.



TCRA Director General, Eng. James Kilaba with signing a memorandum of understanding with the Secretary General of the Arusha-based Pan African Postal Union for the joint construction of a modern office block for the Union. Looking on is the Authority's Acting Director of Legal Services, Fortunata Mdachi.



A blind journalist, Ally Khatibu, taking notes using braille. TCRA is developing guidelines on ICT use by persons with disabilities.



Bank of Tanzania Governor, Professor Benno Ndulu with the TCRA Director General, Eng. James Kilaba at a recent financial services conference in Dar es Salaam.

## MOBILE NUMBER PORTABILITY

Mobile Number Portability (MNP) means you can now change your mobile service provider and keep your mobile phone number within Tanzania. It is a process that allows you to keep your mobile number irrespective of who is your mobile service provider, thus enjoy freedom and convenience (and hence; MY NUMBER MY IDENTITY).

With Mobile Number Portability, you can now retain your number when moving from one mobile service provider to another; receive all your calls and messages regardless of which mobile network you may have ported your number to, without having to inform your friends, relatives, colleagues or clients about your change of mobile service provider. You will also be able to save money as you do not have to purchase additional SIM cards for each mobile service provider or maintain more than one mobile hand set. You can choose the mobile service provider whom you feel they offer better quality of service (QoS), better customer experience or innovative services. There is no charge to port your number.

**MNP** is available to both Post-Paid (Pay Monthly) and Pre-Paid (Pay As You Go/ PAYG) mobile customers of all mobile service providers in Tanzania, as long as your number has not been barred or suspended.

To use the system, one has to fulfil the following:-

### If you are a Post-Paid customer:-

- You cannot port a suspended or barred number.
- You have to clear your bills before porting,
- You have to complete the minimum required terms and conditions of the contract with your current service provider and fulfil your monthly dues under the contract before porting.
- You will still receive bills for your usage up to the time your number is switched to the new service provider. You will receive a final bill up to 60 days after you port your number, you will then have 30 days to settle this final bill or risk having the port reversed and/or losing your number.
- You cannot port if you have a loan from a mobile service provider.
- You cannot port if you have been involved in a fraudulent or criminal activity where by your current number is barred
- You cannot port if you are having unpaid bills in place.

### If you are a Pre-Paid customer:-

- You will not be able to take your outstanding credit with you, and thus, you should use it up before you switch.

All subscribers who wish to port and have an associated mobile wallet, **MUST** cash out all their money prior to porting, otherwise their balances will be orphaned and a complex procedure will need to be followed to recover the money which will however remain intact until you recover it.





**ISO 9001:2008 CERTIFIED**

# TZ-CERT

TANZANIA COMPUTER EMERGENCY RESPONSE TEAM

## TANZANIA COMPUTER EMERGENCY RESPONSE TEAM (TZ-CERT)

### INCIDENT REPORTING

TZ-CERT addresses all types of computer security incidents, which occur at its constituency. TZ-CERT may act upon requests of one of its constituents or may act if one of its constituents is involved in a computer security incidents.

The level of support given by TZ-CERT will vary depending on the type and severity of the incidents or issue, the size of the user community affected and the TZ-CERT's resources at the time which occurs at its constituency.

Users and System Administrators can report computer security incidents and vulnerabilities to TZ-CERT.

If you encounter any of the violations given below, you may contact TZ-CERT for technical assistance:-

- Attempts (either failed or successful) to gain unauthorised access to your system or data therein
- Disruption or Denial of Service
- Unauthorised use to a system for the processing or storage of data
- Changes to system hardware, firmware, or software characteristics without owner's knowledge, instruction, or consent
- Email-related security issues, spamming, mail bombing etc
- Attempts for Identity theft such as phishing

- Unauthorised modification of website content, defacement, injection of Malicious link etc

Users of different systems working on various platforms and using different applications may report any vulnerability found in these systems, platforms, applications, services and devices to TZ-CERT. An incident can be reported to TZ-CERT as follows:

#### ■ Website

The incident can be reported by filling in the incident reporting form on our website ([www.tzcert.go.tz](http://www.tzcert.go.tz)) and fill in as many fields as possible to enable TZ-CERT to assess the severity and nature of the incident and assist in recovery, as needed.

#### ■ Electronic Mail

The TZ-CERT email address for reporting incidents is: [incidents@tzcert.go.tz](mailto:incidents@tzcert.go.tz)

For all other inquiries and correspondence, write to: [info@tzcert.go.tz](mailto:info@tzcert.go.tz)

#### ■ Telephone

Occasionally, a compromised system's electronic mail may be under surveillance by the intruder. If that is suspected, you are advised to use a telephone to file your report.

You can contact the TZ-CERT Team on numbers:

**Tel: +255 22 2412 039 / +255 22 2199 760-9**

**Fax: +255 22 2412 038**