

I n t e r n a t i o n a l T e l e c o m m u n i c a t i o n U n i o n

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

BRIDGING THE STANDARDIZATION GAP

ITU-T Research Project: Measuring and Reducing the Standards Gap

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FOREWORD

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The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications and information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

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BRIDGING THE STANDARDIZATION GAP PROGRAM

The International Telecommunication Union's Telecommunication Standardization Sector (ITU-T) remains at the forefront of efforts to improve the capacity of developing countries to fully participate in the development and implementation of information and communication technology (ICT) standards. Inequality in national standards capability continues to be a contributive factor to the persistence of the digital divide between the developed and developing worlds and to diminished opportunities for economic development and technological innovation. ITU's Constitution provides that ITU-T's work should always take into account the concerns of developing countries.¹ ITU has a longstanding commitment to improving opportunities for developing countries to develop and implement ICT standards and is seeking to identify remaining standardization disparities and recommend actionable measures that can help to ameliorate these disparities. To this end, ITU-T has embarked upon an ambitious effort called Bridging the Standardization Gap (BSG) between developing and developed countries. This report describes a recent research project on BSG and related activities.

Bridging the Standardization Gap Program Objectives

The overarching goal of the 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. One specific objective of this project is to understand the primary gaps that must be overcome to improve the standards development, implementation, and usage capacities of developing countries.

This report will introduce the ITU-T's current research project on building standards capacity in the developing world; will present case studies of national standards capability; will identify the primary standards gaps between developing and developed countries based on these case studies; will recommend what a national profile of standards readiness would look like; and will propose a set of indicators, best practices and actionable steps for improving national standards capacity in the developing world. This report encompasses work being done to measure the standards gap and a recent workshop on BSG, with the kind support of the Korean administration.

History of the BSG Program

The Bridging the Standardization Gap program is a continuation of ITU's historic mission and concern about the digital divide and development disparities in information and communication technologies. The United Nations Millennium Declaration, adopted by the General Assembly in 2000, recognized that developing countries and countries with economies in transition encounter particular challenges in the context of new forces of globalization.² These challenges are

¹ See, for example, Article 17 of the ITU Constitution available at <http://www.itu.int/net/about/basic-texts/constitution/chapteriii.aspx>.

² See the United Nations Millennium Declaration, 8 September 2000. Available at

particularly pronounced in the area of ICTs, as ITU-T has historically articulated and addressed.

Reflecting this concern, the 2002 Marrakesh Plenipotentiary Conference adopted resolution 123 calling for the pursuit of initiatives that assist in bridging the standardization gap between developing and developed countries. The 17th Plenipotentiary Conference in Antalya in 2006 adopted a revised resolution 123 “Bridging the standardization gap between developing and developed countries.” ITU’s concern about standardization and the developing world was consistent with issues elaborated in the first and second phases of the World Summit on the Information Society (WSIS), organized by the Union and held in Geneva, Switzerland in December 2003 and in Tunis, Tunisia in November 2005.

The WSIS Geneva Declaration of Principles identified standardization as not only a fundamental architectural component of the global information society but as a precursor to the diffusion of affordable and accessible information and communication technologies in the developing world:

*Standardization is one of the essential building blocks of the Information Society. There should be particular emphasis on the development and adoption of international standards. The development and use of open, interoperable, non-discriminatory and demand-driven standards that take into account needs of users and consumers is a basic element for the development and greater diffusion of ICTs and more affordable access to them, particularly in developing countries. International standards aim to create an environment where consumers can access services worldwide regardless of underlying technology.*³

The ensuing Geneva Plan of Action called upon governments, along with other stakeholders, to emphasize and raise awareness about the critical role of global interoperability standards in electronic commerce, eHealth, and scientific information and to promote the development and adoption of “open, interoperable, non-discriminatory and demand-driven standards.”⁴ The Tunis Agenda for the Information Society further emphasized the criticality of technical standardization, the important role of international organizations in standards development and policies, the opportunity for cooperation among relevant institutions in standards development, and the role of open standards in eGovernment systems.⁵

Progress at the World Telecommunication Standardization Assembly (WTSA)

Within the ongoing historical context emphasizing the increasingly important role of standardization and identifying disparities in standardization capability between developing and developed Member States, ITU-T has pursued several initiatives to improve standardization

<http://www.un.org/millennium/declaration/ares552e.htm>

³ World Summit on the Information Society (WSIS) Declaration of Principles, Building the Information Society: a Global Challenge in the New Millennium, Principle 44. Document WSIS-03/GENEVA/DOC/4-E, 12 December 2003. Available at <http://www.itu.int/wsis/docs/geneva/official/dop.html>.

⁴ World Summit on the Information Society (WSIS) “Geneva Plan of Action,” Document WSIS-03/GENEVA/DOC/5-E, 12 December 2003. Available at <http://www.itu.int/wsis/docs/geneva/official/poa.html>

⁵ World Summit on the Information Society (WSIS) “Tunis Agenda for the Information Society,” Document WSIS-05/TUNIS/DOC/6(Rev. 1)-E. 18 November 2005. Available at <http://www.itu.int/wsis/docs2/tunis/off/6rev1.html>

capability in the developing world. The World Telecommunication Standardization Assembly held in Florianópolis, Brazil, in 2004 and in Johannesburg, South Africa in 2008 adopted Resolution 44, “Bridging the standardization gap between developing and developed countries.” Resolution 44, includes an action plan to help developing countries improve their standards-development and implementation capacity. The Resolution 44 action plan also recommended measures for developing countries to build human resource capacity in the area of standardization. The action plan additionally called for establishment of a BSG Fund, based on voluntary contributions, to support BSG activities.⁶

Resolution 56 of WTSA-08 furthermore called for the Telecommunication Standardization Advisory Group (TSAG) Vice-chairmen, appointed on a regional basis, as well as study group Vice-chairmen from developing countries, to be tasked with specific responsibilities designed to promote greater participation of developing countries in ITU-T’s standardization work. These efforts include the mobilization of regional ITU members to actively participate in ITU standards activities, the development of participation reports to ITU about the region, and the development of a formal mobilization program for the respective region.

ITU also convened the first international forum on “Bridging the ICT standardization and developing gap between developed and developing countries,” in Kigali, Rwanda in October 2007. Hosted by the government of Rwanda, the gathering brought together more than 160 participants from 38 countries.

Regional Development Forums

Another WTSA-08 Resolution (Res. 54) called for the creation of regional groups. ITU-T invited regions to identify study groups and to work with relevant regional organizations. ITU-T committed that it would facilitate the organization of the meetings and provide “all necessary support for creating and ensuring the smooth functioning of the regional groups.”⁷ In 2008, ITU convened Regional Development Forums to discuss issues related to bridging the standardization gap. These forums were held in conjunction with the preparatory regional meetings for WTSA-08 in the following locations:

- Brasilia, Brazil
- Accra, Ghana
- Tashkent, Uzbekistan
- Damascus, Syria
- Hanoi, Vietnam.

These regional gatherings attracted a large number of attendees and addressed a variety of topics ranging from reducing sector membership fees for small and mid-sized enterprises in developing

⁶ ITU-T, World Telecommunication Standardization Assembly, “Resolution 44 - Bridging the standardization gap between developing and developed countries,” Florianópolis, 2004 and Johannesburg, 2008. Available at http://www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.44-2008-PDF-E.pdf.

⁷ ITU-T, World Telecommunication Standardization Assembly, “Resolution 54 – Creation of Regional Groups,” Florianópolis, 2004. Available at <http://www.tra.gov.eg/presentations/Arab%20Regional%20Group%20of%20ITU-T%20SG2/2.doc>

countries to addressing specific standardization issues in telemedicine, environmental technologies, cybersecurity, and education. For example, the regional development forum in Accra, Ghana included the participation of 210 delegates from 39 ITU Member States and addressed a wide range of issues related to bridging the standardization gap.

There has also been an increased effort to facilitate remote participation in ITU-T meetings. In 2008, more than 100 remote meetings involving more than 700 participants were held using remote collaboration tools. These efforts were initiated at the December 2007 TSAG meeting.

Ladder of Standardization Development

The TSB secretariat created a “Ladder of Standardization Development” to depict how countries can engage in different levels of participation in the ITU-T standardization process. The regional forums mentioned above included presentations and discussions of this framework. The ladder depicts eight rungs of standards involvement, with the lowest level of participation, Step 1, consisting of domestic usage of ITU-T recommendations. This level of standards involvement primarily involves use of ITU materials, such as ITU-T Recommendations, meeting documents, and other materials as a source of information. Step 2, “Capacity Building,” involves the existence of a base of technical experts capable of implementing ITU-T Recommendations. Step 3, “Membership,” involves existence of an increasing number of ITU-T Sector Members and Associates from developing countries. Step 4 of the ladder of development involves the participation of ITU-T Sector Members and Associates from developing countries in ITU meetings, study groups, and regional development forums. In Step 5 of the ladder of development, the Member State seeks to hold ITU meetings within the country or establishes or hosts regional groups that spur participation in standards development. Achieving Step 6, “Making Written Contributions,” refers to making written contributions to ITU-T standards work while Step 7, “Taking Leadership Positions” involves the nomination of representatives from developing countries as study group chairs, vice-chairs, and rapporteurs. The final rung of the ladder of standardization involves the submission of proposals for future study questions and work programs. Figure 7 later in this report provides a graphical depiction of the ladder of development for ICT standardization.

Global Standards Symposium

In 2008, ITU-T held an inaugural Global Standards Symposium (GSS) to deal with strategic issues in standardization including the standardization gap between developed and developing countries. Other strategic themes included: ICTs and accessibility; ICTs and climate change; the need to strengthen collaboration and limit duplication of effort among standards-setting institutions; and improving coordination between the private sector and governments in standards development.

The second session of the GSS addressed the bridging the standardization gap issue and was moderated by H.E. Ambassador Ronaldo Sardenberg, President of the National Telecommunications Agency of Brazil (Anatel). The session included case studies of successful initiatives to bridge the standardization gap. The session reviewed the general status of developing country involvement in a variety of standardization activities and the role of

regulators. For example, the session discussed how developing countries' domestic implementation of ITU Recommendations and degree of membership in the ITU still needs improvement. On the other hand, developing country delegate attendance and contributions at ITU-T meetings have increased, most likely due to ITU-T efforts to geographically distribute the location of ITU-T seminars and workshops. The session furthermore identified a potential area of improvement related to large companies recognizing the value of involving local personnel. One outcome of the BSG session of the GSS was an acknowledgement of the successful BSG work accomplished to date but recognition as well that this must be an ongoing process leading to concrete accomplishments.

One of the objectives set forth in ITU's Strategic Plan for the Union 2008-2011 (Antalya 2006) is 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."⁸ To meet these objectives, ITU has made significant progress in defining disparities in standardization between developed and developing countries, gathering statistics to more accurately measure the standardization gap, making Recommendations and ITU activities more accessible to participants in the developing world, and convening regional development forums to make standards discussions and development more regionally accessible.

Current Project Phase

The objective of the current phase of the Bridging the Standardization Gap project is to develop indicators and present concrete recommendations and best practices for improving standards capability in the developing world. The first part of this project involved the development of a matrix of indicators with which to evaluate national standards capability. These variables were collected into a questionnaire, called the Tool for Assessing Standards Capability (TASC), designed to elicit a self-assessment of standards capacity from developing countries for effectively developing, accessing, and deploying ICT standards. In the initial stage, the questionnaire was distributed to a selected number of countries, chosen to reflect a diversity of regional, linguistic, geographical, economic, and technical criteria. The TASC questionnaire was designed to supplement and extend a previous TSAG questionnaire which was more narrowly tailored to ITU-specific standardization involvement. This research project analyzed the questionnaires, as well as other material, to identify the primary gaps in standards capacity in the developing world and to develop a set of indicators, case studies and categories of standards readiness. This report presents the methodology, indicators, case studies and results of this phase of the research project, identifies tangible gaps in standards capacity in the developing world, presents four national profiles of standards readiness, and recommends best practices and model approaches for the resources, knowledge, policies, and institutional activities that can bridge the standardization gap between developed and developing countries.

This project is part of an overall effort to measure and analyze the standards gap and organize

⁸ International Telecommunication Union, "Strategic Plan for the Union 2009-2012," Antalya, Turkey, 2006. Available at <http://www.itu.int/osg/spu/stratplan/2006/resolution-71-antalya-2006.pdf>.

workshops to assist developing countries, funded through a generous contribution from the Korean administration. As part of the project, the questionnaire is being used to gather data and material to develop a statistical profile of the standards capability of all developing countries. This statistical profile (SCI) will further help countries to understand their standards needs and to set priorities for actions to improve their capabilities. In addition to organizing a workshop on BSG, this activity contemplates providing consulting and assistance to individual countries.

Fiji Workshop

The results of the above project and activities were presented at the ITU-T "Forum on Implementation of WTSA-08 Decisions and Workshop on Bridging the Standardization Gap," which took place in Nadi, Fiji on 16-17 September 2009. At the invitation of the Government of Fiji, ITU-T organized the event in association with the Commonwealth Telecommunications Organization (CTO). The two-day ITU workshop was preceded by the 7th Annual Forum of the CTO, which took place on 14-15 September at the same venue, the Sheraton, Fiji Hotel, Denarau Island in Nadi, Fiji. The theme of the CTO event was "Delivering Broadband Connectivity for All: Needs and Challenges." The two-day CTO session was thematically well coordinated with the ITU's Bridging the Standardization Gap topic and included panel discussions on government policies on broadband, bridging the broadband gap in the Fiji Islands, the importance of affordable Internet connectivity in emerging markets, and the transition from IPv4 to IPv6. Participants in the Fiji Workshop were primarily from the Asia-Pacific region but also travelled as far as Africa, Europe, and the United States to attend.

The objectives of the ITU-T Workshop in Fiji were threefold: 1) to review the Asia-Pacific experience in WTSA-08 and to consider the activities put in place to implement those Resolutions of particular interest to the region; 2) to discuss and recommend actions to bridge the standardization gap in the Asia-Pacific region and 3) to address key emerging topics in ITU-T standards work. Malcolm Johnson, the Telecommunication Standardization Bureau (TSB) Director, gave opening remarks along with Dr. Ekwow Spio Garbrah, the CEO of the CTO and the Honourable Aiyaz Sayed-Khaiyum, the Minister of Industry, Trade, Tourism and Communications for Fiji. Part of the workshop presented an overview of the main WTSA-08 results, reviewing the WTSA-08 outcomes in relation to the interests of developing countries and specifically to countries in the Asia-Pacific region. Arthur Levin, the Head of the Standardization Policy Division, moderated the main session on WTSA-08 outcomes. The session particularly examined Asia-Pacific input to WTSA-08, how the region fared in WTSA-08 outcomes, and how these questions are linked to the next Plenipotentiary Conference (PP-10).

Another section of the Fiji workshop addressed "hot topics" in standardization. One session addressed emerging conformance assessment and interoperability issues, examining the results of the Global Standardization Symposium as well as the concerns of countries in the Asia-Pacific region related to conformance of equipment and services to ITU-T standards. Another session addressed acute standards issues such as ICTs and climate change, standards and next generation networks, and the issue of number highjacking.

The ITU-T's Bridging the Standardization Gap initiative was the third, and perhaps most prominent theme of the workshop. One BSG session brought together experts and practitioners

from Papua New Guinea, Thailand, Korea, Vietnam, the United States, and elsewhere to make the case for how developing countries can benefit from increased standards capability and to present country specific contexts and efforts to improve the national standards readiness of developing countries. This session examined the public policy implications of information and communication technology standards; addressed the consequences of lack of standards participation to developing countries; and described how the ITU's Bridging the Standardization Gap project is addressing these issues. Among topics addressed were how TTA, the Korean ICT standardization organization, has been providing a consultation program to developing countries to help ameliorate the standards gap; other specific work being done in Asia-Pacific regions to improve developing country involvement in standardization activities; and open issues on BSG that need to be solved by ITU and developed countries.

Another BSG session, "Measuring and Reducing the Standardization Gap" provided expert, concrete advice to developing countries on how to improve their standards readiness. The session described in detail the ITU-T's BSG project, its standardization development ladder, and specific efforts to increase capacity, participation, and collaboration in standardization. It also included a presentation by Professor Shin-Won Kang of Sunchon Nat'l University on the Standardization Capacity Measurement Model for creating a standardization capacity index from which to evaluate national standards readiness in the developing world. The session also discussed some of the information that is described in later sections of this report, including case studies of national standards capacity, research findings about the seven primary standardization gaps in the developing world, and best practices for national standards capacity. Discussions at the workshop also provided feedback on the TASC questionnaire used to gather material presented in this report and resulted in the development of a revised questionnaire with fewer questions and with a greater emphasis on numerical rather than descriptive evaluation.

THE ROLE OF STANDARDS IN DEVELOPING COUNTRIES

Standards have a central technical objective of making pragmatic decisions that enable compatibility between telecommunications infrastructures, network equipment, data formats, and software interfaces. Because of the highly specialized and technical nature of standards, this area is sometimes viewed as purely technical. The Bridging the Standardization Gap initiative recognizes that ICT standards are not only the technical blueprints necessary for interoperability and connectivity within global information infrastructures. They are also tools with significant public policy and economic consequences. Exclusion from accessing, adopting, or developing standards can heighten economic inequalities in the context of ongoing information globalization. The following sections describe ways in which standards participation, or barriers to participation, can have significant implications for developing countries.

Effective Government Services

The use of ICT standards can improve the effective functioning of government in several ways. First, the adoption of high-quality and interoperable standards within government ICT infrastructures can increase the efficiency of government. These efficiencies arise from improvements in interoperability among government agencies, increases in the reliability of government information exchange and communications, and by reductions in operating costs. Use of ICT standards can similarly improve the ability of governments to serve citizens in a variety of areas. During a disaster response, the ability of government agencies, first responders, and private entities to communicate using interoperable technologies is a prerequisite to effective, multistakeholder coordination. National security is an area of public services in which technical standards play an increasing role and the standardized use of security protocols is a key element of national cybersecurity policies for protecting information networks and providing critical infrastructure protection. Governments also provide public information to citizens, increasingly through digital archives. Standard interfaces and data formats are a prerequisite of this type of information provisioning. Finally, standards enable a wide range of eGovernment services to citizens, ranging from functions like motor vehicle registration to more complex areas such as electronic voting.

Public Interest Effects

Standards design decisions have direct public policy implications in areas ranging from individual privacy, public safety, environmental issues and access to knowledge. For example, the design of encryption standards is a vital area of public policy that intersects with national security, individual privacy, and the security of financial transactions. Another example of ICT standards creating de facto public policy is in the emerging area of eHealth. Electronic health systems and repositories have the potential to improve access to medical services and health informatics in the developing world. The design of these standardized electronic medical records can determine the degree of interoperability among medical systems, the quality controls in these systems, and the security, privacy, and accessibility of eHealth recordation. As vital systems of health, education, entertainment, journalism, and commerce are increasingly exercised online, the ICT standards that underlie these technologies will increasingly affect the public interest in these areas.

Innovation Policy and National Competitiveness

From an economic standpoint, access to ICT standards is a critical factor in a country's innovation policy, economic competitiveness, and global trade. The ability to access and implement standards in ICT products is directly relevant to the ability of businesses to compete globally and develop products that are compatible with a competitor's products. This is because ICT standards can provide a common platform from which innovation can proceed and a level playing field on which competition can occur and through which the risk of experimentation is lowered. ICT standards can therefore provide developing countries with the opportunity to become more competitive with other nations in technology product markets and can provide entrepreneurial opportunities for a nation's technology companies to engage in product development based on universal standards. Conversely, if standards are not available, or if use of standards requires high royalty payments, emerging markets will have a diminished chance of becoming competitive in global technology markets. Standards accordingly play a significant role in the facilitation of global trade or, if proprietary, may lead to technical barriers to trade.

Global Access to Knowledge

Finally, the interoperability afforded by standards enables new forms of knowledge exchange. Interoperability, achieved through agreed upon ICT standards, enables information sharing within governments, between governments and citizens, and more ubiquitously, in the global information society. This type of access provides new avenues for citizens in developing countries to access emerging forms of digital education, medical and health diagnostic information, and to participate more actively in cultural and political life.

Consequences of Lack of Standards Participation

In all of the ways listed above, technical standardization is not only an issue of technical interoperability and efficiency but an area, though often invisible to the general populace, which has significant public interest implications. Lack of participation in any of these aspects of standardization carries consequences to developing countries.

"Participation in standards" can take many forms:

- Developing standards - Private and public entities within a country can become involved in the actual development process of technical standards, either nationally, regionally, or internationally.
- Influencing the Design of Standards - Private and public entities within a country can influence the design of standards by determining which standards are needed and what objectives they must meet.
- Adopting Standards in Products and Services - Private enterprises or public research institutions can choose to adopt universal standards in the equipment and services they develop.
- Using Products Based on Standards - Private and public entities within a country can choose to purchase products based on certain criteria of standards embedded within these

products.

- Regulating Standards or Developing Standards Policies - Governments can establish procurement policies about what technological standards they will use in government ICT infrastructures; they can develop national standards strategies; they can establish laws and policies about various aspects of standardization.
- Providing Standards Education - A nation's educational institutions, private industry, standards institutions, and government agencies can try to build human resources capacity and expertise by providing standards education.

Lack of participation in any of these aspects of standardization can carry consequences, generally negative, to developing countries, as described in the following sections.

Impeding Public Services

Problems with standards can create social or economic harm or contribute to a loss of faith in government. For example, there can be both economic and public safety consequences of using coexisting but distinct standards. Lack of access to or adoption of effective ICT standards can create problems such as inhibiting public services or compromising critical infrastructures. Lack of interoperability between first responder technical infrastructures can impede services during a natural disaster. For example, during rescue and victim identification efforts in the aftermath of the 2004 Southeast Asian tsunami, there were reports that various Thai agencies and other responding institutions were unable to exchange documents because of incompatible proprietary document formats.⁹ The ICT standards underlying digital archives can also be problematic if the formats and network protocols necessary to access these documents are incompatible with technologies used by the public or if they rely on proprietary standards that may become inaccessible or incompatible in the future. Use of products with technical standards vulnerable to critical infrastructure attacks or network security attacks can disrupt the functioning of public services, disrupt public utilities or financial networks, or compromise individual or national security.

Exclusion from Policy Making

Lack of participation in standards development can sometimes result in exclusion from policy making. As mentioned above, the design decisions made in the development of ICT standards can have implications for a variety of public policy areas. When developing countries do not directly influence or contribute to standards development processes, these countries' interests are not directly reflected in these policy choices.

There are many potential reasons for exclusion from standards development processes. Developing countries may be late entrants into standards-setting processes. Some countries may have inadequate technical infrastructures for reliable access to standards and electronic participation in standards development. Countries may not have the funding necessary to participate in standards development, including the funding for travel to meetings and

⁹ See Berkman Center for Internet and Society, Open ePolicy Group's *Roadmap for Open ICT Ecosystems* (September 2005). Accessed at <http://cyber.law.harvard.edu/epolicy/roadmap.pdf>.

conferences. Developing countries may have knowledge barriers to participation if they do not have an adequate number of standards experts. Countries not involved in standards development for any of these reasons must accept the design choices and associated policy consequences of dominant standards without necessarily having given input into these choices. This may lead to more costly products not well-suited to domestic use.

Innovation Barriers

In the developing world, the production of innovative products based on ICT standards holds the potential to create new economic opportunities. Standards barriers to innovation can include: lack of access to ICT standards; inadequate research and development capacity; insufficient standards education capacity; lack of human resources and expertise; or insufficient private industry capacity for standards adoption. If developing countries face any of these barriers, emerging businesses and research institutions will not have the maximum opportunity to develop innovative products based on standards and products they do develop may not be marketable outside their domestic borders.

Economic Inefficiency

Interoperability problems resulting from the lack of adoption of universal standards or the use of incompatible standards can drive up the cost of day-to-day business, government, and consumer activities. For example, lack of standards for health information systems and networks can increase the cost of delivering healthcare by requiring the same information to be captured multiple times and by precluding the sharing of patient data among hospitals, primary care doctors, pharmacists, and other health care providers. Similarly, lack of adoption of compatible ICT standards among government agencies not only impedes the flow of vital information necessary to perform government functions but also significantly raises the cost of providing these government functions. While governments are accountable to citizens to spend limited resources efficiently and wisely, lack of ICT standards in government information networks can result in inefficient and costly technology infrastructures.

Global Trade Barriers and Global Knowledge Barriers

In the context of ICT globalization, technical interoperability is the precursor to economic interoperability. The World Trade Organization's Agreement on Technical Barriers to Trade (TBT) asserts that standards should not create unnecessary obstacles to trade. Relatively closed standards can serve as alternative trade barriers, in contrast to open standards which have tended to promote competition and free trade. In the global knowledge economy, countries failing to use universal ICT standards can be impeded from tapping into global exchange markets with trading partners. Lack of technical interoperability or information access in the developing world can also cut off citizens from emerging forms of digital education, medical and health diagnostic information, participation in digital cultural life, and participation in global political spheres.

SOME PARAMETERS FOR ASSESSING STANDARDS CAPABILITY

The significant consequences of standardization participation - and lack of participation – demonstrate the critical need for bridging the standardization gap between developing and developed countries. The national standards assessment conducted as part of this project was designed to identify and measure the gaps that exist. Because of the unique demographic, economic, and technical circumstances within each country, this phase of the BSG project developed a questionnaire designed to be a self-assessment rather than an external description of each country’s standards landscape. To capture the significant effects of standards on countries, whether developed or developing countries, the questionnaire took into account the following complex characteristics of national standards involvement.

Qualitative and Quantitative Metrics

The questionnaire solicited both quantitative and qualitative indicators of standards capacity. The questionnaire was also designed to elicit more qualitative descriptions of standards readiness from each of the respondents. The questionnaire replies were used to develop the case studies and national profiles of standards readiness presented later in this report and will also be used to develop a national capability index.

Multifunctionality of Standardization

National involvement in standardization takes many forms. At the simplest level, a developing country can choose to use ICT products and services based on compliance with international standards. At another level, private enterprises within developing countries can access standards with the intent to implement them in products to sell nationally or into global technology markets. At another level, representatives of developing countries can become involved in the development of standards regionally or globally. The questions sought to capture all of the potential gaps that can exist in the ability of representatives of developing countries to:

- Procure ICT Technologies Based on Standards
- Access Actual ICT Standards
- Adopt/Implement ICT Standards in National Technology Development
- Influence the Development of Standards
- Directly Contribute to Standards Development
- Provide Standards Education and Training
- Propose Standards
- Lead Standards Development
- Regulate Standards or Establish National Standards Policies
- Participate effectively in ITU and other standards development organizations.

Multistakeholder Nature of Standardization

The questions recognized that there are many stakeholders in ICT standardization. Governments in developing countries typically play a significant role in many aspects of standardization

including: regulation and policy formulation; education; standards-setting processes, such as ITU; standards implementation; and standards adoption. The questionnaire measures indicators in each of these areas. The questionnaire also seeks information about the gaps and opportunities among stakeholders outside of government. The questionnaire, to some degree, solicited information about the following stakeholders:

- National Government
- Private Enterprises
- Academia
- Standards Institutions
- Regional Government Bodies

Not Limited to International Standards

The questions assumed that regional and national standardization issues exist alongside international standardization. This is particularly the case for standards related to national security and other uses of information and communication technologies that are perhaps unique to an individual country or region.

Not Limited to ITU Standards

There are many standards-setting institutions involved in various aspects of ICT standardization. ITU works with many of these institutions. While the focus of the BSG project is primarily on the capacity to participate in ITU processes, the questionnaire generally solicited information about national readiness in development, adoption, and regulation of all ICT standards.

Scope Limited to ICT Standards

The scope of the questions and of the BSG project, more generally, was limited to information and communication technology standards. Other types of standards-setting activities and standards adoption and use beyond the scope of ICTs were not addressed.

THE TOOL FOR ASSESSING STANDARDS CAPABILITY (TASC)

The Tool for Assessing Standards Capability was a questionnaire designed to facilitate national self-assessments of current standards participation and readiness. The questionnaire was divided into the following four broad categories: standards development capacity, standardization human resources, government standards policy, and national standards use and adoption, and reflected the parameters described in the preceding section. The following describes the questions in each of these categories.

Standards Development Capacity

The first of the four sections of the TASC questionnaire assesses the extent of a country's involvement in standards-setting processes and development, including international and regional activities and including ITU and other standards-setting bodies. This first section of the questionnaire is divided into the following seven questions.

1. Existence of a national ICT standards body and/or standardization committee
2. Participation in international ICT standards development processes
3. Participation in regional ICT standards development processes
4. Private industry involvement in ICT standards development
5. Adequacy of technical infrastructure to participate in ICT standards development
6. Number of Domestic Standards in Past Year
7. Number of Patent Applications Filed in Past Year
8. Number of ICT R&D Institutions in Country

Standardization Human Resources

The second of the four sections 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 is divided into the following eight 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. Other ICT standards body training held in country in past year
4. ICT standards conferences held in country in past year
5. Access to electronic training courses and materials
6. Estimated number of individuals engaged in domestic standardization organizations
7. Estimated number of standard experts in the country
8. 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 and

government personnel involved in standards, the nation's laws, procedures and strategy on standards, and the nation's funding of standardization activities. This section is divided into the following six questions.

1. Existence of national procedures for enacting standards
2. Existence of a national ICT standards agency, department, or advisory council
3. Existence of a national ICT standards strategy
4. Government laws, regulations, and policies on ICT standards
5. Existence of government guidelines on the country's standards development
6. Government funding and investment in ICT standardization

National Standards Use and Adoption

The fourth section of the questionnaire solicits information about the use and adoption of standards within the country. This includes government policies on the use of standards in government ICT infrastructures, and whether the country's global market share of information and communication technology products it produces based on international standards is increasing, as opposed to decreasing. 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 final questions of a more qualitative nature designed to identify the country's key stakeholders (e.g. private companies, standards institutions, government authorities and agencies) involved in standards development and adoption and to solicit suggestions for 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?

Standardization Capability Index (SCI)

As part of the KCC (Korea Communication Commission)-ITU-T joint project aimed at bridging the standardization gap, the set of indicators was developed to measure the standardization capability of developing countries. These include indicators in legal systems, policies, systems, R&D, human resources, standardization activities, and ICT infrastructure, and can be used to develop a standardization capability index. The TASC questionnaire responses and other data

will eventually be used to develop the SCI.

The SCI aims to identify and measure the standardization capability of developing countries, and thus to efficiently bolster their standardization capability and bridge the standardization gap. It will offer the following anticipated effects. To identify the standardization gap of developing countries and help bridge the gap, the study develops a standardization gap measurement index, based on hard data, and thus identifies developing countries' standardization status and levels. The standardization capability index will help define practical improvement measures for developing nations, suggest priority areas for each country to improve standards readiness and therefore assist in bridging their standardization gap.

The SCI is a statistical figure that shows a country's standardization capability in the most brief and distinctive way; it will enable one to identify a country's overall standardization capability, and to forecast its standardization capability trends, as well as to compare the country with other countries; as such, it will be a very useful tool that a government can use when formulating a national policy and strategy for bridging the standardization gap.

NATIONAL STANDARDS ASSESSMENT CASE STUDIES

The TASC questionnaire was sent to a select set of ITU Member States in the developing world. Because the BSG workshop took place in Asia, some emphasis was placed on Member States in that region. Eventually, the TASC questionnaire will be sent to all developing country Member States.

The ITU-T received helpful responses from six Member States that had been sent the TASC questionnaire: China, Czech Republic, Lebanon, Mali, Mongolia, Papua New Guinea, Thailand, and Zambia. This section summarizes some of the unique standards contexts in each of these countries and presents some results of the country self-assessments of standards readiness. The case studies are based upon responses to the TASC questionnaire but do not necessarily represent the official positions of the government of each country.



Figure 1: Countries Responding to the ITU-T TASC Questionnaire

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 describes its activities as follows:

- Promulgate laws, regulations and policies on standardization
- Propose standards R&D projects; conduct compliance testing and interoperability testing
- Promote standards implementation through consultation/training
- Domestic and international exchange cooperation in ICT standards
- Undertake work related to standardization commissioned by the authority, members of CCSA or other organizations.

China has thousands of individuals directly involved in standards development. These standards experts come from industry, research institutions, government agencies, and academic institution. They work on standards development processes within the ITU, the International Organization for Standardization (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. They are also involved in regional and national ICT standards development processes. Like the other country respondents, China has few standards courses in higher education but has some government ICT standards training. 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.

According to the self-assessment on standardization reflected in its response to the TASC questionnaire, the strengths of China's standardization capacity include: a strong national standards body; thousands of standards experts; significant participation in international ICT standards development; multi-stakeholder participation from government, industry and academia; extensive regional ICT standards development; and national laws and a national standards strategy. Some challenges and opportunities reflected in the self-assessment include: the need for further involvement of private industry in standards development and adoption and greater coordination between private industry and government; a need for international organizations like the ITU to encourage greater developing country involvement in standards development (such as providing education, holding ITU meetings in developing countries, engaging experts from developing countries to participate in the ITU); and the possibility of the government establishing more national standards policies and increasing funds to support standards development and adoption.

Czech

Numerous standards professionals in the Czech Republic participate in ITU activities as well as in other standards bodies such as the International Organization for Standardization (ISO) and the Institute of Electrical and Electronics Engineers (IEEE). The Czech Telecommunication Office (CTO), formally established by the 2005 Electronic Communication Act, is the state administrative agency responsible for market regulation, resolution 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. The electrotechnical standards section of this office is one of seven standards-setting areas.

According to the self-assessment on standardization reflected in its reply to the TASC questionnaire, 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.

Lebanon

In Lebanon, Libnor is the state-owned standardization agency responsible for recommending Lebanese standards in all fields including information and communication standards. 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 of standards. 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 domestic 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 as indicated in its reply to the TASC questionnaire, 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 Telecommunications. 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. According to the self-assessment on standardization reflected in its reply to the TASC questionnaire, 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 tremendous opportunities for greater private industry involvement in ICT standardization activities; there are opportunities for government training and funding and international standards body training to develop standards expertise.

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 five departments, two offices, 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 reflected in its reply to the TASC questionnaire, 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 standardization; 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

Papua New Guinea (PNG), with a population of almost 6 million people speaking hundreds of indigenous languages, is located in the southwestern Pacific Ocean. The digital divide is a significant issue for Papua New Guinea, 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 PNG, complicated by both geographical and demographic challenges. Limitations in standards capacity in PNG contribute to the digital divide, decrease opportunities for individuals to develop technology skills, decrease technology transfer opportunities, and complicate 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 responsible 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 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 APT (Asia-Pacific Telecommunity); 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

In Thailand, the National Telecommunications Commission (NTC), in close association with the Thai Industrial Standards Institute (TISI), develops and promulgates any mandatory telecommunication standards in the country. The NTC 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 (APC). Private industry involvement in

standardization takes place via a public hearing process.

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.

According to its reply to the TASC questionnaire, Thailand's standardization system is still relatively nascent. Thailand makes use of ITU-T recommendations, has national standards agencies in information technology and telecommunications, and participates in some regional and international ICT standards development processes. The country does not explicitly have a national ICT standards strategy. It noted opportunities for improving technical infrastructure for participating in ICT standards development and adoption, and for increasing standards education and training in the country, including standards conferences and workshops.

Zambia

The key standards stakeholders from the Zambian government are The Communications Authority of Zambia (CAZ), the Zambia Bureau of Standards, and the Zambia Telecommunications Company Limited. The private telecommunications operators in Zambia are MTN Zambia and mobile phone operator Zain Zambia Limited. The Communications Authority of Zambia is the regulatory body overseeing the country's telecommunications and spectrum policy. The Authority describes five regulatory principles for promoting universal access to ICTs in Zambia: promote universal access; develop capacity for using ICTs in education; encourage telecommunication investment by creating trusted, transparent, and non-discriminatory legal and policy frameworks; promote subsidized investments, such as community-based telecentres, in rural and underserved areas; and stimulate private investment and foster public/private partnerships.¹⁰

The Authority has approximately eight standards professionals participating in ITU-T and ITU-R study groups. It also participated in the ITU regional Study Group 5 for Africa. The Authority is in the process of signing a memorandum of understanding with the Zambia Bureau of Standards (ZABS), the national standards body of Zambia. This standards bureau was established in 1982 and updated with the passage of the Standards Act of 1994, which called for the creation of the Standards Council of Zambia as a governing body over the Zambia Bureau of Standards. The memorandum would expand the mission of ZABS to include information and communication technology standards. Zambia is also expected to soon pass a new ICT Act which will elaborate on the relationship between the Communications Authority and the Zambia Bureau of Standards and which will formulate new laws on ICT standards.

According to the self-assessment on standardization reflected in its reply to the TASC questionnaire, some of the opportunities for improving national standards capability include the

¹⁰ From the "Statement from National Regulatory Authorities to WSIS" contributed by the Communications Authority of Zambia. Accessed at <http://www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR03/WSIS-CountryContributions/Zambia.pdf>.

following: development 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. The questionnaire response also suggested opportunities for international standards-setting institutions to provide incentives such as sponsorship of standards participation and the development of additional programs for building standards capacity.

NATIONAL STANDARDS CAPABILITY SCALE

Based on the case studies and the research conducted thus far, countries generally fall into one of four national categories of standards readiness: Low Standards Capability, Basic Standards Capability, Intermediate Standards Capability, and Advanced Standards Capability. Figure 2 illustrates these four categories.

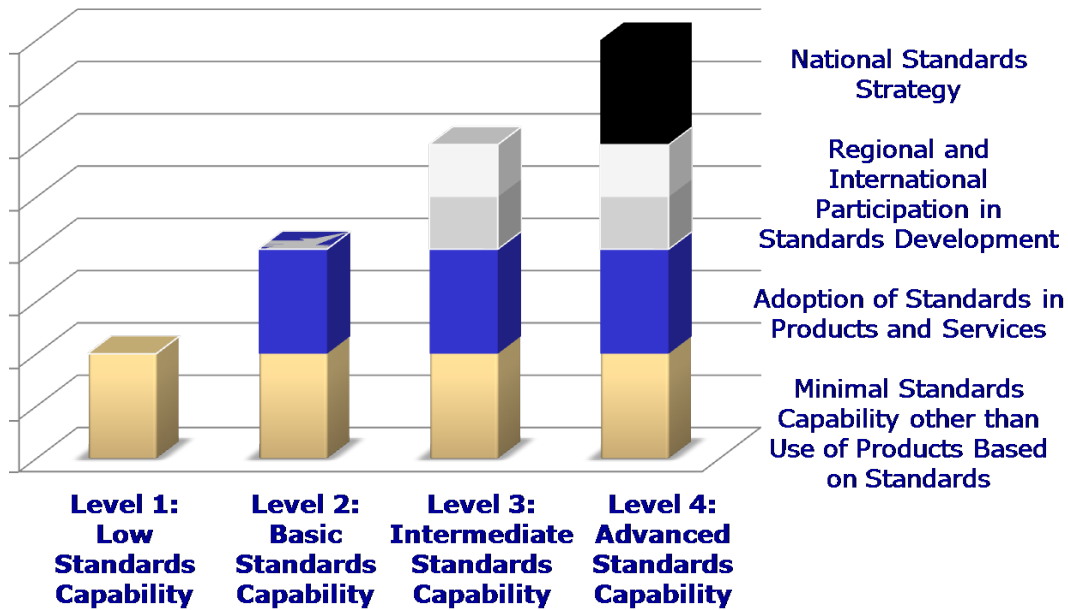


Figure 2: Four Levels of National Standards Capability

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 of the standardization characteristics of levels one through and three along with additional characteristics unique to Level 4. The category to which a country belongs can be useful in identifying primary gaps and providing guidance about priorities for improving standards readiness. The following sections describe each of these four levels of national standards capability.

Level 1: Low Standards Capability

A very small number of developing countries can be characterized as Level 1 countries with "Low Standards Capability." 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 adopting standards into new products. No institutions, whether private entities, non-governmental organizations, or government agencies are involved in international

or regional standards-setting processes to any significant degree. Level 1 countries exert influence over standards and the implications of standards primarily through procurement of technologies based on ICT standards.

Although, on the surface, this level of standards engagement seems extremely limited, Level 1 countries with appropriate procurement strategies can still experience significant benefits from ICT standards. The use of products based on universal ICT standards within national telecommunications infrastructures can provide the technical interoperability with global networks necessary for opening economic opportunities with trading partners. Global interoperability through universal ICT standards also produces certain public interest effects such as improving access to knowledge, whether 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. Another advantage this level of standards capability brings is the opportunity to provide cost-effective and functionally effective government services because of the efficiency of using interoperability standards.

Level 2: Basic Standards Capability

Other countries are at Level 2, or "Basic Standards Capability." These countries are not only users of ICT products based on standards but have some manufacturing and development capability whereby private industry, academia, or research institutions adopt and implement technical standards in products manufactured within the country or services offered in the country. These products could in turn be exported or sold within the country. Countries at this level are not involved in regional or international standards development institutions to any great extent but have access to the standards developed in these regional or international processes and adopt and implement them in ICT products. Nearly every country with this type of standard implementation capability, even if only through a handful of private companies developing products or services, also has the capabilities described in Level 1, meaning also some use of products based on standards. At Level 2, countries may have undertaken some efforts to establish national standards, or adopt international standards as national standards, but are not actively involved in international standards-setting processes to any significant degree. 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 non-regulatory, more technical Study Groups. 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 activities.

Level 2 national standards capability provides many benefits 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. Even selling these products nationally versus importing products for national use creates huge benefits in closing global trade gaps.

Level 3: Intermediate Standards Capability

Level three, or "Intermediate Standards Capability," describes countries which engage in standardization activities in three general ways: they use ICT products based on universal standards (Level 1), they implement standards within products manufactured in each country (Level 2), but they also engage in some degree of more active participation in regional and international standards development processes. Standards experts from private industry, academia, non-profit institutions, or government contribute to the development of standards in regional organizations or in international organizations. For example, these countries have ITU sector members or associates, actively make written contributions to standards development and participate in ITU Study Groups or workshops.

Active participation in standards development offers three significant benefits to a country operating at this level. First, a country with entities and interests directly involved in standard setting has the ability to influence and shape the design choices and associated policy consequences of standards. Second, participation provides some market advantage in later product development based on standards because private industry manufacturers involved in standards selection can attempt to directly make the case for the selection and design of standards that are most compatible with their existing and planned product lines. Finally, participation has an enormous educational benefit of exposing national standards experts to an even greater knowledge base for future standards work and ICT innovation.

Level 4: Advanced Standards Capability

Level four is Advanced Standards Capability, which incorporates levels one through three but also includes more strategic national policies regarding standards. At this level, countries demonstrate an understanding of the national importance of standards by: having an overall national strategy for using ICT standards to maximize economic positioning and to support innovation policy; having adequate funding for standardization activities, whether in the private or public sector; produce a cadre of standards experts; influence, at a strategic level, the international and regional direction of new ICT standards; and often holding standards events within the country.

At this level, strategic market influence can be exerted nationally by using procurement policies to influence the success of certain ICT standards or by developing effective partnerships and incentive structures between a country's public and private entities. Strategic influence can also be exerted internationally by offering proposals to major Assemblies and conferences, for example, ITU study questions or work programmes, or by nominating representatives as study group chairs, vice chairs, or focus group chairs.

The SCI will complement the self-assessment analysis done under the TASC. While the analysis done to date of the TASC replies has identified 4 broad categories of standards readiness, the SCI should provide further granularity of the respective national situations and help to better identify the most appropriate and effective priority actions to improve standards readiness for individual Member States.

PRIMARY STANDARDS GAPS IN THE DEVELOPING WORLD

There are many factors preventing developing countries from reaching Level 4, Advanced Standards Capability. This research project has identified six primary standards gaps in the developing world, many of them interrelated:

- Lack of Understanding of the National Importance of Standards
- Relatively Less Private Industry Involvement in Standards
- Inadequate Funding of Standardization
- Insufficient Standardization Human Resources
- Insufficient Involvement in International Standards Development Processes
- Inadequate Technical Infrastructure for Standards Participation.

I. Lack of Understanding of the National Importance of Standards

This report has described the pronounced implications of standards in the developing world and the consequences of lack of effective standards participation. Research conducted within the BSG program and country feedback presented at the ITU's Fiji workshop indicate that one gap between the developing and developed world is the lack of recognition within many governments of the national importance of standards and consequently the lesser priority assigned to such work. Lack of government understanding about the critical role of standards to national economic competitiveness, innovation policy, and public interest concerns usually has its origination in one of the following reasons. 1) Because of the somewhat invisible, abstract, and technically complex nature of standards, government officials are not familiar with the technical role of standards in ICTs or their economic value; 2) Government officials who are familiar with standards from a technical perspective may not fully be aware of the public policy implications of standards; 3) In other cases, government officials may appreciate the important technical and public interest implications of ICT standards but invest greater attention in more pressing national problems such as alleviating hunger, addressing unemployment, or dealing with drought, climate change, or national security challenges.

II. Relatively Less Private Industry Involvement

There is relatively less private industry participation in standardization in the developing world. For example, fewer ITU-T sector members are from the developing world and more than 85% of national standards bodies in the developing world are government bodies. This gap includes lower rates of participation by the national private sector in regional and international standards development processes and lower rates of adoption of international standards in ICT products. This gap also includes lower attendance rates at standards forums. As one example, Figure 3 depicts the number of recognized operating agencies and scientific or industrial organizations attending WTSA-08 from developed, developing, and least developed countries.

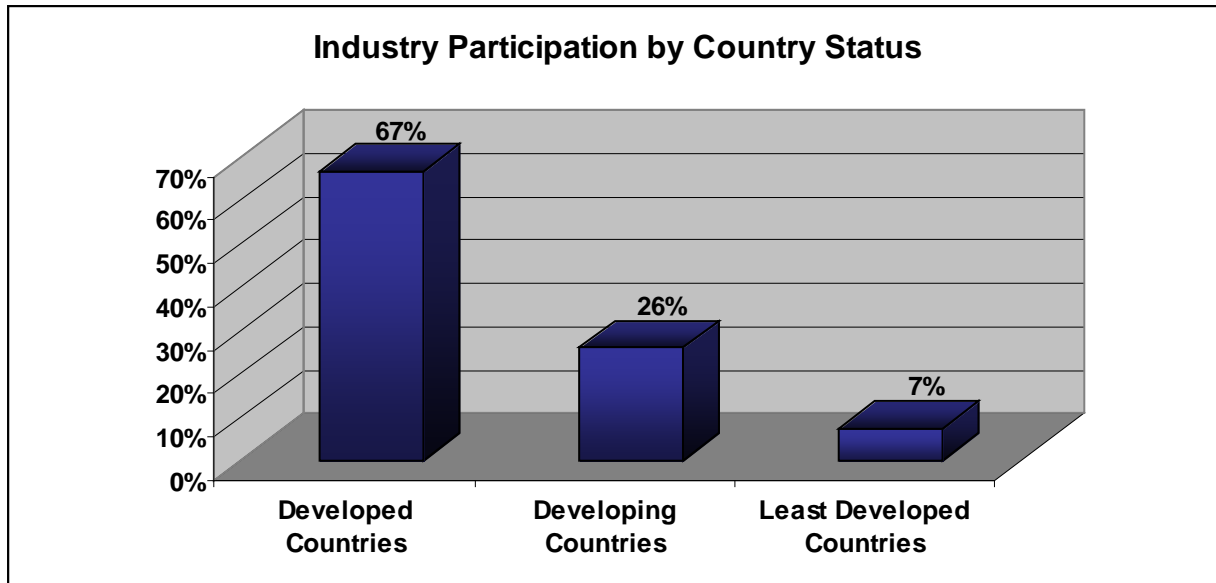


Figure 3: Industry Presence at WTSA-08

Many of the TASC questionnaire responses cited greater private industry involvement as an opportunity to improve national standards capacity. One contributor to this gap is the reality that some developing countries are net importers rather than exporters of ICT products. They are ICT adopters rather than ICT developers. In another subset of countries that export ICT products, these products are sold by multinational companies headquartered in developed countries but with manufacturing facilities in the developing world rather than by homegrown companies. A lesser degree of private industry participation and expertise in ICT standardization also places a relatively greater burden on government agencies and public institutions to provide leadership, expertise, and financial resources in ICT standardization.

III. Inadequate Funding of Standardization

A consistent response in the TASC questionnaire and associated interviews was that there is inadequate funding of ICT standardization activities in the developing world. Some countries provide almost no funding for standardization activities. Others provide funding for national standards agencies or national standards bodies but little else. Funding priorities relative to more immediate services or critical social priorities take preference over longer term funding of ICT standardization. Only a small number of developing countries, such as China, have made a significant investment in ICT standardization. In the so-called developed world, a significant portion of standards development costs are borne by private industry, a phenomenon not replicated in many developing countries because of relatively less private industry engagement with ICT standards or a small or non-existent domestic private ICT sector.

The results of inadequate funding include: less participation in standards development processes; logistical limitations such as the inability to travel to standards development activities or workshops; lack of funding for standards events within the country; inadequate funding to support the government personnel and researchers necessary to perform all aspects of standards activities described above in Level 1-4 capabilities; and limited funding for standards education.

IV. Insufficient Standardization Human Resources

In part because of the three aforementioned standards gaps - lack of prioritization, less private industry participation, and lack of funding - many developing countries have an insufficient number of standards experts in government, industry, and academia than necessary to improve national standards capability. In the United States, for example, a significant portion of standards experts come from the private ICT sector. Countries without this product development and manufacturing base will have a smaller base of experts. Countries not prioritizing the role of ICT standards in national economic policies and funding priorities are developing fewer standards experts. A final contributor is the gap in standards education. In developing countries, there are far fewer industry conferences, government training workshops, international standards meetings, and standards courses in higher education.

V. Insufficient Involvement in International Standards Development Processes

Developing countries generally have lower levels of participation in international standards development processes across all stakeholders including industry, government, academia, and civil society. There are at least five reasons for this diminished involvement in international standards processes. The first explanation is financial. Membership in many international standards development organizations requires a membership fee; it may require funding for travel to working groups and for ICT infrastructures to support involvement; it requires funding of the appropriate number of personnel to realistically participate in standards development. The second explanation is human capital, including the necessary number of experts and the necessary knowledge and expertise to meaningfully become involved in standards development. A third barrier is cultural. The language of business, including standards development, is English and this can be a barrier to participation, as can different cultural practices and norms within various institutions. A fourth barrier that has been mentioned already is that the private sector is not filling the void in emerging market standards development as it does in the developed world. A final reason revealed during this research project is that the sheer number of international standards development organizations and forums is very high. Developing countries can not realistically become involved in all of these organizations.

The ITU has made a concerted effort to increase the number of developing country Study Group Chairmen and Vice Chairmen representing developing and least developed countries and has made progress in this area. For example, Figure 4 below illustrates the current percentage of ITU Study Group Chairman from developed , developing , and least developed countries.

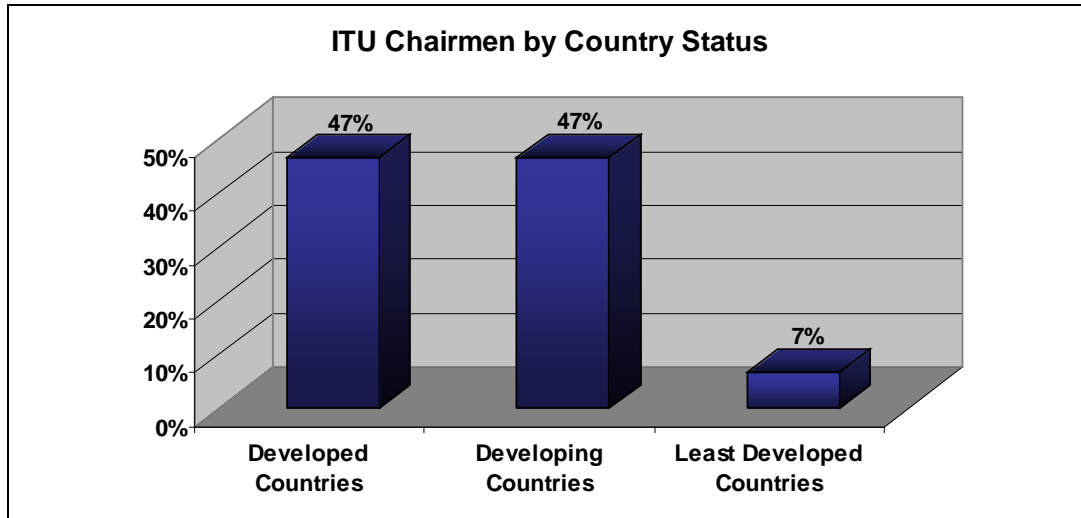


Figure 4: ITU Study Group Chairmen by Country Status

VI. Inadequate Technical Infrastructure for Standards Participation

Finally, the technical infrastructure in developing countries is often inadequate for reaching maximum national standards capability. This limitation affects those involved in developing standards, those involved in adopting and implementing standards, as well as for the general public or researchers who might be interested in accessing or participating in ICT standards. One ancillary example of this limitation is the lack of broadband penetration, which is increasingly necessary for remote participation (such as through video) or at least viewing of standards development meetings or workshops. Another technical limitation involves the lack of ICT infrastructure to handle the requirements of convening a large ICT standards conference or workshop.

The ITU's ICT Development Index (IDI) compares developments in ICTs (e.g. access, skills, number of Internet users) in 154 countries over a five-year period from 2002 to 2007. With the exception of Korea, the ten highest ranking IDI countries are from Northern Europe. (See Figure 5.) The countries with low ICT levels, and associated low IDI rankings, are primarily from the developing world. Figure 6 similarly illustrates the disparate levels of broadband penetration rates by level of development.¹¹

¹¹ The ITU's ICT Development Index report is available online at http://www.itu.int/ITU-D/ict/publications/idi/2009/material/IDI2009_w5.pdf

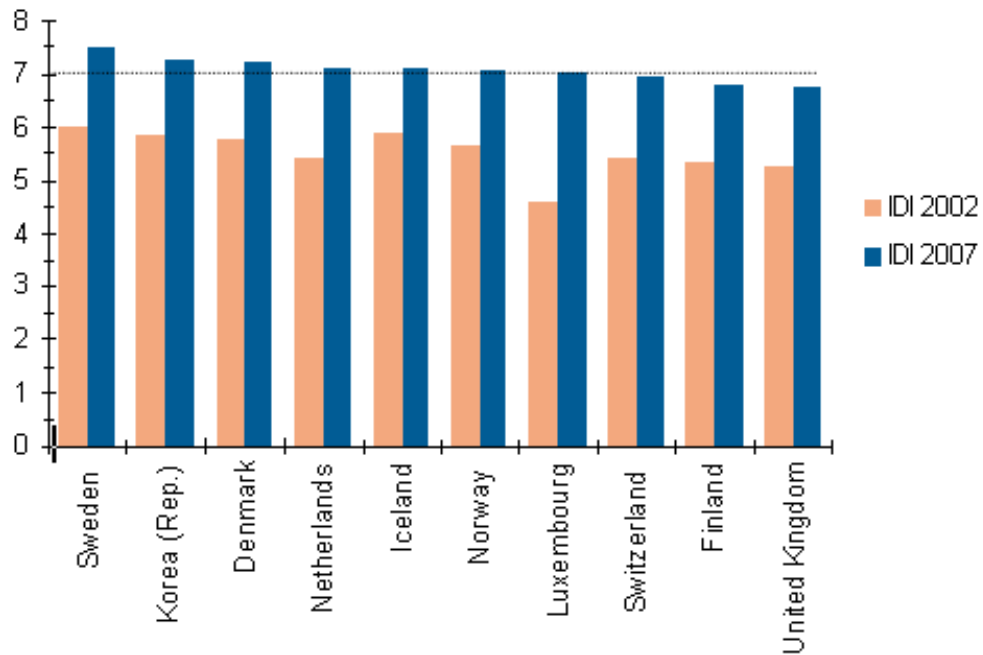


Figure 5: Top Ten IDI Countries

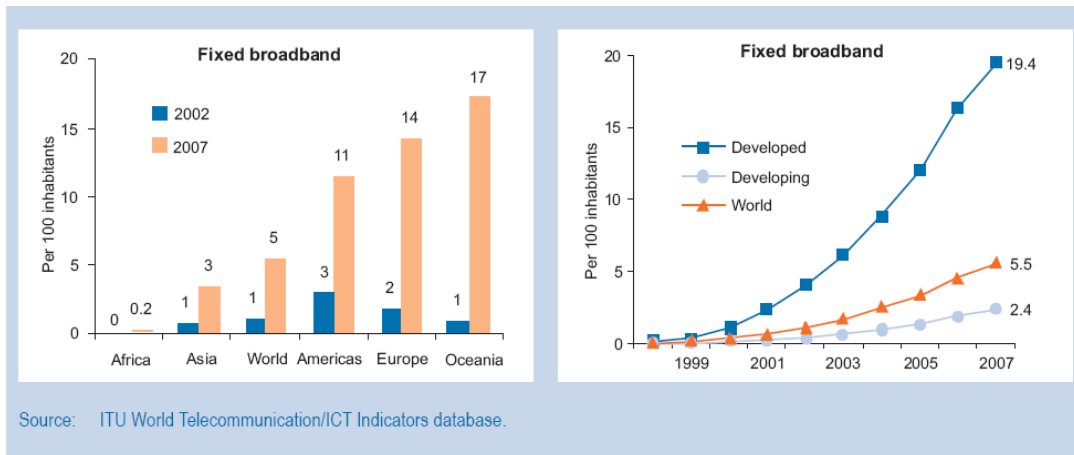


Figure 6: Fixed Broadband Subscribers by Geographic Region and by Level of Development

BEST PRACTICES FOR MAXIMIZING NATIONAL STANDARDS CAPABILITY



Figure 6: Best Practices for National Standards Capability

The previous section identified the primary standards gaps in the developing world. This section synthesizes many of the results in this research project into seven significant steps countries can take to bridge these gaps and to achieve Advanced Standards Capability. While the unique political and standardization contexts in each country vary considerably, this list of best practices attempts to present a high-level strategy for addressing standardization gaps.

National ICT Standards Strategy

Particularly in the current global economic climate, countries should have a national ICT standards strategy. This strategy should emanate from a high-level agency involved in either commerce or technology policy, should seek input and consensus from standards stakeholders from industry, academia, and government agencies, and should include the following elements:

1. It should articulate a statement about the national importance of ICT standards as a critical ingredient to enabling economic innovation and global access to knowledge. As an example, national standards strategy statements could include some of the following elements:

- *ICT standards are a critical ingredient to promoting both national economic innovation and enabling a connected and productive citizenry.*
- *National use of universal standards improves economic competitiveness and efficiency by lowering barriers to entry into IT markets and fostering technological innovation.*

- *ICT standards unlock opportunities for greater public access to government services and information and greater civic engagement in culture, commerce, and digital education*
- *ICT standards policies especially address critical public areas such as national security and law enforcement, emerging electronic health systems, and public safety systems.*

One example found in the research of a national standards strategy statement which provides many of the elements that could be adapted to a model approach is the “Malaysian National Standards Strategy and Action Plan”.

2. Any national ICT strategy should include a national inventory of what is currently in place in terms of standards policies, regulations, standards development activities, standards institutions, existing standards in use, and standards education.

3. It should describe the standards budget allocated for federal involvement in standardization, for standards education and events, and for any subsidization of private industry participation in international and domestic standardization processes.

4. It should lay out the roles and responsibilities of national standards institutions, entities, and agencies across all stakeholders. In some countries, this framework will include a strong private industry and voluntary standards development component. In other contexts, the institutions and entities involved might primarily be within government institutions. Most contexts will include public-private coordination and partnerships.

5. It should include specific strategies for dealing with critical topics such as cybersecurity and standards; climate change and standards; eGovernment and eHealth; ICT standards for national security; ICT standards and financial and personal data, including privacy infrastructures; and the role of standards in critical infrastructure protection.

National Standards Advisory Council

To advise government on federal standards strategy, nations should form and convene a high-level standards advisory council of experts from industry, academia, and non-governmental organizations.

National Standards Body

Countries with advanced standards capability will have a multi-stakeholder standards body made up of private industry, government, academia, and civil society. The function of the national standard body will differ based on political and economic context but will often perform the following functions. This standards body serves the domestic function of developing national standards, participating in regional standards processes, selecting international standards for domestic deployment (either voluntary standards or mandatory standards depending on country), promoting the adoption of ICT standards, publishing national and international standards on a web site, providing tools for improving national standard capacity, and performing a standards

education function.

International Standards Participation

Countries with advanced standards capability actively participate in international ICT standardization organizations such as ITU. ITU has developed the Ladder of Standardization Development as a recommendation for increasing participation in ITU processes. This eight step ladder of development is depicted in Figure 7. From the standpoint of building standards development capacity, a country with advanced standards capability will have the following: ITU sector members or associates; active participation in ITU study groups and workshops, including contributing standards; hosting standards workshops or events in the country; assuming leadership positions in ITU study groups and governance structures; and offering strategic proposals for ITU study questions and work programs.

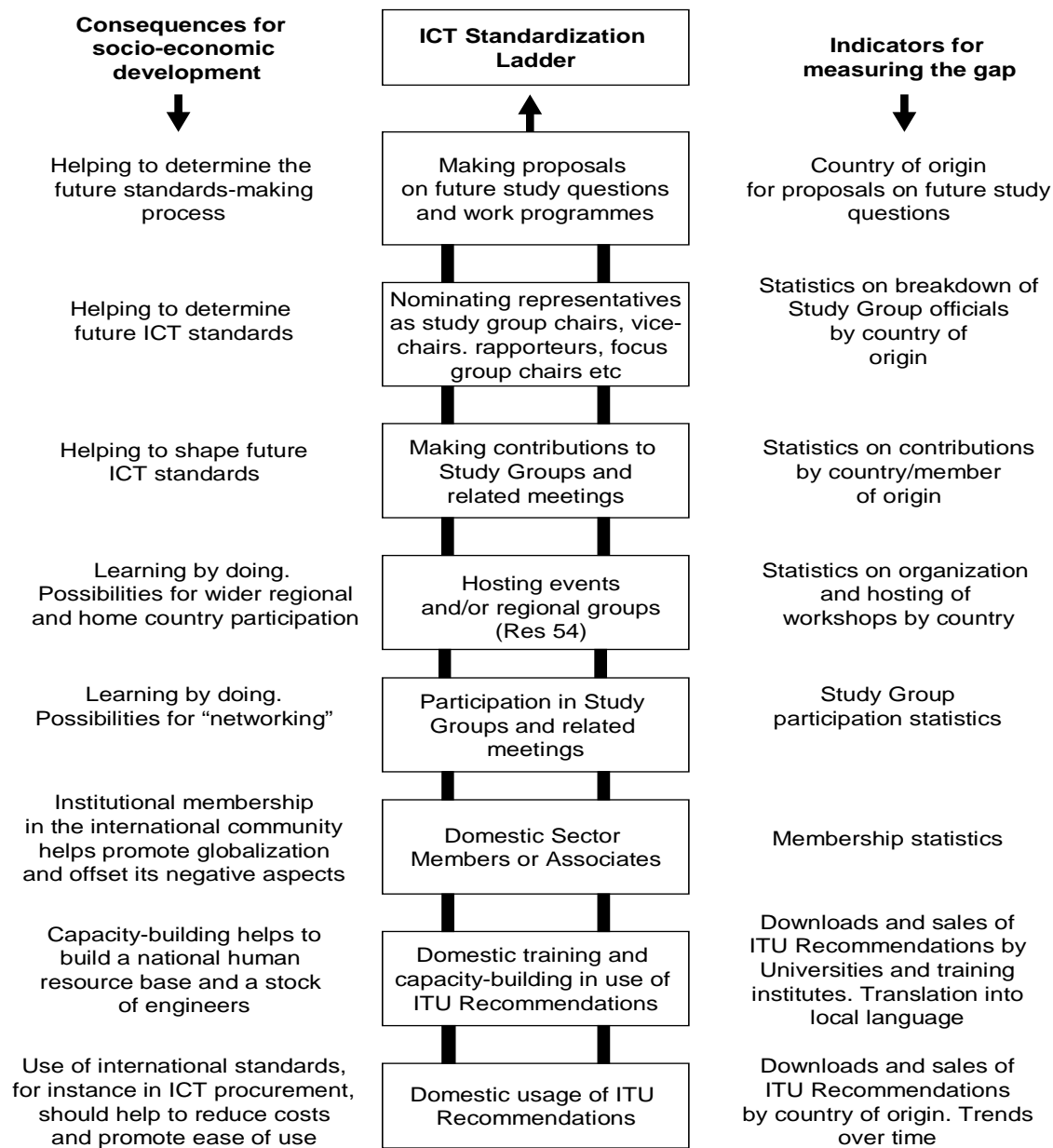


Figure 7: Ladder of Standardization Development

Regional Collaboration

Participation in regional ICT standards development processes and activities is an important component of best practices for building standards capacity in the developing world. This type of involvement is particularly important for small and least developed countries because regional relationships among national standards bodies and other entities create opportunities for

standards education and training, for sharing of standards implementation advice, and for joint participation in international standardization. Regional coordination meetings and processes to obtain broad support for proposals can also strengthen the ability of individual countries to influence global standards work. Holding standards meetings in the regions also plays an important role in facilitating participation in ITU-T standards work.

National Framework for Standards Adoption and Use

Countries with advanced standards capability have a blueprint (sometimes called an interoperability framework, an ICT procurement policy, or a code of best practices for procuring ICTs) for the use of products based on certain ICT standards within government ICT infrastructures. In the developing world, governments are often the largest national purchasers of ICT products. As a significant part of domestic ICT markets, governments can exert influence by adopting certain standards within government infrastructures. One overall purpose of this type of framework is to insure interoperability, efficiency, and cost-effectiveness within government ICT architectures. In some contexts, governments may establish policies for national use of ICT standards beyond government infrastructures, particularly in areas in which standards most directly have public policy implications such as standards for electronic health systems or for information security or privacy. Governments choose to achieve this type of outcome through a variety of means ranging from the more direct, such as government regulations about mandatory standards, to more market-based approaches such as government incentives (e.g. advantages in procurement, tax breaks) for companies and other entities to adopt standards within products and services.

Standards Education Strategy

Countries wishing to achieve advanced standards capability should seek opportunities for increasing standards education to build a national knowledge base and increase standardization human resources. Three opportunities for improving national standards education capacity include taking advantage of freely available electronic materials on various aspects of ICT standardization, offering government-sponsored ICT standards training in collaboration with private industry and international standards-setting organizations, and incentivizing and encouraging the convocation of ICT standards conferences and workshops in the country.

RECOMMENDED PRIORITIES FOR ITU-T ACTION

The introductory section of this report described some of the actions that the ITU-T has already taken to help bridge the standardization gap between developing and developed countries. Some of these actions have included adopting resolutions, establishing the BSG fund, holding regional development forums, establishing regional groups and convening the first Global Standards Symposium. This report has described the results of the ITU-T's current research project to better understand the reasons for standards gaps in the developing world, to present indicators and case studies of standards capacity, to synthesize these results into four national categories of standards readiness, to present recommended best practices to help countries achieve advanced standards capability and to develop a standards capability index.

At the Fiji workshop, one of the key questions raised by developing countries was how they can ascend the BSG ladder and how the ITU can help. This section turns attention to five concrete actions the ITU-T can take to continue its effort to bridge the standardization gap.

Priority Action #1:

Perform Qualitative Measuring and Ranking of National Standards Readiness

The findings in this report reflect both qualitative self-assessments of national standards capability and quantitative data of select countries. The next part of this analysis will expand this to a more quantitative analysis requiring numerical data gathering from all developing countries that are ITU Member States. As mentioned earlier, this analysis will result in the development of a standardization capability index (SCI), a numerical figure reflecting a country's overall capacity in all aspects of standardization including development, human resources, government policies, and standardization usage. The numerical figure will help evaluate current standards capacity, forecast standardization trends, and hopefully serve as a metric to inform government standards policy and improve standardization capability. The Res. 44 Action Plan calls for developing methods, tools and indicators for accurate measurement of the results and the level of effectiveness of the efforts and activities applied in bridging the standardization gap.

To gather this information, the revised TASC questionnaire was sent in November 2009 to all developing countries that are Member States of ITU and that had not been previously contacted. Some of the information needed already can be found in the databases of the ITU. This analysis will also look at the ICT capacity of countries to assess whether they have the necessary communication infrastructure to participate fully in standards work remotely and to make the fullest use of on-line electronic tools and working methods. TSB staff is conducting on-line research to add to the data and is compiling the information in a series of analytical spreadsheets.

There are additional considerations that will need to be addressed to complete a more statistical approach to identifying national standardization capacity. The identification and weighting of indicators for standardization capability will require determination of what variables to include and what relative weighting to give each variable. The definition and weighting of SCI indicators will be developed using the Delphi method of incorporating the opinions of experts on standardization both within and outside of the ITU. Obtaining sufficient data for each Member

State also will be a challenge. It is anticipated that this numerical evaluation system will be updated on a regular basis to reflect rapid changes in global standardization strategy and requirements.

Priority Action #2:

Develop a BSG Toolkit to Distribute to Developing Countries

To help countries achieve the best practices for maximizing national standards capacity described in this report, the ITU-T will consider developing a Bridging the Standardization Gap Toolkit. This BSG toolkit will include the following resources:

- A sample ICT standards strategy statement about the national importance of ICT standards.
- A sample approach to a national ICT standards inventory.
- Sample national strategies for dealing with a selected number of key standards topics such as eHealth, climate change, and cybersecurity.
- Drawing from real life examples, several options for a national framework laying out roles and responsibilities for agencies, standards institutions, and private industry in standards setting.
- A model ICT interoperability framework of standards used within governments that countries can choose to adapt to their unique circumstances.
- An electronic repository of existing, free training materials about ICT standards and ITU processes.

Priority Action #3:

Conduct Intensive Research on Key Countries and Make Targeted Recommendations

The ITU-T will select a few countries, e.g. one with low standards capability, one with basic standards capability, and one with intermediate standards capability, conduct intensive research and analysis of their standardization capabilities, and make targeted recommendations unique to each country with the goal of increasing standardization capability.

In addition, regional workshops will be organized to assist Member States in strengthening national standards capacity as well as on how to participate effectively in the work of the ITU.

Priority Action #4:

Develop e-Education and Training for Standards Work

The ITU-T will progressively develop an on-line standards program to include:

- An electronic repository of existing, free training materials about ICT standards and ITU-T processes.
- The expert presentations and panel discussions from the Fiji workshop and other expert lectures to be developed
- A set of guidelines on how to apply ITU-T Recommendations, in particular on manufactured products and interconnection, with emphasis on Recommendations having regulatory and policy implications.

- A forum where developing countries can raise questions concerning their understanding and application of Recommendations and seek advice from study group experts.

Priority Action #5:

Facilitate Participation in ITU Events

The ITU has made great progress in facilitating remote participation in ITU events and will continue this effort using remote collaboration tools and live video feeds.

WTSA Resolution 54 has called for the creation of regional groups and ITU has responded by convening numerous Regional Development Forums to discuss issues related to bridging the standardization gap. Based on the positive feedback about these meetings as well as emerging needs, ITU will continue to facilitate the organization of these meetings and will help gear these meetings toward specific areas of standardization training. Flagship groups will also be created.

Annexes:

Tool for Assessing Standards Capability

Presentation of Report Findings and Conclusions