Regional Development Forum 2008
"Bridging the Standardization Gap in Developing Countries"
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Electromagnetic Compatibility (EMC) Standards

Presentation
By
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Introduction

1. The ITU Plenipotentiary Conference (Antalya, 2006) updated Resolution 123 on "Bridging the standardisation gap between developed and developing countries" The World Telecommunication Standardization Assembly (WTSA), that took place in Florianópolis in 2004, adopted Resolution 44, which sets out a detailed action plan for addressing the standardization gap and for implementing Resolution 123.

2. "the continued shortage of human resources in the standardization field in developing countries, resulting in a low level of developing-country participation in meetings of ITU-T and of ITU-R and, consequently, in the standards-making process, leading to difficulties when interpreting ITU-T and ITU-R Recommendations;" This contributes to the standardization gap between developed and developing countries which adversely affects the ability of representatives from developing countries to access, implement, contribute to and influence international ICT standards, specifically ITU Recommendations. The standardization gap contributes to the persistence of the wider digital divide

3. Resolution 123 invites Member States and Sector Members among others , to make voluntary contributions to the fund for bridging the standardisation gap, as well as to undertake concrete actions to support the actions and initiatives of ITU in this matter in conformity with the follow-up and implementation of this resolution, as well as the operative paragraphs of Resolutions 44 (Florianopolis, 2004), 54 (Florianopolis, 2004) and 17(Rev. Florianopolis, 2004 and Resolution 47 (Doha, 2006).

4. Resolution 123 which recognises the continued shortage of human resources in the standardization field in developing countries, resulting in a low level of developing country participation in meetings of ITU-T and of ITU-R and, consequently, in the standard-making process, leading to difficulties when interpreting ITU-T and ITU-R Recommendations also takes into account that

developing countries could benefit from improved capability in the application and development of standards.

5. ***One of the fundamental steps towards bridging the standardisation gap is for developing countries to be assisted to acquaint ourselves in the field of EMC Standards. This is necessary because all equipment standards be it Defacto or Dejure standard, one way or the other, has to comply with EMC standards in order to operate in a given environment without causing any harmful interference.***

EMC

6. EMC is the situation where two or more electromagnetic equipment working together in the same environment performs together without causing undue interference with each other.

7. The RF Spectrum used as a transmission medium in the provision of Communication services in this era of convergence, involving Telecommunications, Broadcasting and Information Technology Services, are based on mostly ITU Recommendations or Standards.

Assistance

8. To assist developing countries meet national and international EMC standards, so as set up adequate Test Approval Laboratories to determine the conformity of telecommunications equipment to ITU Recommendations/ Standards.

In addition seminars may be organized where by experienced developed countries would share their expertise with developing countries as part of the fundamental measures envisaged in Resolution 123 (Rev. Antalya, 2006).

Strengthening standard-making capabilities
Such seminars on EMC Standards may serve not only to form the basis of providing an informed and practical introduction to EMI problems and EMC solutions but will serve to improve the standard-making capabilities of developing countries.

The above shall fit into the Action Plan for the implementation of Resolution 123(Marrakesh, 2002) of the plenipotentiary Conference's Programme 1: Strenhtening standard-making capabilities. The objective would be to improve the standard-making capabilities of developing countries.

Noting that many countries in developing countries especially in Africa are yet to develop their own National Electromagnetic Compatibility Framework Standards,

organising EMC Seminars shall be one of the essential and fundamental steps to assist in bridging the standardisation gap between developing and developed countries.

Developments
For about two decades now, the ITU has shown great concern about disparities between the developed and developing countries in terms of development in the telecommunications sector.

In the late 20th Century it was the missing Link.
In the beginning of the 21st Century the emphasis has been on Bridging the ICT developing gap between the developed and developing countries.

This presentation recognises the importance of the standardization gap which contributes to the persistence of the wider divide.

Aim
The aim of my presentation therefore is to serve to raise awareness for the need for greater emphasis to be given to this important subject ELECTROMAGNETIC COMPATIBILITY STANDARDS.

EMC implies an electrical system or products ability to operate

- without causing electromagnetic interference (EMI) that would interfere with other equipment and
- without being affected by EMI from other equipment or environment
-

(EMI is the radio frequency (RF) energy that interferes with the operation of a device. This RF energy may be produced by the device itself or by other device.

Virtually all electronic products from the simplest toys to the most sophisticated Telecommunication/ICT equipment, including sensitive airport control towers as well as medical equipment in hospitals are potential emitters of electromagnetic waves.

In addition, many devices are potentially affected by electromagnetic waves from other products in the vicinity.

These emissions may interfere with sensitive telecommunication equipment's safe operation and performance. As more electronic products enter the market place, and as products become more sophisticated and more sensitive, it becomes increasingly important to ensure electromagnetic compatibility (EMC)

Laws on EMC Standards

Due to its economic and security importance , many countries especially developed countries (who are manufacturers of most telecommunications/ICT Radio equipment and cable accessories) have strict laws and regulations governing EMC Standards.

In the EU Countries, despite individual member States regulations, each Member State is subject to EU directives. The EMC directive 2004/108/ec is one of a series of measures introduced under article 100a of the Treaty of Rome.

Similarly in the US, Public Law 97-259 gives the FCC the authority to set standards.

For instance RF emanating from digital devices such as computers, and other incidental radiation devices such as power, individual machines and electrical fences are regulated in Part 15 of the FCC rules.

Communication devices such as cordless, FM wireless microphones and other low power are also covered in Part 15... These devices may not cause harmful interference to other radio communication services.

In addition specifications for limits on RF energy emanating for a given device are included. For example, the wireless microphone mentioned earlier may not exceed certain field strength.

Radiation limits also apply to all equipment from mobile phone handsets to powerful Television and radio transmitters.

Government regulation is not a panacea however .Being in a period of shrinking government involvement in the life of the society it governs, thus we have seen deregulation on the part of an FCC determined to let market forces resolve their differences.

Associations Contribution

Manufacturers and professional trade Associations are aware of the RFI phenomenon. While these organisations are not in position to dictate policies to members, they can promote the need for responsibility in manufacturing and operations.

Associations often publish pamphlets and manuals for their members explaining how they can make products less susceptible to RFI problems. The same associations lobby the Government on behalf of their members. This sort of Associations is not available in most developing countries.

The Challenges of Developing Countries
Most developing countries do not have written Laws on EMC Regulations and do not have the necessary Type Approved Laboratories to ascertain compliance of equipment that come from developed countries.

Nowadays there are many imitations of equipment products in the market place and this makes the situation very serious as such equipment may not be compliant with the EMC standards required of them even though brochures accompanying shipment may indicate compliance to ITU, EU, or FCC Standards etc.

There should be the need for random checks by experts using the right testing equipment at a state-of-the art Type Approved Test Laboratory. Cost of equipment may deter a developing country from undertaking above project however **Chapter IV programme 4 of the Action Plan for the Implementation of Resolution 123 (Marrakesh, 2002) recommends what it terms** a Flagship Groups For Bridging The Digital Divide whereby a developed country may voluntary join number of developing countries in a small group in order to support them in their standardization activities. The close cooperation and direct support thus provided will enable countries within such groups to carry out their standardization activities more effectively. Similarly;

Under Programme 3: Human Resource Building;
ITU-R and ITU-T (to be specific Study Group 5) in close collaboration with BDT may organise seminars, workshops and study group meetings in developing countries to provide training courses on EMC analysis/standards. This can be by way of establishing and maintaining a forum, moderated by a group of experts, to support and provide advice in developing countries.

A typical seminar on EMC may have the following Outline:

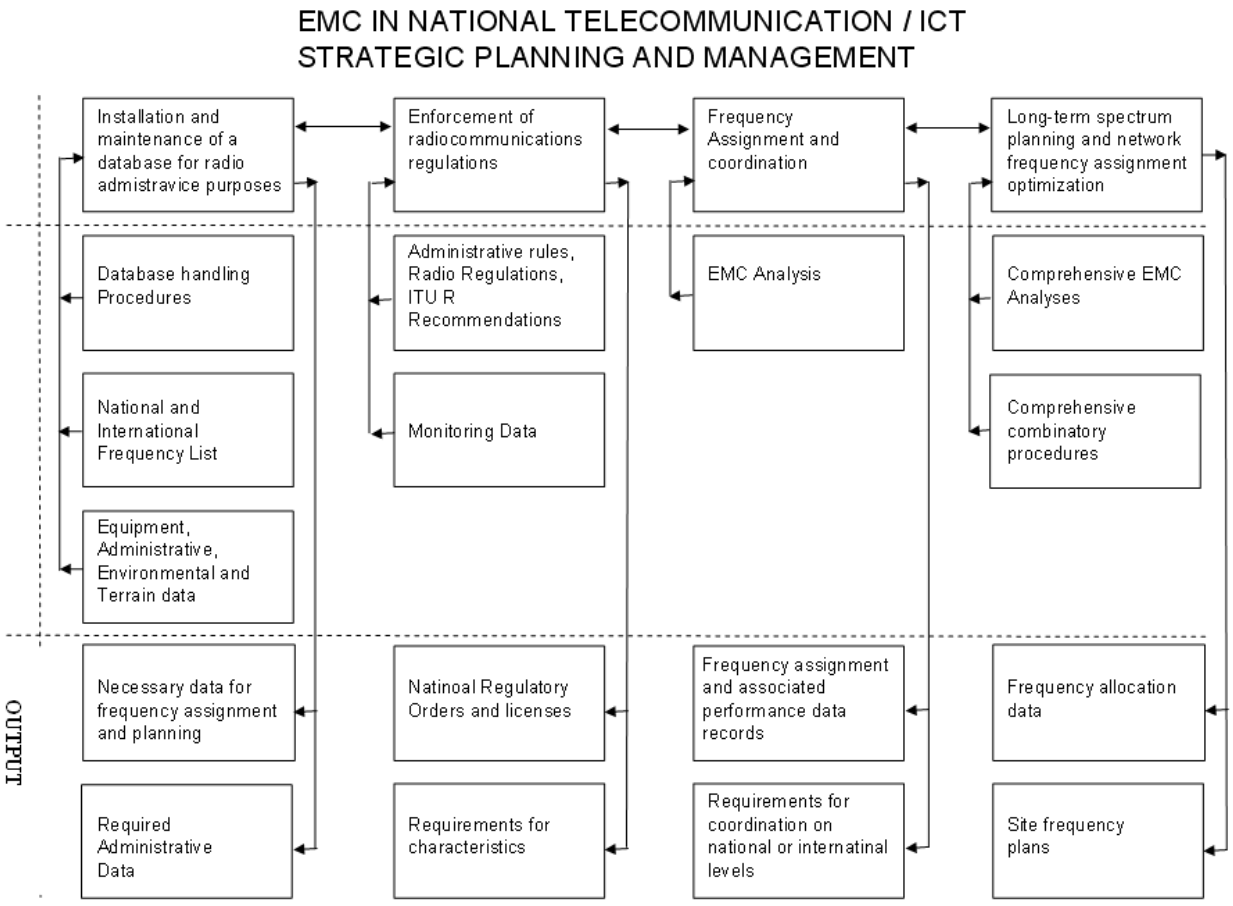
- The Importance of Meeting EMC Standards
- National and International Standards
- Detailed overview of a typical EMC Standards
- Compliance Costs
- EMC Management
- Fundamentals of EMC
- EMC Regulations

- EMC test methods
- Designing for EMC
    - Grounding
    - Shielding
    - Cabling
    - Filtering
    - Transient Suppression

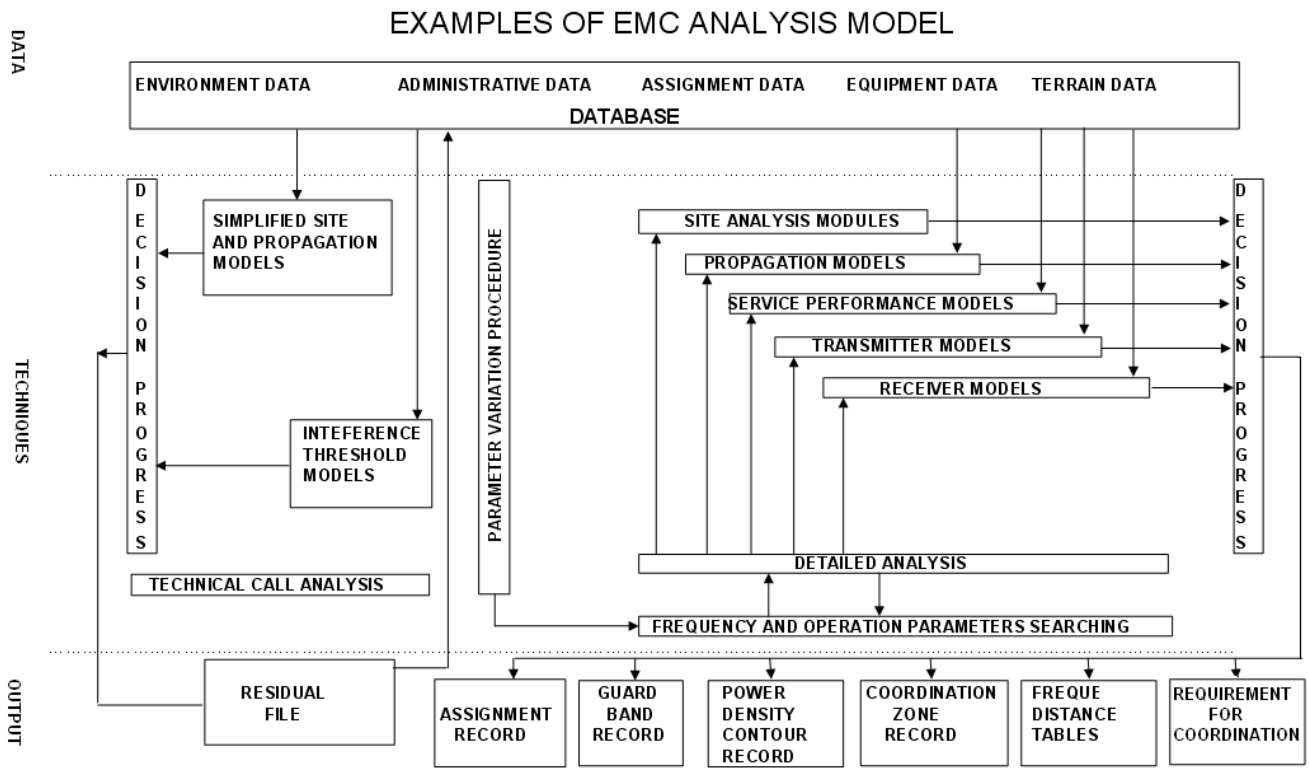
- Check lists for good EMC design

- Developing a National EMC Framework

- Introduction to EMC Models for the development of a National Database based on practical Research



Source: ITU Handbook on Spectrum Management and computer Aided Technique



ENVIRONMENT DATA

Accurate data on the environment is necessary in order to achieve EMC.
It has been observed that data on radio wave propagation in temperate regions of the world are sometimes 30% +/- off the value obtained in the Tropical Region of the world particularly countries below south of the Sahara desert and Above the equator
This is quite obvious considering the fact that factors such as temperature, pressure, humidity etc vary.
These have effect on atmospheric refractivity.

The distribution of temperature, pressure and water vapour content of the Atmosphere near the earth's surface is the major factor that affects the propagation of microwaves. The variation of the refractive index, n, at height, h, above the earths surface with pressure, p (mb), temperature, T(K) and water vapour pressure e(mb), is given by the relation: -

$$\mathbf{N} = (n - 1)x10^{-6}$$

$$= \frac{77.6}{T} \quad \frac{(P + 3.73 \times 10^5 e)}{T^2}$$

Where:

n = refractive index

N = difference between refractive in and unity or co-index. It is expressed in millionth parts (N-units in order to give numbers that are easier to handle.

T = absolute temperature ($T = t + 273$)
Where T is temperature in degree Celsius

P = atmospheric pressure in millibars

e = partial pressure of water vapour in millibars

This equation is found to be accurate to about 5% (Hall, 1979)

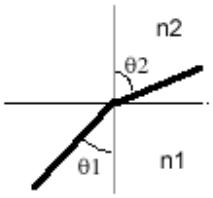
Atmospheric Refraction

Refraction on the troposphere relies on the variations in space of the refractive index n. Typically, the refractive index falls with increasing height. The refractive index governs the speed of propagation in a medium - which can be seen from the equation for the electric field in space and time:

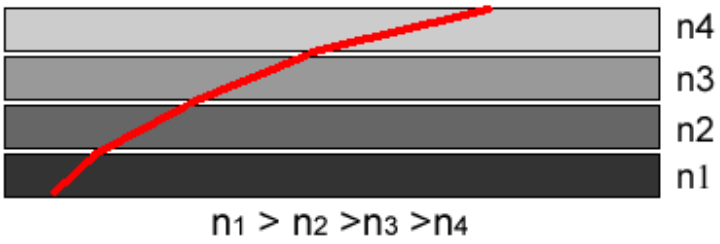
$$E(r,t) = E_o\, e^{i[n(r)k_o \cdot r - \omega t]}$$

$\omega = 2\pi f$ k_o = a vector normal to wavefront magnitude = $2\pi/\lambda$

Snell's Law



$$\frac{\sin\theta_1}{\sin\theta_2} = \frac{n_2}{n_1}$$



$n_1 > n_2 > n_3 > n_4$

ATTENUATION DUE TO RAIN

This is another area where accurate data is required from each climatic region in other to achieve EMC.

For an assembly of uniform raindrops, where there are N drops/CC of diameter D, the attenuation is given by:

$$a = 4.34 \times 10^5 \ \frac{N(\prod D^2)}{4} f_a \quad \text{db/km}$$

Where:

The function f_a depends on the ratio $\frac{(\pi D^2)}{4}$ and the complex permittivity, - the factor

$(\frac{D}{\lambda})$ is the effective area of a square for combined absorption and scattering etc.

Attenuation due to rain is therefore among the factors considered under Environmental Data and terrain Data in a typical EMC Database. Others are:

a. Administrative Data
b. Assignment Data
c. Terrain Data and obviously,
d. The Equipment Data.

Equipment *Data* This include data on all telecommunication, ICT ,Radio and Television broadcast equipment. The purpose is to achieve EMC.

EMC WORKSHOP
A detailed overview of key EMC concerns including the theory of EMI, various case studies, and measurement and prevention methods, national and testing issues shall go a long way to safeguard the increasing use of the electromagnetic spectrum for the provision of communication services in this convergence era of Telecommunication, Broadcasting and ICT.

This will serve as one of the initial steps towards the bridging of the standardisation gap between the developed countries, (who have well established National EMC Framework/Standards), and developing countries, especially in Africa, who are yet to develop their National or Regional vital EMC Framework/Standards.This shall be in accordance with

Considering (c) of Resolution 123 (Rev. Antalya, 2006) which states;

"That, under the Strategic Plan for the Union 2008-2011, ITU-T is to work to provide support and assistance to the membership, mainly to developing countries, in relation to standardization matters, information and communication network infrastructure and applications, and in particular with respect to (a) bridging the digital divide; and (b) providing training and producing relevant training materials for capacity building,"

Resolution 47 (Doha, 2006): Enhancement of knowledge and effective application of ITU Recommendations in developing countries also notes
the difficulties in understanding ITU recommendations and related international standards to apply new technology to the network appropriately and effectively.

- The lack of practical information on the application of ITU recommendations and related standards of other countries, and the lack of guidelines on applying technical document and therefore instructs the ITU

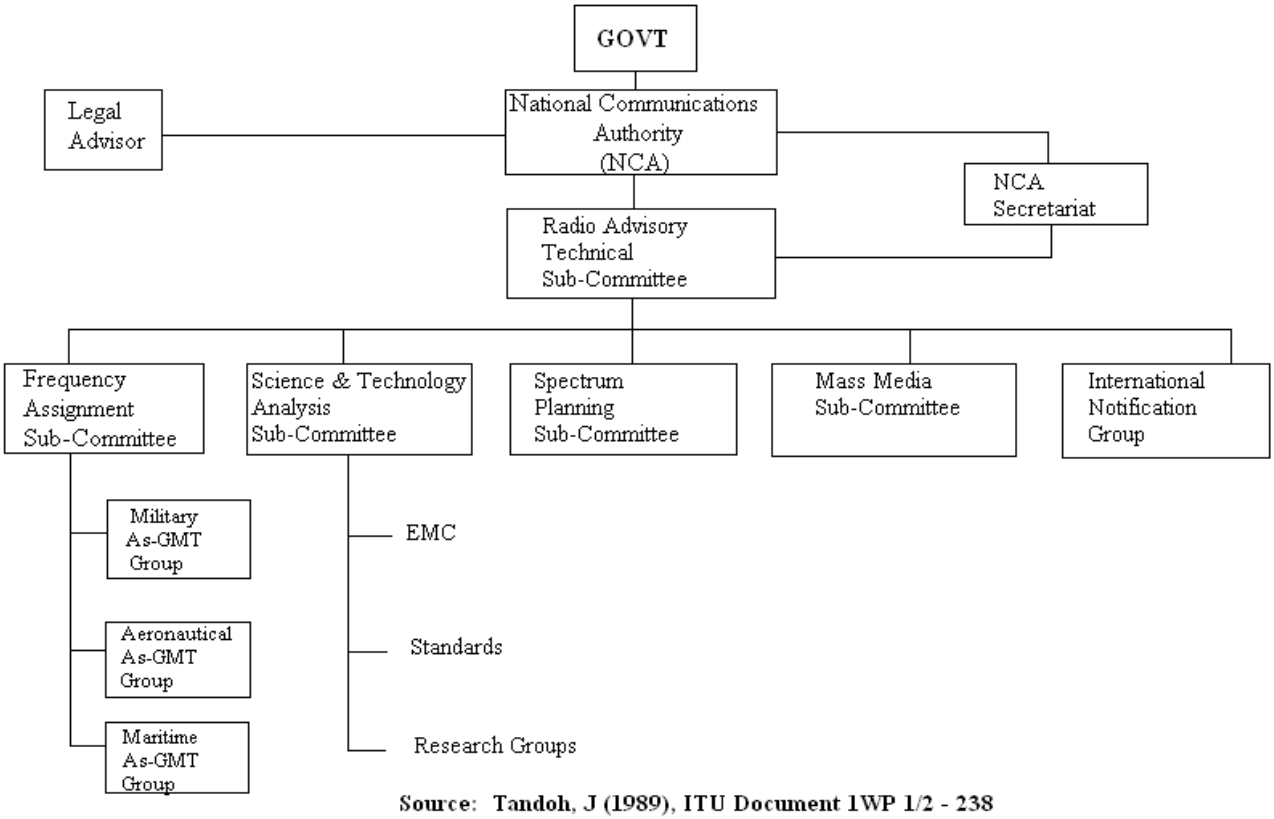
- To promote participation in training courses and workshops on best-practice application of ITU recommendation for developing countries

- To establish a database containing information on new technologies that are standardized and develop guideline on applying ITU recommendations.

In this regard;
Administrations should encouraged to establish and maintain active national structures to provide for coordination of internal preparation and follow-up, and coordination of participation in external regional and international standardization bodies (e.g. ITU – T, and ITU-R), to protect their government and industry interests. A typical National Structure of this kind is the establishment of a *National Radio Advisory Technical* Committee.

NATIONAL RADIO ADVISORY TECHNICAL COMMITTEE

- A National Technical Radio Advisory Committee drawn from identified experts from Government agencies, Stakeholders, the Academia, etc. to advise the Government through the accredited National Regulatory Agency on ITU-T and ITU-R technical matters similar to Annex 1 to CCIR 1WP 1/2 -238 ,dated July 1989, as illustrated below;



Source: Tandoh, J (1989), ITU Document 1WP 1/2 - 238

OTHER STRUCTURES TO BE CONSIDERED ESTABLISHING TO ASSIST CLOSE THE DIGITAL DIVIDE

The establishment of An African Telecommunications/ICT Standard Institute (ATSI)

- (ATSI) similar to the European Telecommunication Standard Institute (ETSI). The ATSI among other things is to coordinate for the harmonisation of standards in the African Sub-Region.

-ATSI's role can be developing a wide range of standards and other technical documentation ,using experts at both at home and in the Diaspora, as Africa's contribution to world-ICT standardization. This activity may in future to be supplemented by interoperability testing services and other specialists and ,

-To form strategic alliances through ATU and the ITU with other standardization specification bodies around the world.

-ATSI's prime objective may be to support global harmonization by providing a forum in which all the key players can contribute actively. This then shall be the beginning of "Bridging the Standardization Gap in Developing countries "from Africa.

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- The establishment of Chairs in the Universities to specialise in selected relevant ITU-T and ITU-R Study Group Activities. The aim would be to provide relevant training material for capacity learning for young under graduates and graduate students.This will address
- The continued shortage of human resources in the standardization field in developing countries, resulting in a low level of developing-country participation in meetings of ITU-T and of ITU-R and, consequently, in the standards-making process, leading to difficulties when interpreting ITU-T and ITU-R Recommendations
- The setting up of R & D Funds by Government Agencies and other Stake holders for research purposes in Telecommunication/ICT.

Bridging the Standardization Gap Fund" can be used to achieve its objectives so as; ,./

- To facilitate the participation of developing countries in the standards development process
- To allow developing countries to profit from access to new technology development
- To ensure that their requirements are taken into account in the development of standards
- Such contributions will be used for: workshops and meetings in developing countries, fellowships, surveys and study programmes.

These shall go a long way to address the continued shortage of human resources in the standardisation field in developing countries.

It will serve to increase the present low level developing countries participation in meetings of ITU-T and ITU-R and, consequently, in the standard-making process and thus increasing in understanding when interpreting ITU-T and ITU-R Recommendations/Standards.

Conclusion

- Throughout this presentation, most of the various concerns shown by ITU dating back from Marrakesh PP – 02 through to Antalya PP – 06 have been outlined. The ITU further calls for "bridging the standardization gab between developed and developing countries, have been captured under the following:WTSA's :

- Res. 44 amplified by Res 17 (standardization in relation to the interest of developing countries).

- Res.54 (creation of Regional Groups) and,
  WTSA Res.47 (enhancement of knowledge and effective application of ITU Recommendations in developing countries)

- The importance of the standardization gap which results from the continued shortage of human resources in the standardization field in developing countries resulting in low level of participation in Study Group meetings and other ITU-T and ITU-R meetings has also been recognised and that one consequence of this being difficulties in accessing and implementing ITU Recommendations, as recognized in PP Resolution 123 (Antalya,2006).

- ***And that Member States should endeavour to facilitate effective participation in ITU's activities and to ensure consistency and continuity of participation.***

- I have the confidence that at the end of this Forum this meeting would serve as a catalyst towards bridging the standardization gap between developed and developing countries and towards the harmonization of a uniform Telecommunications/ICT Service Standards in Africa .jiol

- Thank you for your attention