

The Need For Standardisation In the Developing World

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Abstract. Standardisation is a key part of the microeconomic infrastructure with the benefits arising from the reduction of costs and the growth of quality. It is in Nigeria's interest to engage in international standardisation activities as such is of benefit to the economy. This paper aims to raise awareness on the importance of standardisation activities, its economic and other effects, as well as the importance of taking part in the process of developing standards within the International and national standardisation bodies. Identifying the positive relationship between perceived effects of standardisation as innovative, economic, technical-technological and social effects, this paper also identifies approaches through which Nigeria's standardisation bodies (SON and NNIEC) may engage with international standardisation bodies with the view of maximising its socio-economic benefits.

Keywords: Standardisation, economic development, international trade

1 Introduction

The spread and dissemination of new technologies is often coupled with standardization of product and process innovations. New technologies, when first conceived and implemented, are often complex and require skilled personnel to operate. At this stage, their use in the economy is limited both by the patents of the innovator and the skills that these technologies require. Their widespread adoption and use necessitate the tasks involved in these new technologies to become more routine and standardized, ultimately enabling their cheaper production using lower-cost unskilled labour. Social-economic development tends to tilt towards greater division of labour and specialisation of organisations that results in the definition and definition of standards through the exchange of knowledge and goods.

When one thinks of standardisation, it is usually in reference to the technical domain and the various technical environment frameworks that exists. It is however worth noting that non-technical domains, e.g., the service sector, have a tradition of standardisation as well. In this paper, I use the term standardisation widely but with specific reference to the technical domain. Standardisation in relation to products has long been a key element of trade and procurement particularly in the international sense, and often in response to regulatory requirements, e.g., safety, or because of conflicting commercial requirements. Participation in standardisation committees is one specific form of alliance formation. Yoshino *et al* in [1] states that standards setting qualifies as alliance

formation because the participating firms stay independent after the alliance formation, share benefits and control, and contribute to mutually defined goals. In standards setting alliances, firms voluntarily cooperate with competitors and form partnerships with other stakeholders such as public research laboratories and consumer organisations. Such participants jointly discuss and design technical specifications and can coordinate their efforts to create common technical solutions [2]. In general, standardisation causes self-regulation among the participants in innovation systems and promotes further progress within the existing technological path.

Furthermore, as technologies evolve complex, technical gaps between developed and developing countries widened [3][4]. Developing countries have traditionally been standard takers, taking foreign-made standards as given and complying with them to achieve trade goals [3][5]. Standards have been a key component for national scientific and economic policies in developing countries, by unifying isolated measurements and complying with global needs. Despite the importance of standards, developing countries have rarely been visible in standardisation. In particular, developing countries are passive in the activities of international standardisation due to limitation of technical capacity and resources [6].

Under such circumstances, firms in developing countries have improved borrowed technologies and modified them to meet their needs within the technological frames given by developed countries [7]. One of these technological frames is [technical] standards, defined by International Standard Organization as '*document[s] that provide requirements, specifications, guidelines, or characteristics that can be used consistently to ensure that materials, products, processes, and services are fit for their purpose.*' Standards describe demonstrable features or conditions, that can be inspected or assessed. Standards can be defined as rules, guidelines, or characteristics established by consensus and approved by a recognised body. A standard is an institutionally established agreement

2 The Role of Standards

Voluntary, consensus-based standards play a vital, though largely invisible role in national and international infrastructures, economies and trade. By providing agreed ways of naming, describing and specifying, measuring and testing, managing and reporting, standards provide:

- basic support for commercialisation, markets and markets development.
- a recognised means for assuring quality, safety, interoperability and reliability of products, processes and services.
- a technical basis for procurement.
- technical support for appropriate regulation.

and can lead to variety and cost reduction through optimization and best practice.

There is no doubt that without standards the complex, technological world in which we live could not possibly operate. However, though standards are essentially ubiquitous, applying to virtually every aspect of our lives – from the highly innovative, e.g., internet protocols, to the mundane, e.g., shoe sizes, and including aspects that even most people actively involved in standardization do not appreciate. Standards are virtually invisible to the general public. Standards play an important role in promoting economic development and in promoting the welfare of producers and consumers. They do so by performing several functions such as:

- a) Commercial communication: Convey information about a product to the buyer in a consistent and understandable manner.
- b) Technology diffusion: Enable technological advances to be more readily adapted
- c) Production efficiency: Standardisation of parts, processes and products enable economies of scale in production.
- d) Enhanced competition: Enable easier comparison between products of different manufacturers and thus promote competition.
- e) Compatibility: Enable products to work or communicate with each other.
- f) Process management: Define procedures for the effective and consistent management of manufacturing processes.
- g) Public welfare: Provide a mechanism for promoting societal goals such as protection of health, safety and the environment.

Standards can be considered a near universal element of the world economy, pervading virtually all aspects of products, processes and services. However, whilst standardisation is key to the promotion of economic and technological development, it can also have a significant influence on trade. On the one hand, standards can promote trade by overcoming compatibility differences between countries and reducing transaction costs. On the other, where standards differ between countries these can act to impede trade flows with potentially negative welfare effects. Furthermore, differences in standards and/or conformity assessment procedures can be employed purposefully as a technical barrier to trade. Thus, in order to avoid this, increasingly the focus of standardisation has been regional and/or international, with the aim of establishing commonly acceptable standards to which internationally traded goods and services should conform.

2.1 The task of standardisation

There is an infinite number of standards; and they all differ in form and purpose. Standards can be categorised propriety or open and as *de facto* or *de jure* [8]. Typically, propriety standards are owned by a company may license them to others, while open standards are available to all potential users, usually without fee [9]. *De facto* standards achieve adoption through standards competition among rival standards consortia. Whereas *de jure* standards are adopted through consensus, which is sometimes formally expressed through industry committees or formal standards organizations. At the most fundamental level, standards help to ensure the quality and safety of products, services

and production processes, and to prevent negative impacts on health and the environment [10]. Hence, an important function of standards is to reduce risks for makers of compliant products and users of these products. In addition, standards enable companies to reap the growth and productivity benefits of increasing specialization. Charles Kindleberger in [11], expressed this clearly when he said... “[f]or the most part, standardization was originally undertaken by merchants to facilitate a progressive specialization through trade.”

In today’s modern world, specialization extends well beyond trade into manufacturing and services, including engineering, product development and research. Equally important is the international dimension. As globalization has been extended beyond markets for goods and finance into markets for technology and knowledge workers, standards are no longer restricted to national boundaries. Standards have become a critical enabler of international trade and investment – they facilitate data exchange as well as knowledge sharing among geographically dispersed participants within global corporate networks of production and innovation [12][13]. As network sociologists emphasize, the creation and diffusion of standards underlying new technologies is a driving element of contemporary globalization [14].

In short, standards are the life blood of innovation in the global knowledge economy. Today, standards are necessary not only to reap economies of scale and scope, but also to reduce transaction costs and to prevent a duplication of efforts. In addition, standards are required to enable data transfer and knowledge exchange and to facilitate interoperability of components and software within increasingly complex technology systems (e.g., a smart phone or a switching system). Without interoperability standards, it would be impossible to achieve network externalities’ which shape competition in markets for products and services that use information and communication technologies [15]. Rohlfs [16] expresses the point that in these markets, —...[a]s the set of users expands, each user benefits from being able to communicate with more persons (who have become users of the product or service). Network externalities’ imply that a company succeeds —when customers expect that the installed base of ... [the company’s] ... technology [will] become larger than any other, with the result that the customers —adopt that technology to the virtual exclusion of others [17].

Developing these interoperability standards is a complex and moving target. The challenge is to allow for a continuous adjustment to cope with technical progress. To cope with these critical challenges, standardization has become a complex and multi-layered activity that involves multiple stakeholders who differ in their objectives, strategies, resources and capabilities. Most importantly, standardization is a highly knowledge-intensive activity that requires well educated and experienced engineers and other professionals. While engineers originally created this discipline, key concepts are now shaped by legal experts as well as corporate executives and government officials – take for example, the European Directives. Schumpeter’ [18] creative destruction theory implies that economic institutions incessantly need to adjust to changes in markets and technology. This theory still holds true today as standardisation is dynamic, constantly evolving and never static.

3 Developing Countries and the Importance of Standards

The 1990s were characterised by a dramatic acceleration of world trade, with growth rates typically around 7 percent per annum. Developing country exports, with an average growth rate exceeding 10 percent per annum, increased faster than those of high-income countries as illustrated in Fig.1. This contributed to an average rate of growth in gross domestic product (GDP) amongst developing countries of around 5 percent per annum [19].

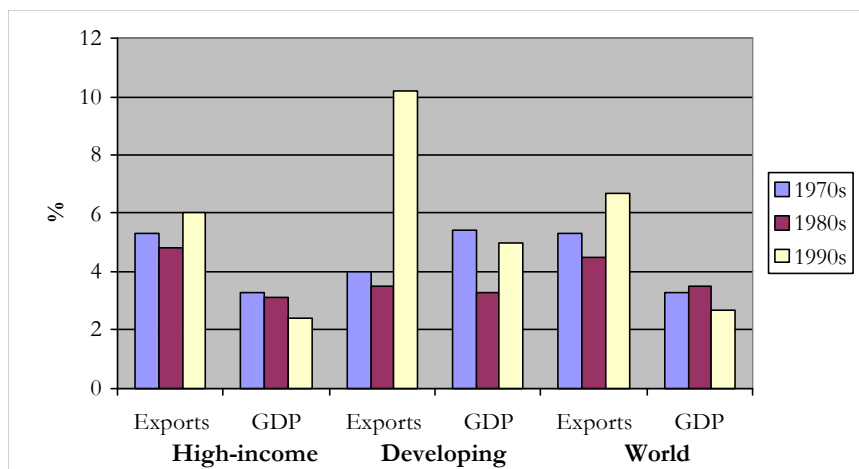


Figure 1: Growth in GDP and export volume amongst high-income and developing countries, 1970 – 90s

Reflecting the growth in world trade, the economic performance of developing countries has become increasingly reliant on volumes of imports and exports. Thus, the share of foreign trade in GDP increased in East Asia and the Pacific, Latin America and the Caribbean, and South Asia as shown in Fig. 2.

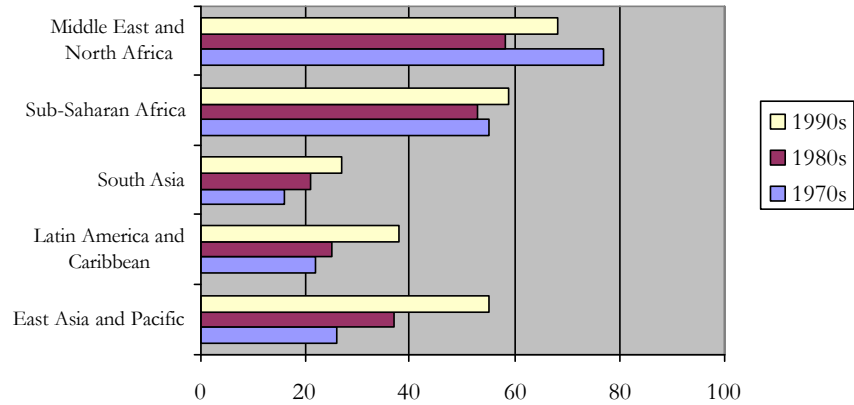


Figure 2: Foreign trade as proportion of GDP in developing countries, 1970- 90s

Whilst the share of foreign trade in GDP declined in Sub-Saharan Africa and the Middle East and North Africa, this was from a high base and foreign trade remained a major component of GDP. It is widely acknowledged that the continued and increasing participation of developing countries in world trade is one of a number of mechanisms through which sustained economic growth and, in turn, poverty alleviation, can be achieved particularly within the context of an increasingly globalised world economy [19]. This is dependent, however, on continued access to export markets, in particular those of high-income countries. Whilst traditional barriers to trade such as tariffs have declined for many goods (although remaining high in the case of agricultural products), new challenges have arisen in the form of non-tariff measures such as standards and technical barriers to trade.

Simultaneous to the proliferation of technical measures, the composition of developing country exports has changed, with growth in the share of manufactures and decline in the share of minerals and, to a much lesser extent, food. Significant differences remain, however, between developing countries, with manufactures remaining important relative to traditional mineral and/or food exports in, for example, Africa and the Middle East. Furthermore, a number of developing countries have shifted their exports towards medium and, to a lesser extent, high-technology exports. Thus, whilst traditional resource-based and low-technology products remain important exports for many developing countries, in certain markets they are directly competing against developed country suppliers. As a result of these trends, developing country exports are increasingly influenced by the standards and technical measures applied to manufactured products, as well as the wide range of measures typically applied by high-income countries to traditional exports such as food and other agricultural products. Furthermore, developing countries which have progressively shifted the focus of their exports towards medium- and high-technology products are increasingly subject to standards that are scientifically complex and subject to rapid change.

3.1 Standardisation and economics growth

Economists and economic historians have analysed factors that lead to economic growth. They expressed the understanding that technological growth is a key driver of economic growth. From the economic perspective, standards that promote interoperability are particularly important [21], as interoperability promotes efficiency. Standardization of technologies is closely linked to the development of general-purpose technologies. Standardized technologies, such as cellular connectivity, can be viewed as a general-purpose technology that enables downstream technological trajectories [22] in multiple industries [23]. Standards are a heterogeneous set [24][25][26][27][28][29], and some “upstream” standards enable a larger variety of downstream products and innovations. Swann [30] notes: *“The ultimate measure of how a standards infrastructure contributes to the economy is the sum of additional innovative products and services (and any attendant cost reductions) that grow on the back of that standards infrastructure.”*

Standardization is based on a balance between competition and collaboration (i.e., “coopetition”) where the aim is to achieve consensus [31][32][33]. Standardization can be understood as a coordination mechanism [34][26] by which economic actors can collaboratively decide the technical specifications for products, etc. based on specific criteria and through either consensus or majority vote [29]. The focus is not on increasing the variety of ideas but, in contrast, reducing the number of ideas and amount of variety. Standardization is, in essence, variety reduction [35][24]. This process leads to focused technological trajectories with reduced market uncertainty. Sometimes, there are also competing standards that can co-exist and compete on the market. It is not hard to see why increasing variety of incompatible or non-interoperable product interfaces is anything but welfare increasing. In the standardization process, decision makers collectively select technical solutions on the basis of a consensus, and there is thus no need for all of the competing standards to enter the market when competition and selection of technical solutions occur within standardization process instead [36].

Standardization has long been recognized as playing an important role in technological innovation, the diffusion of new technologies, and economic growth. Therefore, it is expected that standards’ impact on the rate and direction of technological progress and economic growth has similarly increased. Standards are a heterogeneous set, as are standard development organizations. An important aspect of standards and standardization is geography. Standards are often classified as national, international, or global [37][30]. The geographical dimension affects particularly strongly the scale effects and, in the case of compatibility and interoperability standards, the network effects of standardization. Researchers of economic growth have allocated a significant amount of their attention to country comparisons and cross-country knowledge spill overs. International trade promotes the efficient division of labour, fosters the diffusion of ideas, and causes economic growth [38]. Empirical evidence suggests that certain standards promote trade [39][40][30]. Standardization increases the size of the markets and promotes economies of scale by enabling compatibility. When standards are national and differ across countries, domestic companies may face entry barriers to foreign markets due to

incompatible standards. International standardization promotes, therefore, international competition, and competition puts pressure on companies to innovate.

3.2 The Task Ahead for Nigeria

The transatlantic movement of goods requires an understanding of global consumer values and the need to design goods such that they do not pose a hazard to the intended users. Market globalisation thus presents a perfect forum for the understanding of the differences between state legislative requirements [41]. As previously discussed, standards have become a near universal element of the world economy, pervading virtually all aspects of products, processes and services in most countries of the world. However, whilst standardisation is key to the promotion of economic and technological development, it can also have a significant influence on trade. On the one hand, standards can promote trade by overcoming compatibility differences between countries and reducing transaction costs. On the other, where standards differ between countries these can act to impede trade flows with potentially negative welfare effects [42]. Furthermore, differences in standards and/or conformity assessment procedures can be employed purposefully as a technical barrier to trade. Thus, in order to avoid this, increasingly the focus of standardisation has been regional and/or international, with the aim of establishing commonly acceptable standards to which internationally traded goods and services should conform.

In properly functioning markets, private enterprises, with the incentive to minimise costs and enhance sales, will take actions to minimise incompatibilities. This can be either through their own actions by, for example, making their products compatible with others in the market, or co-operatively through the creation of a private standards-setting body [42]. There is evidence of this in developed countries, and in particular the United States, where many private standards-setting bodies have evolved, but much less so in developing countries, where standards-setting bodies are often non-existent [43]. This suggests that standardisation is less evolved as a mechanism to overcome incompatibilities within markets in developing countries, reflecting both the structure and modus operandi of markets and the existence of resource and technological constraints [44]. The foregoing discussion suggests that standards-setting in developing countries tends to lag than those in developed economies, implying that product and process incompatibilities will be more prevalent. Furthermore, in the context of international trade, there is the potential for significant incompatibilities between the products and processes in developed countries and those in developing countries, acting as a potentially significant barrier to trade. This is a particularly acute problem in developing countries that, until relatively recently, had closed markets with little or no exposure to international trade. In summary, the relationship between standardisation initiatives and economic development in developing countries remains extremely weak, particularly in the international context [45][46].

The establishment of the Nigeria National Electrotechnical Committee as a member of the International Electrotechnical Commission (IEC) should therefore be seen an instrument by Nigeria to engage the international market and to facilitate economic growth. However, establishing the Nigeria chapter of the IEC is one element, the active

engagement of businesses and technology experts in the process of standardisation is a necessity to ensure that the anticipated economic growth is achieved and sustained. The engagement of Nigeria and Nigerian technology experts in the process will promote the transfer of scientific and technical knowledge from developed countries - standards are themselves valuable documents that contain detailed scientific and technical information. The engagement in international standards development and standardisation will also reduce the cost of standardisation in Nigeria - by transferring know-how and good practice, for example regarding methods of conformity assessment. The engagement of our standardisation bodies – Standards Organisation of Nigeria (SON) as well as NNIEC – in the international standardisation also has the benefit of promoting production efficiency and product quality, to the potential benefit of both domestic producers and consumers through, for example, lower prices. Finally, the participation of Nigeria, and by extension Nigeria experts and specialist, in this activity will lead to greater participation in international trade by reducing product and process incompatibilities and transaction costs.

Recognising Nigeria's poor position with regards to standardisation and the impact this has on its economic growth, there are potential three approaches, strictly in a standardisation sense, to overcome the trade effects of incompatibilities between standards across the global market:

- a) Co-ordination: Through this approach Nigeria can aim to reduce the gap between standards, for example through the application of voluntary international codes of practice. Whilst such efforts may facilitate trade between countries that co-ordinate their requirements at a similar level, they do not overcome the problems faced by countries adopting relatively low standards (for example developing countries) when exporting to countries with relatively high standards (for example high-income countries). Thus, co-ordination may enable trade to proceed more easily from high to low standard countries, but trade in the opposite direction will remain impeded. It is important to note that low standard countries, such as Nigeria, may benefit from participation in co-ordination, despite the fact that barriers to trade with high standard countries remain unaffected. For example, such an approach can facilitate trade between low standard countries and may be part of efforts to enhance domestic consumer protection. It may also be part of longer-term efforts to enhance regulatory capacity.
- b) Mutual Recognition: This approach is based on a recognition that technical requirements and/or conformity assessment procedures that differ can result in the same level of protection. Under mutual recognition, therefore, whilst countries may apply different technical standards, these measures are regarded as 'equivalent'. In this case, the dominant direction of trade is from low to high standard countries, presuming that lower standards are associated with lower costs of compliance. International organisations, such as the WTO, encourages Members to adopt the principle of mutual recognition to overcome the trade effects of technical measures. However, experience to date suggests that mutual recognition efforts typically take

place between countries with similar standards. On the one hand, this recognises the fact that low standards might be reasonably expected to produce a different outcome to high standards. On the other, it reflects a lack of understanding and trust between high and low standard countries over the technical measures, and in particular conformity assessment procedures that they apply. This suggests that mutual recognition is unlikely to be widely applied where major differences in standards exist, for example between low/middle income and high-income countries.

- c) Harmonisation: The other approach, and perhaps the best, is harmonisation whereby different countries strive to apply identical technical requirements and/or conformity assessment procedures. Harmonisation implies that low and high standard countries agree some mutually acceptable standard. There are three possibilities to engage in harmonisation.
- (1) Low standards countries, such as Nigeria, adopts technical measures of high standard countries
 - (2) High standard countries adopt the technical measures of low standard countries.
 - (3) Low and high standard countries may agree to adopt technical measures that are somewhere between the standards they currently adopt.

Harmonisation has the potential, at least in the medium term, to facilitate trade flows in all directions between low and high standard countries. In the short term, however, there may be significant adjustment costs that may disadvantage low and/or high standard countries depending on the level of technical measures at which harmonisation takes place. In this regard, International trade organisations place a great deal of importance on the role of international standards as a mechanism to overcome the trade effects of standards and technical regulations. International trade agreements require members to justify the standards and technical measures that they apply in terms of obligations under such international agreements. Justifications that are based on international standards are considered more favourably and are rebuttably assumed to comply with this obligation. In practice this has enhanced the status of international standards and, more generally, the work of international standards-setting organisations. In turn, it has equally focused attention on international standards-setting organisations and the extent to which developing countries are able to participate and thus represent their own particular interests. It is clear therefore with the benefits of adopting the harmonisations approach that Nigeria, through the instruments of SON and NNIEC, needs to be engaged in international standardisation efforts with the view of reducing the gaps between standards by active participating in standards development.

4 Conclusion

Standards and regulations are important factors that influence our export capability. International standardisation is one mechanism through which incompatibilities between national standards and technical measures can be overcome, with the objective of facilitating trade. Standards are established by international standards-setting organisations of which the most important are ISO and IEC. These international standards organisations aim to establish international standards through a process of consensus building, involving drafting and redrafting of standards within technical committees.

The degree to which international standards address the needs of developing countries, such as Nigeria, is dependent on the ability of developing countries to participate in international standard-setting organisations. To ensure active participation in the international standardisation arena, Nigeria has established two standardisation vehicles – the Standards Organisation of Nigeria and the Nigeria National Electrotechnical Committee. These vehicles require technical experts, subject matter experts, companies, researchers as well as products users to engage in the development and setting of standards through the participation in technical committees (International and National). It is acknowledged that resource, financial, technical expertise and infrastructure constraints are factors that have hampered Nigeria's participation in international standard setting efforts, it is important that Nigeria addresses these constraints and taps into its massive talent pool (home and abroad) to drive this effort. Finally, the paper discusses three ways in which Nigeria may engage with these international bodies and suggest that it is best that Nigeria engages these bodies on a harmonisation principle as this offers the best benefit with respect socio-economic development.

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