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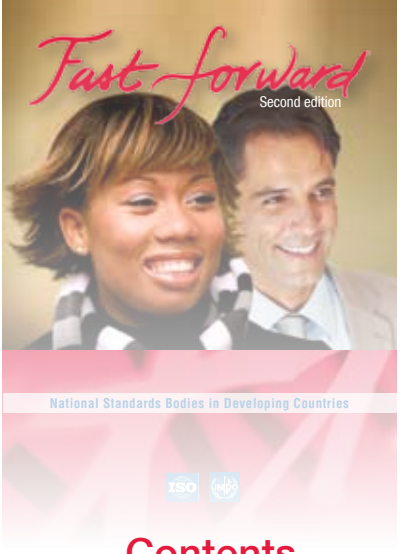
Fast forward

Second edition

National Standards Bodies in Developing Countries

ISO

UNIDO



Contents

International Organization for Standardization

ISO (International Organization for Standardization) is a global network that identifies which international standards are required by business, government and society, develops them in partnership with the sectors that will put them to use, adopts them by transparent procedures based on national, multistakeholder input, and delivers them to be implemented worldwide.

ISO Standards distil an international consensus from the broadest possible base of stakeholder groups. Expert input comes from those closest to the needs for the standards and also to the results of implementing them. In this way, although voluntary, ISO standards are widely respected and accepted by public and private sectors internationally.

ISO – a non-governmental organization – is a federation of national standards bodies, from all regions of the world, one per country, including developed and developing countries as well as countries with economies in transition. Each ISO member is the principal standards organization in its country. The members propose the new standards, participate in their development and provide support in collaboration with ISO Central Secretariat for the 3300 technical groups that actually develop the standards.

United Nations Industrial Development Organization (UNIDO)

UNIDO promotes improvement in the living conditions of people and reduction of poverty in developing countries as well as in countries with economies in transition through sustainable industrial growth.

UNIDO mobilizes knowledge, skills, information and technology to support trade and industrial development on the basis of three thematic priorities: **(a)** poverty reduction through productive activities; **(b)** trade capacity building and **(c)** energy and environment improvement.

UNIDO actively works to maximize developing countries' productive capacity to benefit from global and regional trading opportunities, and to set up and upgrade countries' standards and conformity assessment infrastructure, including a significant component aiming at overcoming technical barriers to trade (TBT) addressing sanitary and phytosanitary (SPS) measures and fostering market access.

UNIDO, which has strengths in its direct contact with local enterprises, standards and conformity assessment bodies, and technical and development players, has planned and set up national standards bodies and has created quality infrastructures where none existed before.

It is widely respected for its "tailor-made" approach and capacity-building skills and its emphasis on regional activities. It continuously carries out research and studies related to standards and conformity assessment and it has published several guides for developing countries showing how they can boost their international trade and achieve sustainable development.

In the recent study commissioned by NORAD with the goal of documenting and systematizing the experiences and results of Norwegian support for trade-related assistance channelled through multilateral organizations, UNIDO was found to be delivering good value for money in the field of standards and quality, an area where the organization has a unique competence internationally [1].

1) Paragraph based on *Norway's Trade Related Assistance through Multilateral Organizations: A Synthesis Study Report 8/2011 – Study*.

Preface

The role of national standards bodies (NSBs) has been evolving over the last 50 years. Improvements in economic and physical infrastructure, advances in information technology, manufacturing techniques, automation, transportation and changes in numerous other aspects that affect trade and industry have led to dramatic increases in the volume of trade within and between countries. The effects of globalization are everywhere, and the range of areas considered suitable for standardization has extended to include management systems, the service industries and newer technologies that did not exist in the latter half of the 20th century.

Standards are increasingly being used to support technical regulations, and are more and more addressing fast-moving and converging technologies. In addition, standards are being developed for a wider variety of stakeholder groups than in the past. New standards "deliverables" that rely on fast development times are an attempt by the standards community to meet the demands of governments, businesses and consumers worldwide. Companies, consortia of commercial organizations, individual countries, and sub-regional and regional groups of countries, all now have an interest in standardization, and, in addition, the number of truly international standards continues to show impressive growth.

The world of standardization has thus become more complex, and yet has become more important to national and international development. The creation of the World Trade Organization (WTO) in 1995 led to the development of various agreements, notably the Agreement on Technical Barriers to Trade (WTO/TBT) and the Agreement on the Application of Sanitary and Phytosanitary Measures (WTO/SPS), which must be adhered to by all WTO members. These agreements are an attempt to reduce the incidence of standards, and regulations based on them, being used as technical barriers to trade between countries, now that tariff-based barriers have largely been eliminated by the various rounds of the General Agreement on Tariffs and Trade (GATT).

These developments have been accompanied by a global realization that standards, and the NSBs that develop and promote them in individual countries, cannot stand alone. Conformity assessment, accreditation, metrology and standards, which are components of the quality infrastruc-

ture, all play a part in the integrated technical mix that is necessary for a country to be able to trade successfully, both bilaterally and within the multilateral trading system.

This mix is already in place, in a variety of configurations, in developed countries, but many questions arise when developing countries are considered. In particular, what mix is affordable, or even appropriate, for a particular developing country? Realities and priorities in developing countries are different from those that pertain to the developed world; a typical standards body structure and mode of operation that work well and meet the needs of stakeholders in a developed country are unlikely to be the perfect answer in the developing world.

In 2004, the Joint Committee on Coordination of Assistance to Developing Countries in Metrology, Accreditation and Standardization (JCDCMAS), of which both ISO and UNIDO are members, published a background paper entitled *Building corresponding technical infrastructures to support sustainable development and trade in developing countries and countries with economies in transition*. The JCDCMAS members [2] recommended, *inter alia*, that to provide for a composite approach to developing technical infrastructures, assistance should be based on *"the understanding that there is no ready-made model for technical infrastructures, either in terms of the components that are required, the degree of sophistication they should have, or the way that technical infrastructure services can be delivered, and as such developing countries themselves must make these policy decisions and provide their ongoing political commitment to those decisions"*. JCDCMAS was renamed as the Network on Metrology, Accreditation and Standardization for Developing Countries (DCMAS Network) in 2010 and now includes a new member – the United Nations Economic Commission for Europe (UNECE) – Working Party on Regulatory Cooperation and Standardization Policies (W.P.6).

2) The members of the JCDCMAS are:

- International Bureau of Weights and Measures (BIPM)
- International Accreditation Forum (IAF)
- International Electrotechnical Commission (IEC)
- International Laboratory Accreditation Co-operation (ILAC)
- International Organization for Standardization (ISO)
- International Trade Centre – UNCTAD/WTO (ITC)
- Telecommunication Standardization Bureau of ITU (ITU-T)
- International Organization of Legal Metrology (OIML)
- United Nations Industrial Development Organization (UNIDO).

This publication represents an updating and broadening of ISO Manual 1:1994, *Establishment and Management of a National Standards Body*. It covers the main principles of standardization at national, regional and international levels and illustrates the elements of structure from which it is necessary to choose in order to manage the process at a national level. It encapsulates the experience of the ISO Committee on developing country matters (ISO DEVCO) in dealing with developing countries, and draws upon UNIDO's 40 years of work in helping to establish and upgrade NSBs and the quality infrastructure in developing countries and in assisting users in the implementation of standards.

We hope that this publication, which is based on a long-lasting cooperation between UNIDO and ISO, will be of benefit to developing countries, as well as countries with economies in transition, in their efforts to establish or upgrade their NSB, as part of their quality infrastructure, to a level that is appropriate for them – both as a means of increasing their productive and trade capacity and as a support for consumer, social and environmental protection.

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Disclaimer

The guidance provided and opinions expressed in this publication are based on the collective experience of recognized experts and practitioners in the field of standardization. However, it is not an ISO guide or normative document and does not prescribe rules regarding the operation of NSBs; neither does it define conditions for becoming a member of ISO.

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Introduction

A national standards body exists to meet the standardization needs of the country concerned. While the needs of the population for consumer protection and fit-for-purpose goods and services are essentially the same as those of people in more industrialized countries, there are constraints to the implementation of standards in a developing country:

- The industrial infrastructure might be insufficient to produce local goods of the required quality
- Governmental technical regulations are often insufficient to adequately protect the environment or to prevent the importation or dumping of lower quality or unsafe products

- Consumer awareness and passion for good quality may be absent or exist only at a low level

For governments, the means of rectifying this situation involves the creation of an efficient infrastructure, from what seems at first to be a bewildering array of choices, to satisfy the demands and requirements of globalization and a multilateral trading system. Different countries and regions refer to the necessary infrastructure using a variety of acronyms, for example:

- MSTQ or SMTQ (standards, metrology, testing and quality management) or
- SQAM (standards, quality, accreditation and metrology)

In this document, for the sake of uniformity, the term "quality infrastructure" is used to refer to all these terms.

As part of the necessary infrastructure, the term "conformity assessment" has also become well established and is defined in ISO/IEC 17000:2004[3] as a "demonstration that specified requirements relating to a product, process,

3) ISO/IEC 17000:2004, *Conformity assessment — Vocabulary and general principles.*

system, person or body are fulfilled". Conformity assessment of a product or system to a given standard often involves inspection, testing and certification.

Testing and certification bodies, whether for products or systems, as well as inspection bodies, seek to demonstrate their competence, hence the advantage of being accredited. Accreditation bodies, in turn, need to demonstrate their impartiality and competence and do so by means of peer review and international recognition using ISO/IEC Standards on conformity assessment.

While an NSB plays an important part in this infrastructure, it cannot exist and be efficient in isolation. This publication sets out to examine the functions of and the linkages between the various elements referred to above, as an aid to explaining the role and importance of standards and the key functions a modern NSB in a developing country should perform.

It is an entry-level text aimed at interested parties who are tasked with the establishment, upgrading and management of an NSB in a developing country, and it considers relevant commercial as well as technical issues. It recognizes the role of standardization in industrial development, trade facilitation and improving market access, and takes as its departure

points the "three pillars of sustainable development" that are referred to in the ISO brochure *Metrology, standardization and conformity assessment – Building an infrastructure for sustainable development*[4], which are also the building blocks of the UNIDO Trade Capacity Building (TCB) Approach. The impact of the World Trade Organization and its various agreements forming part of the multilateral trading system on standardization issues are also covered.

4) Obtainable from ISO Central Secretariat or from the ISO Web site at: ***www.iso.org/iso/devt_3pillars_2006-en.pdf.***

List of acronyms and abbreviations

ACCSQ	Asian Consultative Committee on Standards and Quality
AIDMO	Arab Industrial Development and Mining Organization
AMN	Mercosur Standards Association
ARSO	African Organization for Standardization
ASEAN	Association of South East Asian Nations
BIPM	International Bureau of Weights and Measures
CAC	Codex Alimentarius Commission
CASCO	ISO Committee on conformity assessment
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CIPM	International Committee of Weights and Measures
COMESA	Common Market for Eastern and Southern Africa
COPANT	Pan American Standards Commission
CROSQ	CARICOM Regional Organisation for Standards and Quality
DCMAS	Network on Metrology, Accreditation and Standardization for Developing Countries
DEVCO	ISO Committee on developing country matters
DFID	Department for International Development (United Kingdom)
EAC	East African Community
EASC	Euro-Asian Interstate Council for Standardization, Metrology and Certification
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States
ETSI	European Telecommunications Standards Institute
EurepGAP	Euro-Retailer Produce Working Group on Good Agricultural Practices (now renamed as GlobalGAP)
FAO	Food and Agriculture Organization of the United Nations
FTA	Free trade area

GCC	Cooperation Council for the Arab States of the Gulf
GSO	GCC Standardization Organization
IAEA	International Atomic Energy Agency
IAF	International Accreditation Forum
IATA	International Air Transport Association
ICT	Information and Communication Technology
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ILAC	International Laboratory Accreditation Cooperation
IPPC	International Plant Protection Convention
IPR	Intellectual property rights
ISO	International Organization for Standardization
ITC	International Trade Centre
ITU	International Telecommunication Union
ITU-T	International Telecommunication Union -Telecommunication Standardization sector
LDCs	Least developed countries
MERCOSUR	The Southern Common Market
NSB	National standards body
OIE	World Organisation for Animal Health
OIML	International Organization of Legal Metrology
PASC	Pacific Area Standards Congress
POCOSA	Policy for the distribution of ISO publications and the protection of ISO's copyright
SADC	Southern African Development Community
SDOC	Supplier's Declaration of Conformity

SI	International system of units
SMTQ	Standards, metrology, testing and quality management
SPS	Sanitary and phytosanitary measures
SQAM	Standards, quality assurance, accreditation and metrology
TBT	Technical barrier to trade
TCB	Trade capacity building
UEMOA	West African Economic and Monetary Union
UIC	International Union of Railways
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organization
WIPO	World Intellectual Property Organization
WSC	World Standards Cooperation
WTO	World Trade Organization
WTO/SPS	World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures
WTO/TBT	World Trade Organization Agreement on Technical Barriers to Trade

Part 1. Metrology, standardization and conformity assessment

1.1 The building blocks

Three separate but interdependent and interlinked "pillars" of knowledge are essential for developing a quality infrastructure that enables sustainable development, can lead to full participation in international trade, and satisfies the technical requirements of the multilateral trading system. These are metrology, standardization and conformity assessment. Before considering the role, structure and functions of a national standards body, it is essential to understand how these three pillars fit together.

Figure 1 shows the principal linkages as they affect standardization.

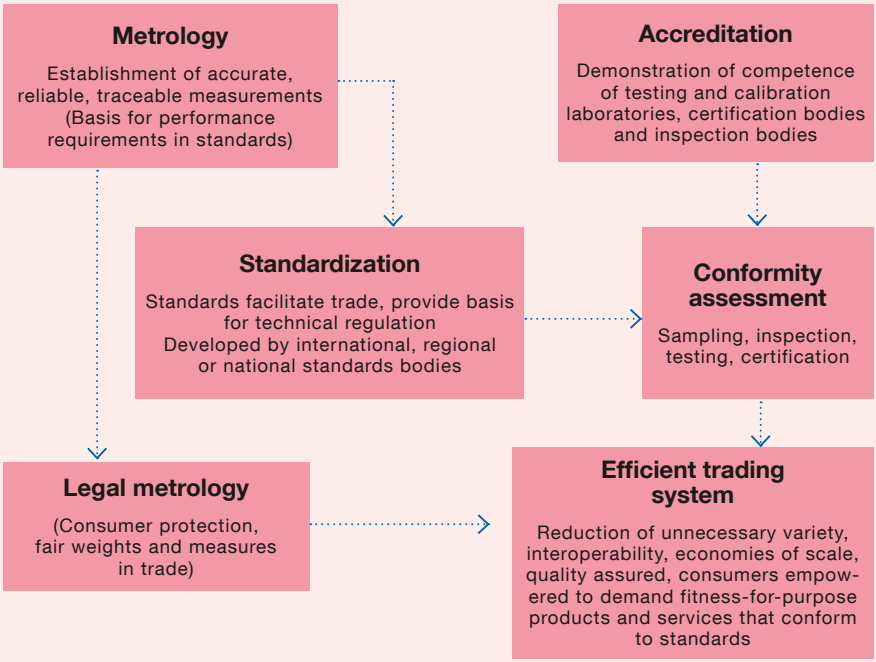


Figure 1 – How metrology, standardization and conformity assessment are interlinked

There are other linkages, of course – for example, an accreditation system for laboratories cannot work in the absence of reference materials and a functioning system of metrology – but the figure has been kept simple in order to highlight the central role of standardization, and therefore of national standards bodies, in the overall process.

As a first priority, governments in all countries need to put in place and maintain the basic infrastructure to assure the security, health and well-being of their citizens – adequate and safe supplies of food and drinking water, access to healthcare and education, societal security, transportation and communications systems, etc. Once these are in place, even at a rudimentary level, the need to establish an efficient trading system becomes paramount. Economies cannot survive in the absence of trade, and it is therefore essential that the building blocks be put in place to facilitate access of goods and services to markets, both internal and external. Market access and the creation of an efficient trading system are the goals; metrology, standardization and conformity assessment are some of the main building blocks. It is therefore necessary to consider these three pillars in some detail.

1.2 Metrology

It can be argued that the most basic necessity of a trading system is metrology – the provision of reliable and accurate measurements. Without the ability to determine length, mass, volume, time and temperature, even the simplest of transactions would be open to abuse, fair trade would be impossible, and legislation aimed at protecting the health and welfare of citizens would be of no effect. No technical standards could exist for products, because there would be no reliable means of measurement of their performance against requirements. A national measurement or metrology system is therefore the first step in facilitating trade. Where trade across borders enters the picture, it is necessary that the equivalence of the national measurement standards between countries be demonstrated. This need led to the establishment of the International Bureau of Weights

The first step in facilitating trade is a national measurement system, which should include measurement standards that are appropriate to national needs.

and Measures (BIPM) which operates under the exclusive supervision of the International Committee for Weights and Measures (CIPM) under the terms of the Metre Convention.

The mandate of the BIPM is to provide the basis for a single, coherent system of measurements throughout the world, traceable to the International System of Units (SI). This task takes many forms, from direct dissemination of units (as in the case of mass and time) to coordination through international comparisons of national measurement standards (as in electricity and ionizing radiation).

The CIPM is made up of 18 individuals, each from a different member state of the Metre Convention. Its principal task is to promote worldwide uniformity in units of measurement. The CIPM Mutual Recognition Arrangement provides governments and other parties with a secure technical foundation for wider agreements related to international trade, commerce and regulatory affairs. It helps to eliminate technical barriers to trade and instil greater confidence in the measurement capabilities of individual countries. The result is billions of dollars of increased trade.

Legal metrology involves the legislated use of metrology to ensure that fair weights and measures are applied in both national and import/export trade. Typical activities in this field include the calibration of weighbridges and transportation belts, the calibration of volume measurement equipment, such as that used for imports of large quantities of oil, the type approval of measuring instruments used in trade (scales, fuel pumps, etc.), their ongoing verification and inspection, and the application of sanctions in cases of non-compliance with legislation. Standards used in legal metrology are developed by the International Organization of Legal Metrology (OIML) and are adopted nationally, usually through the national standards body. The OIML also makes available a model law on metrology, developed in 1975 and revised in 2004, that is available for use when establishing this aspect of the quality infrastructure in a developing country.

With this in mind, it is important to understand that developing countries

cannot and should not be expected to put in place sophisticated measurement or other facilities that are not appropriate for them at their specific stage of development. A national measurement system in a developing country should cater for measurement standards that are appropriate to national needs. This implies continuous reassessment of the role of such a system, and improvement in its scope and level of working as the economy develops, rather than to use a "big bang" approach. As an example of this in practice, the Metre Convention is an inter-governmental treaty that provides the international infrastructure to enable member states to develop measurement standards at whatever level required by them, and is therefore relevant to countries at all stages of technical development.

1.3 Standardization

Standards can be used as the technical basis for trade in end-products and services between willing buyers and sellers, or as a means of facilitating compliance with technical regulations. They are also used extensively by companies in production, product, service and process environments. They are developed by a transparent, open and consensus-based process, involving interested stakeholders, and define fitness for purpose in the case of standards for products, and good practice in the case of processes or services. Management system standards assist organizations in the management of their operations. The widespread use of standards is a necessary precursor to the evolution of a culture of quality in society. Consequently, the number of national standards developed, or based on regional/international standards, is often used as a "yardstick" measure.

Standardization involves the development and provision of standards, and the supply of information on standards to interested parties, and takes place on various levels. Companies, trade associations and consortia may produce standards for their own purposes. For national application, a national standards body may develop a national standard or may adopt an international standard that has been

developed by international consensus and published by one of the main international standards organizations (ISO, IEC, ITU, Codex Alimentarius Commission, etc.). The advantage of this latter route is that when two countries adopt the same international standard, trade between them is simplified.

ISO develops international standards in all fields other than the electrotechnical field, which is covered by the IEC, and telecommunication, which is covered by the ITU. The three organizations together form the World Standards Cooperation (WSC) and cooperate on cross-cutting areas of work, for example, information technology and new converging technologies such as nanotechnology.

The widespread use of standards is a necessary precursor to the evolution of a culture of quality in society.

When two countries both adopt the same international standard, trade between them is simplified.

The World Trade Organization Agreement on Technical Barriers to Trade (WTO/TBT) recognizes the contribution that international standardization can make to the transfer of technology from developed to developing countries, and the role of international standards and conformity assessment systems in improving the efficiency of production and in facilitating international trade.

Developing countries face particular challenges when it comes to the development and use of standards. The choice has to be made as to whether it is appropriate to develop purely national standards or to adopt and disseminate existing international or, in some cases, regional standards in their jurisdictions. Development of purely national standards requires significant technical resources and expertise, and results in standards that, while focused on national needs, might hamper international trade with other countries that have gone

the "international" route. The adoption of international standards leads to better trading opportunities and may reduce avenues for the dumping of poorer quality goods; but this also poses many problems for industries in developing countries which might not be in a position to produce according to international standards and, thereby, lose market share to imports. Additionally, developing countries might not possess the technical expertise or resources to make a meaningful contribution to the content of an international standard. In all developing countries, decisions between being a "standards maker" and a "standards taker" on the multitude of standardization subjects are often difficult; therefore, active involvement in particular "standards-making" must consider national economic priorities, available expertise and necessary resources. Nevertheless, the contribution of standards to trade is evaluated at the company level in all countries and it has to meet, on an ongoing basis, the changing needs of the marketplace.

When a developing country is establishing a national standards body for the first time or is reviewing an existing structure to adapt it to national and global trends, achieving this balance is one of the most critical aspects of the planning process as there is no single solution that can be applied, and it is necessary to choose from a menu of possibilities in order to arrive at the most effective solution for a particular country at a particular stage of development.

1.4 Conformity Assessment

Conformity assessment, according to the definition in ISO/IEC 17000, is the "demonstration that specified requirements relating to a product, process, system, person or body are fulfilled". It involves sampling, inspection, testing and certification as a means of giving assurance to the parties to a transaction that the product, process, system, body or person does in fact conform to the requirements of a standard.

Conformity assessment is stated to be:

- ***First party*** – the supplier or manufacturer of the product or service, etc. (the party that "claims conformity")
- ***Second party*** – the purchaser, or the party receiving the product or service (the party that "requires conformity")
- ***Third party*** – an unbiased party, unrelated to the transaction, who may be called upon to provide assurance to both the above parties regarding the conformity, or otherwise, of the product or service

In the case of voluntary transactions, the parties concerned in the transaction are free to decide for themselves on the conformity assessment procedures.

If the second party is willing to accept the first party's assurances of conformity (supplier's declaration of conformity, SDoC) then there is no need to involve a third party.

In the following cases third party conformity assessment may be called in to provide unbiased and factual assurances to the relevant parties, thereby facilitating trade of goods and services:

- When it is the law – when devices or systems need to comply with minimum safety or performance levels
- When it is an imperative for market entry – because it provides quality assurance to consumers and retailers
- For liability reasons, when retailers want to make certain that products comply with international standards

In many developing countries, third party conformity assessment has become a necessity in practice, owing often to an absence of strict product liability legislation. By adopting existing international conformity assessment systems, developing countries are able to ensure that imported goods comply with international standards and satisfy minimum levels of performance and safety.

Where technical regulations exist, the decision as to the means of conformity assessment may be taken out of the hands of the two main parties to the transaction, and proof of conformity, in a prescribed format, might be required.

This raises the question of how the competence and independence of the third party conformity assessment providers can be demonstrated, and introduces the subject of accreditation. ISO/IEC 17000 defines accreditation as the "third-party attestation related to a conformity assessment body conveying formal demonstration of its competence to carry out specific conformity assessment tasks". The competence and independence of third party conformity assessment providers can also be done through internationally-recognized peer-assessment schemes, such as the Conformity Assessment (CA) Systems administered by the IEC.

Accreditation and CA schemes can relate to competence in the performance of tests and calibrations in laboratories, or to the competence of certification and inspection bodies. Accreditation bodies and members of the IEC CA Systems need themselves to show that they are independent and unbiased, and for this reason are often established as national or regional entities that in practice need to demonstrate the existence of mutual or multilateral recognition arrangements by means of membership of relevant international bodies that engage in peer reviews of each other. In the field of accreditation, two key international groups are the International Laboratory Accreditation Cooperation (ILAC) and the International Accreditation Forum (IAF). In the electrotechnical sector, IEC operates third party CA schemes and programmes and attests the competence of certification bodies and testing laboratories through peer assessment evaluation. IEC's CA Systems are: IECEE[5], IECEx[6] and IECQ[7]. In this way, international trade can be facilitated with greater confidence.

Developing countries often do not have the resources or the expertise to establish national accreditation bodies, national certification bodies and testing laboratories. They are frequently operating at a low economic level that makes it unprofitable for third party conformity assessment providers to operate exclusively in their territory.

5) *IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components.*

6) *IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres.*

7) *IEC Quality Assessment System for Electronic Components.*

A combination of local and international conformity assessment providers, backed up by internationally-recognized accreditation and/or internationally-recognized peer assessment registration, is often the answer.

One of the major decisions for a developing country therefore involves the way in which its conformity assessment and accreditation requirements are to be carried out. Use of a combination of national and foreign conformity assessment providers, backed up by regional accreditation structures[8)] may be an answer, although specific solutions to specific countries' needs will always be required to be tailored to suit the circumstances.

8) A successful example of the establishment of a regional accreditation structure is within the UEMOA region as a result of a UNIDO Technical Cooperation Project.

It should be mentioned that the ISO Committee on conformity assessment, ISO/CASCO, has published a series of ISO/IEC Standards and Guides known as the "CASCO Toolbox" that can be used to provide the basis of a conformity assessment infrastructure that is effective, tailored to the specific needs of the country concerned, and is compliant with the requirements of the WTO.

1.5 Capacity building in developing countries

It is recognized that for many countries the cost of providing all these activities at their most advanced level is prohibitive. Even in the case of developed countries, there are variations in the sophistication of each part of the technical infrastructure. In many cases some parts of the quality infrastructure may be jointly owned or shared by one or more countries. Sometimes the services of another country are relied upon altogether. It is important for sustainable development and trade to ensure that organizations and industries in developing countries have access to a quality infrastructure that reflects their specific needs and those set by the multilateral trading system.

Capacity building should be based on a thorough needs assessment: bilateral or regional service delivery options may achieve better economies of scale.

Any capacity-building intervention should therefore be based on:

- A thorough needs assessment for all parts of the economy
- The understanding that there is no ready-made model for quality infrastructure. Developing countries themselves must make policy decisions and provide an ongoing political (and financial) commitment to those decisions
- Careful consideration of the assessed needs, based on the type and appropriate sequencing of assistance, to ensure that the technical infrastructure is built in a sustainable and planned manner, in phases
- A clear articulation of the resources and finance that will be required to sustain the necessary quality infrastructure and
- The fact that the development of a national quality infrastructure should not preclude consideration of bilateral or regional service delivery options that may achieve better economies of scale

1.6 Summary

The three pillars, namely metrology, standardization and conformity assessment, are the necessary building blocks of an efficient quality infrastructure that facilitates trade through increased market access and ensures adequate protection of consumers and of the environment. Sustainable development in developing countries is dependent on their participation in global trade. However, it should be realized that it is not absolutely necessary for every developing country to invest heavily in the full quality infrastructure all at once. Basic measurement systems are essential, followed by the provision of standards and information on them. Complex facilities for the development of standards (as opposed to adoption of existing international standards) and exclusive national conformity assessment structures, while possibly desirable, are in many cases not essential. In this regard much depends on the nature of the economy concerned and the relationship between government, consumers and the business sector. National accreditation bodies may be similarly desirable but not absolutely necessary, given the existence of a number of excellent international accreditation bodies operating from developed countries, or where an efficient, recognized regional alternative exists. Clearly, decisions have to be made based on sound assessment of costs and benefits.

Capacity building and other aid to developing countries establishing their own technical infrastructure should take into account the "three pillars" but be selective, based on a thorough, holistic needs analysis, bearing in mind that there is no ideal or perfect model. In addition, efforts have to be made to support users in the use of standards to improve quality and trade opportunities.

The complex inter-relationships between metrology, standards, conformity assessment and accreditation are considered further in **Table 1**, in which an attempt is made to take into account the costs and likely financing arrangements of these various elements in relation to national needs, and to draw attention to considerations that might apply when planning to establish or upgrade the infrastructure in developing countries. Of particular relevance in certain areas is the decision as to whether to adopt national or regional solutions.

Note: The degree of effective coordination between the functions responsible for metrology, standards, conformity assessment and accreditation varies in practice from one country to another, and where public and private entities compete among themselves in a disorderly manner, the linkages presented in **Figure 1** might not function as efficiently as possible; this fact should be borne in mind when considering **Table 1**.

Table 1 – Infrastructure costs, needs and the national/regional dilemma – some pointers

Element of infrastructure	Costs	Financing	National needs	Planning considerations
Metrology	• Measurement and traceability infrastructure and operating expenses can vary from moderate to costly, depending on needs • The necessary calibration to satisfy system standards requirements (ISO 9001, ISO 14001, ISO 17025, etc.) can be costly to establish and maintain • The availability of suitable reference materials is often a problem and can be moderately expensive. Regional solutions to this problem should be sought • Legal metrology market surveillance activities are relatively cheap once the necessary measurement and calibration capability is in place	• Metrology infrastructure is in the public interest, therefore it is normally financed by national government • Once the necessary infrastructure is in place, market surveillance can be supported by levies on industry and importers	• Appropriate legislation to establish a national measuring standards institute and legal metrology requirements is necessary • Some degree of national measurement and calibration infrastructure is essential. What is appropriate will depend on the prevalent industries in the country	• First priority is to establish a national measurement system • Some elements of calibration can be obtained regionally if this is cost effective, i.e. where demand is relatively small in relation to cost • As the national economy grows, any regional involvement should cease in favour of national facilities, as reliance on a neighbour or a regional structure can be unfavourable to intra-regional trade

Element of infrastructure	Costs	Financing	National needs	Planning considerations
Standards	• Cheap, especially in the case of harmonization with existing regional or international standards and provision of information on them. Slightly more costly where purely national standards need to be developed • Capacity building and capital costs (computers, etc.) are relatively affordable • Additional costs arise when international participation in standards setting is envisaged • Additional costs arise for establishing WTO/TBT and SPS enquiry points	• Standards information provision and sale is normally by national governments, as they often focus on standards for the national good • Often falls under trade or industry ministry or equivalent ; privatized in some countries • Costs can be partially offset by income from sales of standards or conformity assessment activities • As the economy develops, other income can be generated through development of other standards deliverables for industry, or through subscriptions from industry to standards committees, but this is a long-term possibility	• Adoption, development, and harmonization mechanisms • Fairly limited infrastructure (computers, Web site, ability to set up and coordinate mirror committees) • Meeting facilities (physical rooms, meeting equipment, etc.) • The NSB is normally associated with a TBT and sometimes an SPS enquiry point • Establishment of enquiry point(s) require(s) capacity building and an appropriate level of communications and IT function	• National standards provision is recommended, by whichever means is appropriate and affordable • Appropriate legislation is necessary to establish the NSB, its governance and financing • The benefits of working regionally to develop standards where needed can be considered in areas of common interest • The cost of participation in international or regional standardization committees and of setting up a national enquiry point can be significant but can start from a low base

(Continued overleaf)

Continued from ***page 31***

Element of infrastructure	Costs	Financing	National needs	Planning considerations
Conformity assessment	• Basic testing facilities for simple products can be fairly cheap; for more complex products the test equipment can be costly and would require sufficient usage to warrant the costs • Some test facilities are required for "good of the nation" reasons and might not be required to do sufficient testing to cover costs • Product and system certification costs are moderate and again would require sufficient throughput to justify costs • In both cases accreditation is necessary and these costs also need to be recovered	• Provided sufficient testing and certification work is needed, income generated should exceed costs • As part of the drive to instil a quality culture in LDCs and lower level developing economies, all of these components of conformity assessment are often provided by government. Private competitors should be permitted in the market • Good practice would require that government funding for core activities such as standards and metrology not be used to subsidize conformity assessment activities, but the reverse situation is often found, where profit from these activities is used to support the standards body	• An appropriate level of test facilities is needed for the products likely to be tested. This will range from country to country • Inevitably, not all the required test facilities are likely to be available in one developing country, and regional cooperation, especially Mutual Recognition Arrangements for test reports of complex products between accredited providers, might be appropriate in some instances, provided acceptable facilities exist • Obtaining accreditation is likely to be a problem in the early stages, both for testing and certification	• Basic test facilities should be provided for the country's main products • Complex testing that is required infrequently could be outsourced, especially where accredited providers are only likely to be found externally • "Good of the nation" test facilities should be provided, but regional cooperation (joint ventures) might have to be considered as a compromise • As the economy grows, the arrival on the scene of private competitors in conformity assessment is inevitable, should be planned for and should be welcomed – government involvement can possibly start to be phased out

Element of infrastructure	Costs	Financing	National needs	Planning considerations
Accreditation	• Costly, in view of the need for ILAC and IAF Mutual Recognition and the expertise required	• Creation and operation of a single accreditation body for laboratory, inspection and certification body accreditation should be financed by government, at least during the first stage. Where the scale of national requirements is insufficient to justify the cost, a regional solution should be sought. Industry should pay for services received, possibly on a reducing subsidy basis as the economy grows	• See column to the left	• The viability of regional or sub-regional accreditation structures as an alternative to national structures should be carefully considered. As the economy develops, a national solution becomes more attractive, and thus any regional solution needs to be re-evaluated periodically

Part 2. The WTO and its influence on standardization

Note: In a publication of this nature, it is not possible to give a comprehensive overview of the workings of the WTO. Interested readers are referred to the WTO Web site (***www.wto.org***), which is highly informative.

The World Trade Organization, established in 1995, is an international organization that effectively lays down legal ground rules for international trade. It has extended the reach of multilateral trade rules far beyond trade in merchandise to trade in services and trade-related aspects of intellectual property rights. These rules also deal with numerous other areas such as dumping, customs procedures, technical barriers to trade and sanitary (human and animal health) and phytosanitary (plant health) measures. They are contained in multilateral trade agreements, which are essentially contracts that bind governments to operate their trade policies in accordance with what was agreed in the multilateral negotiations. In short, all of the 154 countries that have acceded to the World Trade Organization (at April 2012) are bound by its agreements and are automatically part of what is known as the "multilateral trading system".

Of particular interest and importance to standardizers are the WTO Agreements on Technical Barriers to Trade (WTO/TBT) and on the Application of Sanitary and Phytosanitary Measures (WTO/SPS).

The WTO/TBT Agreement recognizes that access to markets can be impeded through the use of technical regulations and standards, which can vary from country to country and, if set arbitrarily, can be used or perceived as disguised protection in the form of non-tariff barriers to trade. The WTO/TBT Agreement acknowledges that the existence of too many standards makes life unnecessarily difficult for manufacturers and exporters, and tries to ensure that technical regulations, standards, and conformity assessment procedures do not create unnecessary obstacles to trade. It recognizes the right of a country to adopt those technical regulations, standards and conformity assessment procedures it considers appropriate to sustain and protect human, animal or plant life or health, to assure the protection of the environment or to meet other consumer interests, but encourages countries to use, and consider basing technical regulations on, international standards where they exist. In terms of the WTO/TBT Agreement, countries may also employ other

mechanisms such as equivalence and mutual recognition of the standards of others when developing technical regulations.

Access to markets can be impeded by technical regulations and standards that can be used or perceived as disguised protection in the form of non-tariff barriers to trade.

The WTO/SPS Agreement is concerned with measures taken to protect human, animal or plant life from risks arising from additives or disease-causing organisms in food, and to protect a country from the damage caused by the spread of pests, which may, directly or indirectly, affect international trade. The WTO/SPS Agreement recognizes the sovereign right of governments to take such measures, but requires that they not be arbitrarily or unfairly discriminatory against other countries, and be based on scientific evidence. As with the WTO/TBT Agreement, the WTO recommends that countries base their SPS measures and technical regulations on international standards, where they exist. Of particular relevance here are the standards of the Codex Alimentarius Commission (CAC), the International Plant Protection Convention (IPPC) and the World Organization for Animal Health (OIE). In turn, the CAC has adopted more than 100 ISO Standards on test methods and related subjects in the food sector.

While SPS measures may be based on CAC, IPPC and OIE standards, conformity assessment procedures including sampling, inspection, certification and testing are based mostly on ISO standards. There is thus a natural need for these organizations to work closely for the benefit of their members, which is what they have been doing since the 1960s. The 30th session of the CAC, held in July 2007, supported continued cooperation and coordination with ISO and agreed that Codex and ISO maintain contact at the central secretariats level. The Commission also supported increased coordination and cooperation between the national focal points of CAC and the national ISO member bodies.

As is the case with ISO, the majority of the membership of the WTO comes

A country should consider basing technical regulations on international standards, where they exist.

from developing countries and much attention is paid in the multilateral trading system to their particular needs. Various deviations from the requirements of the General Agreement on Tariffs and Trade (GATT) are permitted for developing countries, and in the case of the least-developed countries (LDCs), WTO members have agreed on a plan of action that envisages special efforts to improve access to developed country markets, including the possibility of removing tariffs completely. The WTO's (and UNIDO's) close involvement in "Aid for Trade" initiatives are of particular relevance.

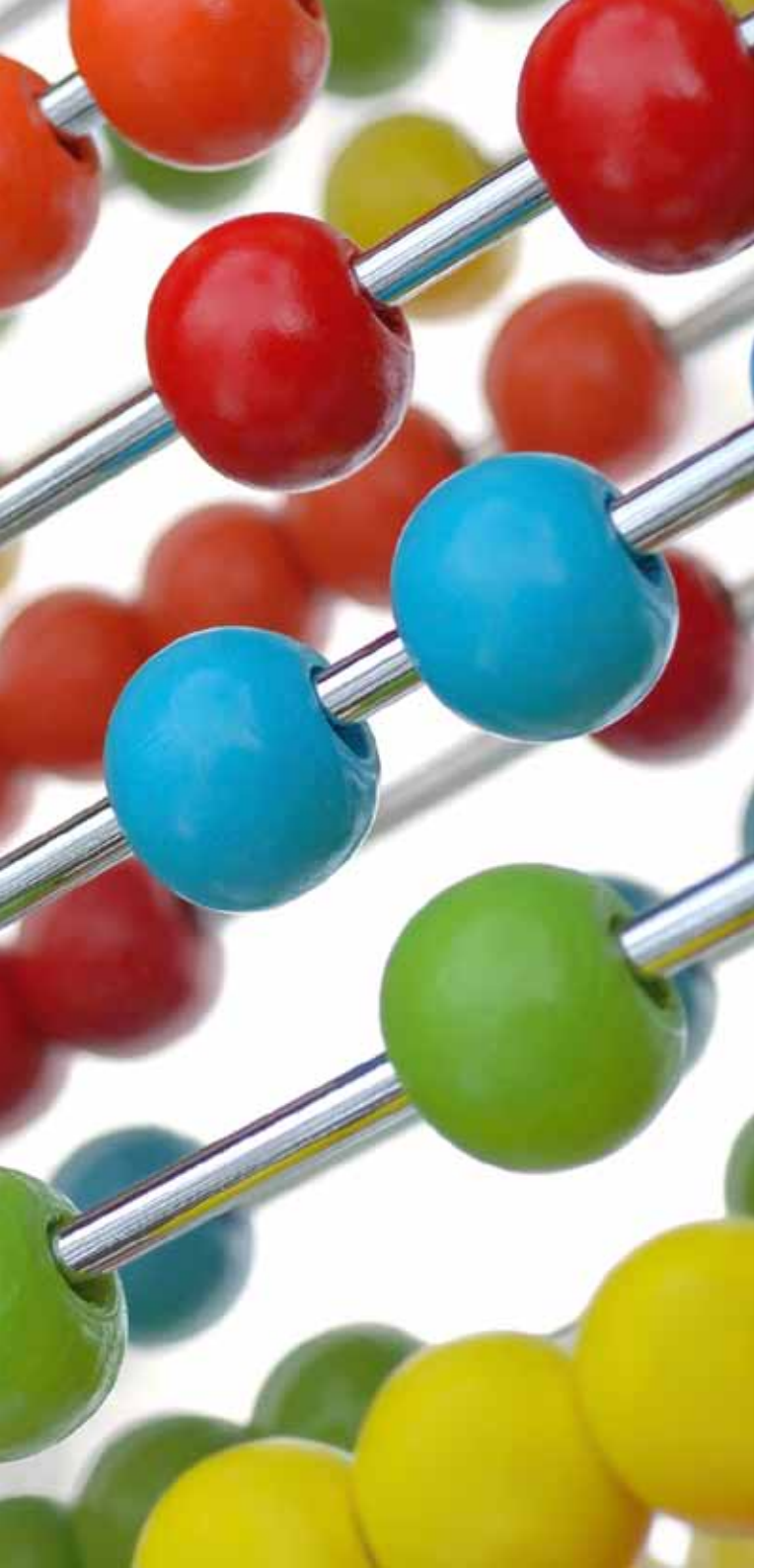
Within the ambit of the WTO Multilateral Trade Agreements, there are also special provisions for developing countries that include:

- Provisions that require WTO members to safeguard the interests of developing countries when adopting their own trade measures
- Provisions that grant longer transition periods for the implementation of commitments on the part of developing countries
- Provisions for technical assistance in the implementation of commitments undertaken by the developing countries and to ensure that developing countries benefit from the outcome of negotiations

Ensuring compliance with the Code of Good Practice (Annex 3 to the WTO/TBT Agreement) forms a major part of the operations of a national standards body.

It can thus be seen that the WTO Agreements can have a marked influence on standardization and, by implication, on the mode of working of an NSB in a developing country. The WTO has published a Code of Good Practice for the Preparation, Adoption and Application of Standards as Annex 3 to the WTO/TBT Agreement. The substantive provisions of this code are reproduced for ease of reference in the annex to this document, and ensuring compliance with them should form a major part of the operations of a national standards body.

Of course, standards do not exist for every product or service, and much trade is carried out in practice on a business-to-business level under private contracts that remain outside the scope of the multilateral trading system; this represents a continuing challenge for standardization.



Part 3. A closer look at standards

3.1 What is a standard?

ISO Guide 2:2004 defines a standard as a "document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context".

A standard for a product is therefore any document that establishes provisions that have the effect of reducing unnecessary variety in the marketplace, and thereby enables economies of scale to occur, with a consequent reduction in the unit cost of production. In an efficient market system, these reduced costs are passed on along the supply chain to the eventual purchaser. Typically, a product standard takes into account the latest state of the art and contains provisions that, if adhered to, result in a product that delivers what the purchaser might reasonably expect – in other words, fitness for purpose. The implication of this is that product standards are inescapably linked to product quality and to stable, well-defined production processes.

Standards can also apply to processes, such as manufacturing processes, and more recently standards have begun to appear in significant numbers for services. Some of the most important standards cover management systems, including quality management systems, environmental management systems, food safety management systems and information security management systems. Standards exist to support all aspects of conformity assessment and to facilitate the implementation of integrated quality management systems at all stages in the production process, from product design, through inputs to the process, process control, to the final product.

Other issues with which standards concern themselves include:

- Compatibility or connectivity with other products, services and systems
- Best practice – typically in the case of process or service standards
- Any requirement or constraint applicable to the entity being standardized

Standards are produced by a process of consensus-building between stakeholders in a committee environment, who eventually reach a single technical solution that reduces costs and improves quality.

3.2 How are standards produced?

The details of this process are discussed later in this document, but essentially standards should be produced by a process of consensus-building between stakeholders, in an open and transparent manner in a committee environment, who eventually reach a single technical solution that reduces costs and improves quality. In the case of national standards, an NSB is then required in terms of WTO obligations to submit a draft standard to a public inquiry before publishing the final standard. With draft international standards, this stage is achieved by circulation to all participating member countries, which in turn are required to consult stakeholders and approve of the draft before it may be published. (Voting rules apply, in order to establish when consensus is deemed to have been reached.)

3.3 Who uses standards?

Published standards are available for use by a wide variety of constituencies, in both the public and private sector, as well as by the informed consumer. Willing buyers and sellers at all stages in the supply chain are free to base their purchase agreements on the technical provisions contained in standards. This implies that conformity assessment often enters the picture; consequently, inspection bodies, laboratories, certification bodies and accreditation bodies all have an interest in standards. Consumers who wish to purchase a fit-for-purpose product or service are free to demand compliance with standards, as this guarantees them a certain level of quality and protection. In areas subject to regulation (typically, those areas where the market system cannot be relied on to provide a quality product, and the safety, security or health of the consumer is at risk), governments and other regulators are free to base the technical content of their regulations on standards. This is an especially useful benefit of standardization, and carries with it the validity, required by any responsible regulator, that the technical content of regulations has been compiled by a consensus of experts and submitted to a public inquiry.

The WTO Agreements, in fact, recommend that prior to embarking on a standardization project in a field already covered by an existing international standard, the standards committee and NSB concerned should consider adoption of the international standard rather than "reinvent the wheel".

It is important to realize that a standard is a document that is made available by its publishers for voluntary use by interested parties and is a copyrighted document, in particular to ensure its integrity. Only when parties to a transaction decide to base their transaction on the standard, or when a regulator incorporates the standard in regulation, does the use of the standard become mandatory.

3.4 What areas do standards cover?

Standards can cover many trade sectors. Technical standards cover a range of traditional industries from construction, the electrotechnical industry and engineering to IT and medical devices. In recent years, "horizontal" standards across a range of technical sectors have been developed covering issues of quality, the environment, health and safety and IT security. Standards for the service industries have also been developed for areas such as household removals, travel agents, car rentals, etc., and a new area of standardization that is generating a great deal of interest is that of social responsibility. Any area in which industry and consumers will benefit from reduction of unnecessary variety, definition of fitness for purpose, or the establishment of best practice is a candidate for standardization.

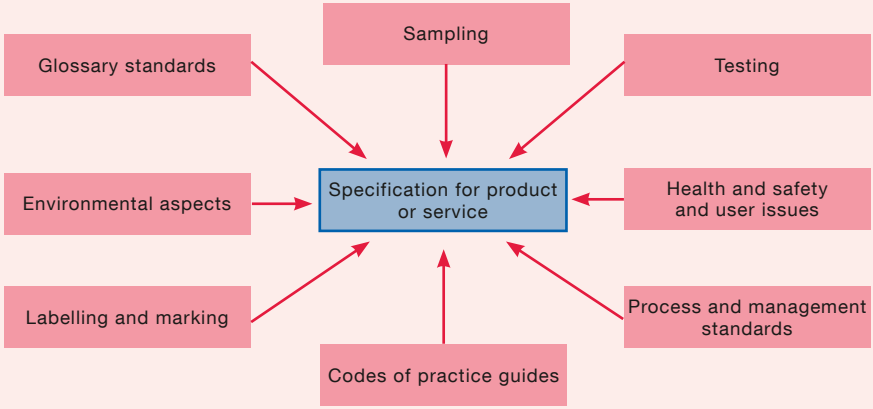


Figure 2 – A suite of standards

3.5 How are standards organized?

In many cases, a single product standard might be sufficient to lay down performance criteria in a finished product that, once met, demonstrate fitness for purpose. In other cases, it might be necessary to develop a suite of standards that cover the production process itself, specific sampling or test methods and criteria for the product, labelling, marking, environmental or health and safety aspects, guidance on the use of the product, etc.

In such a case, each standard supports the others, like bricks in a wall, as shown in **Figure 2**.

3.6 "Formal" (full consensus) standards and "informal" (lesser consensus) standards deliverables

Whilst standards have traditionally been developed by interested market players to establish a common specification, thereby reducing cost and eliminating waste in a mature market, some markets cannot exist in the modern world without establishing some degree of technical order to define the parameters of their operations. There is a need to ensure compatibility and interoperability among the various related product elements in a market even before that market exists. Thus, there is a tendency, par-

ticularly apparent in the high technology sectors of information and communication technology (ICT) and electronics, to create *de facto* standards at the beginning of a market cycle. The initial product concept and design "standards" for CDs or DVDs are typical examples. It should be noted that such standards are frequently not "formal" standards, i.e. those produced by a properly constituted standards body, as they have not undergone a consensus-building process involving all stakeholders. Very often the reason for this is that the particular sector of the economy is extremely fast-moving, and market advantage would be lost if early developers of technology were to wait for full consensus to be reached, especially as this would involve "showing their hand" to their competitors.

A formal or full-consensus standard has the following characteristics:

- It is established by all relevant interest groups to fulfil a market need
- The process of development is open to representatives of all groups
- The process of development is transparent and does not stifle innovation or technological development
- The process of development is conducted via published rules and procedures
- The process of development is driven by consensus
- As part of consensus-building, the technical standpoints of the interested parties are taken into account by the responsible technical committee, which seeks to resolve all substantial objections
- The draft standard undergoes a public enquiry prior to ratification by the NSB
- The body facilitating the development has legal recognition by relevant governments and is established specifically for standards development
- The published standard can be implemented or used under reasonable and non-discriminatory (RAND) terms where patents (intellectual property rights) are included in the standard

A "formal" standard may thus be described as having some "democratic legitimacy".

It follows that an "informal" standard exhibits only a selection and not all of the above characteristics. It should also be realized that such "lesser consensus" standards can at any stage be advanced, if necessary, through consensus building and public enquiry, so as to become "formal" consensus

standards either at the national or at the international level, e.g. in ISO or IEC. Informal standards can be divided into three sub-categories.

a) Informal via standards bodies – These are relatively faster track deliverables created by legally established standards bodies to provide rapidly the consensus-based solutions that are needed to, for example, help establish a new market. These avoid some of the time-consuming stages of development and, in some cases, involve a narrower range of stakeholders.

Such "new deliverables" may take various names, including "Technical Report", "Technical Specification", "Workshop Agreement", "Publicly Available Specification". For further information, readers are referred to the latest edition of the ISO/IEC Directives, Part 2.

There is an additional need for fast-track standards deliverables.

b) Informal via trade associations – Many trade associations, national, regional and international, and other agencies publish guides, codes and specifications for their members to follow. These are standards in the broadest sense, even though they do not meet the full consensus and public inquiry criteria for publication by an NSB. Examples include documents published by the International Air Transport Association (IATA), the International Atomic Energy Agency (IAEA) and the International Union of Railways (UIC).

What distinguishes these organizations from NSBs is that the development of such guides, codes and specifications is not necessarily the main purpose of these organizations and such documents are normally directed towards the members of the organizations, with no status or applicability in other contexts.

c) Informal/commercial – Since the process of developing standards can be slower than needed, there has been a tendency in recent years for com-

panies to form consortia and agree on the specifications that they need to open up a new market. The process is typically closed and exclusive, and operates to more directly address commercial and market development issues.

An alternative to this is where a single powerful organization uses its size and market dominance to impose its own tailor-made specification on a market. While this is rare, as few companies have such global market power, it still occurs, an example being in the software industry. Such documents are often protected by intellectual property rights (IPRs).

From the above, it can be seen that informal standards are not designed to correspond to legal frameworks (e.g., WTO), are not necessarily transparent or consensus driven, and may be protected by IPRs.

Examples of informal commercial standards are those developed by EurepGAP (recently renamed as GlobalGAP), an association of agricultural product retailers and global suppliers that has created a series of sector-specific farm certification standards on good agricultural practices (integrated farm assurance standard).

3.7 Why do we need national standards bodies?

As industry has developed worldwide, it has become clear that not all production units are efficient at manufacturing all its component and material needs. From the earliest stages, mass production based on a high degree of vertical integration whereby all elements of production are conducted within a single factory, is inefficient and costly. Companies, like individuals, tend to be good at certain things and not at others; thus, by specializing in what they do well (i.e. leveraging their competitive advantage) and purchasing from others who specialize in different fields, they can produce a composite result that can be less costly and of better quality. As a first step, this can be achieved by outsourcing against one company's standards.

However, an organization that receives orders from different customers against different specifications is forced to make small unit production runs, resulting in relatively high unit costs. This results in a move to harmonize the various company standards into a common "trade standard", "sectoral standard" or a "national standard". This, in turn, has resulted over time in the establishment, in many countries, of a dedicated organization to develop harmonized tech-

nical standards – the national standards body.

Many developing countries are also producers of primary materials (minerals, raw materials, basic food products, etc.) that are further processed either in the source country or, very often, in more developed countries to produce value-added finished products. While the eventual (often international) standards for the finished products are very much the concern of the global standards community, frequently it is found that the technology used for extracting or producing the raw materials evolves in the developing countries where they are found (for example, rubber in South East Asia, gold mining in South Africa). National, or in some cases regional, standards for the inputs to the production process of these primary materials therefore need to be developed at source.

> It makes sense for regulators to use standards as the basis of their technical regulations, given that standards are performance-based, developed by a consensus of experts across all stakeholder groups, and represent the state of the art.

3.8 More about standards and technical regulations

Governments and legislators in all countries need to protect their citizens against failures in the market system. While a market "supply and demand" system of trade generally works well in optimizing prices and quality, occasionally market pressures to lower prices in order to compete, result in products of a quality that may become dangerously low. Where consumers are ill-equipped to discern acceptable quality products from dangerous products that might affect their health and safety (for example, in the areas of food, electrical components, or automobile components), governments need to step in to regulate the market and lay down minimum standards, accompanied by legal sanctions for cases of non-compliance. This is achieved by the issuance of technical regulations.

Technical regulations typically may consist of two parts:

- An administrative part that establishes the identity and powers of the regulating authority and lays down requirements applicable to the nature and submission of products for testing, the inspection and testing regime, the mo-

There is much to be gained from harmonization of technical regulations among countries, and from the establishment of free trade areas at the regional or sub-regional level.

dalities of market surveillance and the appropriate sanctions for non-compliance, and

- A technical part that lays down the performance requirements the products have to satisfy in order to be deemed compliant

This is where standards come in. While regulators are not compelled to use standards as the basis for their technical regulations, it makes sense to do so, given that standards are performance-based, developed by a consensus of experts across all stakeholder groups, and represent the state of the art. Technical regulations based on standards are therefore likely to receive public and stakeholder acceptance, and are also likely to be compliant with WTO requirements. This in turn means that they are less likely to constitute technical barriers to trade when enforced. In fact, the WTO/TBT and SPS Agreements recommend that technical regulations be based wherever possible on international standards from, in particular, ISO, the IEC, the Codex Alimentarius Commission, etc.

There is much to be gained from harmonization of technical regulations among countries, and from the establishment of free trade areas at the regional or sub-regional level, and the simplest and often most appropriate route for achieving this is for individual countries to agree to base their national standards on the relevant international texts.

A national standards body in a developing country therefore has a duty to establish and maintain relationships with its own national regulators, and with NSBs within its region or sub-region, so as to encourage and coordinate good regulatory practice via the harmonization of technical regulations based wherever possible on international standards.

The ISO Technical Management Board has developed a guide on *Using and referencing ISO and IEC Standards for Technical Regulations*, obtainable from the ISO Central Secretariat.

Part 4. International, regional and national standards bodies

4.1 General

An NSB in a developing country is well advised to hold memberships in appropriate international, regional and, where relevant, sub-regional standards bodies and to participate actively in their activities. Such memberships are invaluable in assisting the NSB to fulfil its mandate of meeting the standards needs (and technical regulation needs) in its own country. Training and technical assistance are frequently provided directly by, or channelled through, these bodies to individual NSBs. WTO Agreements also make it necessary for an NSB to consider harmonization with existing international standards, and this implies that if the NSB wishes to influence those international standards as they are developed or revised, some level of membership of the international bodies is necessary.

At the international level, the major international standards organizations are ISO, IEC and ITU. In the context of the WTO SPS agreement, the specific organizations of OIE, IPPC, and the Codex Alimentarius Commission (CAC) – established by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO) – are important. Various other sub-structures of the United Nations, such as the United Nations Economic Commission for Europe (UNECE), produce standards that are effectively international in their application. There are a number of other standards-producing organizations that develop standards that are in global use or have economic importance because of the markets for which they are primarily produced (ASTM International[9], CEN[10], IEEE[11], etc.).

There are also regional bodies that, in a variety of ways, assist national standards bodies to achieve their aims and to cooperate on a regional basis. These regional bodies are helpful in facilitating the harmonization, on a regional basis, of standards, which might be truly international or developed for use within the region (for example, where there might not be sufficient interest or need in other areas of the world to warrant the de-

9) Originally known as the American Society for Testing and Materials (ASTM).

10) European Committee for Standardization.

11) Institute of Electrical and Electronics Engineers.

velopment of an international standard). Regional standards bodies can also assist NSBs by organizing, and sharing resources for, the translation of international standards into the common language of the region (for example, Spanish in much of South America, Arabic in North Africa and the Middle East, etc.).

A recent development that is gaining ground and recognition is the emergence of sub-regional standards bodies or committees that cater on a more focused basis for the standards harmonization needs between neighbouring countries.

If an NSB wishes to influence international standards, some level of membership in the international standards bodies is necessary.

4.2 International standards organizations

Note: For the sake of brevity, only the members of the World Standards Co-operation (WSC), namely ISO, IEC and ITU are considered.

ISO, the International Organization for Standardization – a non-governmental organization – is a federation of the national standards bodies of 163 countries (at April 2012), one per country, from all regions of the world, including developed and developing countries as well as countries with economies in transition. Each ISO member is the body most broadly representative in its country in matters of standardization. The members propose the new standards, participate in their development and provide support in collaboration with ISO Central Secretariat for the 3300 technical groups that actually develop the standards.

ISO members appoint national delegations to standards committees. More than 50000 experts voluntarily contribute annually to the work of the organization. When their work is published as an ISO International Standard, it may be adopted as a national standard by the ISO members and translated.

ISO has a current portfolio of over 19000 (at April 2012) standards

that provide practical solutions and achieve benefits for almost every sector of business, industry and technology. They make up a complete offering for the three dimensions – economic, environmental and social – of sustainable development. ISO's work programme ranges from standards for traditional activities, such as agriculture and construction, through mechanical engineering, manufacturing and distribution, to transport, medical devices, the latest in information and communication technology developments, and to standards for services and conformity assessment.

Membership in ISO is subject to the payment of a fee, which is variable and takes into account the category of membership, the degree of activity of the country concerned within the ISO system and its stage of economic development. ISO has three categories of membership. Full members (member bodies) may participate in all activities of the organization and have the right to vote. Correspondent members may attend meetings as observers, but have no right to vote; nor are these members eligible to participate actively in the work of technical committees. However, like full members, they can use ISO standards as the basis for national standards. In addition, there are subscriber members, which are entitled to receive a number of ISO publications and attend the ISO General Assembly, but have no right to participate in the meetings of technical committees or of ISO policy committees.

Regional standards bodies can assist by cooperating in harmonization and sharing resources.

IEC, the International Electrotechnical Commission, works differently to ISO, in that its members are NCs (national committees), which sometimes include national standards bodies. The IEC has published close to 6 300 international standards and similar types of publications.

There are two forms of membership in the IEC, both of which are subject to the payment of annual dues. At April 2012, the IEC had 60 full members and 22 associate members. Full members can participate in all activities, access all IEC standards and have full voting rights. Associate members can also access IEC's entire collection of standards, may vote in four technical committees of their choice and attend meetings of all technical committees as observers with commenting rights.

Together with its Affiliate Country Programme (covering 81 countries at

April 2012) the IEC family addresses 163 countries around the world. IEC's free programme for developing countries aims at encouraging countries that are not IEC members to use and adopt its international standards as national ones and to participate in the work of 10 technical committees of their choice through commenting on working documents. The programme also provides assistance in establishing NEC (national electrotechnical committees) to give Affiliate Countries the appropriate infrastructure to participate actively in the IEC programme. As at April 2012, NECs have been established in 33 Affiliate Countries. Since 2009, the Affiliate Plus status is granted to countries that have established an NEC and adopted at least 50 IEC international standards under the terms of the Affiliate Country Programme. Fifteen countries have been granted the Affiliate Plus status which offers additional benefits, such as 400 free copies of IEC international standards for adoption instead of the initial 200. In 2012, developing countries participating in the IEC Programme have been offered participation as observers in IECEE activities as IECEE Affiliates (see section on conformity assessment).

Both international standards organizations develop standards by consensus, through technical committees. Voting by the national members occurs at various stages during standards development and comments on draft documents are requested from members as part of the consensus-building process. The national members, whether NSBs in the case of ISO, or NCs (national committees) in the case of IEC, establish national "mirror committees" to give local direction to technical work. Further details of the international standards development processes can be obtained from the latest editions of the ISO/IEC Directives, published jointly by the two bodies.

ITU, the International Telecommunication Union, has as members over 190 individual national states and over 700 sector members and associates. It is unique among international organizations in that it was founded on the principle of cooperation between governments and the private sector. Work is carried out in study groups to develop authoritative "ITU Recommendations", which have the status of international standards. There are three sectors of the Union — Radiocommunication (ITU-R), Telecommunication Standardization (ITU-T), and Telecommunication Development (ITU-D), each of which develops ITU Recommendations in its own sector. To date, over 4500 ITU Recommendations have been published.

Sub-regional bodies cater on a more focused basis for standards harmonization needs between neighbouring countries.

4.3 Regional standards organizations

Over the last 50 years, regional free trade areas (FTAs) have developed in many parts of the world. Neighbouring countries with common economic interests, language compatibility, cultural links and good transport links have established such FTAs to develop synergies and improve economic performance. However, to be successful, such FTAs not only need to eliminate tariff barriers and quotas; they also need to address Technical (non-tariff) Barriers to Trade (TBT).

Standards and conformity assessment issues can be some of the major TBTs if they are unique to individual countries and are in effect mandatory, since they represent a hurdle that exporters must clear in order to trade. Thus, establishing a free trade area often entails creating a regional or sub-regional body or committee to harmonize standards and conformity assessment within the region. There are seven such regional organizations around the world with which ISO has formal links – the Asian Consultative Committee on Standards and Quality (ACCSQ) in the Association of South East Asian Nations (ASEAN) region; the Arab Industrial Development and Mining Organization (AIDMO) in the Arab region; the African Organization for Standardization (ARSO) in Africa; the European Committee for Standardization (CEN) in Europe; the Pan American Standards Commission (COPANT) in the Americas; the Euro-Asian Interstate Council for Standardization, Metrology and Certification (EASC) in the Euro-Asian region; and the Pacific Area Standards Congress (PASC) in the Pacific Area. A South Asian Regional Standards Organization (SARSO) is currently being considered.

Few of these actually develop new standards, preferring either to adopt existing international ones or to harmonize on the text of an established national standard that is suitable for the region. However, the three main regional standards bodies in Europe, CEN (European Committee for Standardization), CENELEC (European Committee for Electrotechnical Standardization) and ETSI (European Telecommunications Standards Institute), have progressively created a substantial body of standards for the European Union. In total, nearly 20 000 such standards now exist.

In so doing, CEN and CENELEC have created agreements respectively with ISO and IEC to avoid duplication and competition. These agreements are known as the Vienna (CEN/ISO) and Dresden (CENELEC/IEC) agreements.

Regional structures do not limit themselves to standards and conformity assessment matters. In many cases, either directly or via substructures, they also deal with metrology and accreditation issues. Typically, the national standards body would be the member of the regional standards structure, with the national metrology institute and accreditation body (where they exist) belonging to the relevant regional substructure.

Where national bodies do not exist (for example, in many cases of accreditation in developing countries), the regional substructure is invaluable in providing a platform for addressing the needs of the countries in the region in that sphere.

These, sometimes complex, relationships are shown in Table 1 on **page 30**.

4.4 Sub-regional standards organizations

The subject of regional standardization was covered at specialist workshops organized by ISO/DEVCO in 2004 and 2007 and by UNIDO, and reference should be made to UNIDO articles published in *ISO Focus* (September 2004 and June 2007) on "Fostering regional quality infrastructure" and "Complying with international standards – Costs and benefit of a regional approach". It should be noted that, for example in Africa, there are many sub-regional structures [e.g. the West African Economic and Monetary Union (UEMOA), the East African Community (EAC), the Economic Community of West African States (ECOWAS), the Economic Community of Central African States (ECCAS), the Southern African Development Community (SADC), the Common Market for Eastern and Southern Africa (COMESA), etc.]. All of these structures recognize the need to address their quality culture and develop a sound infrastructure in a cost effective manner – preferably, for practical reasons, at the sub-regional level. In light of this, UNIDO has re-focused its efforts from dealing with a large number of individual countries to groups of countries or established regional groups.

Examples from other regions are the GCC (Gulf) Standardization Organization (GSO), the CARICOM Regional Organization for Standards and Quality (CROSQ) and the Mercosur Standards Association (AMN).

ISO established working relations with CROSQ, ECOWAS, GSO and SADC in 2012 in view of enhancing collaboration in capacity-building and training.

Sub-regional groups enable neighbouring countries that often share the same language, similar climates and produce similar products, to share experiences and access to infrastructure, enabling them to benefit from shared resources. This can be of particular practical benefit, given that in many developing countries national standards bodies are publicly funded, can only pay relatively low salaries, and therefore continually struggle to retain qualified staff. Such a situation imposes additional costs for training new staff on those standards bodies that can least afford it, and makes sub-regional cooperation more necessary and more attractive, provided that the will exists among the leadership to develop the appropriate mechanisms for cooperation.

Part 5. Activities and structure of an NSB

5.1 Form follows function

The form an NSB takes, whether in terms of its statutes, governance, financing, functional organization or choice of *modus operandi*, will depend to a great extent on the functions it is mandated to perform. These will, in turn, depend on government policy and macroeconomic realities in the country and within the region. This is especially important in a developing country, for which the complex structures of standards bodies in the developed world may frequently be inappropriate. For example, in the USA, strong industry groupings have contributed to the establishment of over 400 separate organizations developing standards for US industry. In such a decentralized system, the national standards body, ANSI, fulfils a coordinating and accrediting role nationally and, as the peak standards federation in the country, it represents the USA in international fora. In Europe, a variety of approaches are used, from devolution of all or part of the national standards activities to a number of specialist sectoral trade associations, to a system of centralized control, where different sectors are managed under one organization. In all cases, however, European NSBs operate within the ambit of the European Union and its legislative framework. Standards developed under CEN and CENELEC are required by law to be transposed as national standards in the individual countries, which has a great effect on the activities of the European NSBs.

The above approaches may not be valid for developing countries, where industry is insufficiently strong to make a decentralized system viable, and differences in national legal systems, and the lack of a coordinated political agenda, make regional legislative frameworks, of the European type, difficult to implement, at least in the short to medium term. It is thus necessary and appropriate for each developing country to put in place a quality infrastructure that caters for its specific stage of development at any point in time, takes into account regional and sub-regional realities and remains open to continual refinement. This implies that no single model should be universally promoted to apply across the board to developing countries, and it is recommended that professional advice be taken by those contemplating establishing an NSB for the first time or re-engineering a precursor organization, based on the considerations outlined in this document. In particular, the decision

There is no single model that can be applied across the board to developing countries.

needs to be taken as to whether it makes sense to immediately become a standards developer and conformity assessment provider, or rather to first concentrate on the basics of providing standards through adoption and harmonization, and providing information on standards to stakeholders.

5.2 Stakeholders

Stakeholders are parties that stand to benefit from voluntary, consensus-based standards and for whom the existence and content of standards play an important role. Key stakeholders include:

- Industry (including services)
- National, state/provincial and local government
- Consumers and consumer groups
- Professional institutions
- The quality/conformity assessment sector
- Organized labour
- Educational and research establishments

As an economy develops, the relative importance of these stakeholders changes. For example, in a developing country, the role, and therefore the degree of control, of national government is frequently very strong, while the level of involvement of organized consumers is often very low. As consumers become better organized and a quality culture begins to emerge in the society, central government can start to relax its control – although there will always be areas where technical regulation is needed for consumer or environmental protection.

5.3 The progressive harmonization of standards

The requirements of the WTO, the emergence of a multilateral trading system, the effects of globalization, and the increasing importance of regional cooperation have brought about a change in the role of an NSB from that of a developer of purely national standards to a partner in harmonizing standards on a regional and international basis. While an NSB in a developing country might have a genuine need to establish national standards for specific commodities in order to improve the quality of exports from certain sectors, the emphasis should still be more and more on alignment with international standards to benefit the national economy as a whole. The mechanism for this does not have to be onerous; while it is desirable for any country to have the resources necessary to influence the content of international standards so as to make them more acceptable to its stakeholders, the benefits of harmonization can be enjoyed quickly, and with minimal investment of time or resources. Through the establishment of mirror committees, the NSB in a developing country can quickly and efficiently involve stakeholders in achieving the goals of harmonization without the need to embark on

lengthy programmes of training, national standards setting and publication, etc. What is most important in the initial stages of an NSB's life is that the harmonization take place efficiently and that the NSB be in a position to supply information on the standards and their development. At a later stage, when resources permit, the scale of operations can be expanded to allow for international participation, drafting of national standards, provision of conformity assessment services, etc.

5.4 The changed role of the NSB

While the need for national standards will never disappear entirely, the realities of the multilateral trading system make it clear that the fundamental role of NSBs in developing countries has changed to a combination of:

- Monitoring and contributing to international and regional developments in standardization on behalf of stakeholders
- Providing information on standards and related conformity assessment issues
- Raising awareness and promoting the importance of standards and quality infrastructure as tools to improve market access, to transfer technology and to encourage good business practices and sustainable development
- Conducting appropriate training activities in standardization for its own staff as well as for stakeholders
- Spearheading and coordinating the process of regional and international harmonization
- Representing national interests in regional and international standards environments
- Developing national standards where needed
- Assisting regulators in the development of technical regulations and
- Complying with WTO requirements (often including the hosting of the national TBT enquiry point)

In addition, where the necessary resources exist and where an assessment of needs has shown the provision of conformity assessment activities (testing and calibration, product and system certification, inspection) to be desirable, its role can be expanded to provide these services, which can be a valuable source of income. In some countries, the role of the national measurement institute is also centralized and delegated to the NSB. In such a case, as with standards, measurement and calibration have to be treated as a national priority. Where such conformity assessment roles do exist, it is important that they be separated in some manner from the NSBs' responsibilities to represent the needs of all stakeholders in standardization.

Accreditation is, however, a function that should not be carried out by an NSB that performs conformity assessment activities, as it constitutes a conflict of interest – rather, regional solutions should be sought for this where no other national body exists with the necessary expertise.

Similarly, a conflict of interest can occur where an NSB offers consultancy services – for example, the provision of advice on drawing up quality manuals – alongside certification services. Caution needs to be exercised in this regard.

5.5 Governance and funding

In many developing countries, it normally falls to governments to initiate the creation and strengthening of NSBs because the private sector is not strong enough or well organized to initiate such a process. In such a scenario, the NSB runs as a government department for a certain time but should eventually move away to either become a para-statal organization or a not-for-profit organization. Whatever the legal status of the NSB, it should endeavour to seek increasing stakeholder involvement and active participation. The optimum organization is a joint public/private sector body, in which governance is shared jointly by the government and the private sector. Good corporate governance principles would dictate that such a body be jointly financed and governed by the government and the private sector, in such a way as to separate the "for the good of the nation" areas of operation such as standards and metrology, that should be financed by government, from commercial areas such as testing and certification, that should not benefit from government funding apart from the remuneration of services performed for governmental entities. These commercial areas of operation should function on an open-market basis and compete for business.

A possible alternative solution consists of a governance structure dividing into two wings, one dealing with standards, involving the private sector, and the other with technical regulations, which is governmental. However, funding for this type of arrangement can pose difficulties, as private sector subscriptions or other funding mechanisms can be construed by industrial firms as buying them influence within the standards committees.

Whichever model is chosen, it is recommended that there be a legislative instrument (act of parliament) that defines the role and responsibilities of the NSB, and the head of the NSB (typically designated as the CEO or director general) should report to, or through, a governing board or council that is established by government from high level representatives of the main stakeholder groups, including the government itself. The board or council should be independent and focused on those issues that are in the best interest of the NSB, whilst at the same time supporting government policy in trade-related matters. Ideally, it should have a non-executive chair, who should be a person of stature with wide industrial experience and strategic vision. The CEO or director general of the NSB should serve on the board and should be a person of stature, with diplomatic skills and drive, together with a good understanding of standards and trade, coupled with appropriate experience in the public or private sector.

The board may establish a number of committees in the interests of good governance, such as

- A standards policy advisory committee
- A finance committee
- A certification advisory or permit issuing committee (where relevant)
- A committee to oversee metrology, testing and calibration activities where these fall under the NSB

The above recommendations apply to an NSB that is established with the intention of operating at a comprehensive level. For the least developed countries, a less complex structure can be envisaged, starting from a "standards office" that reports through line management in a trade or industry ministry.

Funding for an NSB may come from two main sources:

- Regular government or "core" funding that supports the "good of the nation" activities ("public good")
- Commercial funding in relation to the activities of the testing and product/system certification activi-

ties, training, sales of standards and publications, etc.

In addition, when the legal structure allows it, such as that of a not-for-profit organization, membership fees might be considered to attract ongoing support of stakeholders. Core funding should be budgeted for appropriately, and there should be regular liaison between the relevant government department, the board and the chief executive officer/director-general (CEO/DG).

Additional income from sales of standards and provision of information can in theory fall under either "good of the nation" activities or commercial activities. With a new NSB, such income is not likely to be large, and it is recommended that it report to the standards function. Income from industry subscriptions or grants is to be welcomed, but is not guaranteed. Other income can be obtained from the provision of training or other services.

Best practice for developing countries thus appears to be based upon a mix of income streams as follows:

- Core funding from government with long-term security based upon medium/long-term plans

Note: In some of the least developed countries, where the private sector is not yet ready to buy documents or services, direct core funding from government is likely to be the only possible source of revenue.

- Income from the sales of documents (standards) and publications
- Income from product and system certification
- Income from the provision of training
- Income from consultancy, and other services

Note: NSBs are cautioned about indiscriminate provision of consultancy services that might be inappropriate where system or other certification schemes are offered.

- Membership schemes

It should be noted that NSBs in developing countries often suffer from their legal status which impedes them, preventing them from retaining generated income, which is to be returned to the national treasury. Therefore, standards laws/acts should be amended to ensure financial and administrative autonomy and stability to NSBs.

5.6 A management system for an NSB

The NSB exists to meet standardization needs in the country, and this carries with it the responsibility to be the guardian and promoter of quality and, in the case of ISO members, the body that represents itself as "ISO in country X". As with all competent organizations, an NSB should aim to establish a management system that conforms to relevant management system standards, such as ISO 9001, in particular to cover the standards development process. It may also be appropriate for the NSB to demonstrate compliance by certification of the system. Besides enhancing the performance of the organization, it clearly demonstrates that the NSB practices what it preaches.

5.7 Structure and organization

The following suggestions are made with regard to the structure and organization of an NSB in a developing country.

- The NSB should be formally recognized by legislative instrument or governmental decision as the body most broadly representative in its country in matters of standardization, in particular to ensure national representation at the regional and international levels
- The NSB should promote quality, be the national focal point for all forms of standards, and support the implementation of technical regulations – including, where possible, in the fields of food and agriculture, electro-technology, metrology and services – without itself being seen as a regulatory body

Note: In many countries, food, agriculture and pharmaceuticals regulation is kept separate from the NSB, usually under the auspices of the ministries responsible for agriculture or health.

- The NSB should provide a range of information on standards, possibly combining this with the national WTO/TBT enquiry point
- The NSB should be the main national liaison body with ISO. If its national mandate makes it responsible for standardization ac-

tivities in the electrotechnical field, the NSB may hold the Secretariat of the NC (national committee) of the IEC, which is the IEC Member. In many developing countries, the NSB chooses first to join the IEC Affiliate Country Programme free of charge, before establishing an NC in view of membership

- If the NSB has responsibility for metrology, the scope of its services should be clearly defined. In some countries, the NSB retains all activities related to scientific and industrial metrology, whereas the aspects concerning legal metrology are vested with a separate organization so as to clearly distinguish the latter's regulatory role as compared to the NSB's role as a support to industry. The various functions of metrology may be regulated by an appropriate legal framework
- The NSB should be incorporated as a public or not-for-profit organization. If it is a public body under the control of government, it may have various levels of autonomy and independence in its day-to-day operation. If it is a department within government, it is most likely that it may not have autonomous budgetary control, meaning, *inter alia*, that revenues from its various activities may not accrue to the organization but to the central government treasury

In such cases, the governing body is merely an advisory council appointed by the relevant minister with limited powers. However, it may be interesting for public bodies to move to the next level of autonomy by becoming para-statal bodies. These bodies are still state-owned but have their own board of directors and operate like a private corporation. Para-statals are normally partly financed by government and have the ability to collect revenue. The NSB may also be established as a not-for-profit organization and run as a private sector organization with its own independent governing board, but with still a certain amount of funding from government to cater for its "public good" aspect of operation. Stakeholder involvement is critical to make this type of organization work

- This board should have its own chairman, ideally from industry, and have representatives from all major stakeholder groups. The full-time chief executive of the NSB should sit on the board
- The NSB should have a process for identifying the standardization needs of each main industrial and social sector of importance to the country and should have the relevant committee to evaluate those needs for inclusion in the work programme and priorities

- The NSB should have a standardization policy that promotes the adoption, wherever possible, of all relevant international standards and other deliverables, replacing purely national standards, in accordance with ISO/IEC Guide 21-1:2005[12], and where relevant with ISO/IEC Guide 21-2:2005[13]
- The NSB should adhere to the "Code of Good Practice for the Preparation, Adoption and Application of Standards" published by the WTO as Annex 3 to the WTO/TBT Agreement (parts reproduced as the Annex to this publication) and, for the member of ISO, to the ISO Code of Ethics (can be downloaded from the ISO Website at ***www.iso.org/iso/codeethics_2004-en.pdf***)
- The NSB should actively participate in sub-regional, regional and international activities in its spheres of interest so as to share experiences and ensure that its standardization work fits in a harmonized manner to other work being carried out elsewhere

12) *Regional or national adoption of international standards and other International Deliverables* — Part 1: *Adoption of international standards.*

13) *Regional or national adoption of international standards and other International Deliverables* — Part 2: *Adoption of International Deliverables other than international standards.*

- The functions of the NSB should include the following as a minimum:
  - Standards development
  - Information, sales and promotion
  - International, regional and sub-regional liaison
  - Training (which could fall under the information section)

Assuming that there is a need and that the necessary resources exist, the following functions may also be considered:

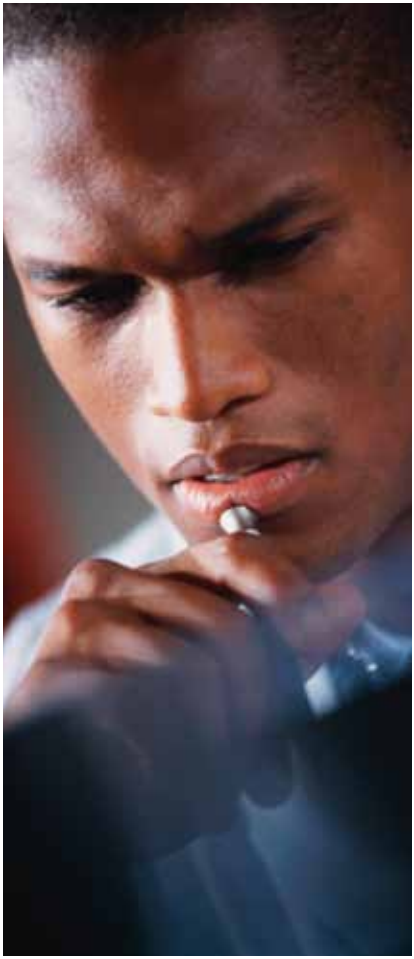
- Conformity assessment

Note: This can be further subdivided into testing, calibration, inspection, product certification and system certification. If the NSB does not cover conformity assessment, it might enter into consultancy services.

- Metrology
- Corporate services (HR, finance, IT, facilities management, etc.)

The first three of the above functions are considered in detail in Parts 6, 7 and 8 respectively, and training is discussed below. Conformity assessment, metrology and corporate services are outside the scope of this document, and the level to which they are undertaken will be a reflection of the stage of development of the NSB. It should be noted that when an NSB undertakes conformity assessment

activities, its policy, governance and management should be kept separate from any accreditation body. If a national accreditation body is deemed necessary, it must be entirely separate from the NSB when the latter is involved in conformity assessment, but regional solutions to accreditation needs should be considered.



The NSB should establish a training policy.

5.8 Training

5.8.1 Introduction

Financial realities in the developing world often dictate that training has to be outsourced and financed by donor agencies. This should not be seen as a reason to avoid the development of a formal training policy, but rather the opposite – donor agencies are more likely to favour an NSB with assistance when it has articulated a clear idea of what it wants to achieve. Training policies should be reviewed at regular intervals.

It is therefore recommended that a national standards body in a developing country work towards establishing a dedicated training unit that caters for three main groups:

a) Internal staff, mainly technical officers of the NSB

b) Technical committee members and chairs

c) External stakeholder staff

Internal staff responsible for the adoption or development of standards, or for providing information on

There is much to be gained from regional or sub-regional cooperation in training.

standards, need to be trained sufficiently to develop the required level of competence. Staff who are trained overseas through the process of twinning of the developing country NSB with an advanced foreign NSB can assist in training other local staff. Where an NSB also performs conformity assessment or other functions, appropriate training for internal staff in these areas should be provided. Internal training of an NSB's staff needs to be properly integrated, with individual modules building one on another so as to facilitate the development of different career paths for staff.

Technical committee members need to be trained to understand, as a minimum, the process they are to become involved in, while committee chairs need additional skills, such as the ability to achieve consensus and to operate within the national or international rules applicable to their committee.

As part of its duty to serve the standardization needs of its community, the NSB also needs to promote an understanding of the implementation of standards to stakeholder groups, and to expose them, as appropriate, to the application and benefits of product and system standards, conformity assessment and technical regulation.

As a starting point for effective internal and external training, the NSB should have a clear and documented training policy that outlines whom it intends to train, on what subjects, by whom the training is to be provided and under what circumstances the training will be provided on a commercial basis. It should be realized that the provision of training to external parties can become an important and ongoing source of additional income, and the regular holding of workshops on current standards issues can, additionally, be used to introduce those parties to the conformity assessment services offered by the NSB. In such a way, the provision of necessary training to stakeholders can be leveraged to assist in the development of the NSB itself.

When an international standards meeting is held in a country or within the region, there are also valuable opportunities to harness the expertise present by organizing regional workshops, and planning for these should be part of any training policy.

The international standards organizations have developed a range of train-

ing materials that can be made available for use in developing countries, and an NSB's training policy should be so designed as to make full use of these.

5.8.2 Internal technical officers

National standards bodies are very specialist organizations. Because there is only one in each country, it is normally not possible to recruit fully qualified and appropriately trained staff from other organizations in the country, except perhaps in the fields of testing and certification. Thus, staff will need to be employed and subsequently trained by the NSB itself.

Traditionally, technical officers in NSBs were trained engineers or scientists. Whilst this is a still a good starting point, the role of technical officers in standards development demands significant skills in other areas. The process of developing standards is managerially challenging. The development of a standard often has great commercial and economic significance, and thus delegates to technical committees often attempt to impose their own favoured technical solution in order to gain commercial advantage. This frequently results in technical conflict in the committee, which must be resolved. Further, technical committee members are not employees of the NSB and thus not "controllable" by normal sanctions and managerial discipline. The standards technical officers have to manage the process and assist in the resolution of conflict in order to ensure an acceptable result and a valid standard within a realistic time scale. The standards technical officer must thus exhibit diplomacy, and a quiet, understated leadership role. Indeed, in some NSBs such staff are now termed "project managers" – a title reflecting this role. Thus, in the standards area, a technical officer/project manager should exhibit the following characteristics or have skills in:

- Management
- Interpersonal skills, such as the ability to facilitate consensus
- Organizational aptitude
- Self-motivation and drive
- Language
- IT skills

Internal staff and TC members need to be trained; committee chairs need additional skills.

Specific courses in the standards-setting process (national and, where relevant, international), facilitating consensus, WTO agreements and

international liaison, together with technical writing training and an understanding of the elements of conformity assessment, are typically needed.

In the area of laboratory testing and product certification, technical officers should have experience in customer contact, project management and report writing, or show evidence of the ability to develop such skills. Further, for such staff, a clear understanding of formal conformity assessment procedures and quality management principles, or good laboratory practice, would be appropriate.

Depending on the total number of staff, the NSB may appoint a training officer or facilitator whose main responsibilities would be:

- Planning the training of all new, reassigned and promoted staff
- Keeping records of all training provided
- Organizing all internal training courses, using external trainers if considered necessary (from a university, other NSBs or specialist consultants) and coordinating applications for donor funding
- Working with NSB managers to follow up on training needs subsequent to performance reviews of staff
- Identifying external training courses of value to specific staff and organizational needs
- Reporting on training and organizational needs to senior NSB management

Training is an ongoing activity, and individual training needs should be identified as a continuing part of the performance review process.

5.8.3 Technical committee delegates

In order to ensure that technical committees function as efficiently as possible, it is critical that the members understand and abide by the documented procedures and rules covering the development of standards. Thus, courses covering one to two days should be run for all new technical committee members. Whilst the main beneficiary of such training will ultimately be the NSB, it is reasonable to request a contribution towards the cost of such training from the stakeholder that the committee member represents. The training should be a shortened version of that undertaken for the standards technical officers and thus should cover:

- The role, structure, internal rules and governance of the NSB
- The wider world of standardization
- The process of project acceptance

- The standards development and approval processes
- Conformity assessment procedures
- The expected performance of committee members

5.8.4 TC chairs

The most important relationship in a standards technical committee is that between the secretary, usually a technical officer in the NSB, and the committee chair, who is normally elected by the technical representatives of stakeholders from amongst themselves. Occasionally, in a developing country economy, the committee members request the NSB itself to provide an unbiased chair. The chair of the technical committee should receive dedicated training on the role and tasks pertaining to this function. Typically, this kind of training would cover:

- Planning for a TC meeting
- Preparation and organization of TC meetings
- Chairing the meeting
- Communication theory and practice
- Principles of group dynamics
- Organization and delegation of sub-tasks
- Communication and documentation after the meeting
- Communication with stakeholders
- Post-publication activities

5.8.5 Regional synergies

One advantage that is often overlooked by the management of an NSB is that their training needs are almost always very similar to those of their peers in neighbouring countries. There is much to be gained from regional or sub-regional cooperation in training, especially where different countries in a region share a common language. Regional and sub-regional standards liaison meetings should have cooperation in training as a permanent agenda item, and international events, such as donor-funded training and international standards meetings hosted by one country in a region, should ideally be publicized and leveraged to the benefit of all the NSBs in the region.

5.8.6 Assistance from ISO and IEC

The various training services provided under the ISO Action Plan for developing countries can be used to great effect by ISO members. Three comprehensive e-learning modules have been developed by ISO to assist in the training of standards professionals, and a series of "enhanced participation" courses in standardization are proposed from time to time in different regions of the world. A

brochure on the training provided by ISO is available from the ISO Central Secretariat. For more information on the types of assistance provided by ISO, please refer to section 8.5 of this publication.

IEC regularly provides workshops for affiliates – during its annual General Meeting or back-to-back with regional events.

5.8.7 Assistance from UNIDO

UNIDO is committed to foster developing countries' access to and integration in the global markets, assuring adequate protection of consumers and the environment. UNIDO's position with regards to trade, poverty and sustainable development and the solutions the organization offers its member states are defined in the organization's Trade Capacity Building (TCB) Initiative and approach that encompass the improvement of supply capacity, conformity to market requirements to overcome barriers to trade, and enhanced access to markets. The UNIDO TCB approach has been developed on the basis of research activities carried out by UNIDO and the organization's 40 years of experience in strengthening developing countries' supply capacity and their metrology, standards, testing and quality (MSTQ) infrastructure and skills. A large number of NSBs in developing countries have been assisted and still benefit from UNIDO capacity building and technical assistance services.

UNIDO projects are developed and implemented to build legal, institutional and human capacity in the field of MSTQ with emphasis on:

- Standards development and harmonization
- Certification and inspection
- Accreditation (of testing and calibration laboratories, inspection bodies and certification bodies)
- Calibration
- Legal metrology
- Material testing laboratories
- Quality management
- Consumer and environmental protection

Typical areas of UNIDO intervention are:

- Development of national standards bodies, including TBT and SPS enquiry points, and the upgrading of national legal and regulatory frameworks
- Assistance to NSBs for participation in international standardization work and to consumers to take part in standardization activities
- Regional harmonization of standards and conformity assessment systems

- Establishment and upgrading of inspection and certification schemes and services for the assessment of conformity against product and system standards (including ISO 9001, ISO 14001, ISO 22000) with increased emphasis on public-private partnerships
- Development of national and/or regional accreditation schemes for the accreditation of national laboratories, inspection bodies, certification bodies, etc.
- Development of metrology (calibration) capacities towards international recognition of their services for the calibration of national product testing equipment
- Development of product testing capacities (micro-biological, chemical, textile, leather, electrical laboratories) towards international recognition of their services for the proof of conformity with foreign buyer requirements
- Development of projects covering supply capacity, value addition and conformity assessment for groups of developing countries producing high-profile products (e.g. cotton, sugar, fish, garments)
- SMEs' quality and productivity improvement and conformity to standards and other market requirements including, *inter alia,* ISO 9001, ISO 14001, ISO 22000
- Pilot projects to assist developing countries to implement "farm to fork" traceability systems

The UNIDO-ISO memorandum of understanding (MoU) signed in December 2003 was replaced by a new MoU signed in June 2009 by the UNIDO Director General and the ISO Secretary-General. The MoU aims at assisting developing countries and countries with economies in transition, to focus on the use of standardization to enhance industrial development and participate in world trade. In the implementation of the MoU, UNIDO has been supporting a number of NSBs towards ISO membership, increasing their participation in international standardization activities, helping them to harmonize national standards with ISO standards and also assisting users such as businesses, governments and consumers in the implementation of standards.

5.8.8 Other assistance

Numerous other national, regional and international donor agencies and programmes include assistance and support to awareness raising and capacity building in standardization and related issues, as a key component of economic competitiveness and social development. The World Trade Organization and the International Trade Centre themselves have specific actions in this area.

Part 6. Standards development

6.1 Introduction

The development of purely national standards by an NSB is, as we have seen, an increasingly rare occurrence. The trend is for NSBs to adopt the standards prepared by international or regional bodies, or if another country's national standard has global currency, then this could be adopted with its permission. Such adoptions can be "identical", i.e. with unchanged text, or "modified", with some elements or clauses tailored to make them more suitable to local conditions. ISO/IEC Guide 21:2005 (Parts 1 and 2) gives guidance in this respect. However, whether the NSB is a "standards maker" or a "standards taker", a common development procedure that is compliant with the WTO/TBT Code of Good Practice for the Preparation, Adoption and Application of Standards should be used.

In order to make the most effective use of limited resources, an NSB should develop two "tools". These are:

- A long-term programme or plan of activities (strategic plan) that outlines, in strategic terms and as far as possible in detailed terms, the scheduled activities and priorities of the NSB over several years. The period chosen, which is typically three to five years, may be aligned with the public economic development plan of the government in developing countries.
- A screening procedure to assess the importance of any new proposed project, international or domestic, prior to the commitment of resources to it. There are always more working projects than money and staff available. Starting too many will merely extend development time, create frustration and make programme management problematic. Such a screening process could involve a "score card" approach and a minimum entry score for any proposal. The score card should cover issues of economic development, export importance, health and safety, consumer requirements, regional harmonization requirements or relationships to proposed legislation. Alternatively, a formal programme of project consideration acceptance by a standards policy committee may be used to screen project proposals.

6.2 Development procedure

An NSB should establish new standards and amend or revise existing ones through the medium of a technical committee (TC). It is desirable to form a TC from a representative group of stakeholders in each technical area of interest, and, where necessary, to subdivide the work between more focused sub-committees that concentrate on specific subject areas and report to the parent TC.

The large NSB may choose to take policy advice from sector boards, at a higher level than that of a TC, that would be responsible for overseeing the establishment and work programmes of TCs within their scope, and for setting priorities; alternatively, a small NSB may choose to use a single standards policy committee for this purpose.

Where a TC wishes to develop a standard itself rather than adopt an

existing international or regional standard, it should establish a working group of a few technical experts to draft the standard for consideration by the full TC. However, a developing country is better advised to use TCs as mirror committees of international standards committees, and to seek to adopt, preferably without modification, as many international standards as possible. Adoption with modification should only take place where essential reasons exist for so doing; the tendency to modify standards to suit local capabilities should be avoided as far as possible, and enterprises should be encouraged to focus on improving their capability to the extent that they become able to meet the requirements of the standards.

As a general rule, a developing country NSB should aspire to monitor international developments of interest to its economy at national and, in cooperation with its neighbours, regional levels. This can be achieved through the medium of such mirror committees before embarking on the costly and time-consuming task of developing its own standards. The advantages are clear – purely national standards ultimately work against national interests when a suitable international alternative exists and is in use by other countries, especially those that are trading partners.

Within a TC, there should be voting rules that establish when the TC has reached consensus.

The NSB should document its standards development procedure and make it available free of charge (perhaps via its Web site) to all interested parties.

The following generalized procedure should be used in establishing a new standard:

Stage 1	**Identification of the need for a standard** This can arise from the perceived need of any of the stakeholder groups (i.e. reactive), or it can develop from analysis of future needs by the NSB.
Stage 2	**Screening and justification of the project** Apply the screening tool to establish whether work on the proposal should be advanced and whether it fits in with the long-term strategic programme.
Stage 3	**Assessment of existing published standards or work in progress within international, regional or national bodies** Determine whether there is an existing published or draft standard at the international or regional level or via another NSB.

Stage 4	**A. If another published standard covers the proposal** If another international or other standard exists, assess it to determine whether it can be adopted unchanged. If so, implement adoption. **B. If there is a suitable standard in development elsewhere** Approach the developing body, advise it of your interest in adoption and seek to input your national requirements to influence the standard's content, then adopt it with the permission of the developing body. **C. If a comparable standard exists that needs modification prior to adoption** • Seek approval from the relevant sector board or the standards policy committee to include the proposal in the work programme. • Establish a technical committee, if one does not already exist in the technical field, composed of representatives of involved stakeholders to develop the new standard. The technical committee should prepare a project plan with priority assessments and target completion dates. • If the project involves adopting and modifying an existing international, regional or another country's national standard, the following factors should be taken into account. – Modifications should only be made for specific scientific or economic criteria, rather than to artificially "tailor" them to the country (this process would create a new technical barrier to trade). Factors that are unique to a country or region, e.g. temperature (absolute and diurnal range), humidity, soil conditions, salinity, cultural issues, economic limitations, etc., should be established in a technical memorandum and, once detailed, no variations from this list of criteria should be permitted. – If modifications are necessary, follow ISO/IEC Guide 21:2005 (Part 1 or 2).
	D. If no standard exists or there is none in development elsewhere • Agree in the TC on the scope of the future standard. • Ensure that the standard has a sound technological basis, is economically justifiable and is implementable. • Development should ensure that it will be as widely accepted as possible by all stakeholders.
Stage 5	Consensus building within the TC Submit the draft (or the text of the existing standard that is to be adopted) to the TC for comments and their resolution, until consensus is achieved. Voting rules should be used to establish consensus.
Stage 6	Public enquiry, ratification and publication After the TC has reached technical consensus, submit the draft standard to a public enquiry process prior to ratification by the standards policy committee and publication. (If the public enquiry generates technical objections, refer these to the TC for resolution prior to ratification.)

In addition to the generic procedure given above, for those countries that wish to adopt international standards and where the first language is not one in which international standards are prepared, the issue of translation becomes very important. Sufficient time and resources need to be allocated to complete this task and to enable stakeholders sufficient time to judge the suitability or otherwise of a given standard. The international standards organizations allow for this by incorporating lengthy public enquiry periods into their procedures, but obtaining resources for translation can be a difficult and ongoing problem for some developing countries. Regional solutions to this problem should be sought where appropriate.


Sale

Part 7. Information, sales and promotion

7.1 The needs of a national standards body's stakeholders

Perhaps the most essential role of a modern NSB is to be capable of monitoring international developments in standardization fields relevant to its national economy, and of supplying rapid information regarding standards, conformity assessment and technical regulations. This is especially critical for developing countries which often have few private sector information sources. Studies have shown that the lack of such information is a significant problem for industry, as the availability of advice on standardization issues is critical to economic performance.

The availability of information and advice on standardization issues is critical to economic performance.

At the outset, the NSB should design its information system with security in mind and should be inspired by ISO/IEC 27001:2005[14]. If users of the system are to trust the NSB, the latter should provide the guarantee that queries submitted are not disclosed to third parties. A manufacturing company, for example, might need information for export of its product on a given market and would not wish either its queries or the information retrieved to be disclosed to its competitors.

A natural consequence of the provision of information is the distribution of paper and electronic copies of international and national standards and of standards published by other bodies, as many companies require having their own copies of standards to which they are working. Sale can therefore become a major activity and source of income for an NSB in a developing country, and appropriate planning and resources should accompany the establishment of sales and information activities. Usually this requires that the NSB become a member (for example, of the international standardization organizations) or conclude distribution agreements with the publishers concerned. In addition to the financial flows involved in such agreements, issues such as copyright

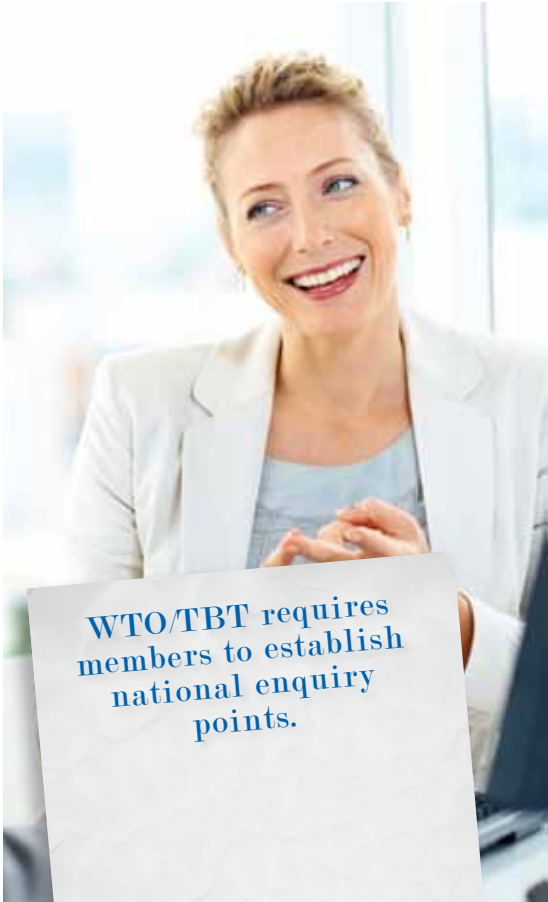
14) ISO/IEC 27001:2005, *Information technology – Security techniques – Information security management systems – Requirements.*

and intellectual property rights (IPR) protection have to be attended to.

As a sales and information centre develops and resources permit, additional value-added services are usually proposed to industry and to standards users in general, that can also generate significant income for the NSB. Such services can include, for example, the provision of information on standards developments in identified subject areas for subscribing customers, automatic notification of amended, revised and new standards in identified areas to subscribers, the sale of standards through Web stores, allowing the immediate delivery of products, and the sale and regular updating of compilations of standards in paper or electronic formats for customers who require them.

Additionally, the WTO, as part of the TBT agreement, requires each member to establish one or more national enquiry points which can respond to all reasonable questions regarding technical regulations, standards and conformity assessment. This enquiry point should also be able to supply relevant documents. The sales and information centre of an NSB is an efficient location for a WTO/TBT enquiry point.

Other promotional and marketing activities can be provided by an NSB, subject to demand and the necessary resources. Examples are workshops for industry to explain the implications and content of new standards, and launch functions to accompany the publication of key new standards, etc. These are potential sources of extra income where industry is willing and able to pay. In many developing countries, where a mature "quality culture" does not yet exist, it might be necessary for the NSB to seek donor funding to organize such activities and then to present them free as a service to stakeholders.



7.2 The information centre

A standards information centre should be organized so as to maintain awareness and be able to find information on standards quickly and to pass it on to interested parties, who might be physical "walk-in" customers, telephone or email enquirers or subscribers to an information provision scheme. In a developing country, the initial response to this need is to maintain a collection of paper, and increasingly electronic, copies of standards and journals. As the NSB grows, additional facilities can be added.

These include:

- Entering into commercial and reciprocal agreements with external standards providers
- Providing conventional library services, including the facility for customers to consult paper or electronic copies of standards
- Having the ability to search for standards information on the Web or by means of subscriptions to commercial services such as "Perinorm" [15)]

15) Perinorm is a bibliographic database dedicated to assisting users on standards and technical regulations enquiries. It is a bibliographic database of national, European and international standards from 23 countries – a total of more than 1 400 000 records.

Note: Poor infrastructure in the least developed countries typically puts this type of activity out of reach of an NSB, but is an ideal opportunity for donor assistance to make a difference.

- Employing trained, technically qualified information officers who can respond accurately to across-counter, telephone or written enquiries
- Providing technical help to exporters and SMEs, including links to relevant Web sites and services, support documentation, etc.

Note: This is of special importance where the NSB also functions as the WTO/TBT national enquiry point.

- An interface to the standards sales function

The material held should eventually grow to encompass:

- National standards (including drafts)
- Regional, foreign and international standards
- Technical regulations
- Obsolete standards (national, international, etc.)
- Translations of foreign language standards
- Catalogues, bibliographies and handbooks
- Standardization periodicals

In addition to the above, the following general information products

should be retained in paper form, CD form or in an electronic database:

- Thesaurus
- Dictionaries
- Indexes and directives
- Information bulletins
- Technical reference material

Research in six of the largest NSBs has shown that some 70% of all enquiries relate to, or result in, the purchase of a standard. Some 25% involve the supply of detailed information and the balance of 5% requires consultancy and in-depth research. In order to avoid major staff costs, it is recommended that, as an NSB develops, as much information as possible be put on the NSB's Web site. Even questions regarding the interpretation of clauses can be facilitated by an enquiry form on this Web site, which can then be forwarded to the relevant technical committee for response. To cater for complex requirements, a small consultancy unit can be established and charges should be made for the services provided.

For NSBs that also carry out metrology and conformity assessment activities, the information centre can take the form of a call centre to which all incoming telephone enquiries are directed, and from which customers may be routed to the appropriate department.

70 % of all enquiries relate to, or result in, the purchase of a standard.

7.3 The standards sales function

Standards are not mere information. They represent the distilled wisdom of experienced leading technical experts. Thus, the value of a standard is not in its marginal cost of transmission – the cost of the paper it is printed on or other costs directly associated with the delivery – but in the value of the advice and guidance it offers. Standards should therefore be priced accordingly – at a level that reflects their value and also attempts to cover, partly or entirely, the costs involved in their development and publication.

Income from the sale of standards documents can typically represent a major income stream for a standards body. In some countries, such income represents more than 50% of total income. Pricing is a national decision but has to reflect the value of the content of standards, while at the same time taking into account affordability. In particular, NSBs should resist pressure to make standards available at a very low price (or even free), as this devalues the process by which they were created, and can negatively impact the financing of standards bodies in neighbouring countries and the standardization system as a whole.

Modern technology permits the "printing on demand" (POD) of paper copies of standards from master electronic copies. While in many developing countries this technology is not in wide use in view of its capital cost, as the demand grows for standards, there is a business case for abandoning the expensive storage of paper copies of printed standards in favour of the POD route. Similar considerations apply with the dissemination by electronic means of standards purchased via Web stores.

In addition to standards, some NSBs supply the texts of technical regulations. These are often supplied on behalf of governments free or at a low cost, as they constitute legislation that

has to be available to all. Where the NSB also carries out the function of a WTO/TBT national enquiry point, this is especially relevant.

Other standards deliverables and formats can be developed and sold, such as CD-ROM or DVD versions, electronic compilations or sets of standards within a subject area, etc.

An NSB that does not have the technology to produce such products may contract with a commercial organization or another standards body – even in another country – to print and despatch under contract. Typically, the sales price received by the external organization would be remitted, less an agreed commission, to the NSB. Similarly, creation and maintenance of a Web site, together with a Web store for standards sales, can be subcontracted where the demand and financial figures warrant it.

7.4 Distribution of international standards and sales policy

It is important to realize that stakeholders may require copies not just of national standards but also of international standards. It is therefore sensible to offer to obtain these for customers, charging for them as appropriate.

In those countries where there is no sales or distribution capability for standards, this often results in stakeholders approaching the international standards organizations directly for copies of their standards. ISO has a formal commercial policy on supplying ISO standards. This policy covers the conditions of ISO members to reproduce and sell original versions of ISO standards, or certain types of national adoptions. This policy is called ISO POCOSA 2012[16]. The main objective of POCOSA is to ensure the widest possible dissemination of ISO standards, allocating responsibilities to ISO members regarding exploitation rights, copyright protection and the treatment of national adoptions.

The IEC has a similar sales policy. Customers wanting to purchase IEC publications can either contact their local NC (national committee), an NC appointed sales outlet or the IEC Central Office in Geneva. A list of authorised distributors is available on the IEC webstore.

16) *ISO Policies and Procedures for Copyright, Copyright Exploitation Rights and Sales of ISO Publications.*

NSB members of ISO are responsible for protecting the copyright of ISO standards in their jurisdictions.

7.5 Copyright in standards

Copyright is part of the generic area of "Intellectual Property". Anyone who creates and records an original product of the mind becomes the owner of the copyright. Copyright is deemed to exist in an original work. In theory, it is automatic and does not need registration or claim, provided that the work is fixed or recorded in some form, although NSBs are recommended to protect their standards, and those of the international standards organizations that they transpose as national standards, by appropriate means, such as a visible copyright sign and notice. It should be noted that NSBs that are members of ISO are responsible for protecting the copyright of ISO standards in their jurisdictions. Legal advice should be obtained where necessary. Additional information may be found in the ISO/IEC brochure *Copyright, standards and the Internet*.

Copyright law is not uniform throughout the world. Since copyright in a standard may vary dependent upon where it is created, a careful assessment of applicable legislation is advisable.

Whilst copyright laws are complex and not uniform, there are important international instruments, such as the Bern Convention (1886) or the WTO Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement, which include useful guiding principles.

7.6 Promotion

An NSB has a duty to promote itself and its products and services to stakeholders in support of the national economy as well as to promote the benefits of standards. Communicating in the print media or on television, enhancing public awareness of standards issues and the establishment of good relations with the media are typically part of a public relations strategy. Where the demand exists, commercial workshops or seminars can be organized around standards issues or in conjunction with international standards meetings, even on a regional basis.

Some NSBs run membership or subscription schemes as a means of attracting interest; typically in return for an annual subscription from an industry member, the NSB gives discounts on standards or other services it provides. These schemes have generally not been successful in the developing world where the prices of stand-

An NSB has a duty to promote the benefits of standards and its products and services to stakeholders in support of the national economy.

ards are relatively low and demand in industry is insufficient to make it a viable proposition. Nevertheless, subscription-based standards-updating schemes can be commercially successful and provide a valuable service to industry.

A dedicated Web site for the NSB, that is active and regularly updated, can be an excellent promotional tool and a simple means of publicizing general developments, making available draft standards for public enquiry and publishing the standards development work programme (a requirement of the Code of Good Practice for the Preparation, Adoption and Application of Standards – see annex).

7.7 WTO/TBT national enquiry point

The issues surrounding the possible incorporation of a WTO/TBT enquiry point into a national standards information centre are beyond the scope of this document, and require specialized training and information.

Part 8. International and regional relations

8.1 The need for ongoing monitoring of developments

A national standards body needs to be able to monitor international and regional developments in the technical standards areas in which its country has an interest, irrespective of whether it participates actively in the international work. This is because the country's trading partners will of necessity also be following the development of new standards in areas that concern them, and it is likely that national or regional standards will need to be set, either by adopting the international standards (the WTO preferred route) or by other means, to keep pace with developments in technology and markets. To ignore developments in international standardization could prejudice the country's chances of trading in the related products in the future. This implies a need for international liaison, which can take many forms, depending on whether a country is a provider or an active developer/adopter of standards.

To ignore developments in international standardization could prejudice a country's chances of trading in the related products and services in the future.

8.2 Resources required for international participation

When a country decides to participate actively in the development of international standards, it will be necessary for its NSB to maintain mirror committees and to channel draft international standards and requests for voting and comment backwards and forwards between the international standards committee and the local mirror committee, and to keep scrupulous records. The resources required in the NSB might vary from one person spending less than their full time on a combination of ISO and IEC related work, to the creation of separate ISO and IEC Offices, each employing several people.

Even where a country does not participate actively in a technical sense (for example, where it is a correspondent or subscriber member in ISO, or an associate member or affiliate in IEC), its needs and those of its stakeholders might require that records of the progress of draft standards in areas of interest be kept, in order to keep local industry informed and facilitate the national standards-setting process at an appropriate stage.

The form of relation with ISO and IEC and the resources required for it

will thus depend on the level of activity undertaken. The advent of electronic balloting in both organizations now requires a certain degree of IT infrastructure and connectivity, which might not readily exist in the least developed countries. To send national representatives to international standards meetings (technical committees, subcommittees, working groups, etc.) in order to influence the content of those international standards costs money, and available resources have to be applied in targeted areas where they are most effective and relevant for the economy of the country concerned. A budgeting and approval process is required at the beginning of each year to highlight those areas in which resources are to be applied. In many countries, this requires that the government's role in adequately funding these activities be formalized.

Resources have to be applied in targeted areas, where they are most effective and relevant for the economy.

8.3 Regional cooperation

It is through participation in international standardization work that developing countries within a region can benefit their region greatly by establishing not only their national positions, but also defending their regional positions in the international environment. This requires planning, cooperation and coordination at a regional level.

When it comes to hosting international standards meetings, this can be a costly exercise for a developing country. However, the benefits to local industry from hosting such meetings cannot be underestimated. A good strategy to employ when a developing country is considering making an offer to host such a meeting is to encourage other standards bodies in the region to assist with funds, and to organize in conjunction with the meetings a regional workshop, wherein the international experts attending the meeting can be requested to remain in the country for an extra day or so and give of their time in passing on their knowledge to local industry representatives. Workshops of this nature can often be run at a profit, and can mitigate the costs of hosting the meeting whilst at the same time allowing local industry members from the region to interact with world experts. It is not merely the written standard

that can facilitate technology transfer to developing countries, but also the leverage that can be obtained from the standards-setting process.

> Planning, cooperation and coordination at a regional level are necessary.

Sponsorships from local or regional industry and local branches of multinational companies can also prove effective, provided that commercial advertising and promotion are kept within reasonable limits.

8.4 Twinning

Developed countries hold the secretariats of over 90% of the technical committees and subcommittees established by ISO and IEC. It is therefore not surprising that few developing countries' NSBs possess the trained personnel required for providing secretariat assistance and management to international standards committees. Committees are encouraged to take major decisions by correspondence rather than at meetings, and to hold meetings only when absolutely necessary, in order to reduce the costs of participation. In ISO, while encouraging all member bodies to consider "twinning" arrangements at all levels, member bodies in developing countries are encouraged to offer to host ISO meetings and are given preference when applying for vacant committee secretariats. Participants in the IEC Affiliate Country Programme learn to establish an NEC (national electrotechnical committee) to monitor relevant technical work in their technical committees with a view to participate in the development of IEC international standards and to facilitate their adoption on the national level. Affiliates Plus also benefit from a mentoring approach from IEC members and technical committees.

DEVCO, the ISO Committee on developing country matters, encourages

twinning arrangements between developed and developing countries, aimed at facilitating the transfer of necessary skills, and the ISO Technical Management Board has published guidelines for achieving this goal. If properly implemented, twinning arrangements can assist in improving the standardization infrastructures and capacities in developing countries and can enhance their participation in international standardization. The ISO Strategic Plan for the period 2011-2015 includes as its Key Strategic Objective 3:

"The capacity and participation of developing countries in international standardization is significantly enhanced".

In September 2010, the ISO Council endorsed the ISO Action Plan for Developing Countries 2011-2015. This Action Plan comprises six outputs, of which the following two relate to participation:

" Capacity built in standardization and related matters for ISO members and their stakeholders", and

"Increased participation in ISO technical work".

Typically, the principal objectives of a twinning arrangement are for the developing country seeking assistance and capacity building to learn by doing, by truly administering the relevant committee role. Its developed country partner provides training, guidance and assistance to ensure that the developing country NSB builds the skills necessary to take on similar committee management roles in the future.

Twinning facilitates the transfer of necessary skills.

8.5 Other assistance provided to developing countries

While a number of international organizations such as UNIDO provide targeted training and other aid interventions to developing countries, capacity building in the field of standardization is highly specialized. Fortunately, help is at hand. DEVCO's aims are

- *To identify the needs and requirements of developing countries in the fields of standardization and related areas (quality management, metrology and certification, etc.) and assist developing countries, as necessary, in defining these needs and requirements*
- *Having established these needs and requirements, to recommend measures to assist developing countries in meeting them*

- *To provide a forum for the discussion of all aspects of standardization and related activities in developing countries, and for the exchange of experience between the developed and developing countries, as well as among developing countries*
- *To advise the ISO Council on the above matters*

DEVCO membership is open to interested member bodies as participating or observer members, and to interested correspondent members as observer members. It has a chair, from a developing country member, and a secretariat based at ISO in Geneva. DEVCO meets in plenary session once a year prior to the ISO General Assembly and its Chairs' Advisory Group meets more frequently.

ISO, through the Development and training services unit (DEVT) based at the ISO Central Secretariat, implements the following types of activities:

- Providing national, regional and global training and awareness-building seminars and workshops in developing countries on topics related to standardization for ISO members and industry
- Building capacity at the level of ISO members and their stakeholders in the development and use of international standards
- Further training of officers of ISO members in developed and developing countries
- TC chairs' and secretariat training
- Coordination of sponsorships to attend technical meetings, where donor funds exist
- Provision of reference publications on technical matters related to standardization

It should be noted that developing countries can pay significantly reduced membership fees to ISO through the correspondent and subscriber categories of membership. Further details are available from the ISO Central Secretariat.

The ISO Central Secretariat also provides training on the IT tools and templates associated with the standards development process, and has published various helpful documents aimed at providing basic information on the ISO Committee processes, such as *My ISO Job* and *Joining in*, both of which are obtainable from the ISO Central Secretariat. A brochure on the training offered by ISO is also available from the same source. A new ISO training course is under development on Good Standardization Practice, focusing on implementation of the Code of Good Practice for the Preparation, Adoption and Applica-

tion of Standards (see the annex of this document).

Officers from developing countries and from countries with economies in transition are also occasionally sponsored to attend ISO technical committee meetings that are of interest to them. In particular, a large number of developing countries have been sponsored to attend meetings of ISO/TC 176, *Quality management and quality assurance*, and of ISO/TC 207, *Environmental management*, and a large capacity-building programme has been deployed to support standardization initiatives in the field of social responsibility.

Within the field of conformity assessment, CASCO, the ISO Committee on conformity assessment, has embarked on a programme to convert many of the numerous conformity assessment guides and standards into an integrated set of standards in the ISO 17000 series, known as the "CASCO Toolbox". DEVT holds various regional workshops in developing countries aimed at enhancing awareness of the CASCO Toolbox.

In addition to ISO, various other international bodies involved in standardization have special committees for developing countries and set lower fees for developing countries. All employ various measures to encourage participation in their technical meetings, such as:

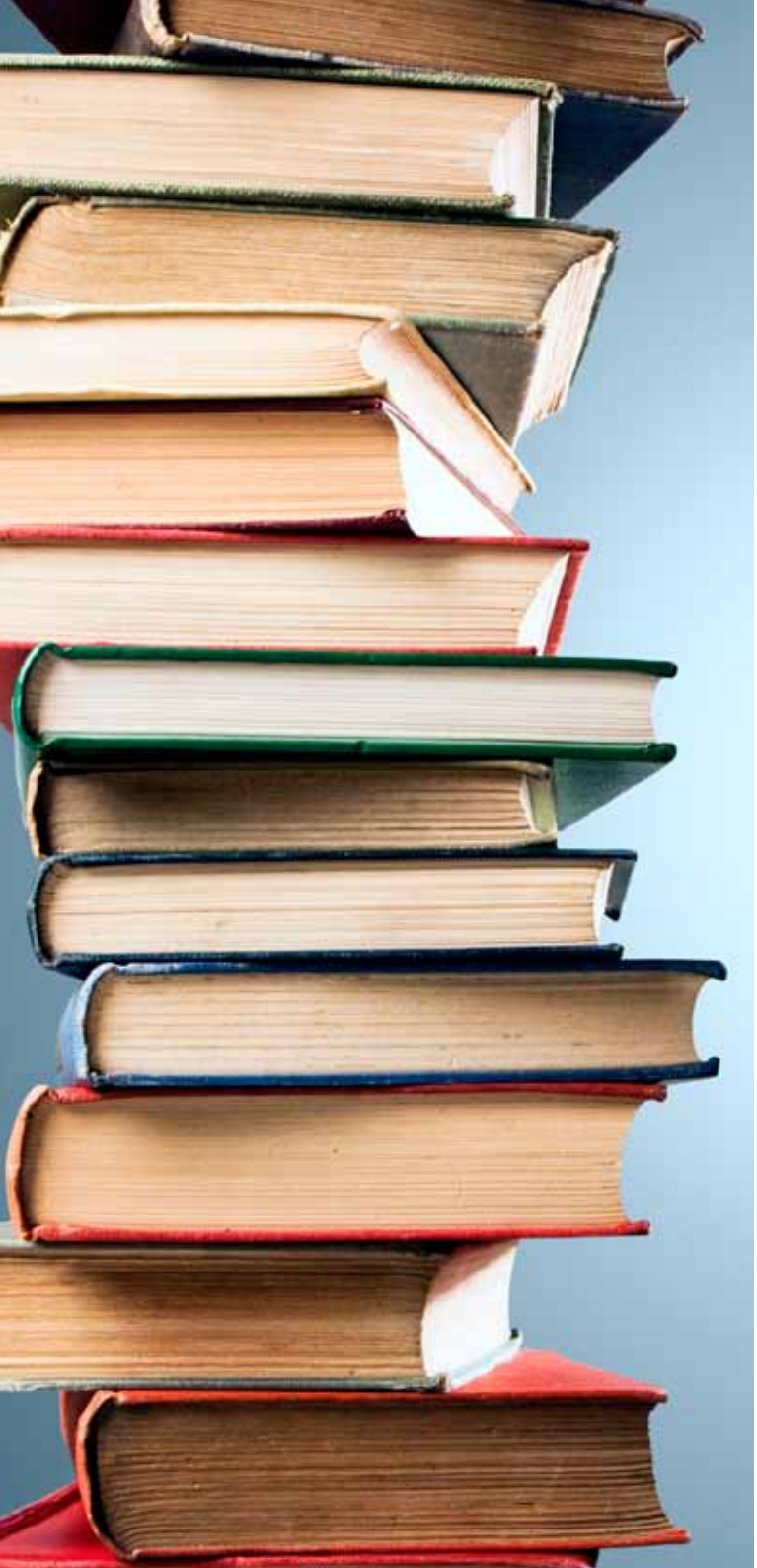
- Providing financial assistance to attend meetings
- Encouraging written submissions on proposals and electronic voting
- Holding workshops to improve the participation of developing countries

These measures are complemented by the establishment of trust funds by international organizations such as FAO, WHO, WTO and the World Bank for, *inter alia*, facilitating attendance of developing countries at meetings and enhancing their capacities for participation in standardization activities.

8.6 Regional representation of the international standards organizations

Regional and sub-regional levels of cooperation on standardization and related matters are those most suitable for organizing training, sharing experience and optimizing participation in international standardization, and all international standards organizations are active on a regional basis. In particular, the ISO Action Plan for Developing Countries, which is based on a broad consultation of ISO members and international organizations through contacts, surveys and regional seminars, defines a number of actions designed to mobilize its members, regional organizations and donor agencies. Within ISO, nine regions have been identified. The DEVCO Chairs' Advisory Group, which is responsible for monitoring progress against the Action Plan, is comprised of 11 senior representatives from different regions (eight of whom are from developing countries).

IEC has three regional centres for Asia-Pacific, Latin America and North America located in Singapore, São Paulo (Brazil) and Worcester, Massachusetts (USA), respectively. The mission of the regional centres is to promote awareness of the IEC in the regions, increase the use of IEC international standards and enhance participation of all countries in the regions in the Commission's work.



Part 9. Further reading

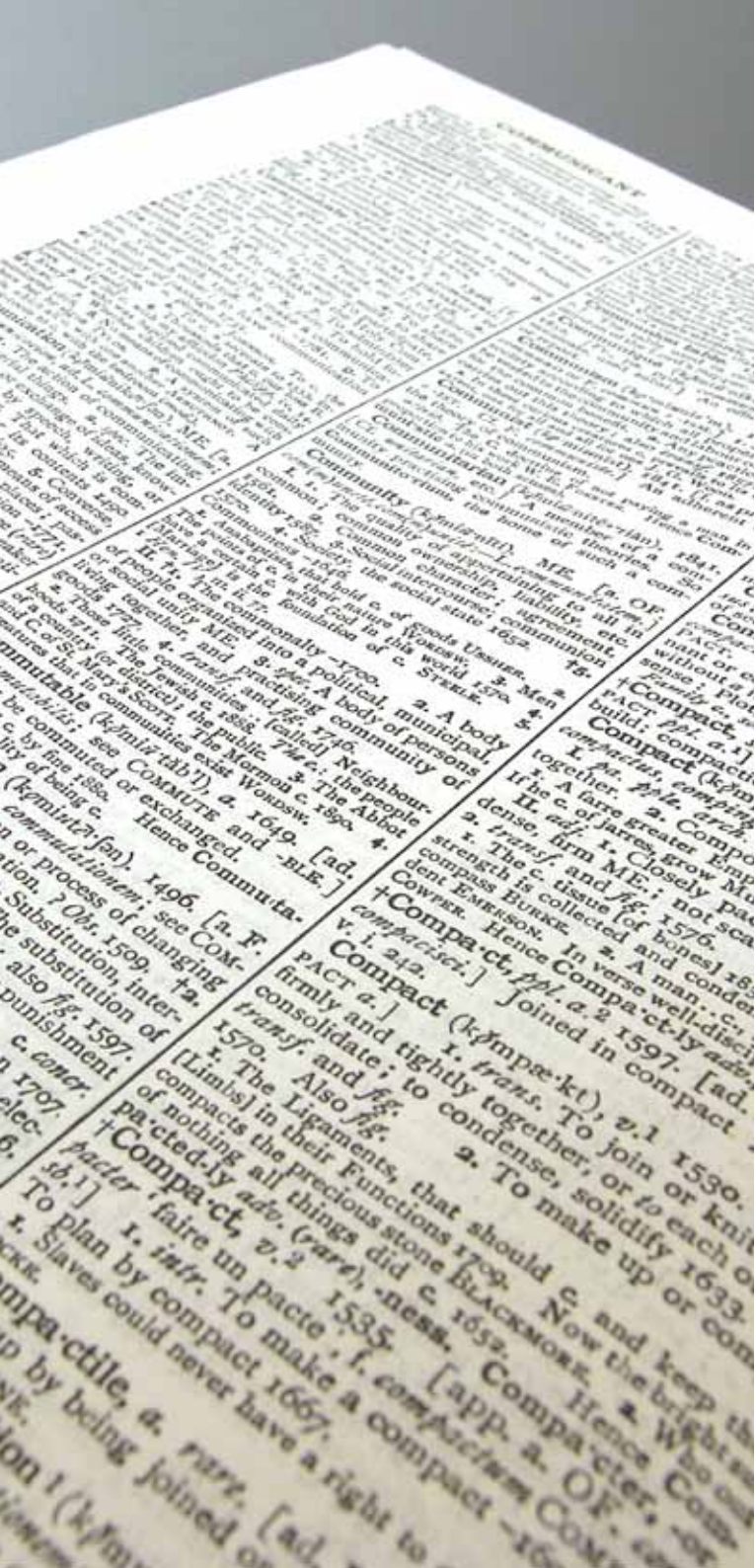
WEB sites

- BIPM Website: ***www.bipm.org***
- IEC Website: ***www.iec.ch***
- ISO Website: ***www.iso.org***
- ITU Website: ***www.itu.int***
- OIML Website: ***www.oiml.org***
- UNIDO Website: ***www.unido.org***
- WTO Website: ***www.wto.org***

Publications

- ISO Action Plan for Developing Countries 2011-2015, available at: ***www.iso.org/iso/resources/developing_countries/publications_and_resources_devco.htm***
- ISO brochure *Joining in* - Participating in International Standardization, 2007 available at ***www.iso.org/iso/joining_in_2007.pdf***
- ISO Code of Ethics available at ***www.iso.org/iso/codeethics_2004-en.pdf***
- ISO POCOSA 2012: Policy for the distribution of ISO publications and the protection of ISO's copyright
- ISO Strategic Plan 2011-2015 available at ***www.iso.org/iso/iso_strategic_plan_2011-2015.pdf***
- ISO/IEC brochure *Copyright, standards and the Internet* available at ***www.iso.org/iso/copyright_information_brochure.pdf***
- ISO/IEC Directives: 2004
  - Part 1 – Procedures for the technical work
  - Part 2 – Rules for the structure and drafting of international standards
- Supplement Procedures specific to ISO, available at ***www.iso.org/directives***
- ISO/IEC: Using and referencing ISO and IEC standards for technical regulations, 2007, available at ***www.iso.org/iso/publications_and_e-products/standards_development_publications.htm***

DCMAS: Building corresponding technical infrastructures to support sustainable development and trade in developing countries and countries in transition, available at ***www.dcmas.net/public-docs/background_paper_2005.pdf***



Annex

Extract from the WTO "Code of good practice for the preparation, adoption and application of standards" (Published as Annex 3 to the WTO Agreement on Technical Barriers to Trade)

"SUBSTANTIVE PROVISIONS

D. In respect of standards, the standardizing body shall accord treatment to products originating in the territory of any other Member of the WTO no less favourable than that accorded to like products of national origin and to like products originating in any other country.

E. The standardizing body shall ensure that standards are not prepared, adopted or applied with a view to, or with the effect of, creating unnecessary obstacles to international trade.

F. Where international standards exist or their completion is imminent, the standardizing body shall use them, or the relevant parts of them, as a basis for the standards it develops, except where such international standards or relevant parts would be ineffective or inappropriate, for instance, because of an insufficient level of protection or fundamental climatic or geographical factors or fundamental technological problems.

G. With a view to harmonizing standards on as wide a basis as possible, the standardizing body shall, in an appropriate way, play a full part, within the limits of its resources, in the preparation by relevant international standardizing bodies of international standards regarding subject matter for which it either has adopted, or expects to adopt, standards. For standardizing bodies within the territory of a Member, participation in a particular international standardization activity shall, whenever possible, take place through one delegation representing all standardizing bodies in the territory that have adopted, or expect to adopt, standards for the subject matter to which the international standardization activity relates.

H. The standardizing body within the territory of a Member shall make every effort to avoid duplication of, or overlap with, the work of other standardizing bodies in the national territory or with the work of relevant international or regional standardizing bodies. They shall also make every effort to achieve a national consensus on the standards they develop. Likewise the regional standardizing body shall make every effort to avoid duplication of, or overlap with, the work

of relevant international standardizing bodies.

I. Wherever appropriate, the standardizing body shall specify standards based on product requirements in terms of performance rather than design or descriptive characteristics.

J. At least once every six months, the standardizing body shall publish a work programme containing its name and address, the standards it is currently preparing and the standards which it has adopted in the preceding period. A standard is under preparation from the moment a decision has been taken to develop a standard until that standard has been adopted. The titles of specific draft standards shall, upon request, be provided in English, French or Spanish.

L. Before adopting a standard, the standardizing body shall allow a period of at least 60 days for the submission of comments on the draft standard by interested parties within the territory of a Member of the WTO. This period may, however, be shortened in cases where urgent problems of safety, health or environment arise or threaten to arise.

M. On the request of any interested party within the territory of a Member of the WTO, the standardizing body shall promptly provide, or arrange to provide, a copy of a draft standard which it has submitted for comments. Any fees charged for this service shall, apart from the real cost of delivery, be the same for foreign and domestic parties.

N. The standardizing body shall take into account, in the further processing of the standard, the comments received during the period for commenting. Comments received through standardizing bodies that have accepted this Code of Good Practice shall, if so requested, be replied to as promptly as possible. The reply shall include an explanation why a deviation from relevant international standards is necessary.

O. Once the standard has been adopted, it shall be promptly published.

P. On the request of any interested party within the territory of a Member of the WTO, the standardizing body shall promptly provide, or arrange to provide, a copy of its most recent work programme or of a standard which it produced. Any fees charged for this service shall, apart from the real cost of delivery, be the same for foreign and domestic parties.

Q. The standardizing body shall afford sympathetic consideration to, and adequate opportunity for, consultation regarding representations with respect to the operation of this Code presented by standardizing bodies that have accepted this Code of Good Practice. It shall make an objective effort to solve any complaints."

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