



ICT Standardization Capabilities of Developing Countries

Bridging the Standardization Gap



Standardization is one of the essential building blocks of the Information Society. It is not only a fundamental architectural component of the global information society, but also a precursor to the diffusion of affordable and accessible information and communication technologies (ICTs) in the developing world. International standards aim to create an environment where people can access services worldwide, regardless of the underlying technology.

The goal of the ITU-T Bridging the Standardization Gap program is to facilitate increased participation of developing countries in standardization, to ensure that developing countries experience the economic benefits of associated technological development, and to better reflect the requirements and interests of developing countries in the standards development process.

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Please send your feedback and comments to bsg@itu.int.

The opinions expressed in this report are those of the authors and do not necessarily reflect the views of the International Telecommunication Union or its membership.

This report, along with other Bridging Standardization Gap material, can be found at <http://www.itu.int/en/ITU-T/gap/Pages/default.aspx>.

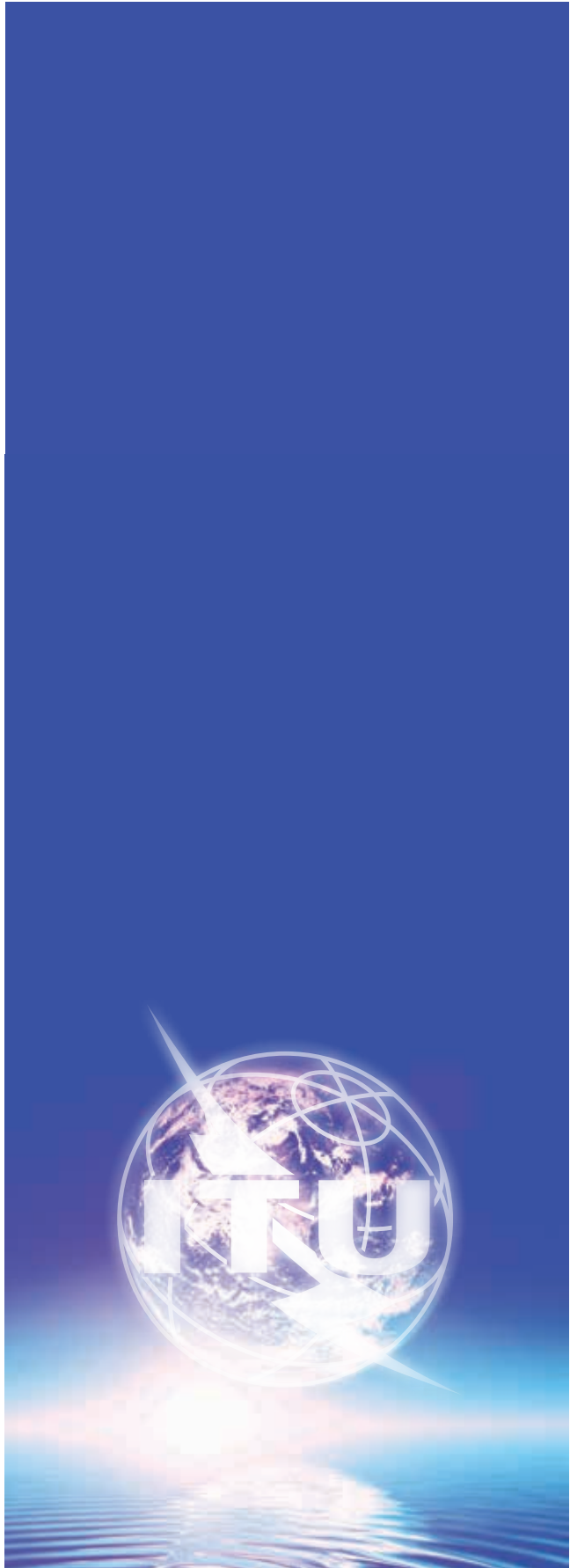


Study to Assess the Standards Capabilities of
Developing Countries:

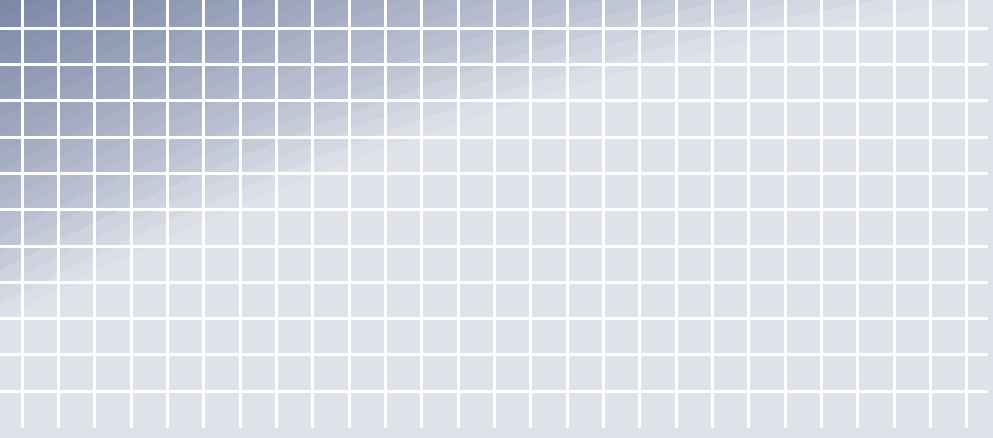
Analysis of Country Case Studies

Study to Assess the Standards Capabilities of Developing Countries

Bridging the Standardization Gap



| | |
|--|----|
| Executive Summary | 5 |
| Introduction | 7 |
| Assessing National Standards Capabilities | 7 |
| Analysis of Countries by Region | 10 |
| Africa and the Middle East | 10 |
| Burkina Faso | 10 |
| Burundi | 10 |
| Egypt | 11 |
| Gambia | 12 |
| Ghana | 12 |
| Lebanon | 12 |
| Mali | 13 |
| Mauritius | 13 |
| Nigeria | 14 |
| Qatar | 15 |
| Tanzania | 15 |
| Senegal | 16 |
| Uganda | 16 |
| Zambia | 17 |
| Asia-Pacific | 18 |
| Kingdom of Bhutan | 18 |
| China | 18 |
| Fiji | 19 |
| Mongolia | 19 |
| Papua New Guinea | 20 |
| Thailand | 21 |
| Republic of Vanuatu | 22 |
| Vietnam | 22 |
| Europe and CIS | 23 |
| Bosnia and Herzegovina | 23 |
| Czech Republic | 23 |
| Republic of Moldova | 24 |
| Slovakia | 24 |
| Turkey | 25 |
| Ukraine | 25 |



| | |
|--|-----------|
| America | 26 |
| Argentina | 26 |
| Mexico | 27 |
| Suriname | 28 |
| Trinidad and Tobago | 28 |
| Uruguay | 28 |
| National Standards Capability Scale..... | 31 |
| Classification on National Standards Capability Scale..... | 34 |
| Annex 1: Levels of National Standards Capability Scale..... | 38 |

Executive Summary

Inequality in national standards capabilities continues to contribute to the persistence of the digital divide between the developed and developing worlds, and to diminished developing-world opportunities for economic development and technological innovation.

This report presents the findings of the ITU-T study assessing the standards capabilities of developing countries. In 2009, the Tool for Assessing Standards Capability Questionnaire (TASC) was sent to some 162 developing countries. The TASC questionnaire was sent out again in December 2010 to developing countries that did not reply on the first occasion. Thirty-five countries from different regions have responded to the study. The draft report on the results of

the study was sent to countries which had responded, requesting their comments. The comments received have been incorporated in the final report.

Based on the study's results, countries were categorized under the four levels on the National Standards Capability Scale (a tool developed by ITU in 2009): low standards capability, basic standards capability, intermediate standards capability and advanced standards capability. The box below shows the classification of the countries on the National Standards Capability Scale¹.

¹Note : Croatia and Afghanistan did not provide enough information in their reply to enable an assessment of their state of standardization capability on the National Standards Capability Scale.

| Level 1 Low Standards Capability | Level 2 Basic Standards Capability | Level 3 Basic Standards Capability | Level 4 Advanced Standards Capability |
|-------------------------------------|---------------------------------------|---------------------------------------|--|
| Bhutan | Bosnia Herzegovina | Argentina | China |
| Burkina Faso | Egypt | Czech Republic | |
| Burundi | Lebanon | Slovakia | |
| Fiji | Mauritius | Turkey | |
| Gambia | Mexico | Ukraine | |
| Ghana | Mongolia | Uruguay | |
| Mali | Qatar | | |
| Nigeria | Republic of Moldova | | |
| Papua New Guinea | Thailand | | |
| Senegal | Vietnam | | |
| Suriname | | | |
| Tanzania | | | |
| Trinidad and Tobago | | | |
| Uganda | | | |
| Vanuatu | | | |
| Zambia | | | |

Developing countries are typically involved in regulatory and administrative aspects of standards, such as country code assignments and accounting rates to terminate calls, but are less active in non-regulatory, more technical standardization work. Three main factors hamper developing countries' ability to reach Level 4 on the National Standards Capability Scale:

- Low levels of private sector involvement in ICT standardization activities, which is in turn an indication of the low availability of human resources for standardization work;
- The low priority attached to ICT standardization activities by governments, which is in turn reflected in the role, mandate and resources available to the national standards body or the ICT regulatory body to drive ICT standardization at the national level; and
- The lack of sufficient funds to support ICT standardization activities and ICT standardization capacity building at the national level.

Countries at Levels 3 and 4 have multi-stakeholder approaches to standardization, incorporating private industry, government, academia, and civil society. For countries at Levels 1 and 2, the national standards body and ICT regulatory authority play the primary role in promoting the use of international ICT standards. Governments are also responsible for the promotion of ICT standardization work through their organization of ICT

standards conferences, ICT standardization training and participation in regional or international standards meetings. In such countries, it is essential that national standards bodies or ICT regulatory authorities be allowed the necessary resources to undertake these important activities.

Countries wishing to reach Levels 3 or 4 should invest in opportunities to enhance standards education, and consequently increase human resources available for ICT standardization activities. For countries at Levels 1 and 2 seeking to improve their national standardization capabilities, four steps are recommended:

- Put in place an ICT standardization capacity-building program for officials of the national standards body and ICT regulatory authority, aiming to initiate such standardization activities at a national level.
- Establish public-private partnerships for ICT standardization activities at the national level. Such partnerships should identify new ICT standardization requirements, and define strategies for participation in regional and international standards-setting organizations.
- Offer government-sponsored ICT standards training in collaboration with private industry and international standards-setting organizations.
- Incentivize the hosting of international ICT standards conferences and workshops in the country.

Introduction

This report presents the findings of the ITU-T study assessing the standards capabilities of developing countries. In 2009, the TASC was sent to some 162 developing countries. The TASC questionnaire was sent out again in December 2010 to developing countries which had not replied on the first occasion.

Thirty-five countries responded to the study, as shown in Table 1. The draft report on the results of the study was sent for comments to those countries which responded. The comments received have been incorporated in the report.

Table 1: List of countries which responded to the questionnaire

| Africa and Middle East (14) | Europe and CIS (7) | Asia-Pacific (9) | America (5) |
|------------------------------------|---------------------------|-------------------------|---------------------|
| Burkina Faso | Bosnia and Herzegovina | Afghanistan | Argentina |
| Burundi | Croatia | Kingdom of Bhutan | Mexico |
| Egypt | Czech Republic | China | Trinidad and Tobago |
| Gambia | Republic of Moldova | Fiji | Suriname |
| Ghana | Slovakia | Mongolia | Uruguay |
| Mali | Turkey | Papua New Guinea | |
| Lebanon | Ukraine | Thailand | |
| Mauritius | | Vanuatu | |
| Nigeria | | Vietnam | |
| Qatar | | | |
| Senegal | | | |
| Tanzania | | | |
| Uganda | | | |
| Zambia | | | |

The report provides a description of the study's findings for each country (with the exception of Croatia and Af-

ghanistan, which did not submit information sufficient for analysis).



Assessing National Standards Capabilities

The TASC questionnaire used in 2009 was used again with some slight modifications, and aimed to facilitate national self-assessments of current standards participation and readiness.

The questionnaire was divided into four broad categories: standards development capacity, standardization human resources, government standards policy, and national standards use and adoption. The following describes the questions in each of these categories.

Standards Development Capacity

The questions in the first part of the TASC questionnaire assess the extent of a country's involvement in standards-setting processes and development, including international and regional activities involving ITU and other standards-setting bodies. This first part of the questionnaire consists of the following five questions.

1. Participation in international ICT standards development processes
2. Participation in regional ICT standards development processes
3. Private industry involvement in ICT standards development
4. Number of Domestic Standards in Past Year
5. Number of Patent Applications Filed in Past Year

Standardization Human Resources

The second part of the TASC questionnaire assesses the extent of a country's standardization human resources, such as the number of standards experts in the country and the number of individuals engaged in standards development. It also assesses national standards educational capacity, such as whether there are formal or informal standards education courses, conferences, and electronic training materials. This section consists of the following five questions.

1. ICT standards courses and curricula in higher education (e.g. engineering courses), either in the country or region
2. Availability of government-sponsored ICT standards training
3. ICT standards conferences held in country in past year
4. Estimated number of standard experts in the country
5. Estimated number of standards experts in the country from the business/private sector.

Government Standards Policy

Government standards policy questions seek to examine the organizational framework for standardization activities; the national laws, procedures and strategies regarding stand-

ardization; and the country's funding of standardization activities. This section is divided into the following four questions.

1. Existence of a national ICT standards agency, department, or advisory council
2. Existence of a national ICT standards strategy
3. Government laws, regulations, and policies on ICT standards
4. Government funding and investment in ICT standardization

National Standards Use and Adoption

The fourth part of the questionnaire seeks information about the use and adoption of standards within a country. This includes analysis of government policies on the use of standards in government ICT infrastructures, and the proportion of a country's ICT products adhering to international standards. This section is divided into the following four questions.

1. Government interoperability framework or ICT standards procurement policy
2. Adequacy of technical infrastructure for accessing standards among those involved in implementing standards
3. National use of ITU Recommendations, either in product procurement or product development

4. Increasing development of technology products and market share based on international ICT standards

Additional Questions

The questionnaire concludes with four questions of a more qualitative nature. Firstly, to identify the country's key stakeholders (e.g. private companies, standards institutions, government authorities and agencies) involved in standards development and adoption. Secondly, to solicit suggestions on how private industry, standards institutions, and government entities could help improve national standards capability.

1. Stakeholders. Who are the key standards stakeholders in your country?
2. Opportunities for Private Industry. What could private industry do to improve national standards capability?
3. Opportunities for International Standards Bodies. What could international standards-setting institutions do to better facilitate your nation's international standards participation?
4. Opportunities for Government. What could the national government do to improve national standards capability?

Analysis of Countries by Region

Africa and the Middle East

Burkina Faso

The main institutions which are involved in promoting ICT standards in the country are the Ministry of Postal Services and ICT, the ICT regulatory body, l'Agence nationale de promotion des technologies de l'information et des communications (ANPTIC), l'Autorité de regulation des communications électroniques et de la poste, the private sector and NGOs. The Ministry of Postal Services and ICT has been actively involved in creating awareness at the level of telecom operators about adoption of ICT standards. The government is currently in the process of setting up a nationwide fiber optic communication network system which will link the main provinces to Ouagadougou, the capital.

The country has relatively few standards experts. As regards participation in international standards development fora, there are two experts involved in standardization activities in ITU-T Study Groups (SG) 2 and 3, and African regional groups of SG 5 and SG 12. There is no agency responsible for driving standardization work at the national level. However, it is expected that things will change when ANPTIC is fully set up in 2012, as it is expected to drive ICT standardization work at national level.

There are a number of laws and policies which mandate the adoption of ICT standards.

Some of the main challenges are : increase the number of experts working on ICT standards development; greater involvement of private sector in the formulation of ICT standards that affect industry; better ICT infrastructure to access standards and participate in standards work and the setting up of a strong national standards body to drive ICT standardization activities at national level.

Burundi

The ICT sector is liberalized in Burundi and L'Agence de Régulation et de Contrôle des Télécommunications is the ICT regulatory body. The country



has relatively few standards experts. There is no agency responsible to drive ICT standardization work at the national level. According to the self-assessment on standardization in its reply to the TASC questionnaire, the assistance of international standards bodies like ITU was sought to help in establishing a national ICT standards body and provide fellowships for participation in Study Group meetings. The government does not have a budget for ICT standardization. In addition, the ICT infrastructure in the country needs to be improved in order to enable those dealing with standards-making to access standards and participate in standardization work.

The reply also showed that there is very limited government laws, regulations and policies on application of ICT standards. However, in the framework of a World Bank project on communications infrastructure, it is envisaged to undertake a study on the development of IT architecture standards and interoperability.

Egypt

Egyptian Organization for Standardization and Quality (EOS), established by presidential decree, is the official body responsible for standardization activities, quality and industrial metrology aiming at increasing the competitiveness of the Egyptian products in the international and regional mar-

kets along with consumer and environment protection. The National Telecom Regulatory Authority (NTRA) is responsible for approving the standards that are applicable in Egypt with regard to telecommunication equipment, either imported, locally assembled or manufactured, and setting the rules and procedures regulating their import, sale and usage. NTRA has test facilities and systems for Type Approval of some Telecom equipment.

The Egyptian standards are the approved technical legislation which all stakeholders agree to apply without breaching their transparency and neutrality. Government procurement adheres to Egyptian standards or to internationally well recognized standards.

Egypt participates actively in ITU-T standardization activities as well as at the regional level. NTRA is Vice Chairman of ITU-T SG2 and the Chairman of its regional group (ITU-T SG2 RG-ARB) belongs to NTRA, and participates frequently in the work of Study Groups 3, 5, 12, 13 and 17 as well as in the last two WTSAs (in 2004 and 2008). NTRA has also activities with ETSI and IEEE, and actually has hosted IEEE 802.16 WG meeting. Egypt (through NTRA) is currently the chair of the Permanent Arab Standardization Team which is composed of representatives of administrations in the Arab region. NTRA is also harmonizing Standards within the Arab region through the Arab Regulators Network (ARGNET).

There are some hundred experts working in the development of standards in the country. The private sector is mainly involved in application of standards in product development. For example, telephone switching equipment manufactured in Egypt complies with ITU-T Recommendations. Between 2005 and 2011, some 21 domestic ICT standards were produced. EOS holds general training on standardization, e.g. ISO/IEC 17025 requirements for test labs. NTRA has included a topic on the university undergraduate curriculum on ITU and standardization awareness. However, it was observed that comprehensive university level courses on standardization are needed in developing countries and the development of a model curriculum would be helpful.

Gambia

The ICT regulatory body is the main agency which oversees ICT standards in Gambia. The key standards stakeholders in the country are: the regulator, Ministry of ICT, trade, finance, customs, businessmen, communication service providers, private and public sectors. Compared to other countries, there are relatively few standards experts. Gambia does not participate in ITU Study Groups or in other standard development organizations. Some of the challenges and opportunities indicated in the self-assessment include: national stand-

ards body needs to be more active in ICT standardization; there is a strong need for a ICT standards education programme; there are opportunities for greater private industry involvement in ICT standardization activities; the ICT infrastructure in the country for accessing standards and participating remotely in standardization activities needs to be improved; there are opportunities for government training and funding and international standards body training to develop standards expertise.

Ghana

The main institutions dealing with standards work in Ghana are: The National Communications Authority (NCA), Ghana Standards Board and the Ghana ICT Directorate. The NCA is the regulatory body for ICT and conducts conformity assessment/testing of ICT equipment in accordance with internationally adopted standards for the issuance of certificates. The Ghana ICT Directorate is responsible for IT standards.

Ghana participates in the ITU-T Study Groups 3, 5 and 12 and the meetings of African regional groups of SG 5 and 12, but participation in international standards development is very low. Some of the main challenges are: increase the number of experts working on ICT standards development; greater private industry participation

in the formulation of ICT standards that affect industry; better ICT infrastructure to access standards and participate in standards work and the development of government policies that encourage national standards formulation and capacity building.

Lebanon

In Lebanon, Libnor is the state-owned standardization agency responsible for recommending Lebanese standards in all fields including information and communication technology. The Telecom Regulatory Authority (TRA) is responsible for recommending standards related to telecommunications services and equipment. In many cases, these institutions take international standards and make recommendations (not mandatory) for national use. TRA adopts many ITU-T standards and recommends these standards domestically. A small number of standards experts are involved in international standards development in many international institutions including ITU, ISO, IEEE, IETF W3C and others. Sector-oriented committees made up of individuals from both public and private institutions are responsible for approving international standards as national standards. According to the questionnaire results, there are approximately 120 standards experts engaged in committees to study and approve do-

mestic standards. Many of the standards experts in the country are academics from universities and research institutions.

According to Lebanon's self-assessment of standards capacity, some strengths of Lebanon's standards infrastructure include a strong infrastructure for education about standards, including standards components of higher education courses; strong participation in and adoption of international telecommunication standards; and national standards agencies with well-defined responsibilities. The Lebanese response to the questionnaire also included a number of specific recommendations for improving national standards capacity, most of which are not unique to Lebanon but applicable more universally to improve national standards capacity. For example, there is a need for greater awareness of the national importance of standards, particularly within the federal government. There is a need for more government funding of standardization and also a need for an overall assessment of the national standards landscape.

Mali

The Committee on Telecommunications Regulation (CRT) governs telecommunications in Mali and reports to the Minister of Telecommunica-

tions. Compared to other countries, there are relatively few standards experts in Mali. Standards experts participate in ITU Study Groups but there is “no private industry” involvement in standards development and no government funding of standardization. The reply to the self-assessment on standardization of the TASC questionnaire, showed that the strengths of Mali’s standardization capacity include: the existence of a national ICT agency; the availability of some standards information in higher education; and access to electronic training courses and materials such as through the ITU. Some challenges and opportunities indicated in the self-assessment include: there is no well-defined national standards body; there are great opportunities for more private industry involvement in ICT standardization activities; there are opportunities for government training and funding and international standards body training to develop standards expertise.

Mauritius

The Ministry of Information and Communication Technology, IT Security Unit, Central Informatics Bureau, National Computer Board and the national standards body, Mauritius Standards Bureau (MSB) are the key stakeholders involved in ICT stand-

ards. The country does not manufacture ICT products on a large scale but has been positioned by government as a location for attracting investment from ICT companies in the field of business process outsourcing, software development and multimedia activities. Therefore, great emphasis has been placed on adoption of international standards in process and services. Private sector is also involved in ICT standardization activities at a national level through the IT Standards Committee (which is a mirror committee of the ISO Technical Committee for Information Technology) at the level of the MSB. The work programme of the IT Standards Committee deals mostly with information security management standards. Private sector is encouraged to contribute actively in the standardization related to ICT of national interest. Government has adopted international ICT standards in its interoperability framework and ITU Recommendations in product approval.

MSB is a member of ISO and participates mainly in ISO international standards fora, particularly, ISO standards for information security management systems (ISMS). ISO standards on information security (e.g ISO 27001) have been adopted by MSB at domestic level. MSB receives a grant from the government for standardization activities. There is no national ICT standards strate-

gy and with the growing importance of ICTs, standardization activities in this field would need to be further supported by government. International standards organizations could provide assistance to national standards bodies to participate in Technical Committee meetings for developing international standards.

Nigeria

Nigerian Communications Commission (NCC) is the primary institution responsible for setting ICT Standards. It has a Directorate with more than 20 staff that are routinely involved in setting standards, equipment inter-operability and standard conformity certification as well as related monitoring and enforcement. Other stakeholder organizations are the Standard Organization of Nigeria (SON), the National Information Technology Development Agency (NITDA), Telecom operators, and computer assembly companies.

The NCC has been regularly and actively participating in the ITU/ATU African regional meetings on standards, but expertise in international standards development remains very low. There are no adequate testing facilities in the country or region to confirm compliance of equipments to international standards. There is not

much involvement from the private sector in standardization activities, but standards from ITU, IEEE, ETSI, IEC and FCC have been adopted for decision-making respect to product type approvals.

In an attempt to improve the level of standardization capabilities, Nigeria is promoting the development of Regional Testing Laboratory in Abuja through the ITU. Some of the main challenges for Nigeria are: shortage of human resources involved in standardization work and availability of testing labs to verify whether products are compliant.

The country does not have a specific national ICT standards strategy, but some areas where ITU could provide assistance, stated in the reply, included: provision of training on development of ICT standards, help in setting up of test labs, sponsoring of experts to participate in international standardization activities, and provide an ITU-Mark conformity sticker for equipment confirmed to be compliant to ITU standards.

Qatar

The Supreme Council of ICT (ictQatar), is the main regulatory body for ICT and is also responsible for the promotion and adoption of ICT stand-

ards in Qatar. In 2006, the ITU World Telecommunications Development Conference was held in Doha where a special initiative was created for the specific purpose of providing access to ICT services for persons with disabilities. ictQATAR has also upgraded its website to comply with AA standards of accessibility as outlined by the World Wide Web Consortium (W3C). Moreover, ictQATAR has established a Working Group of local experts to determine specifically how ICT can best play a role in improving life for Qatar's disabled. In April 2009, ictQATAR and key partners announced plans to establish an independent Center for Assistive Technology in Doha that will be dedicated to helping people with disabilities through information and communications technologies. ictQatar developed the architecture and standards blueprint for government ICT infrastructure which specifies the ICT standards for interoperability of government information systems.

Qatar has not been involved in international or regional standards development fora. The private sector is involved in standardization activities but there is a lack of co-ordination with ictQatar. ITU Recommendations are not used in product procurement. There is a strong support from government to fund ICT standardization activities of ictQatar. Some of the main challenges for Qatar are to get

more private sector and academia involvement in standardization activities, develop human resources to undertake standards work and participate in international and regional standards development fora.

Tanzania

Tanzania Communications Regulatory Authority (TCRA), the Fair Competition Commission (FCC) and Tanzania Bureau of Standards (TBS) are the main institutions dealing with ICT standards work in Tanzania. Tanzania has around 50 professionals working on ICT standards. It has participated in ITU-T regional study group meetings in Africa (Study Groups 2, 3, 5 and 12) and has adopted many international/regional standards (e.g. ITU-T recommendations) and recommends these standards domestically. The government provides some facilities to sponsor participation in international standards meetings and training.

The country does not have a national ICT standards strategy. Some challenges stated in the reply included: provision of training on development of ICT standards, additional support from government for standardization activities, holding international standardization events in the country, increasing standards education and

training in the country, including organization of standards conferences and workshops.

Senegal

L'Agence de Developpement de l'Informatique de l'Etat (ADIE) and L'Agence de Regulation de Telecommunications et des Postes (ARTP), the Ministry of ICT and universities are the main stakeholders in ICT standardization in Senegal. Both ADIE and ARTP are involved in developing ICT standards and there is a government strategy for development of ICT standards.

Some of the main challenges are: lack of experts working on ICT standards development; greater private industry participation in the formulation of ICT standards; and the development of government policies that encourage national standards formulation and capacity building.

Uganda

The main stakeholders for ICT standardization are: the ICT regulatory body, Uganda Communications Commission (UCC) and Uganda National Bureau of Standards (UNBS). Uganda adopts many international/regional

standards nationally. It participates in the ITU and IEC standardization processes through the UCC and the UNBS respectively. However, there is a lack of co-ordination which does not facilitate the involvement of other experts in the academia and industry areas and a lack of participation from the private sector in these processes. There are no adequate testing facilities in the country or region to confirm compliance of equipment to IT standards.

The country does not have a national ICT standards strategy and there is a lack of availability of funds from the government for standardization activities. Some areas where ITU could provide assistance, stated in the reply included: provision of training on development of ICT standards, help in setting up test labs, sponsor experts to participate in international standardization activities and provide a conformity sticker for equipment confirmed compliant to ITU standards.

Zambia

The institution mandated by law (section 4 of the Standards Act Chapter 416 of the Laws of Zambia) to establish and publish standards in Zambia is the Zambia Bureau of Standards (ZABS). However, the Zambia Information and Communications Technol-

ogy Authority (ZICTA), is mandated by the ICT Act No. 15 of 2009 to establish ICT industry related standards. Because of this, the two institutions signed a Memorandum of Understanding (MoU) on 18th October 2011 to work together in establishing and publishing ICT standards in Zambia. An ICT Steering Committee (ISC) will be established to oversee the process of standards establishment. The steering committee will incorporate professional institutions like the Engineering Institution of Zambia (EIZ), universities, GSM Association and Internet Service Providers Association of Zambia (ISPAZ) to mention but a few. The ISC will set up Technical Committees in standardization areas that will greatly benefit Zambia.

ZICTA is the regulator of the ICT industry in the country and is an active participant in ITU-T work with participation in at least six study groups which include Study Groups 5, 12 and 17. ZICTA is also active in regional Study Groups for Africa. With the involvement in the formulation of recommendations in the ITU, it will be easy to adopt/adapt some to the recommendations into Zambian standards under ZABS. ZABS is also an active participant in other international standardization bodies such as International Organization for Standardization (ISO).

The Ministry of Commerce Trade and Industry which ZABS fall under has

put in place a National Quality Policy that among other objectives aims at increasing Zambia's competitiveness by strengthening the standardization process in all sectors. In the ICT Sector, ZICTA has installed a National ICT Standards strategy through the 2010 ICT Standard Policy whose vision is "An efficient and advanced ICT sector offering quality and affordable services and products that are safe, environmental friendly and inter-operable"

Some key strategies include:-

- Development of standards by encouraging private and public entities within Zambia to become involved in the actual development process of technical standards, either nationally, regionally, or internationally.
- Encouraging private and public entities to influence the design of standards by determining which standards are needed and what objectives they must meet.
- Ensuring that private enterprises or public research institutions adopt universal standards in the equipment and services they develop.
- Promoting the usage of products based on standards products
- Providing Standards Education by supporting national educational institutions, private industry, standards institutions, and government agencies in building human resources capacity and expertise in providing standards education.

Consequently Zambia, through the ICT Act of 2009, has put in place a robust type approval regime and intends to build further technical capacity by building a Type Approval Test Lab that will also be made available to local academic and research institutions. The modular approach towards establishment of the Type Approval Test Lab will see the wireless and electromagnetic compatibility (EMC) labs being established by 2014.

Some of the main challenges for ICT standardization are: availability of more experts working on ICT standards development; greater private industry participation in the formulation of ICT standards that affect industry efficiency, profitability, and equipment interoperability; and the development of government policies that encourage national standards formulation and capacity building.



Asia-Pacific

Kingdom of Bhutan

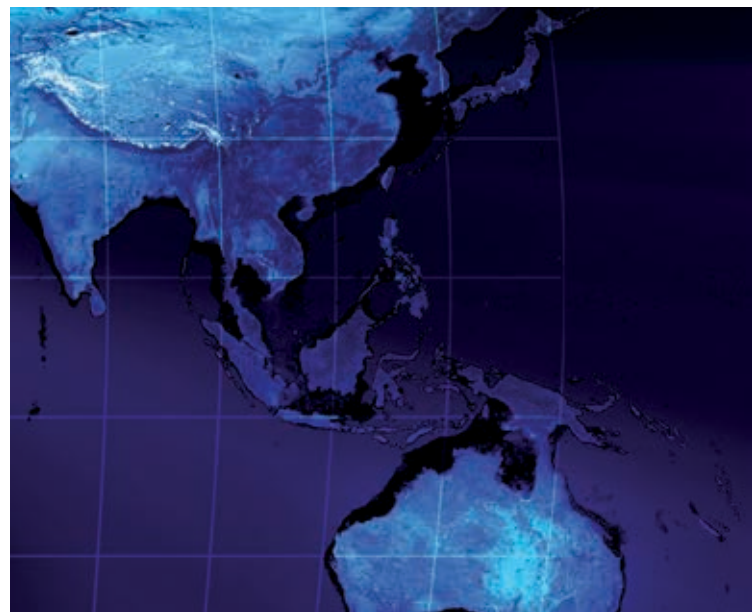
Bhutan has relatively few standards experts and has not participated in regional or international standards development fora. Some challenges stated in the reply included: provision of training on development of ICT standards, support from government for standardization activities, need for adequate ICT infrastructure to access ICT standards and providing specialized standards training in the country, including organization of standards conferences and workshops.

China

The Standardization Administration of China (SAC) is the standards organization, authorized by the State Council of China, responsible for the management, oversight, and overall coordination of standardization in China. The China Communications Standards Association (CCSA) was established in 2002 and includes corporations, universities, and other institutions within its membership. This association conducts standardization activities under the guidance of the Ministry of Information Industry and other authorities. It would appear that there is not an established policy for integrating standards education in the school and university curricula. China though has

a few standards courses in higher education and also some government ICT standards training.

China has thousands of persons directly involved in ICT standards development. These standards experts come from industry, research institutions, government agencies, and academic institutions. Through their work, China has contributed to standards development processes at both national and international levels. At international level, it has contributed to standards work within the ITU, ISO, the Institute of Electronics and Electrical Engineers (IEEE), the Internet Engineering Task Force (IETF), the World Wide Web Consortium (W3C), and other standards-setting bodies. There are many standards conferences held in China, including ITU meetings and workshops. The CCSA also provides electronic training materials on a variety of standardization topics.



Fiji

In Fiji, ICT standards policy and strategy is developed by the Ministry of Communications. The Telecommunications Authority of Fiji (TAF) is the government regulatory agency for the telecommunications sector and was established in 2010. Other stakeholders which are involved in ICT standards are the National Training and Productivity Centre (NTPC) and the University of the South Pacific (USP).

International ICT standards are used and adopted at the national level in Fiji. Fiji has not participated in standardization activities in international standards development organizations such as ITU. TAF is involved in the Asia Pacific Telecommunity (APT) and its Standardization Program (ASTAP) and its relevant Expert Groups/ Working Parties, preparatory process for WTSA-12, World Conference on International Telecommunications (WCIT-12), . The country has relatively few standards experts. There is no agency responsible for the development and promotion of ICT standardization activities at national level.

Some of the main challenges for Fiji are to set up a policy and institutional framework to identify ICT standardization needs and establish a national standards management secretariat to co-ordinate ICT standardization activities at the national level and partici-

pation in international standards development organizations. Also attract more private sector and academia involvement in standardization activities and develop human resources to undertake standards work.

Mongolia

In Mongolia, ICT standards policy and strategy is developed by the Information, Communications, Technology and Post Authority (ICTPA) of Mongolia. The Mongolian Agency for Standardization and Metrology (MASM) is the government regulatory agency which coordinates and manages standardization in the country. This agency reports to the Deputy Prime Minister's office. The MASM has a Council comprised of research scientists, industry practitioners, NGOs, academics, and government officials. The MASM describes its mission as follows: "The aim of MASM in standardization is to contribute to the development of the Mongolian society, economy, industry and trade by establishing standards on the basis of mutual understanding and voluntary agreement between parties in governmental authorities, industry and business, with regard to consumers' rights, and in continuously developing standardization activities aligned to the market system." This agency, which includes 120 staff members, and local centers for standardization in 21 provinces, has many functions

related to standardization including international cooperation with international standards organizations and representing Mongolia in these institutions. The agency also approves and publishes all Mongolian standards, performs some certification, and provides training and consulting.

The Mongolian law on "Standardization and Conformity Assessment," adopted in 2003, defines legal grounds for standardization and conformity assessment and regulates relations between the government, citizens, business entities and organizations involved in standardization. The law states that the "purpose of standardization is to protect public interest, human health, the environment and security of the nation and enhance the compatibility of products."

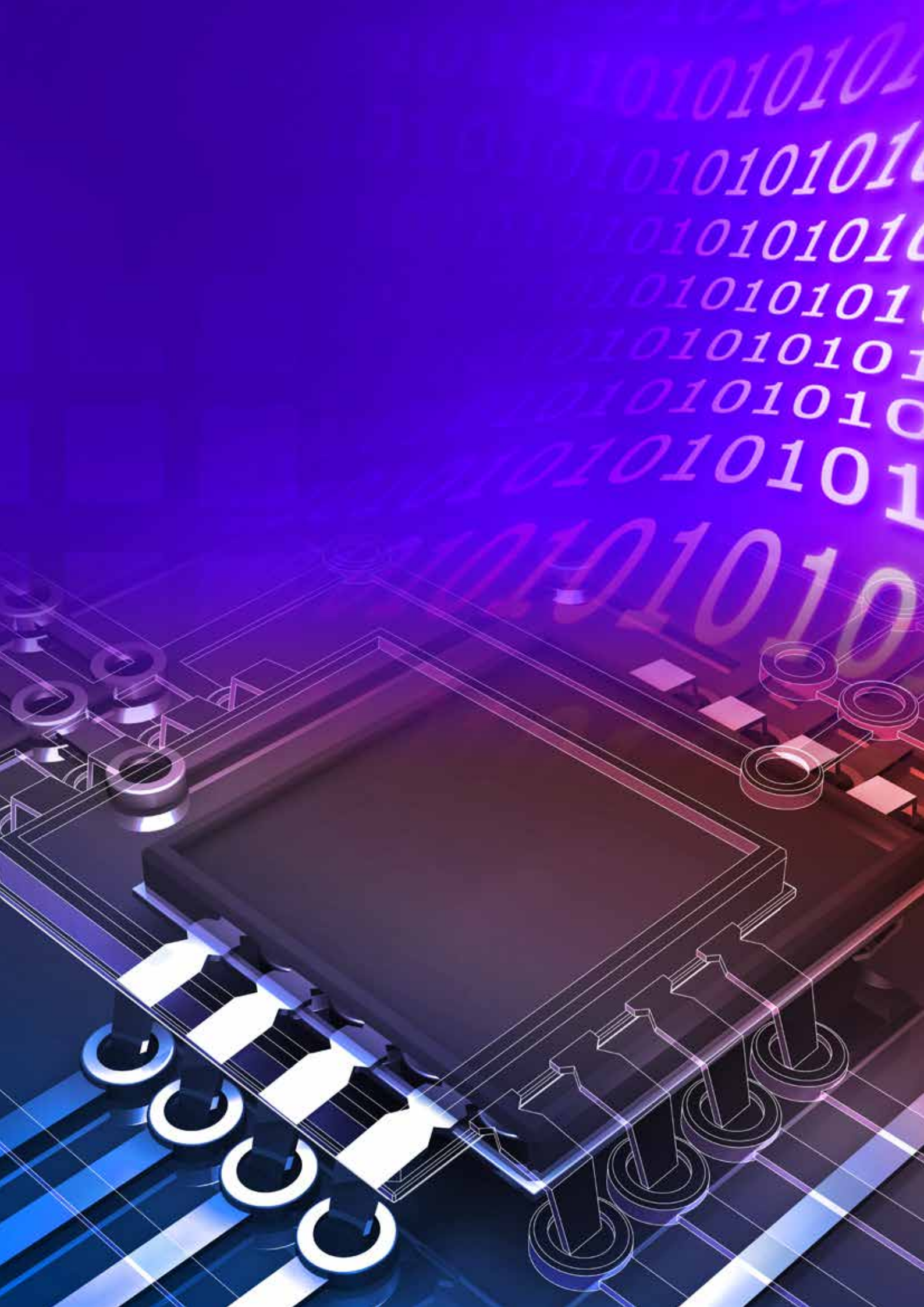
According to the self-assessment on standardization, the strengths of Mongolian standardization capacity include: a strong national standards body; strong private industry involvement in standards development; an increasing number of national standards, usually based on international standards; and the Mongolian law on Standardization and Conformity Assessment. Some challenges and opportunities reflected in the self-assessment include: inadequate technical infrastructure for broader public involvement; lack of extensive educational opportunities in stand-

ardization; a need for international standards bodies to increase standards training and seminars; and more government funding of ICT standards development and processing.

Papua New Guinea

The digital divide is a significant issue for Papua New Guinea (PNG), where ICTs have not yet been adequately harnessed for social and economic benefit. The standardization gap in PNG is both a cause and a manifestation of the wider digital divide in the country, complicated by both geographical and demographic challenges. Limitations in standards capacity in PNG also cause a decrease in opportunities for individuals to develop technology skills, a reduction of technology transfer opportunities, and complicate the migration from legacy to newer technologies.

The Papua New Guinea Radiocommunications and Telecommunications Technical Authority (PANGTEL) is a government institution, established by the PNG Telecommunications Act of 1996, as the regulator and licensing authority overseeing telecommunications and radio communications, including television and broadcasting services. Among PANGTEL's other functions, the agency develops policies for technical standards. The standards branch of PANGTEL is re-



sponsible for the “development, review and maintenance of technical and regulatory policies, plans and standards in collaboration with industry, the Independent Consumer and Competition Commission (ICCC), National Institute of Standards and Industrial Technology (NISIT), other relevant government bodies, and relevant international bodies. The Department also heads the coordination and representation of dialogue in international technical forums/meetings on behalf of PANGTEL and the government of Papua New Guinea (PNG).”

The National Institute of Standards and Industrial Technology (NISIT) is also a National Standards Body overseeing all standardization and conformance activities in Papua New Guinea. NISIT’s functions include standard development and publication, standards dissemination, professional training programs on standardization and quality assurance, and other related functions.

Some challenges and opportunities reflected in its self-assessment include the need to strengthen domestic standards institutions; the promotion of the use of TIES to access ITU recommendations; more active participation in the Asia-Pacific Telecommunity (APT); the need for wider industry participation in standardization and greater coordination between PANGTEL and NISIT; the

need for legislation that promotes the growth of ICT markets and industry in PNG; and the need to bring key issues to APT preparatory meetings.

Thailand

The National Broadcasting Telecommunications Commission (NBTC), in close association with the Thai Industrial Standards Institute (TISI), develops and disseminates any mandatory telecommunication standards in the country. The NBTC was established by Royal proclamation in 2004 to serve as Thailand’s telecommunication regulatory agency. TISI is Thailand’s national agency for standardization. The agency develops national standards in the country and works with international standardization bodies including ITU-T and ISO as well as regional organizations such as Asia-Pacific Telecommunity (APT).

In addition to Thailand’s mandatory standards, there are a small but growing number of voluntary standards primarily from private sector-led forums and non-profit organizations. Thailand has created TRIDI, the Telecommunication Research and Industry Development Institute from part of operator license fees. This provides some funding for researchers, including those involved in standardization activities, and scholarships for students.

Thailand's standardization system is still at an embryonic stage. Thailand makes use of ITU-T recommendations, has national standards agencies in ICT, and participates in some regional and international ICT standards development processes. The country does not explicitly have a national ICT standards strategy. Some challenges stated in the reply included: improving technical infrastructure for participating in ICT standards development and adoption; increasing standards education and training in the country, including standards conferences and workshops.

Republic of Vanuatu

Vanuatu is a 'Y' shaped archipelago of 83 islands, located about 1,750 kilometers east of Australia. The country is mainly a user of ICT standards. It has relatively few standards experts and has not participated in regional or international standards development fora. There is no agency responsible for development and promotion of standards at national level. The regulatory body has been downloading and using ITU Recommendations. Some challenges stated in the reply included: provision of training on development of ICT standards, support from government for standardization activities and need for adequate ICT infrastructure to access ICT standards.

Vietnam

Vietnam makes use of ITU-T recommendations in procurement and although has not participated actively in international ICT standards development processes, it has been involved in regional standardization fora, through ASTAP. There are some 200 standards experts in the country, with some 150 of them from the private sector. There is no ICT Standards agency responsible for the development of ICT standards at national level. The Ministry of Information and Communications (MIC) is setting standardization policies, strategies and plans, based on practical requirements and new trends of technologies. MIC has been promulgating mandatory ICT standards and funding standardization activities with regulatory implication.

Some of the main standardization issues for Vietnam are: lack of experts (most of experts are from operators and research institutes, not from manufacturers and vendors); limited manufacturing capability causing a lack of expertise in developing standards, lack of government funding of ICT standardization activities and low participation of business sector.

Europe and CIS

Bosnia and Herzegovina

In Bosnia and Herzegovina, standardization activities are mainly concentrated on adopting European ICT standards at the national level rather than developing standards. In 2010, some 291 European standards and 146 international standards were adopted at the national level. Bosnia and Herzegovina does not participate in either international or regional ICT standards development processes. Experts from Bosnia and Herzegovina have been involved in the work of ISO/IEC JTC 1 and its subcommittees as observers. The Institute for Standardization of Bosnia and Herzegovina and BH Telecom are members of ETSI. The Institute for Standardization of Bosnia is also an affiliate member of CEN.

Czech Republic

Numerous standards professionals in the Czech Republic participate in ITU activities as well as in other standards bodies such as ISO and IEEE. The Czech Telecommunication Office (CTO), formally established by the 2005 Electronic Communication Act, is the state administrative agency responsible for market regulation, reso-

lution of disputes in communication markets, administration of radio spectrum, and a number of other regulatory activities.

The Czech Office for Standards, Metrology and Testing (COSMT) is the country's national standards agency, established by law in 1993 under the Ministry of Industry and Trade. This office has broad responsibility for developing, publishing, and distributing Czech standards. The COSMT cooperates with international and European standards-setting organizations, develops Czech national standards, and guides and coordinates activities within Czech national technical committees.

According to the self-assessment, the strengths of Czech standardization capacity include: a significant number (approximately 1300) of standards experts in the country; the existence of effective laws on ICT standards regulations applied by the



Czech Telecommunication Office; the existence of a national ICT standards agency (the COSMT); and regular use and adoption of ITU Recommendations and reports. Some opportunities identified in the self-assessment include: the need for greater guidance from international standards-setting institutions on standards development and greater private industry investment and participation in standards development.

Republic of Moldova

The National Institute for Standardization and Metrology of the Republic of Moldova (NISM) is the National Body for Standardization and Metrology. NISM collaborates with international and European (ISO, CEN) and regional (EASC, IRSA) standards organizations, develops national standards, adopts international and European standards and coordinates the activities of national technical committees. These committees are created in various fields of national economy (Law on Standardization no. 590-XIII from 09.22.1995). Currently, there are some 1,000 international (ISO/CEI) and 2,800 European (EN) standards already adopted. At present, NISM is preparing to join the IEC and CENELEC. The participation in ITU and ETSI standardization work is the responsibility of the Ministry of

Information Technology and Communications. In 1995, within the Ministry of Information Technology and Communications 2 Standardization Technical Committees were created: STC 28 "Information technology" and STC 29 "Electronic communications".

In 2006-2010, the technical committees of standardization did not develop any national standard. In this period the 244 international and European standards such as: 145 international standards (ISO/CEI) , 62 European standards (EN, CWA), 19 Romanian standards (SR, STAS), 17 standards of the Russian Federation (GOST R) and one Belarus standard (STB) were taken and adopted as national standards.

Slovakia

Participation in ISO, IEC, CEN, CENELEC and ETSI are under the responsibility of Slovak Standards Institute which is a nonprofit organization. The Slovak Standards Institute collaborates with international and European standards-setting organizations, develops national standards, and guides and coordinates activities within national technical committees. Participation in ITU standardization work falls under the umbrella of the telecommunications regulatory body. According to the reply received from the questionnaire, there are about

52 standards professionals in Slovakia participating in standards bodies such as the ISO, IEC, CEN, CENELEC and ETSI. Slovakia adopts standards from the EU and implements them at national level. There is also not much private sector involvement in ICT standardization.

According to the self-assessment on standardization, the strengths of Slovakia's standardization capacity include: the existence of effective laws on ICT standards regulations and the existence of a national ICT standards agency. Some opportunities identified in the self-assessment include: the need for greater guidance from international standards-setting institutions on standards development, greater support from government for work in standards development and improve the awareness of importance of standards and of participation in standardization work within ministries and other governmental bodies and agencies.

Turkey

The national standard organization, Turkish Standards Institute (TSI), the regulatory body, ICTA, mobile and fixed operators are the key stakeholders in the country. ICTA is responsible to ensure the publication and the implementation of the harmonized national standards for all kinds

of systems and equipments used in electronic communications sector. It also makes technical regulations, perform and/or has third parties to perform market surveillance of them, and establishes and operates a laboratory for this purpose and determines the charges for training and consultancy services to be carried out in such laboratory.

TSI is in charge of developing standards not only for ICT but also for other industry sectors. TSI is a member of international (ISO and IEC) and European (CEN and CENELEC) standardization organizations. Hence, TSI participates in the international and European standard development activities through the technical committees established under ISO, IEC, CEN and CENELEC. There are about 30 experts involved in standardization work in ITU and IETF.

Some of the key strengths of Turkey based on the reply to the questionnaire are: the availability of a strong national standards body, participation in regional standardization activities at level of ISO, CEN, CENELEC and ETSI and legislation on adoption of standards at national level. The main challenges noted were: more support from international standard bodies to provide specialized training on standardization, enhanced coordination among government agencies on standardization strategies

at national level, more support from government for funding of standardization work and more involvement from private sector in standardization activities.

Ukraine

In the Ukraine, state standards are developed according to the Plan of National Standardization and worked out on the basis of proposals from technical standardization. The key stakeholders for standards in the country are the Ministry of Transport and Communications, the State Committee for Technical Regulation and Consumer Policy and the State Committee for Informatization. There is a national ICT standards strategy which is the State Program for Standardization 2006-2010. There are a number of legislations in Ukraine which refer to the use of international standards.

According to the reply received, some 32 state standards were adopted in 2009 and some 180 standards experts in the country. There are about 17 standard experts working on standards development at international and regional levels.

Ukraine has made use of ITU recommendations in product development and welcomes the fact that ITU has provided free access to the standards. Some of the strengths of Ukraine are strong support from the government for standardization, participation of standards experts at international level in standards development and availability of funding from government for standardization work. The main challenges according to the reply received are to get private sector more involved in ICT standardization work and to simplify the procedures for standards development at national level.

America

Argentina

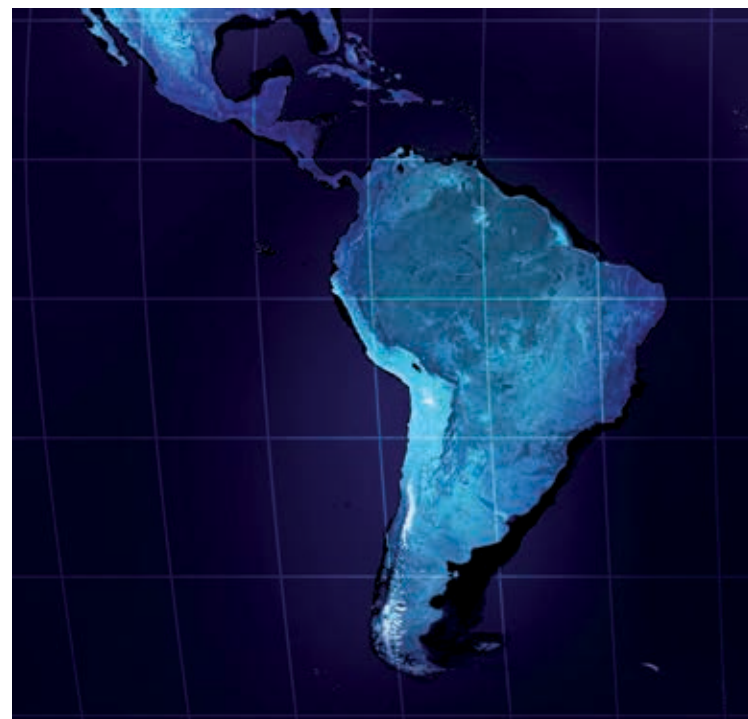
According to the reply received for the questionnaire, the main strengths of Argentina are the support from government for standardization, the legal and policy framework for standards adoption and availability of funds from government to support standardization work.

In Argentina, the main actors in the field of telecommunications are the Communications Secretariat, Instituto Argentino de Normalización y Certificación (IRAM), the National Communications Commission and academic & research institutions. Telefónica de Argentina S.A., Telecom Argentina S.A. and AMX Argentina S.A are among the main players in the private sector in the telecommunications field. IRAM is the National Standardization Organization pursuant to the stipulations of Executive Order N° 1474/94, within the frame of the Standards, Quality and Certification National System. Within the standardization field, IRAM is the only Argentine representative before the regional standardization organizations: MERCOSUR Standardization Association (AMN) and Pan-American Commission of Technical Standards (COPANT), and before international

organizations ISO and IEC in this case together with the Argentine Electro-technical Association (AEA).

Argentina participates in regional or international ICT standards development processes (ISO, ITU and IEEE) and there are about 600 standard experts in the country. ITU recommendations are used in product procurement and there are laws and procedures which make reference to international standards. Some of the government laws and regulations related to ICT standards are:

- Argentina Connected Plan (created by Executive Order 1552/2010)
- My Digital TV Plan (created by Executive Order 1148/2009)
- Conectar Igualdad. com.ar (created by Executive Order 459/10)



- Internet for Educational Establishments Program (created by Resolution 147/2010 of the Communications Secretariat)
- Internet Program for Popular Libraries (created by Resolution 148/2010 of the Communications Secretariat)
- Infrastructure and Equipment Program (created by Resolution 9/2011 of the Communications Secretariat)

The National Telecommunications Plan "Argentina Conectada" defines telecommunication infrastructure and services for the whole national territory. This plan advocates the expansion of the broadband service to all the country, under equal conditions for all inhabitants. Its purpose is to achieve a greater national coverage of the optical fiber network, and will connect nearly 10 million households with broadband, between 2010-2015. The aim of the Information Society Program (PSI) is the elaboration of policies and projects that are necessary to disseminate information, knowledge and exchanges through the use of IT projects. It includes the activities connected to the design and implementation of public policies destined to foster the universalization of the Internet and other digital data networks, the development of e-commerce, the training of human resources specialized in its manage-

ment, the fostering of investment and the overall development of telecommunications, IT, electronics, software, and other similar technologies.

Mexico

The Ministry of Economics is responsible to overview the whole standardization process in Mexico. However, for the standardization activities of each sector specialized committees are set up, which are chaired by a government sector agency. In the case of the ICT sector, the Telecommunications Standards Committee (CCNN-T) is chaired by the Federal Telecommunications Commission (COFETEL). NYCE (Spanish acronym for Electronics Standardization and Certification), is a non-profit civil association created in November of 1994 by a group of leading companies from the Electronics, Telecommunications and Information Technologies sectors in Mexico. NYCE was set up under the Metrology and Standardization Federal Law and opened up the possibility of having in Mexico private bodies engaged in standardization, certification and testing activities, which in the past were only carried out mainly by government agencies. NYCE is accredited and authorized by legal instances and corresponding Federal Government legislation, and forms part of the National Metrology,

Standardization and Conformity Assessment System (SISMENEC). NYCE certifies testing laboratories and elaborate voluntary standards.

ITU Recommendations are often the basis for the development of national standards and are also used as reference for product type approvals. Participation in regional and international standards development processes, have been very limited. According to the self-assessment on standardization the strengths of Mexico's standardization capacity include: the existence of effective laws for ICT standardization activities and the existence of a national ICT standards agency. Some opportunities identified in the self-assessment include: capacity building on standards development at low cost for local experts from international standards-setting institutions, more involvement from private sector in the development of standards and for government to update the procedures for conformity assessment.

Suriname

Suriname, is a country in the northern part of South America. Surinaams Standaarden Bureau (SSB) and the Telecommunications Authority Suriname (TAS) are the main standard stakeholders in the country. According to the reply received for the ques-

tionnaire, ICT standardization is not a priority for SSB at present. SSB has sought affiliation with IEC and needs to set up a National Electrotechnical Commission. Some of the challenges mentioned in the reply received include government support for ICT standardization at national level and the incorporation of standards education at the level of schools and universities.

Trinidad and Tobago

The main stakeholders for ICT standards in Trinidad and Tobago are the Ministry of Trade and Industry, Ministry of Health, Chemistry Food and Drugs Division, Trinidad and Tobago Manufacturer's Association, University of the West Indies, Telecommunications Authority of Trinidad and Tobago (TATT), National ICT Company Ltd, Caribbean Industrial Research Institute (CARIRI), Trinidad and Tobago Bureau of Standards (TTBS). The TATT and TTBS are the main bodies involved in ICT standards development. Participation in regional and international standards development processes, have been very limited. Trinidad and Tobago has adopted a number of international ICT standards.

The TTBS recently signed an MOU with the regional University of the West Indies seeking to introduce courses

on standardization at a tertiary level. According to the self-assessment, ITU assistance in the areas of organization of regional workshops on ICT standards development, establishment of a regional electromagnetic compatibility laboratory and capacity building on standards development for experts in the region would be very beneficial to enhance the country's ICT standardization activities.

Uruguay

The main stakeholders for ICT standardization work are, the national standards body, Instituto Uruguayo de Normas Técnicas (UNIT), the ICT regulatory body, Unidad Reguladora de los Servicios en Comunicaciones (URSEC) and the Agency for the Development of Government Electronic Management and Information Society and Knowledge (AGESIC). UNIT participates as an observer in ISO/IEC JTC 1 on Information Technology. UNIT is particularly involved in SC 7 and SC 27.

Asociación Mercosur de Normalización (AMN), is a civil, non-profit, non-governmental organization, recognized by the Common Market Group (CMG). It is the sole body responsible for administering the voluntary standardization within Mercosur. UNIT is also a member of the Comité Mercosur de

Normalización (CMN) under AMN and which regroups the national standards bodies of Brazil, Argentina, Paraguay and Uruguay. The purpose of CMN is to establish the standardization sectorial programs and to lead the process of development and harmonization of standards for their further approval by AMN. Since 2006, UNIT has been active in regional committees of CMN, CSM 27 Software Engineering and CSM 28 Information Security.

Unidad Reguladora de los Servicios en Comunicaciones (URSEC) is the ICT regulatory body and participates in Working Group No 1 in CMN and its four Thematic Commissions and in the Organization of American States, Inter-American Telecommunication Commission (CITEL) PCC I and PCCII. AGESIC is working on implementation of e-government interoperability standard for government information systems. At university level, there is a specific course in International Standardization for Telecom Engineering courses. International standards are often the basis for the development of national standards and are also used as reference for product type approvals. The main challenges according to the reply received are financial support for participation in international standards development fora and more involvement of private sector in standards development activities.

National Standards Capability Scale

The National Standards Capability Scale was developed in 2009 by ITU and is based on ITU-T's research pro-

ject on building standards capacity in the developing world.

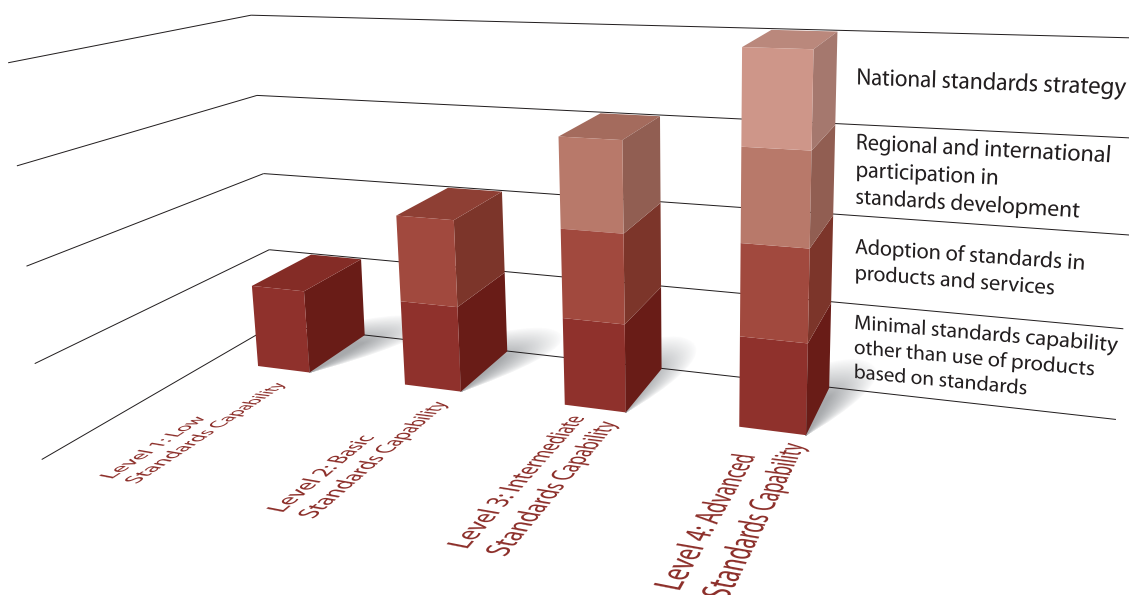


Figure 1 : National Standards Capability Scale

Countries are categorized into four levels of standards capability: Low standards capability, basic standards capability, intermediate standards capability and advanced standards capability (see Figure 1 above).

Each of these categories is cumulative in that each successive capability level embeds the characteristics of the previous level. For example, a nation with advanced standards capability embodies all the standardization characteristics of levels one

through three, along with additional characteristics unique to Level 4. The category to which a country belongs can be useful in identifying countries' weaknesses regarding standardization, and in providing guidance about priorities for improving standards readiness. The following sections describe each of these four levels of national standards capability. The capability of each level on the National Standards Capability Scale is shown in Box1.

Box 1 : Characteristics of Countries on the National Standards Capability Scale

For analysis purposes the various parameters to assess the standardization capability at national level have been grouped in eight broad categories :

- Process in place for adoption of international ICT standards
- Co-ordination at national level for development of ICT standards
- Manufacturing capability for ICT products
- Availability of funding for ICT standardization activities
- Extent of private sector involvement in ICT standardization work at national level
- Availability of experts to lead ICT standardization activities at national level
- Contributions to work at the level of international standards organizations technical committees
- Successful implementation of a National Standards Strategy

The corresponding parameter for each category is shown in the table below. Each category is shown in a different color in Table 2.

Table 2: Grouping of Capabilities for National Standards Capability Scale

| Category | Main Capability Characteristics |
|---|---|
| Adopt International ICT Standards | 1. Process in place to adopt international standards |
| | 2. Legal/policy framework in place for compliance to international ICT standards |
| Coordination at national level for ICT standards development | 3. There is a national agency which is fully functional and active in ICT standardization. |
| | 4. There is a process at national level for identifying new standards based on future needs |
| | 5. Adequacy of ICT infrastructure for remote participation for standardization activities. |
| | 6. There is an active Secretariat to coordinate contributions to international standards development bodies. |
| ICT Manufacturing Capability | 7. Has manufacturing capability to produce ICT products based on international standards |
| Private sector involvement in ICT standardization activities | 8. Contribution of private sector in ICT standardization work. |
| Availability of experts to lead ICT standardization work | 9. Adequate number of technical experts to carry out ICT standardization work. |
| Contributions to the work of international standards development organizations (SDO) technical committees | 10. Participation in meetings of Technical Committees or Study Groups at level of regional/international standards development organizations. |
| | 11. Active contribution in meetings of Technical Committees or Study Groups at level of regional/international standards development organizations. |
| | 12. Hold positions of responsibility (e.g Chair, Vice-Chair or Rapporteur) in technical committees of SDOs |
| Funding support for ICT standardization activities | 13. Host regional/international standards meetings |
| | 14. Financial support is provided for organization of capacity building workshops or conferences on ICT Standards |
| | 15. Strong financial support from government and private sector for ICT standardization activities |
| Successful implementation of National Standards Strategy | 16. Existence of National Standards Strategy |
| | 17. Local companies derive economic benefits from intellectual property rights in ICT standardization activities |

The table below summarizes the main characteristics of the different levels of the National Standards Capability Scale.

Table 3: Capability Characteristics for each Level of the National Standards Capability Scale

| Main Capability Characteristics | Level 1 | Level 2 | Level 3 | Level 4 |
|---|----------|---------|---------|---------|
| 1. Process in place to adopt international standards | ✓ | ✓ | ✓ | ✓ |
| 2. Legal/policy framework in place for compliance to international ICT standards | ✓ | ✓ | ✓ | ✓ |
| 3. There is a national agency which is fully functional and active in ICT standardization. | ✗ | ✓ | ✓ | ✓ |
| 4. There is a process at national level for identifying new standards based on future needs | ✗ | ✓ | ✓ | ✓ |
| 5. Adequacy of ICT infrastructure for remote participation for standardization activities. | ✗ | ✓ | ✓ | ✓ |
| 6. Has manufacturing capability to produce ICT products based on international standards | ✗ | ✓ | ✓ | ✓ |
| 7. Adequate number of technical experts to carry out ICT standardization work. | ✗ | ✗ | ✓ | ✓ |
| 8. Contribution of private sector in ICT standardization work. | ✗ | ✗ | ✓ | ✓ |
| 9. There is an active Secretariat to coordinate contributions to international standards development bodies. | ✗ | ✗ | ✓ | ✓ |
| 10. Participation in meetings of Technical Committees or Study Groups at level of regional/international standards development organizations. | Very few | Limited | ✓ | ✓ |
| 11. Active contribution in meetings of Technical Committees or Study Groups at level of regional/international standards development organizations. | ✗ | ✗ | ✓ | ✓ |
| 12. Hold positions of responsibility (e.g Chair, Vice-Chair or Rapporteur) in technical committees at level of international SDOs | ✗ | ✗ | ✓ | ✓ |
| 13. Host regional/international standards meetings | ✗ | ✗ | ✓ | ✓ |
| 14. Financial support is provided for organization of capacity building workshops or conferences on ICT Standards | ✗ | ✗ | ✓ | ✓ |
| 15. Strong financial support from government and private sector for ICT standardization activities | ✗ | ✗ | ✓ | ✓ |
| 16. Existence of National Standards Strategy | ✗ | ✗ | ✗ | ✓ |
| 17. Local companies derive economic benefits from intellectual property rights in ICT standardization activities | ✗ | ✗ | ✗ | ✓ |

✗ : Implies the capability is not available

✓ : The capability is fully implemented

Classification on National Standards Capability Scale

Box 2 below shows the classification of the countries on the National Standards Capability Scale.

Box 2 : Classification of Countries on the National Standards Capability Scale

| Level 1 | Level 2 | Level 3 | Level 4 |
|---------------------|---------------------|----------------|---------|
| Bhutan | Bosnia Herzegovina | Argentina | China |
| Burkina Faso | Egypt | Czech Republic | |
| Burundi | Lebanon | Slovakia | |
| Fiji | Mauritius | Turkey | |
| Gambia | Mexico | Ukraine | |
| Ghana | Mongolia | Uruguay | |
| Mali | Qatar | | |
| Nigeria | Republic of Moldova | | |
| Papua New Guinea | Thailand | | |
| Senegal | Vietnam | | |
| Suriname | | | |
| Tanzania | | | |
| Trinidad and Tobago | | | |
| Uganda | | | |
| Vanuatu | | | |
| Zambia | | | |

Some of the main findings of the Study can be summarized as follows:

- At levels 1 and 2, there is a lack of government understanding about the critical role of standards in promoting national economic competitiveness and innovation.
- Countries which have not focused on the role of ICT standards in

national economic policies and funding priorities have fewer standards experts and are thus unable to take advantage of the economic benefits conferred by ICT standardization.

- In developing countries, there are fewer ICT standards conferences, international standards meetings and standards courses

in higher-education curricula.

This expands the gap in standards education; a gap developing nations should be seeking to close.

- ICT standardization work in countries at Levels 1, 2 and 3 is driven mainly by public sector bodies (i.e. either the national standards body or the ICT regulatory institution). However, for countries at Levels 1 and 2, work is much more focused on policy and regulatory issues than it is on developing new standards. Developing countries are typically involved in regulatory and administrative aspects of standards, such as country code assignments and accounting rates to terminate calls, but are far less active in more technical, non-regulatory activities.
- The technical infrastructure in countries at level 1 (whether for telecommunications, or basic public utilities such as power) is often inadequate to enable participation in standardization work. One example of this is the low level of broadband penetration. Access to broadband is necessary for remote participation (e.g. videoconference) in standards-development meetings.
- Most countries at Levels 1, 2 and 3 are characterized by a lack of adequate funding for standardization activities. Some countries at Level 1 provide almost no funding for standardization activities. Countries at Level 2 provide funding for national standards agencies or national standards bodies, but very little for other standardization activities. Funding more immediate concerns such as the delivery of critical social services (e.g. health, education, poverty) is deemed more important than longer-term funding for ICT standardization. Countries at Level 4, such as China, have made significant investments in ICT standardization. In developed countries, a significant portion of standards development costs are borne by private industry. This is more difficult to implement in developing countries due to low private-sector involvement with ICT standards, or due to a small or non-existent private-sector ICT industry. Inadequate funding for standardization activities translates into an inability to participate in international standards-development meetings, and an inability to host such events in one's home country.
- Due to a lack of prioritization, private industry participation and funding, many developing countries lack the numbers of standards experts in government, industry and academia necessary to improve national standards capability.
- The lack of private-sector involvement in ICT standardization activities, and the low availability of funding to support ICT standardization work, are among the factors preventing countries' upward progression on the National Standards Capability Scale.

Three main factors hamper developing countries' ability to reach Level 4 on the National Standards Capability Scale:

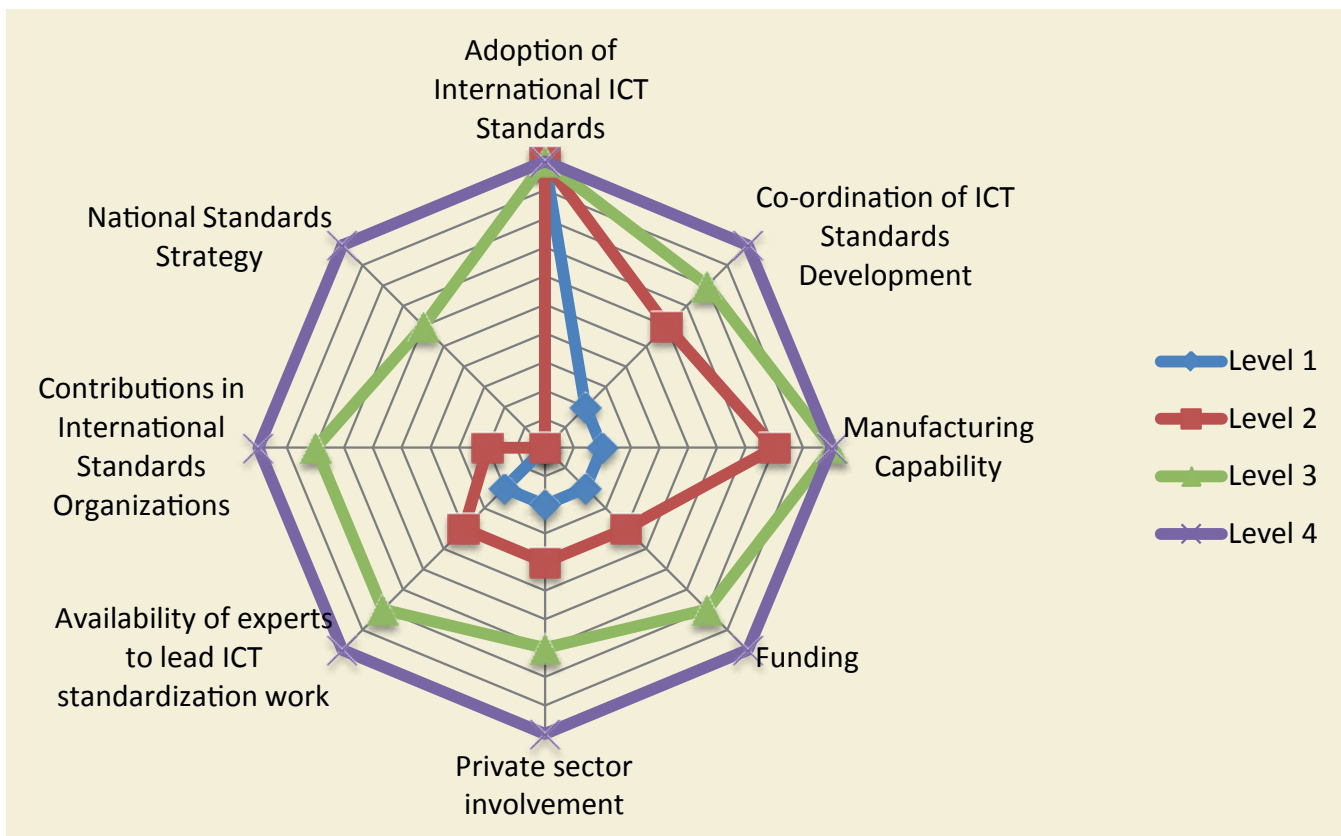
- Low levels of private sector involvement in ICT standardization activities, which is in turn an indication of the low availability of human resources for standardization work;
- The low priority attached to ICT standardization activities by governments, which is in turn reflected in the role, mandate and resources available to the national standards body or the ICT regulatory body to drive ICT standardization at the national level; and

Capability Scale.

- The lack of sufficient funds to support ICT standardization activities and ICT standardization capacity building at the national level.

The chart below summarizes the main strengths and weaknesses of the countries on the National Standards

Chart 1 : Differences between the different levels on the National



Standards Capability Scale

Countries at Levels 3 and 4 have multi-stakeholder approaches to standardization, incorporating private industry, government, academia, and civil society. For countries at Levels 1 and 2, the national standards body and ICT regulatory authority play the primary role in promoting the use of international ICT standards. Governments are also responsible for the promotion of ICT standardization work through their organization of ICT standards conferences, ICT standardization training and participation in regional or international standards meetings. The national standards body or ICT regulatory authority, depending on the country's context, could be assigned the responsibility of developing national ICT standards, participating in regional standards processes, selecting international ICT standards for domestic deployment (either voluntary or mandatory standards), promoting the adoption of ICT standards, providing tools for improving national standardization capacity and performing a standards-education function. In such countries, it is essential that national standards bodies or ICT regulatory authorities be allowed the necessary resources to undertake these important activities. Countries wishing to reach Levels 3 or 4 should invest in opportunities to enhance standards education, and consequently increase human resources available for ICT standardization ac-

tivities. For countries at Levels 1 and 2 seeking to improve their national standardization capabilities, four steps are recommended:

- Put in place an ICT standardization capacity-building program for officials of the national standards body and ICT regulatory authority, aiming to initiate such standardization activities at a national level.
- Establish public-private partnerships for ICT standardization activities at the national level. Such partnerships should identify new ICT standardization requirements, and define strategies for participation in regional and international standards-setting organizations.
- Offer government-sponsored ICT standards training in collaboration with private industry and international standards-setting organizations.
- Incentivize the hosting of international ICT standards conferences and workshops in the country.

Annex 1: Levels of National Standards Capability Scale

Level 1: Low Standards Capability (ICT Standards Users)

Some developing countries can be characterized as “ICT Standards Users”. These countries have little direct involvement in standardization activities other than as purchasers of ICT products based on universal standards. Countries at this level are usually net importers of technology rather than developers and manufacturers of ICT equipment. They do not have a significant base of private industry manufacturers or research institutions incorporating standards in new products. No institutions - private, governmental or non-governmental - are involved in international or regional standards-setting processes to any significant degree. Level 1 countries only exert influence over standards and their implications through procurement of technologies based on ICT standards.

Although, on the surface, this level of standards engagement seems ex-

tremely limited, Level 1 countries with appropriate procurement strategies can still experience significant benefits from ICT standards. A national telecommunication infrastructure making use of products based on international ICT standards can provide the interoperability with global networks needed to establish new opportunities for international trade. The use of interoperable standards allows governments the opportunity to employ internationally-proven, cost-effective ICT services. Global interoperability also produces certain public interest effects such as the improvement of access to knowledge through new forms of digital education and access to global cultural, business, health and political information. Countries that do not use products based on universal ICT standards cut themselves off from the economic and social benefits of global information interoperability.

Level 2: Basic Standards Capability (Adoption of standards in products and services)

At Level 2, countries are not only users of standardized ICT products, but have private industry, academia, or research institutions able to adopt and implement technical standards in products manufactured or services offered within the country.

In these countries, a national standards body is fully operational and able to develop national standards, or adopt international standards as national standards. Countries at this level are not yet actively involved in international standards-setting pro-

cesses to any significant degree. The national standards body may be involved in providing basic awareness and education about the importance of ICT standards.

Nearly every country with this type of standard implementation capability, even if only through a handful of private companies, also has the capabilities described in Level 1. These countries may have ITU-T sector members or associates but, at this level, there is little written contribution to standards development or active participation in more technical, non-regulatory Study Groups.

Level 2 national standards capability provides many advantages over Level 1 capability, particularly in the areas of innovation policy, entrepreneurial opportunities and global economic competitiveness. The development of products based on universal ICT standards provides countries with the opportunity to become more competitive in global ICT markets. The country's product manufacturers can adopt standards within new products and sell them globally. Additionally, producing and selling these products domestically instead of importing them has positive effects for a country's balance of payments.

Level 3: Intermediate Standards Capability (Active participation in regional and international ICT standardization fora)

Level three describes countries which engage in standardization activities in three general ways: they use ICT products based on universal standards (Level 1), and products manufactured within their country are done so in accordance with international standards (Level 2), but they also participate much more actively in regional and international standards-development processes (by submitting written contributions or holding positions of responsibility, e.g. Ladder of Standardization Develop-

ment). Standards experts from private industry, academia, non-profit institutions or government departments contribute to the development of standards in regional or international organizations. For example, these countries are likely to possess ITU sector members or members of other SDOs such as ISO, and these members will participate actively in standards development through their submission of written contributions to these fora.

Level 4: Advanced Standards Capability (ICT Standardization Leaders)

Level four countries have the standards capabilities of levels one through three, but also influence the success of ICT standardization at an international level through their submission of proposals for new work items (e.g ITU study questions), or through their nomination of representatives as study or focus group chairs and vice chairs.

There is adequate funding and institutional support from industry for the national standards body to organize standards conferences, and to draw on the knowledge of local ICT standard experts when organizing regional ICT standardization events.



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