

EMPERICAL ANALYSIS OF THE QUALITY INFRASTRUCTURE IN TRADE FACILITATION WITHIN THE AFRICAN CONTINENTAL FREE TRADE

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ABSTRACT

Abstract

This study mainly focused on exploring the roles of standardisation and quality infrastructure systems in aiding trade and sustainable development within the African continental free trade area. This is a conceptual study. It was established that facilitating trade and sustainable development lead to attaining economic growth of any developing country. Several factors are involved in facilitating trade and sustainable development, including quality infrastructure and standardisation. These two factors foster free trade area establishment by eliminating trade barriers within the African countries. The factors can also assist speeding up the delivery time, reducing goods rejection at crossing borders, environmental protection by adhering to the ISO 14000 series of standards, add competitive advantages and many more. Despite all these benefits, African countries still are challenged regarding effective metrology institutes. To be able to foster a free trade area within African countries, each country needs to establish an influential metrology institute for carrying out all metrological activities which would provide assurance and global recognition to their products and services.

Keywords: *Quality infrastructure, Sustainable development, Standardisation, Trade*

INTRODUCTION

Background Information

Trade is imperative in the economic growth of any African country striving to achieve Sustainable Development (SD). A country attains sustainable development when it adheres to principle that meet human development, satisfies the natural system and ensure the availability of natural resources as well as ecosystem services to which the specific societies and the economy rely on (Brodhag and Talière, 2006; Giangrande et al., 2019; Ramutsindela & Mickler, 2020). SD system includes policy regulation, environmental stress, resource limitation, integration and flow of resources and considerations on a multi-level spatial scale (Lin et al., 2020).

Further, sustainability has always been defined in different perspectives (Moore et al., 2017). For example, Taifa et al. (2020a) defined sustainability in terms of economic, environmental and social values. These three sustainability tenets are related to profit, planet and people respectively. Similarly, environmental sustainability is described as the ability to utilise the resources and offering services for current and future generations without compromising ecosystems (Morelli, 2011). More specifically, as a condition of balance, resilience, and interconnectedness that allows human society to satisfy its needs while maintaining natural resources (Morelli, 2011). The achievement of sustainable development is identified by considering the state of the society, including their living conditions and resource utilisation.

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Economic growth is not a one-night accomplishment; rather, it encompasses a bunch of activities to be undertaken before its realisation. Since economic growth is the result of many interacting aspects, all of them must be intact to realise it. Among aspects that contribute to economic growth are trade and sustainable development. These aspects cannot promote economic growth unless they are backed up or facilitated by other related factors, ensuring that they are intensively promoting the economy of the respective country or region. These factors include government policy, environmental aspects, the geographical location, quality infrastructure, standardisation to mention but a few. All these attributes play a crucial role in facilitating trade and SD within the country or region.

African countries are most likely to benefit from the successful implementation of sustainability aspects. Therefore, this paper sharply focuses on answering the question: what are the roles of standardisation and quality infrastructure (QI) systems in aiding trade and SD as discussed in the subsequent sections? The focus of the QI systems and standardisation is within the African continental free trade area (AfCFTA). It is crucial to explore the QI system and standardisation due to their significance to foster sustainable development. This means that, the success of adhering to the effective QI systems and standardisation elements within the AfCFTA boundaries may massively foster economic growth and environmental values. Three sub-questions were raised: (a) What are the pillars of QI? (b) What are the roles of quality infrastructure in trade facilitation? (c) How QI and standardisation facilitate sustainable development?

The remaining sections of this paper are as follows. Section 2 provides a brief theoretical background on Africa, AfCFTA, quality infrastructure, and standardisation. The brief discussion on the applied methodology is in Section 3. Section 4 discusses the pillars of QI, whereas the roles of quality infrastructure in trade facilitation are in Section 5. Subsequently, Section 6 describes the means of how quality infrastructure and standardisation facilitates sustainable development. Section 7 provides concluding remarks, pertinent implications, shortcomings, and possible future work.

THEORETICAL BACKGROUND

Africa is both the second-most-populated and largest continent globally, behind Asia in both scenarios. In June 2015, the African Union (AU) initiated the AfCFTA and afterwards African Heads of Government agreed to create AfCFTA by 2017 during the 25th Summit of the African Union in South Africa via concessions on the liberalisation of trade in services and products (UNCTAD, 2015). Thus, the agreement instituting AfCFTA entered into force on May 30th, 2019 (ECA, 2020). Figure 1 depicts the AfCFTA member countries, by the ratification status as of 29th October 2019. Up to this date, fifty-four member states of the AU have signed the agreement, and thirty of these have placed official instruments of ratification (ECA, 2020). AfCFTA delivers an exceptional opportunity for African nations to integrate competitively to reduce poverty, increase the global economy, and foster inclusion (Maliszewska & Ruta, 2020). By 2017, the Africa continent had the following regional economic communities (Figure 2).

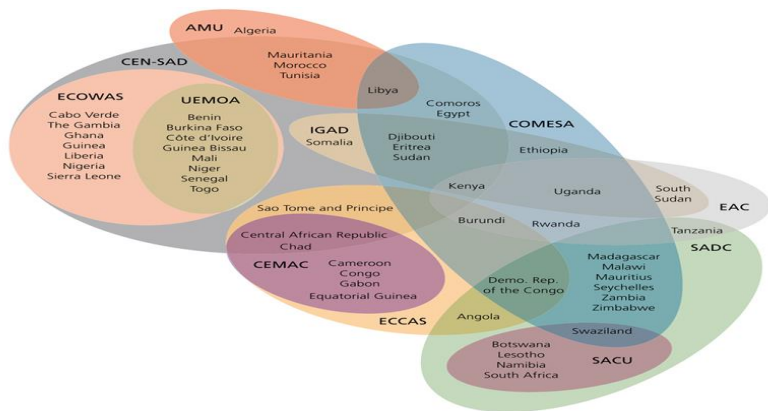


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Source: World Bank study team, as cited by Maliszewska and Ruta (2020, p.12). AfCFTA = African Continental Free Trade Area.

Figure 2. AfCFTA member countries, by the ratification status as of 29th October 2019.



Note(s): Official regional economic communities include the following: “Southern African Development Community (SADC), Intergovernmental Authority on Development (IGAD), Economic Community of West African States (ECOWAS), Economic Community of Central African States (ECCAS), East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), The Community of Sahel-Saharan States (CEN-SAD) and Arab Maghreb Union (AMU). Sub-regional arrangements include the Central African Economic and Monetary Community (CEMAC), West African Economic and Monetary Union (UEMOA) and Southern African Customs Union (SACU)”. Sources: (Ng and Mumford, 2017; Gathii et al., 2017, p.23).
Figure 2. The African regional economic communities.

Quality Infrastructure

Table 1 presents definitions by several international reputable organisations. All provided definitions or descriptions discuss the same context as the emphasis is on who are the responsible people, institutions, or bodies to ensure quality infrastructure, what does the QI comprises and why QI is essential for any country or company.

Table 1: Quality infrastructure (QI) definitions.

QI definition	Sources
QI system is a “combination of initiatives, institutions, organisations, activities and people. It includes a national quality policy and institutions to implement it, a regulatory framework, quality service providers, enterprises, customers and consumers (who include citizens as consumers of government services).”	(UNIDO, 2016)
QI refers to the “public and private institutional framework needed to implement standardisation, accreditation and conformity assessment services including inspection, testing, laboratory and product certification. Governments often play an important role in QI. Governments also delegate QI responsibilities to the private sector, such as laboratory work and other testing and inspection procedures.”	(Capacity4dev, 2017)
QI signifies “the ecosystem of public and private institutions as well as legal and regulatory frameworks and practices that establish and implement standardisation, accreditation, metrology, and conformity assessment (testing, inspection and certification). The QI system is required for the	(The World Bank, 2018)

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Companies, firms or factories from African countries should not underestimate the significance of the QI elements in the enhancement of economic policies because understanding the linkage in the middle of QI elements, global trading, industrialisation and export competitiveness lead the trade policy (Tralac Trade Law Centre, 2018). Also, instituting the QIS should be considered as part of the crucial and practical steps for which a developing country can rely on to foster a flourishing economy as a base for wealth, health and well-being (Tralac Trade Law Centre, 2018).

Standardisation

According to UNIDO (2016), all customers or potential customers have certain expectations regarding services or products received or purchased. The expectations are in terms of fitting the purposes, safety attributes, easy to use, and mostly user environment-friendly (UNIDO, 2016). Standards’ are the documented agreements which transform such desired characteristics into best practices, systems, processes, weights, tolerances, dimensions together with other specifics so as services and products can conform to the requirements to offer confidence to users or buyers (UNIDO, 2016). So, within a QI system, standardisation is generally the responsibility of a country’s national specific body which operates similar to the International Organisation for Standardisation (ISO). For example, in Tanzania, the statutory body of the government fully responsible for standards is the Tanzania Bureau of Standards (TBS).

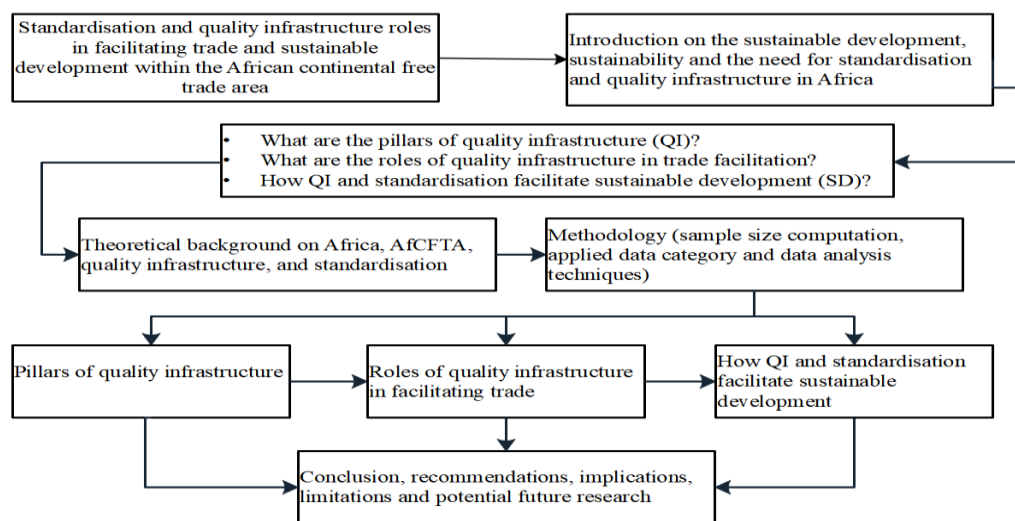
METHODOLOGY

This is the conceptual paper; thus, this study deployed a qualitative approach with the utilisation of secondary sources, mostly documentary review. The documentary analysis (similar to content analysis) involved examining accessible information recorded in several media, including journal articles, conference proceedings, government reports, non-governmental organisations and reputable pertinent websites. Likewise, an expert judgement approach was utilised in examining the gathered information about the roles of QI systems and standardisation.

Sample size computation

Sample size calculation involves selecting or the number of observations or replicates in a specific study (Taifa et al., 2019). The sample size is a vital feature for any empirical-based research and some theoretical studies so that to make inferences regarding the considered population that provides data or information. Two approaches can mainly compute sample size: probability and non-probability. Although probability sampling methods reduce several errors, this study employed non-probability sampling (purposive or judgment or deliberate sampling) (Onwuegbuzie and Leech, 2007). Purposive sampling is also known as selective or subjective sampling (Onwuegbuzie and Leech, 2007). Therefore, the conceptual ideas gathered and included in this study were collected through purposive sampling or expert judgement approach due to the nature of this research which focused on exploring the roles of standardisation and QI systems in aiding trade and SD. Generally, to execute this research, a research framework was developed, as shown in Figure 3.

Figure 3. Research conceptual framework.



QUALITY INFRASTRUCTURE

Quality means fitness for use or the degree of excellence for a product or service. The manufactured product or service offered should satisfy customers' requirements and needs. Some quality dimensions include functionality, conformance, durability, maintainability, serviceability, safety, reliability, and aesthetics. Service dimensions include responsiveness, completeness, assurance, timeliness, responsiveness, accuracy, credibility, reliability, empathy and consistency. Producing quality products or offering quality services requires intensive investments on the procedures, rules, methodologies, technology as well as human resources that altogether bring about the quality infrastructure. Quality infrastructure pertains to all aspects that when they are integrated and implemented effectively, produce products and services of the intended it is inevitable that the products or service offered would be of intended quality. Quality infrastructure aspects include standardisation, metrology, quality management, testing, accreditation and certification (Ramachala, 2013). Figure 4 depicts the pillars that must be considered when seeking successful implementation of quality infrastructure for any country, with their discussion being presented in the subsequent part.

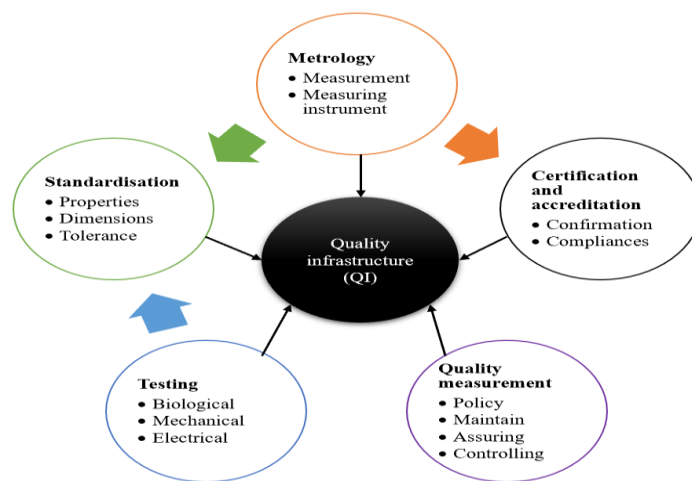


Figure 4. Pillars of quality infrastructure (QI). (Authors' illustration)

Metrology

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Metrology is described as “the science of measurement, embracing both experimental and theoretical determinations at any level of uncertainty in any field of science and technology” (BIPM, 2004). It concerns aspects associated with measurement and measuring instruments. These aspects require to be implemented effectively and efficiently; thus, all the activities about product or service that needs metrological services are well performed using quality instruments and quality measurement. For reliability of measuring instruments and measurement activities, metrology institutes or boards within a specified country are responsible for handling and taking care of all measuring instruments and ensuring that metrological activities are well performed with quality being the utmost consideration.

Additionally, the metrology institute is responsible for ensuring that all the subfields within metrology are well-considered without compromising them as they play a substantial role in ensuring quality product and service are offered to the community. These subfields include:

Fundamental metrology concerned with the establishing of units;

Creation of new measurement procedures and the achievement of measurement standards;

Industrial metrology pertains to the deployment of measurement to the manufacturing process (es) and their application to the society; and

Legal metrology which deals with statutory requirements and measurements.

Standardisation

A standard refers to an established document which is approved by a recognised body based on the consensus that defines the requirements of a product, process, production methods or service to comply with (UNIDO, 2014). Standard usually serves as a reference during production, testing or inspection of the product produced or services offered (Okrepilov, 2015). An activity of establishing a standard by following all the required procedures is termed as standardisation.

Quality of the product or service to a large extent depends on the quality infrastructure that an organisation or company uses during all the phases of product or service development. Standardisation, to a large extent, plays a vital part in ensuring that the manufactured products or offered services are within the bound of specified standards. Standard entail numeral rules, regulations and guidelines about product or services, a company or organisation is supposed to adhere to as they contribute to the quality of the product or service produced. The following are standards to be maintained and monitored for quality products.

Standards on materials used for product manufacturing

Usually, the quality of materials to manufacture products dictates the quality of the specific products. Similarly, product materials dictate the product durability, performance and assist in persuading customers in the market as part of product assurance to them. Therefore, the manufacturers must assess or evaluate the material suppliers as this increases the product quality. There should be zero tolerance regarding this to avoid losing customers over a long period (Nzumile & Taifa, 2019). Failure to adhere to such requirements may result in high defects due to low-quality product standards, and finally, one of the repercussions is customer churn. Customers require products that satisfy their needs, wants and/or demands (Taifa & Desai, 2017). However, it is also possible to have a good quality of materials and end up manufacturing defective products due to factors probably associated with the designing principles aspects, machining or poor process sustainability, poor management control, outsourcing critical tasks, workers skills and experience, etc. Still, the material quality holds the underpins of the product’s quality. Therefore, companies should not lose control over the quality of product materials.

Many companies, specifically in developing countries, usually disregard the quality of the materials because they are sceptical when it comes to the cost of purchasing them. What they are mostly doing is based on additives, which means they add some ingredients to the poor-quality materials to make them of quality.

Standard on the applied processes

If the material quality is good, it is still possible to manufacture defective products due to the applied processes. Manufacturing products should be executed under the stipulated standards. In manufacturing products, people responsible for manufacturing must follow all standards processes; machines must be of the required standards and the working floor or the manufacturing environment must also adhere to the specified standards.

Packaging and labelling standards

Packaging processes assist in protecting products during the distribution processes, storage, sales and usage for some products. It is concerned with designing, evaluating, and producing packages. The packaging is an integrated system of preparing commodities for transport, warehousing, storing, selling, or usage. Labelling is usually an adjunct to packaging whereby it can be presented in the form of a written word, electronic or graphic communication on the package. Aesthetics values due to standard packaging processes attract several customers when purchasing the products. Well-packaged and labelled products simplify marketing processes, especially when persuading customers. It is easier for customers to despise poorly packed products. Despite that customers tend to question the products' durability, reliability, or other attributes, it is still important to add some aesthetics values from the packaging and labelling processes so that to improve the positive or artful appearance of the products. Generally, robust structural design of package elements includes size, shape, packaging material and wrapper design, whereas the graphics elements comprise colour, images, typography and labels (Nzumile, 2020).

Standard on inspection

An inspection usually is considered as a decision-making stage, which is accomplished either before production commences (material inspection), during production (semi-finished product) or after production (finished product). An inspection assures both company and customer that the product complies with the prescribed standards. Standard on inspection is vital for any company.

Testing

Testing is one of the processes in conformity assessment activities. It entails all procedures of examining physical properties of a product which can include mechanical properties, electrical properties, and biological properties. A company which considers quality as their primary focus requires to establish quality infrastructure (QI) for the testing product; the QI facilitates to obtain reliable results about the properties of the manufactured products or purchased raw materials (Diekmann, 2006).

Certification

Both testing and inspection of products which are performed in conformity assessment require confirmation or proof of whether the inspected or tested product meets the standards or specification in every aspect. Certification is "the formal and written confirmation that a product, service, organisation, system, or individual complies with a given set of specifications and/or standards" (UNIDO, 2014). Certification provides an assurance to the customer about the product or service compliance. It reduces worries during consumption or use of the purchased product as the customers will be certain of the product or service quality. Accreditation also goes in parallel to certification as it usually involves issuing a certificate of competence to an organisation, company or institute that is responsible for conducting certification activities to other companies.

Quality management

Having excellent quality infrastructure is not enough; it requires a company or country to ensure that all the established infrastructures are well maintained and managed for its sustainability within the country or company. Quality management plays a vital part in guaranteeing that the infrastructures are continuously monitored, and there is reliable application of standards in every stage of product manufacturing or service provision without compromising any of the pre-established standards.

QI AND STANDARDISATION IN ACCELERATING TRADE

Generally, trade involves selling and buying of goods (product) or services. Facilitating trade means to speed up the rate and/or simplifying the process of buying and selling commodities or services in a given market segment or region to which they are sold or offered. Trade facilitation depends on numeral factors to which, when successfully considered, may result in improved trading activities between countries and regions. In developing countries, specifically in Africa, many factors contribute to trade in which any country seeking to attain trade growth should not disregard. Such factors include the geographical location of the country, government policy, the economic well-being of people, environmental condition, etc. All these factors facilitate trade in different ways in consideration of the roles played by them in various trading aspects. As discussed in Section 1, this paper focuses on how quality infrastructure facilitates trade and

sustainable development. Thus, the roles of quality infrastructure in facilitating trade are described below and are based explicitly on African countries.

Elimination of trade barriers

A trade barrier is categorised into tariff and non-tariff barriers. Tariff barriers are associated with a tax of importing or exporting commodities to the destination countries. Trade barriers are set by a specific country depending on its importation and exportation policies of product and services. On the other hand, non-tariff barriers are associated mostly with technical barriers that the destination country or region imposes to any imported and exported product from or to other countries, respectively. Fundamentally, “non-tariff trade barriers contribute more to the fragmentation of markets than tariffs have ever done” (Jovanovic, 1998). Within the AfCFTA agreement, it is essential to eliminate trade barriers. This is in line with the standard on conformity assessment activities. Conformity assessment should also comply with the international standards, which are also common to a country of destination. The non-tariff barriers that would be overlooked through adequate quality infrastructure and standardisation are related to technical standards, health standards, environmental standards, packaging and labelling standards, testing standards, etc.

Reducing goods rejection at borders

Products should be manufactured by adhering to accepted standards throughout the production phases. The product is normally affiliated with documented information showing its certificates mainly indicating how it complies with international standards and the certification mark of a company which certifies them. Therefore, all institutes or companies accredited to certify products or services standards, should assure the country in which such products or services are imported.

Easy recognition of conformity assessment certificates

Conformity assessment certificates are provided to a company after its products have been tested and inspected following internationally accepted standards of a particular product based on the technical, environmental, legal and safety aspects (OECD, 2005). If an internationally recognised body offers the certificate, it simplifies its acceptance to other countries where the product is to be imported.

Shorten delivery time to the destination country or region

The restriction imposed by countries on the imported product on most occasions leads to the increased delivery time to a country, especially at borders. Inspection and testing of several products take long before they are allowed to cross the border. This usually can be due to the situation of proving whether the product conforms to their standards or not. A country with effective quality infrastructure systems should undoubtedly be assured that all manufactured products by local companies conform to international standards. Such assurance can slightly simplify and reduce unnecessary delivery delay to the destination country.

Cost reduction on both sides

Usually, the cost associated with conformity assessment increases with inadequate quality infrastructure systems used to develop products. Intensive inspection and testing activities usually are to be accomplished if products are suspected not meeting the standards of the importing country. Conversely, if the product fails to comply with the destination country's standards, there should be no other option than deporting them to the country of origin for reworking to meet the required standards. All these costs are in no small extent reduced, considering that the quality infrastructure systems of the country and standardisation are well established and effectively controlled to maintain international recognition of the exported products and services.

Add competitive advantages

Competitive advantage is generally considered as the ability to offer product or services to clients beyond their expectation in terms of quality, price, functionality, reliability, serviceability, etc. as compared to other competitors. Products and services that conform to the international standards mostly surpass those commodities and services which do not conform. If the exported products conform to the standards of the importing country, it becomes easily recognised within the region or country. Eventually, such products enhance its market penetration in different areas within the country.

Increases customer's trustfulness

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Usually, customers increase their trust to products provided they conform to the standards. Customer trustfulness increases with time, which means, during the introduction of the products to market the confidence level of customers is not high because they are sceptical whether the product might satisfy their needs or not. But as the times goes on, the product would gradually increase its popularity, considering that its standards are internationally recognised and accepted.

Enabling access to the international market

Establishment of a free trade area within African countries is very substantial to foster economic growth. The formation of a free trade area is crucial considering that each country would be capable of ensuring that all the exported goods and even the local ones will conform to international standards through effective and efficient implementation of quality infrastructure systems and standardisation as well. Quality infrastructure and standardisation enhance consistency in the quality of the products, which will make it easy to be acceptable in various international markets.

QI AND STANDARDISATION IN FACILITATING SUSTAINABLE DEVELOPMENT

Sustainable development (SD) is considered as the development whereby the current generation should fulfil their requirements without jeopardising the ability of the future generation to meet or exceed their requirements using the available resources (Bottero et al., 2011). Elements of quality infrastructure mostly incorporate the guiding regulations and rules towards achieving SD in any of the activities undertaken in the respective countries. These rules and principles are formulated in such a way that the methods and technologies applied should be well accepted and should not harm or distract the available resources or hinder the achievement of SD. Quality infrastructure and standardisation can facilitate sustainable development in the following ways.

Environmental protection

The environment has a direct link to sustainable development, considering that the resources that are utilised to meet needs are sourced from it. Environmental protection guidelines have been provided in the ISO 14000 family (ISO Central Secretariat, 2009; Patón-Romero et al., 2019). Series of standards in ISO 14000 outlines all the requirements on how the environment should be protected while at the same time, how the community should be well satisfied with their needs. Through the application of standards provided concerning the environment, companies, factories or firms within developing countries are obligated to adhere to standards while conducting their production processes (Cerin, 2006). The significant quality infrastructure of a particular country is substantial as it would ensure that all the companies are adhering to the established standards in protecting the environment. It should be noted that environmental protection is part of the significant three sustainability tenets: the other tenets are economic (profit) and social (people) values. Environmental sustainability value necessitates how environmental resources should be protected and maintained for the future generation.

Foster proper resource utilisation

Sustainable development can also be achieved through proper utilisation of resources while striving to fulfil the needs. This can be realised in the manner that the resources are used without wasting many scarce resources since they will be allocated appropriately to accomplish a specific activity. Subsequently, this would lead to cost reduction in conducting business or manufacturing activities which would similarly enhance the sustainability of companies within a country.

CONCLUSION AND RECOMMENDATIONS

This study mainly focused on exploring the roles of standardisation and quality infrastructure (QI) systems in aiding trade and SD. In order to achieve the core research objective, three specific objectives were stated as follows: to discuss the pillars of QI; to discuss the roles of quality infrastructure in trade facilitation; and to determine the means of how QI and standardisation facilitate sustainable development.

Elements of QI play an essential role in facilitating trade as well as sustainable development in several scenarios. The QI elements should not be undermined or compromised as each of them has its significance in bringing tangible outputs to foster the achievements. Many developing countries, specifically in Africa, are still facing the challenge of ensuring that all the elements of QI are considered uniformly. It is obvious to find a QI system lacking one or two elements. Sometimes the elements are considered but with less attention in comparison to others.

Metrology is one of the most significant and imperative elements on ensuring the ‘reliability and traceability of measurements’ and ‘measuring instruments’ are correctly performed and maintained. These elements are generally considered to be hard and complex to establish because they require investments on all facilities (instruments, tools, machines, etc.), technology as well as technical personnel.

There seem to be obstacles towards establishing effective metrology infrastructure systems within the developing countries.

Developing countries need to establish independent metrology institutes. Such institutes should handle all metrological activities. This will relieve metrological tasks from countries’ specific National Standard Board (NSB) as this has become common in most of the countries in Africa that metrological tasks are handle by NBS.

Furthermore, several continents have kept benefiting from the previous three industrial revolutions: Industry 1.0 to Industry 3.0. However, since 2011, industrialisation has advanced whereby both academicians and practitioners have witnessed the emerging fourth industrial revolution, which is linked with Industry 4.0 (Taifa et al., 2020b). Industry 4.0 is much connected to digitisation, digitalisation, and digital transformation. Whilst countries, firms, companies, and other enterprises have started benefiting from the AfCFTA; it is crucial recognising and laying the fundamental robust infrastructure to embrace Industry 4.0 concepts. This requires setting working infrastructure and environment in general that assist in accruing benefits from digitisation and digitalisation because they can both contribute to enabling multinational value chains, the upsurge of the micro-multinational and offering new tradeable sustainable products and services (Hope, 2020).

According to Hope (2020), establishing an AfCFTA which does not focus on the digitisation, digitalization, and digital transformations of trade risks may inhibit the efficiency and effectiveness of the agreement going forward. In the long run, it might be short-sighted thinking to rely on traditional procedures only on manufacturing products or how firms offer services. Technological advancements should forge a direction for all governments, firms, and companies to put forward implementable strategies that would advance their operations. Having implementable industrialisation strategies and plans would help to accrue several benefits, including better decision making, process optimisation, productivity improvement, cost reductions, product quality improvement, production increase, foster product innovation and creativity, lead time reduction, resource utilisation, improving customer experience, among others. Therefore, QI systems and standardisation should also be linked to digitisation, digitalisation, and digital transformation to create a digital economy for the realisation of sustainable development.

Limitations of the study and potential future research

This paper can be chiefly considered as a general review as much of the discussions provide an overview of several roles of standardisation and QI in facilitating trade and SD within the AfCFTA. This is a conceptual paper. In future, it may be well to conduct an empirical study from Tanzania mainly to establish roles that are known by TBS together with other companies. Such a study would lay fundamental implications which can be benchmarked with the well-established institutions globally on QI and sustainable development.

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