

## MOBILE PHONE REGISTRATION FOR A DEVELOPING ECONOMY: GAINS AND CONSTRAINTS

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### ABSTRACT

The continues increase in the number of mobile phone users and the terrifying increase in the rate of criminal usage of the device, demands for the a strict monitoring of the user behavior in order to checkmate the security status in most developing countries. In order to achieve these goals, the registration of this device becomes imperative. This paper focuses on the mobile phone registration for especially the developing economy by studying the gains, challenges and constraints of this scheme. It was concluded that the proper registration which involves SIM (Subscriber Identity Module) card and mobile phone IMEI (International Mobile Equipment Identity) number registration, will aid the developing economy especially in addressing issues such as impersonation, kidnapping and other criminal activities

**Keywords:** Mobile phone, IMEI, SIM, IMSI, Subscriber.

### INTRODUCTION

Today the mobile phone has became a telecommunication device that every home or even adult is roughly estimated to have in possession, due to its portability, easy use and cost. The mobile phone vendors continues to add numerous facilities in the devices making it so reach that most computing activities including social network services are incorporated, such as Opera and Internet browsers, etc, and many more such as Google services, Face-book, twitter, games, etc can be added by the users. Hence, the mobile phone is assumed to provide a point of contact which can be used to trace and track the user in a particular region. Cell phones have different uses for different people, but sending text messages and taking pictures or video are the most popular activities among mobile owners. In a few nations, such as Kenya, Uganda and Tanzania, mobile banking is also relatively common. Other activities, such as getting political news, accessing a social networking site, getting health and consumer information and looking for a job are done less frequently (Pewglobal, 2015).

Considering the recent incidents of the mobile phone snatching and other perverted use of the device, the need for the registration of this electronic device became an important issue globally. The registration of every mobile phone used in the country is a measure expected to keep track of the user activities and location in a particular country or beyond. This is expected to address such problems like snatching of the device, illegal movement, impersonation and burglary activities etc.

However, some countries more especially the developing nations still encounter so many problems in the mobile phone registration scheme, due to some constraints which includes illiteracy, poverty, level of leadership and economic crises existing in such regions. This paper aims to reveal the importance of the mobile phone registration scheme, the constraints and challenges facing the scheme and the ways out following the situations in most developing countries.

## LITERATURE REVIEW

A mobile phone, cellular, cell phone or hand phone is a mobile electronic device used to make mobile telephone calls across a wide geographic area, served by many public cells. A mobile phone can make and receive telephone calls to and from the public telephone network which includes other mobiles and fixed-line phones across the world. It does this by connecting to a cellular network provided by a mobile network operator. In addition to telephony, modern mobile phones also support a wide variety of other services such as text messaging, MMS (Short Message Service), email, Internet access, short-range wireless communications (infrared, Bluetooth), business applications, gaming and photography. Mobile phones that offer these more general computing capabilities are referred to as smartphones. The first hand-held mobile phone was demonstrated by Dr Martin Cooper of Motorola in 1973, using a handset weighing 2 kg (Heeks, 2008a). In 1983, the DynaTAC 8000x was the first to be commercially available. In the twenty years from 1990 to 2010, worldwide mobile phone subscriptions grew from 12.4 million to over 4.6 billion, penetrating the developing economies and reaching the bottom of the economic pyramid (Heeks, 2008b) as shown in figure 1.

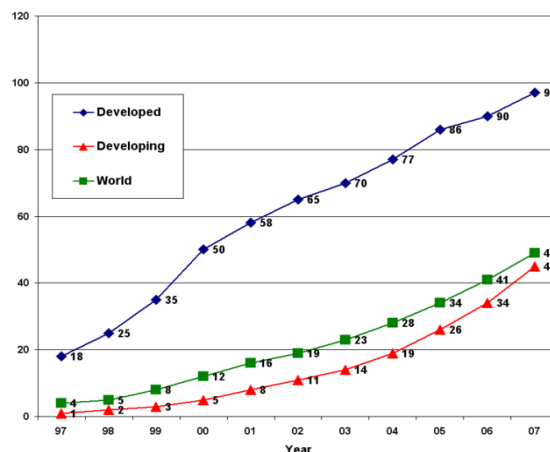


Figure 1: Mobile phone subscribers per 100 inhabitants 1997-2007 (Kosuch, 2009)

There are many telecom industries providing their services in many countries around the globe and the rate of growth in their number is increasing significantly as illustrated in figure 2. While these household names of the telecom industry almost certainly helped the government to illegally snoop on their customers, statements by a number of legal experts suggest that collaboration with the NSA (National Security Adviser) may run far deeper into the wireless phone industry. With over 3,000 wireless companies operating in the United States, the majority of industry-aided snooping (Figure 3) likely occurs under the radar, with the dirty-work being handled by companies that most consumers have never heard of.

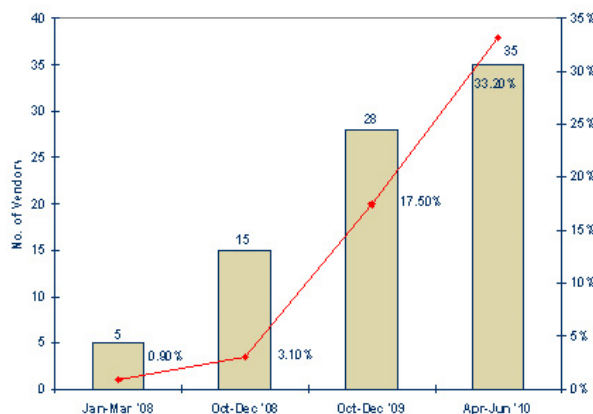


Figure 2: The analysis of number of vendors from January 2008 to April 2010 (ITU-D, 2011)  
A recent article in the London Review of Books revealed that a number of private companies now sell off-the-shelf data-mining solutions to government spies interested in analyzing mobile-phone calling records and real-time location information. These companies include ThorpeGlen, VASTech, Kommlabs, and Aqsacom--all of which sell "passive probing" data-mining services to governments around the world (Chris, 2008).

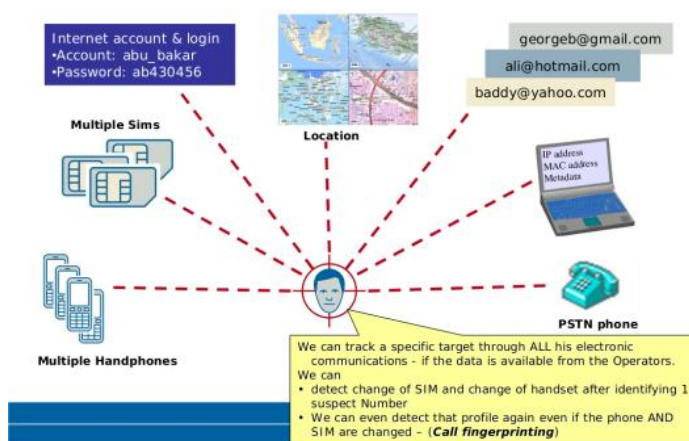


Figure 3: Target Identification diagram (Chris, 2008)

MSISDN (Mobile Subscriber Integrated Services Digital Network Number) is a number uniquely identifying a subscription in a GSM or a UMTS mobile network. It is the telephone number to the SIM card in a mobile/cellular phone. The MSISDN together with IMSI (International Mobile Subscriber Identity) are two important numbers used for identifying a mobile subscriber. The latter identifies the SIM, i.e. the card inserted in to the mobile phone, while the former is used for routing calls to the subscriber. IMSI is often used as a key in the HLR (Home Location Registration) ("subscriber database") and MSISDN is the number normally dialed to connect a call to the mobile phone. A SIM is uniquely associated to an IMSI, while the MSISDN can change in time (e.g. due to number portability), i.e. different MSISDNs can be associated to the SIM. The MSISDN follows the numbering plan defined in the ITU-T recommendation E.164. An MSISDN format is limited to 15 digits, prefixes not included (e.g., 00 prefixes an international MSISDN when dialing from some countries).

MSISDN = CC + NDC + SN

CC = Country Code

NDC = National Destination Code, identifies one or part of a PLMN (Public Land Mobile

Network)

SN = Subscriber Number

Example: MSISDN: 380561234567

CC	380	Country Code
NDC	56	National Destination Code
SN	1234567	Subscriber's Number

### The IMEI Number

The IMEI number is structured by the British Approval Board for Telecommunications (BABT) as shown in figure 4. It has 15 decimal digits. Actually it has 14 digits plus a check digit. First 8 digits of IMEI number are TAC (Type Allocation Code) which gives the mobile phone brand and model. Other 7 digits are defined by manufacturer (6 are serial number and 1 is check digit) (Imei, 2010).



Figure 4: Nokia 6020 IMEI label (Imei, 2010)

**IMEI number** is important for the same reason as car serial number. Mobile operator can track usage of the mobile phone very fast if it is used in the same network, but police cannot track the car so fast. Mobile operator can see if the phone is used by some other user in their network, but if it is used in other operator's network then the network operator cannot see it.

### The SIM card

GSM mobile phones require a small microchip called a Subscriber Identity Module or SIM Card, to function. The SIM card is approximately the size of a small postage stamp (Figure 5) and is usually placed underneath the battery in the rear of the unit or elsewhere in the phone. The SIM securely stores the service-subscriber key (IMSI) used to identify a subscriber on mobile telephony devices (such as mobile phones and computers). The SIM card allows users to change phones by simply removing the SIM card from one mobile phone and inserting it into another mobile phone or broadband telephony device without changing or reconfiguring anything in the new phone. A SIM card contains its unique serial number, internationally unique number of the mobile user (IMSI), security authentication and ciphering information, temporary information related to the local network, a list of the services the user has access to and two passwords; PIN (Personal Identification Number) for usual use and PUK (Personal Unlocking Key) for unlocking.

SIM cards are available in three standard sizes. The first is the size of a credit card (85.60 mm × 53.98 mm x 0.76 mm). The most popular miniature version has the same thickness but a length of 25 mm and a width of 15 mm, and has one of its corners truncated (chamfered) to prevent mis-insertion. The later incarnation known as the 3FF (Third Form Factor) or micro-SIM has dimensions of 15 mm × 12 mm. Most cards of the two smaller sizes are supplied as a full-sized card with the smaller card held in place by a few plastic links; it can easily be

broken off to be used in a device that uses the smaller SIM. Most new mobile phones use the most recent form of the SIM card called Nano SIM card. Nano SIM is the fourth version, or the "fourth form factor" (4FF) of the SIM standard and measures a mere 12.3 mm by 8.8 mm by 0.67 mm, but still holds the same amount of data as earlier SIM cards. Nano SIM is both smaller and approximately 15% thinner than the earlier Micro SIM (3FF) standard as well as the Mini SIM (2FF) cards that were ubiquitous for many years and people commonly refer to simply as SIM cards. Technically, the original SIM (1FF) card standard is the same size as a credit card and most people probably have never seen one in person. The Nano SIM (4FF) reduces the size of the SIM effectively to the gold contact area and has just barely enough extra insulating "card" around it to prevent electrical shorts. A Mini or Micro SIM can be cut down to the Nano SIM size for use in the applicable iPad and iPhone models (Figure 5).

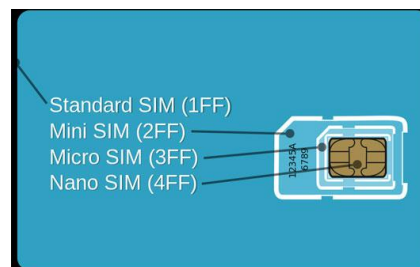


Figure 5: Comparing the relative size of each SIM standard (Everymac, 2016)

Some mobile phones do not use SIM cards and have no space where a SIM can be inserted. These cell phones that do not use a SIM Card have the data programmed in to their memory. This data is accessed by using a special digit sequence to access the NAM (Number Programming Menu). At which point information can be added, including a new number for the phone, new Service Provider numbers, new emergency numbers, new Authentication Key or A-Key code, and a Preferred Roaming List or PRL. However, to prevent the phone being accidentally disabled or removed from the network, the Service Provider typically locks this data with a Master Subsidiary Lock (MSL). The MSL also locks the device to a particular carrier when it is sold as a loss leader which most cases cannot be unlocked by the user.

The MSL applies only to the SIM, so once the contract has expired, the MSL still applies to the SIM. The phone, however, is also initially locked by the manufacturer into the Service Provider's MSL. This lock may be disabled so that the phone can use other Service Providers' SIM cards. Most phones purchased outside the U.S. are unlocked phones because there are numerous Service Providers that are close to one another or have overlapping coverage. The cost to unlock a phone varies but is usually very cheap and is sometimes provided by independent phone vendors. A similar module called a Removable User Identity Module (RUIM) card is present in some CDMA (Code Division Multiple Access) networks, notably in some Asian countries such as China and Indonesia.

**Multi-card hybrid phones:** A hybrid mobile phone can take more than one SIM card which is more common recently, even of different types. The SIM and RUIM cards can be mixed together, and some phones also support three or four SIMs. From 2010 onwards they became popular in India and Indonesia and other emerging markets such as Nigeria, attributed to the desire to obtain the lowest on-net calling rate.



## MOBILE/CELL PHONE REGISTRATION

The mobile phone registration model can be divided into two steps; SIM card registration and IMEI registration. These steps are very important and are recommended to ensure the achievement of the security and crime reduction goal in the society. Completing the two steps will benefit the various aspect of life in the common society by increasing the security measures and reducing the occurrence of criminal activities.

### SIM Card Registration

The SIM card registration is an important stage of phone registration. It involves the personal data and other information of the user which are supposed to be stored in the database of the country or GSM carrier service providers such as MTN, GLO, Airtel, etc. Since every SIM card has a unique number which the owner uses and shares for communication. Then, the registration of the SIM card will help to gather the users' personal information as illustrated in figure 6 and 7, including the SIM card number with which the Mobile phone service providers can use to identify the owner for every activity carried out. This method demands the following data from the user:

1. SIM Card Number
2. SIM Card Serial Number
3. Photograph
4. Right/ Left Hand Thumb prints
5. Full names (Surname, Middle and First Names)
6. Village, Community and Town
7. Local Government of Origin
8. State of Origin
9. Occupation, etc.

Figure 6: Personal Information Window. Figure 7: Customer Photo and thumb print window  
During the registration process, the various information from each SIM card user must be properly and clearly recorded in the computer system before the registration will be successful. This is to ensure that the information required to identify the SIM card owner is captured in the database.

## IMEI Number Registration

The IMEI number registration involves the registration of the IMEI number of every active mobile phone device by recording this unique number in the database of a country. This can be achieved by mandating all phone users in the country to register their phone just like the car engine number which is usually and properly documented. The phone registration requires the following data from the mobile phone owner: Owner's Full Names, User ID, Password, IMEI Number, etc.

When the IMEI number of a stolen phone is known, carriers can scan their networks to identify any person(s) who may be using that phone (Suzanne, 2001) and also identify any unlawfully usage of the phone. Once the carrier has obtained information about the IMEI number of a stolen phone and the corresponding SIM card(s) being used with that phone, unauthorised users could simply be electronically logged off the system. This can be achieved either by blocking the SIM card so that illegal calls cannot be made or by blocking the IMEI code so that the handset cannot be used with another SIM card. This would enable government or the carrier service, with the help of the carriers, to identify and track down offenders. Eliminating the capacity of a stolen mobile phone to receive incoming or make outgoing calls would significantly reduce the value of the handset and thereby reduce the incentive to steal mobile phones (Suzanne, 2001).

However, this strategy would only work if it was employed by all carriers. At present, it is unclear whether all carriers have this technology. Some phones may require the user to enter a password or a Personal Identification Number (PIN) before the phone can be activated. Locking phones with a PIN or password when not in use ensures that if the phone is stolen, an unauthorised user cannot make outgoing calls. Mobile phone users should also change these PINS and passwords regularly and keep IMEI numbers secure in case a report needs to be made to police (the IMEI number on most handsets can be determined by dialing \*#06#) (Smith, 1996).

## Benefits of the Registration

The complete mobile phone registration has a lot of benefits to the society especially in combating crime. The gain of this process can be summarized as follows;

- Every mobile phone user can be tracked and monitored by the police through the carrier service.
- Police can identify the owner of lost & stolen phones thousands of times each day (Immobilise, 2011).
- Loss & theft updates will be immediately available to the Police nationally (Immobilise, 2011).
- Combat the sale of stolen phones (Immobilise, 2011).
- This will help to combat the high rate of other crimes like kidnapping, robbery, burglary, etc.
- Stolen or lost phones can easily be reported to the police for tracking.

## The Challenges and Constraints of Mobile Phone Registration

The challenges of the cell phone registration seem to be greater and more pronounced in the developing countries than the developed countries. The major source of the challenge is the

level of governance in most developing nations. The major challenges can be summarized as follows:

- The level of governance. In most developing countries, there are apparently no laws or laid down rules that mandate every active mobile phone to be registered and disallow unregistered ones from gaining access into the network or track them down for questioning, since some criminal minded persons may not want to register their mobile phones to hide from the police tracking who may eventually identify them.
- There is little or no awareness campaign in the society to educate and inform the populace of the society of the benefits of the cell phone registration.
- Lack of proper central database in most developing nations, the police will find it difficult to track a mobile device even with the support of the GSM carrier service providers.
- Incomplete mobile phone registration. When a SIM Card registration is completed without the IMEI number registered, the user can always replace the SIM card of a stolen or lost phone with another SIM card and the device will never be identified as stolen or lost.
- Lack of technological standard mapped out for the carrier service providers by the government. In most developing countries, almost all the service carriers do not have the mobile phone tracking technology in their systems. This means that the phone registration will remain of little importance since the victim or reported mobile phone cases will not be traced out or monitored, thereby defeating the actual objective of the scheme (Suzanne, 2001).
- At present, however, most mobile phone customers do not know their IMEI number or fully appreciate its importance in police investigations.

## THE WAYS-OUT

In order to achieve the objective of the mobile phone registration scheme especially in most developing countries, the government must be properly educated and involved, including the general public and the major mobile phone service carriers. These will be summarized as follows:

1. The government should be properly educated on the necessary steps and standards involved to achieve the goals of the scheme. This will involve passing a bill or laying down laws to compel every mobile phone device user to complete the phone registration steps as reviewed above.
2. Mobile phone service carriers should be guided by the government rules on the standard of the technology needed to meet up with their plan to ensure security and reduce the rate of crime in the country. Vital machineries such as the tracking device must be made available in the carriers' equipments.
3. There should be a regular and active awareness campaign to educate and inform the general public of the benefits of the phone registration scheme.
4. The service carrier company policies on mobile phone tracking must be properly defined and made affordable to the common man in order to serve the purpose. In most countries, since carriers charge a fee for every search that is conducted, police procedure requires that a separate form be filled out for each stolen mobile phone and a different form is required for each of the five major carriers. This means that if one thousand phones are stolen from a mobile phone retailer, the police would be required to fill out five thousand separate forms (Suzanne, 2001).



5. The police must be properly guided by national laws in carrying out the processes involved in tracking a mobile phone and in apprehending a suspect without abusing the scheme.

## CONCLUSION

The mobile phone usage was observed to be increasing continuously with more functional features added by various vendors making the device to get more involved in human everyday activities. The mobile phone registration scheme was concluded to be of high benefit to the government and the society at large especially in combating crime and recovering of lost and stolen mobile phones. In order to achieve the goals of the registration scheme, it was concluded that every mobile phone device must be registered using the IMEI number: likewise every SIM card. It was recommended that the government should involve the phone registration in their law making policies to properly guide the entire bodies involved; the carrier service providers, mobile phone users and police. Finally, every country in the developing nations should develop a strictly guided unified database that can contain the bio data of every citizen of that country and the data of every new born baby should be captured in the data base from the hospital of birth.

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