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BSI Whitepaper: The role of standards in supporting the transition to a digital economy and facilitating digital trade

Transforming systems using standards

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Abstract

The digitalization of economies and wider society is growing at pace, and the Covid-19 pandemic has only served to accelerate the trend. Although the same process is underway in the developing world, the rate of uptake of digital technology and transition to digital trade is much slower than in the OECD. This is widening the digital divide, and putting at risk their achievement of Sustainable Development Goals. The paper considers the barriers to uptake and identifies trust as being critical. While international development agencies have included legislation and regulation in their policy assessments and action plans, the paper identifies the key role that standards have played in countries like the UK to promote digitalization and tackle concerns about cyber security, interoperability and privacy. It contrasts this with the absence of such standards in the developing world, and suggests that international standards, which build trust in innovative applications of new technology, are the missing keystone in the bridge to a digital economy. To address this gap, the paper proposes a standards-based digitalization toolkit, focused on leveraging standards to address core digital themes and thereby build a resilient digital economy. In this scenario, the National Standards Bodies would have a key role to play in enabling digital transformation, working closely with the public and private sector. However, standards are not enough on their own, and the paper recommends a holistic approach through partnership with the the **"eTrade for all"** network, as well as the International Network for Quality Infrastructure (INetQI), to develop a more concerted and integrated approach required to achieve digital transformation.

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Introduction

Over the last twenty years, the world has experienced a globalization of markets and a matching movement of people that is perhaps unprecedented in history. Digitalization has had a critical role to play. Thanks to the ability to exchange large volumes of data, quickly, securely and reliably, products can be designed, and components manufactured and assembled, in highly distributed supply chains. Digital platforms can identify customers and ship product the same day. But it is not just digital technology and digital skills that have fostered this "supercharged" specialization of value chains and underpinned global sales and marketing on a massive scale. International standards have also played a vital role by enabling:

- Interoperability of components and data;
- Security/reliability of the data (and monetary) exchange;
- Quality of output – on a worldwide basis;
- A system of trust.

This standardization has provided OEMs (Original Equipment Manufacturers), indeed the whole ecosystem, with the confidence to participate and share the necessary information and, perhaps most importantly, persuade customers to transfer their money, electronically.

However, over the past twelve months, COVID-19 has laid bare how vulnerable these interconnected, interdependent systems are to major disruption. It is not the technology or the standards that have proved to be the weak link in global supply chains, but the level/intensity of human interaction, the reliance on non-geographically distributed suppliers and the failure to adopt standards-based procurement. Standards provide trust and assurance to customers that their suppliers have planned, and established systems based on good practice, while digital technology has provided the connectivity in the absence of human interaction. Thus, the pandemic has served to emphasise the benefits of digital technology and provided an impetus to digital transformation, for example:

- All businesses are re-evaluating the resilience of their supply chains. In product supply chains the focus is on the possibility of near sourcing or diversifying sources of supply, and a new impetus has been given to industry 4.0 – machines cannot catch Coronavirus.
- In the non-contact service sectors, the success of home working has opened the opportunity for remote working to be very remote, provided there is access to a secure and reliable digital infrastructure.
- The shift to online shopping has accelerated: a survey by the United Nations Conference on Trade and Development (UNCTAD), reported in October 2020[1], revealed a 10% increase in several segments of the retail sector, with respondents indicating that the changes were permanent. There were differences between countries, with the strongest increases reported in China and Turkey. In the UK, the Office of National Statistics (ONS) reported[2] a 60% increase in online sales during lockdown and, while in-store sales recovered as restrictions were lifted, the level remains 10% below that in February 2020 (pre-COVID-19).
- In the developing world, there has been a marked shift away from cash transactions to mobile money, as the risks of physical transactions have become apparent, and as governments have reduced the cost of use and barriers to adoption; indeed, they have expanded the use of digital technology to provide grants to those in need[3 4].

[1] https://unctad.org/news/covid-19-has-changed-online-shopping-forever-survey-shows
[2] https://blog.ons.gov.uk/2020/09/18/how-the-covid-19-pandemic-has-accelerated-the-shift-to-online-spending/
[3] IMF Mobile Money in the Covid-19 Pandemic Oct 7 2020
[4] https://www.mckinsey.com/industries/financial-services/our-insights/covid-19-making-the-case-for-robust-digital-financial-infrastructure

These opportunities are not new: they have been well-articulated for developed economies by the Organisation for Economic Co-operation and Development (OECD) in several reports - notably in its seminal study of productivity[5], in its report on "Key Issues for Digital Transformation in the G20[6] and, most recently, in its Digital Economy Outlook[7]. These opportunities have also been expressed for the developing world by the World Bank[8], the United Nations Industrial Development Organization (UNIDO)[9] [10] [11] and UNCTAD in its Digital Economy Report of 2019[12]. The difference is that these reports mainly highlight the risks to the developing world of failing to keep pace with developments in the OECD, thereby exacerbating the north-south divide, a situation which the pandemic may very well intensify. However, there are opportunities for developing countries that embrace digitalization to participate in Global Value Chains (GVCs); indeed, countries in South East Asia, e.g. Vietnam, demonstrate the progress that can be made.

The UN's Sustainable Development Goals serve to emphasise that the response to the challenges and opportunities, faced by both the developed and the developing world, needs to be holistic and integrated. However, it is widely recognised that only by making the step change from an analog to a digital society, in which all members of society have the skills and access to the digital infrastructure to participate, can we hope to build a more sustainable economy, and a more inclusive and resilient society.

Digital skills and access to digital infrastructure certainly underpin such a shift - and a wide range of studies and international benchmarks/dashboards focus on these elements – but the purpose of this paper is to look more broadly at the barriers to digital transformation, in particular:

- Business and societal concerns about cyber security;
- The quality of digital identification and product provenance;
- Data privacy;
- The interoperability of data systems and;
- The dangers of lock-in to proprietary solutions.

In so doing, this paper casts a spotlight on a keystone of the analog world, namely the role of the Quality Infrastructure system (QI), specifically standards, in building trust and confidence in the resilience of the digital ecosystem.

[5] http://www.oecd.org/economy/growth/OECD-2015-The-future-of-productivity-book.pdf
[6] http://www.oecd.org/G20/key-issues-for-digital-transformation-in-the-G20.pdf
[7] http://www.oecd.org/digital/oecd-digital-economy-outlook-2020-bb167041-en.htm
[8] https://www.worldbank.org/en/publication/wdr2016
[9] https://www.unido.org/api/opentext/documents/download/16411932/unido-file-16411932
[10] https://www.unido.org/sites/default/files/files/2019-12/UNIDO%20IDR20%20main%20report.pdf
[11] https://www.unido.org/sites/default/files/files/2020-07/UNIDO_COVID_Digital_Transformation_0.pdf
[12] https://unctad.org/webflyer/digital-economy-report-2019

How digitalization is evolving: the shift to data as the driver of change

Ever since the first semiconductors were developed to reduce the payload on space craft, the volume of data that can be stored or processed by a microchip has doubled every 18-24 months. As a result, the functionality of digital equipment has been transformed. It is extraordinary that the Apollo space missions were guided by a computing system with less power than a modern toaster, and today's mobile phones have more computing power than the IBM super-computer, "Deep Blue", which defeated Garry Kasparov in 1997. Technological advance has significantly reduced not only the size of computers, but also the price of computing power, and massively increased the volume of data that can be captured and transmitted. It is this ability to capture data, to manage and to monetize it that is driving change today. There are six main elements that are at the forefront of change:

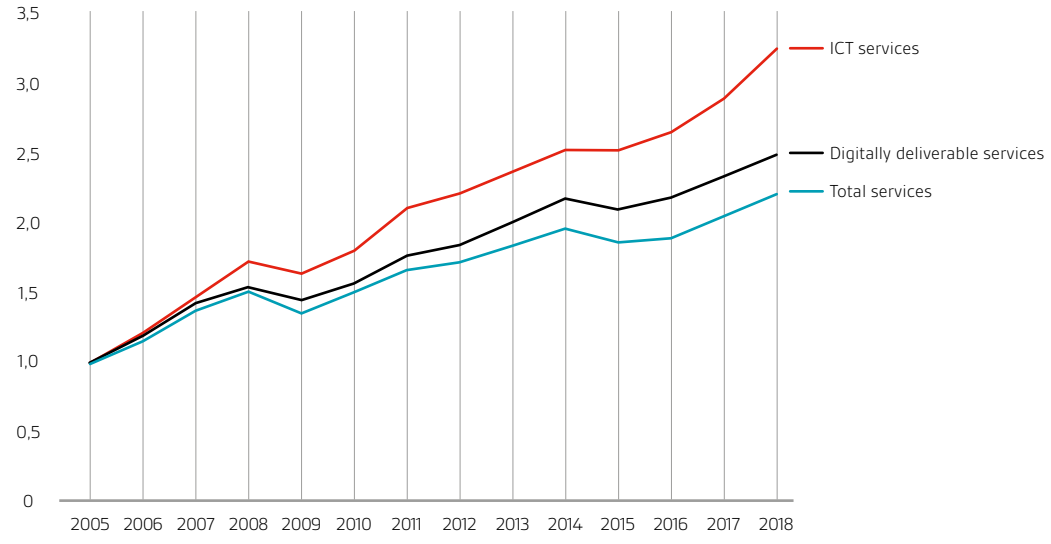
1. Blockchain
2. Industry 4.0
3. Cloud computing
4. 5G
5. Internet of things (IoT)
6. Artificial intelligence (AI)

Although the majority of digital trends are being driven and implemented in the developed world, developing economies will be further left behind if they cannot progress in areas that will benefit them.

These topics have been well covered in the reports referenced above, (see footnotes 3-12) and it is not the purpose of this paper to rehearse their importance or characteristics. However, it is worth focusing on a number of key points:

- In its 2019 Digital Economy Report (see footnote 10), UNCTAD highlighted the exponential growth in global data (IP) traffic since 1992, where the baseline volume was 100GB per day. In 2002 this rate exploded to 100GB per second, to 2017, when it reached 46,600GB per second and, by 2022, it is expected to reach 150,700 GB per second.
- While the growth in global data traffic is being substantially driven by consumer demand, it is also being driven by the growing international trade in services. UNCTAD has identified a significant increase in the value of exports of digitally deliverable services, particularly Information Communications Technology (ICT) services, that is much greater than the growth of total services, as Table 1 below illustrates. There are also significant differences in the growth rate between regions. Between 2005-2018, developing countries experienced, on average, a Compound Annual Growth Rate (CAGR) in data traffic of 11%, whereas Africa's CAGR was 7% - about the same growth rate as the mature developed economies, but from a much lower base.

Table 1. Indices of Global Exports of Services, 2005-2018 (2005=1)



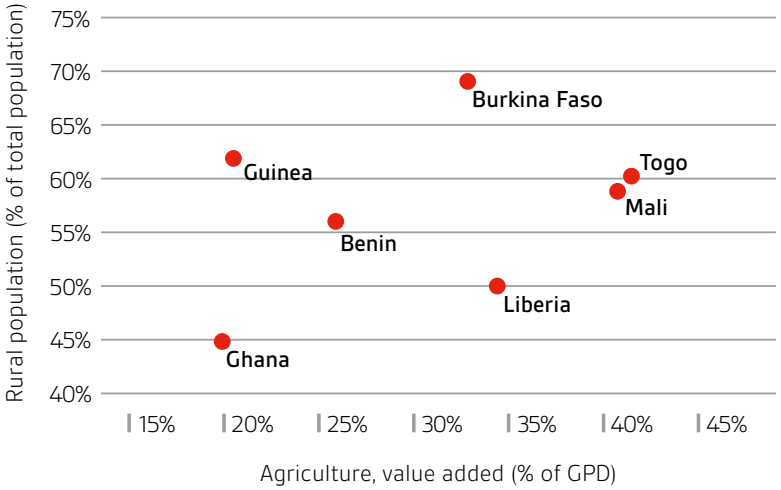
Source: UNCTSDStat

- The growth in global data traffic is also being driven by the exponential increase in the number of devices connected to the internet, the Internet of Things (IoT), which is expected to exceed 22 billion devices by 2024 (a CAGR of 17%), and the market is expected to grow 10 fold to $1.5 trillion by 2025, with the top 7 countries accounting for 75% of expenditure. The average number of human interactions with the IoT is forecast to reach 4,900 times per day compared with 584 times in 2015.
- Such an expansion in online services and data transfer requires a modern telecommunications infrastructure and, by 2025, it is anticipated that, in North America and Europe, 4G and 5G mobile networks will account for 91% of connections, while in sub-Sahara Africa it will merely be 27%.
- UNIDO has highlighted the growth in Industry 4.0, while contrasting its relative absence among less developed countries, where Industry 3.0, and even 2.0, is the norm. There are also almost boundless opportunities in agri-food to improve the quality, efficiency and sustainability of agriculture, and the provenance and well-being of livestock, through the application of digital technologies. The EU has embarked on a series of large, networked demonstrator projects[13] using platform technologies and IoT, aimed at improving interoperability of devices and ensuring security, privacy and business confidentiality across the value chain.

The impact of digital technology and data on the developing world

Digital technology has made an impact in developing countries and, in many regions, it often provides the opportunity to leapfrog now defunct infrastructure. But there are significant differences between developing economies, between sub-regions, and between urban and rural areas in the extent to which they have been able to embrace new technology. Table 2 below illustrates the scale of the rural population and the importance of agriculture in selected countries in West Africa.

Table 2. Relevance of agriculture in selected West African countries, 2016



Source: World Bank 2016

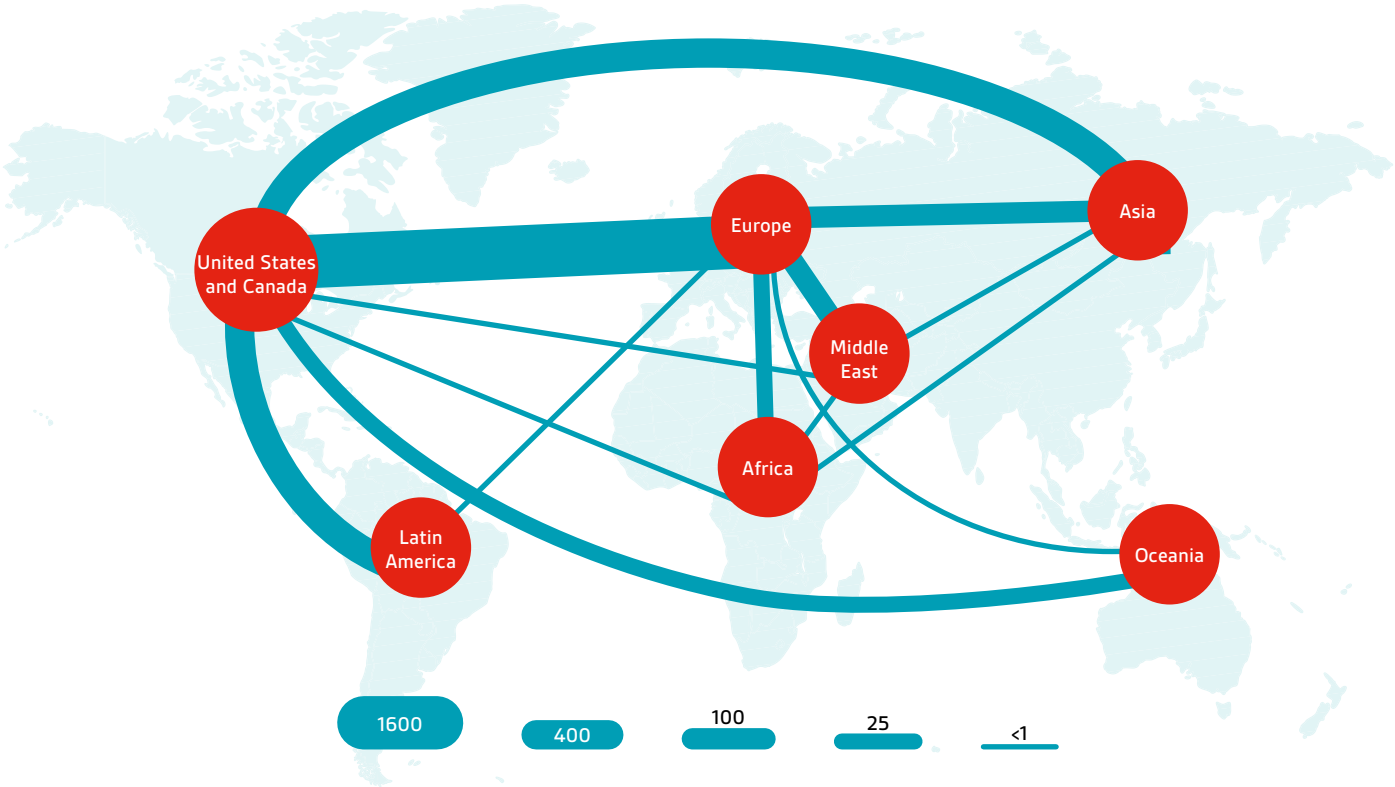
In rural economies, the bulk of transactions are local and in cash, banks and ATMs are a rarity, and the public utility infrastructure can be rudimentary, if not entirely absent. However, in regions where there are cash crops for export, e.g. cocoa and rubber, farmers are turning increasingly to mobile money and (in emerging economies) to mobile banking to avoid the risks and inefficiencies of the cash economy. It is also in the interests of the agri-businesses dealing with local farmers to promote the efficiencies to be gained from digital technology, and the data it generates. This is particularly important in the case of quality control and resource efficiency gains, since buyers from the developed world will only pay a price premium against certified sustainability

[13] https://ec.europa.eu/digital-single-market/en/large-scale-pilots-digitisation-agriculture

criteria. This has resulted in an expansion in the services on offer, including technical advice, monitoring of performance, and mapping of land. The data being generated rewards the farmer and informs potential creditors of the creditworthiness of the client, enabling the farmer to borrow to improve productivity, and to pay for education and the utility bills[14].

COVID-19 has given impetus to the data trend, but digitalization remains far from pervasive and, as the McKinsey article (see footnote 4) explains, it is far from resilient. This is due to the lack of digital payment channels, digital ID, and simple data on individuals and businesses that are tethered to the ID. Even in urban environments, poor connectivity limits the transfer of data, which constrains business development and consumer uptake. This is also reflected in differences in the movement of data between regions, as Figure 1 below illustrates.

Figure 1. Use of Inter-regional Bandwidth 2018 (Terabits per second)



Source: UNCTAD Digital Economy Report 2019

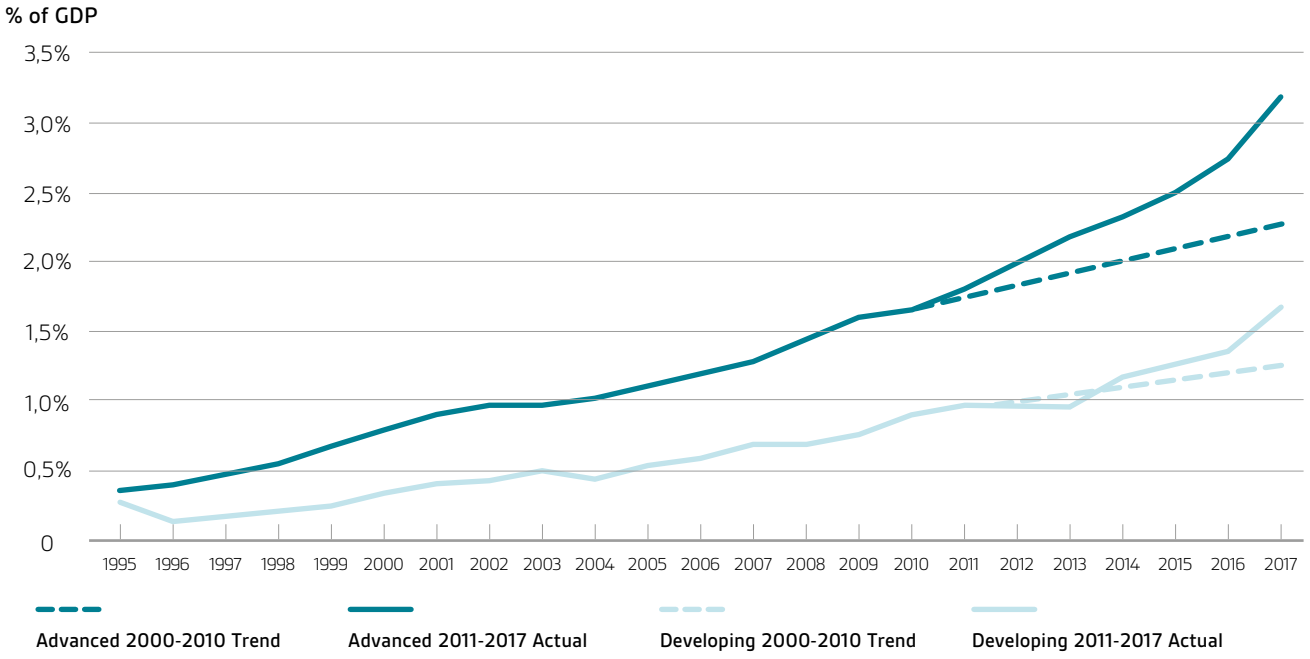
To enable such large volume of data transfers, significant investment is required:

- Fiber optic cable for effective transmission and backhaul;
- Telecommunications networks to cope with the rising demand for data rich services, brought about by IoT and cloud services;
- A network of data centers to handle it;
- A growing investment in AI to interpret the data.

Furthermore, significant complementary investment in reliable energy systems to power/cool the data centers and exchanges is required to prevent system outages. It is this investment in capturing and maximising the returns from data, the "digital spillover", as Oxford Economics[15] describes it, that is raising concern among international agencies. The fear is that the developing world is failing to keep pace with the investment required, with Africa in danger of being isolated from the mainstream of digital activity. The growing gap in spending on digital technologies, between developed and developing countries, is illustrated in Table 3 below.

[14] https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2018/01/Opportunities-in-agricultural-value-chain-digitisation-Learnings-from-Ghana.pdf
[15] https://www.huawei.com/minisite/gci/en/digital-spillover/files/gci_digital_spillover.pdf

Table 3 Digital investment in advanced and developing economies (actual and trended)



Source: Conference Board, Oxford Economics

Drivers of digital technology integration in the developing world

Disruption is being driven by digital entrepreneurs – new entrants to traditional sectors – who, unlike incumbents with vested interests, recognize that digitalization means far more than improving the efficiency of a business process or business process re-engineering. Rather, it involves the complete reconfiguration or "digitalization" of whole value chains through disintermediation, new services, and new business models, leading to digital trade. Furthermore, they have the managerial agility and the support of capital markets to achieve their goals. Schumpeterian "creative destruction" is alive and well in the digital economy, but there are a number of factors which influence the ease, or difficulty, of digital transformation of individual sectors/value chain:

- The complexity and the repetitive nature of the task involved, and the quality of the data being generated;
- The contact intensity (the need for personal contact between customer and service provider or whether the service can be offered online);
- The degree of fragmentation of the value chain, and the market power of the firms in the sector driving change, relative to the value chain as a whole (the more fragmented and dispersed, and the weaker the position of the firms trying to drive change, the greater the cost of co-ordination and, hence, the less able they are to drive that change);
- The digital literacy/maturity of customers, and their trust in digital solutions.

While government may not be able to alter the characteristics of a value chain, the key point is that government has an important role to play in establishing the right business environment to enable change, particularly by promoting a modern competitive digital infrastructure. However, societies will only prosper, and achieve their Sustainable Development Goals (SDGs), if all members have access to that infrastructure. They also need the skills and willingness to engage with the digital services on offer. Thus, the digital skills/literacy of both the private sector and the public at large need to be improved to maximise the benefits from infrastructure investment.

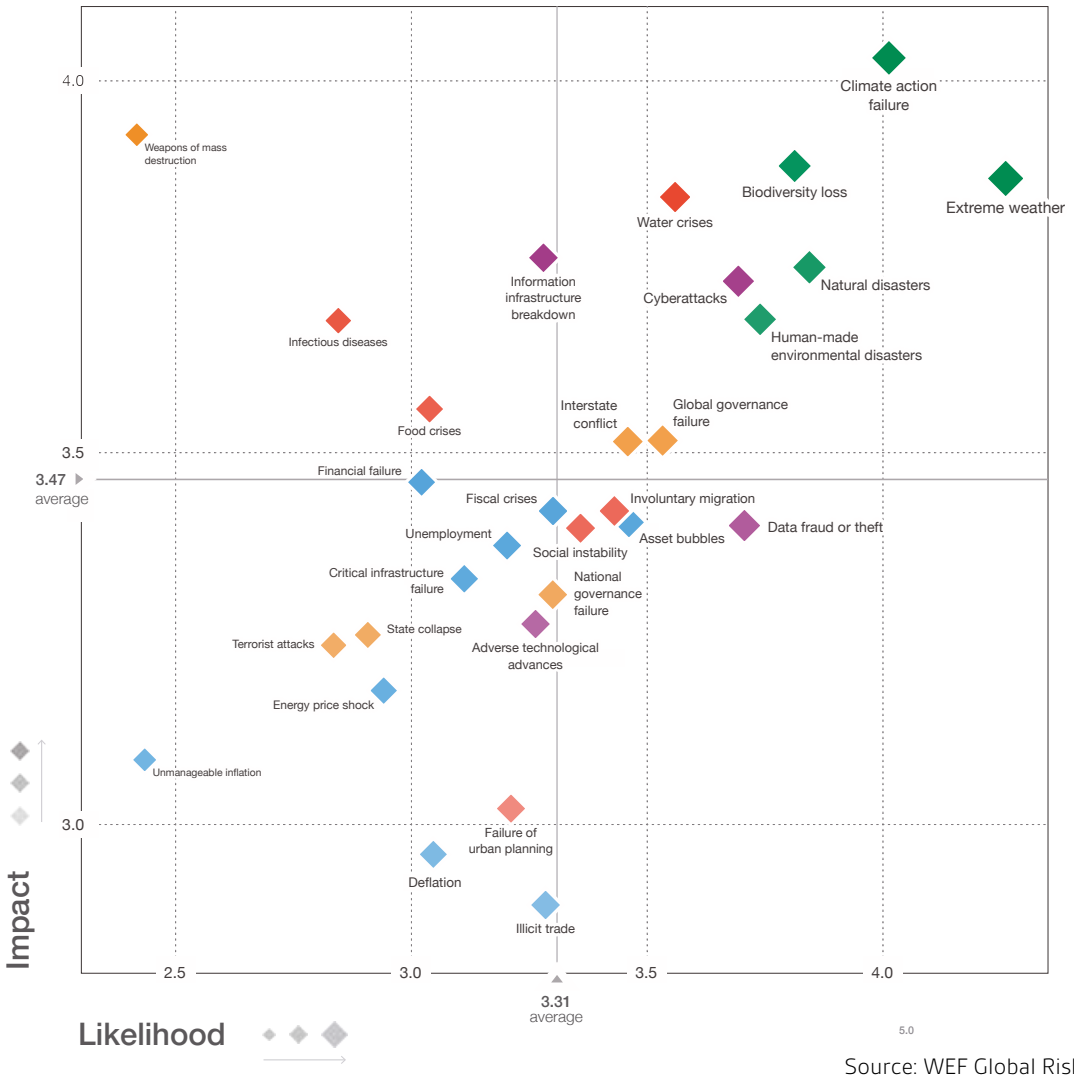
Governments should also encourage openness and flexibility in all markets, and give customers/consumers reason to be confident in the digital services on offer, to allow new entrants and enterprise to capitalize on digital innovation. The QI system and standards have an important role to play in strengthening this market confidence because they underpin the system of trust in an economy and across global value chains.

The barriers to change: case study of e-commerce

In spite of the huge benefits digitalization offers to society, and the existential threat it poses to tardy corporates, significant barriers to the transition to a digital economy remain. There are common issues that need to be addressed in both the developed and developing world, but the key difference lies in the starting point of the transition. In most cases, developing countries are starting from a very low level of digital maturity compared to their developed counterparts.

For example, one set of barriers relates to risk. A survey of organizations, undertaken for the WEF Global Risks Report 2020[16], revealed that, while environmental risks were rated most highly, the risks of cyber-attack and information infrastructure breakdown were not far behind. This assessment puts a spotlight on a crucial risk that needs to be addressed for the digital transformation process to be successful, namely the issue of trust. If the actors in an economy do not trust the digital system to be secure, or fear the change to the new, efforts made to make the step change from an analog to a digital society will be in vain. Thus, the real change required is a shift in the mindset of citizens to one that embraces the digital economy as reliable, secure and efficient. In order to achieve that objective, and provide assurance, different mandatory and voluntary instruments need to be deployed.

Table 4. WEF Global risk landscape 2020



Source: WEF Global Risk Report 2020

[16] http://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf

Case study on the e-commerce sector

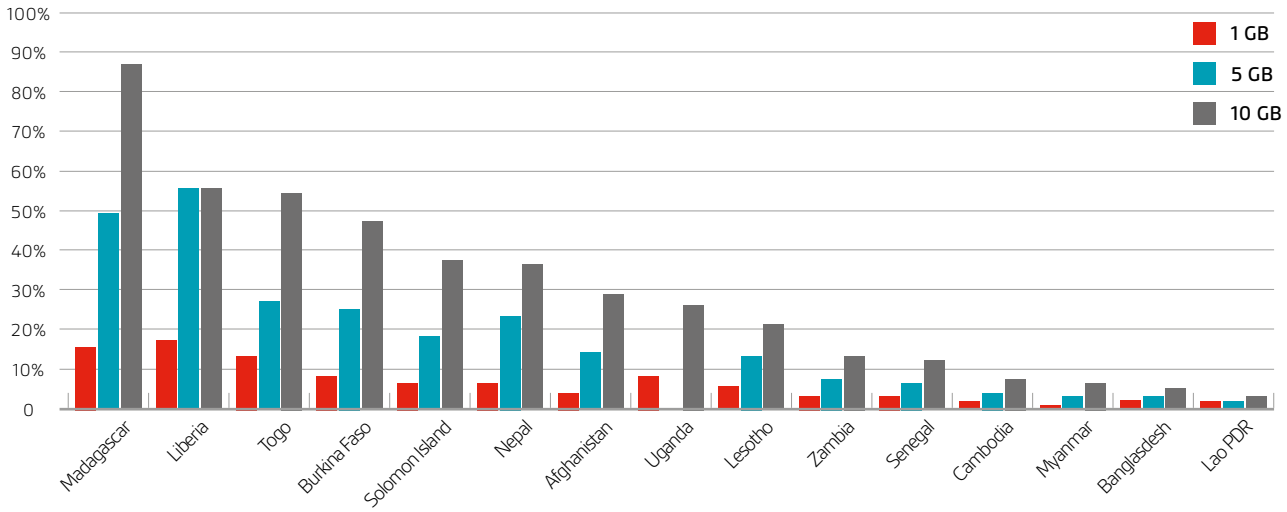
UNCTAD has given a particular focus to e-commerce – one key element of the digitalization agenda – and, since the launch of the **eTrade for all** initiative in July 2016, it has undertaken some 27 assessments of the eTrade readiness of selected developing countries, mainly in least developed countries (LDCs). It has utilized an analytical framework with seven main themes or building blocks to promote the transition to e-commerce and digitalization:

- The priority attached to e-commerce and evidence of an implementation strategy;
- Access to an ICT infrastructure and services;
- Trade logistics and trade facilitation;
- Payment solutions;
- The legal and regulatory framework;
- Skills development for e-commerce;
- Access to finance.

Using a combination of desk research, surveys and workshops, the assessments produce a high-level review of the strengths and weaknesses of e-commerce in the target country and a suggested action programme. UNCTAD prepared a synthesis of the first seven studies undertaken in Africa in 2018[17] and, more recently, it published an overview of its studies in West Africa[18], as well as a review of the progress being made by countries in implementing the recommendations of earlier eTrade readiness assessments[19]. While the studies are focused on the barriers to e-commerce, they are, in effect, an analysis of the barriers to enterprise and economic development, where digitalization (or e-commerce) is a key component.

The assessments identify a wide range of performance in the quality and accessibility of infrastructure – physical and digital – and the capacity of different LDCs to respond to the challenge of e-commerce and digital enterprise. For example, the price of access to the internet differs widely, as table 5 below shows, and electrification in African LDCs is only 33.2%, compared with 86.2% in LDCs in Asia – Pacific. There are similar concerns about trade facilitation and logistics, the lack of digital skills, and access to finance. However, considerable improvements have been made on one front, namely in the shift to digital processes as a means of payment, driven in part by the COVID-19 pandemic.

Table 5. Price of internet data packages (% of average income) 2019

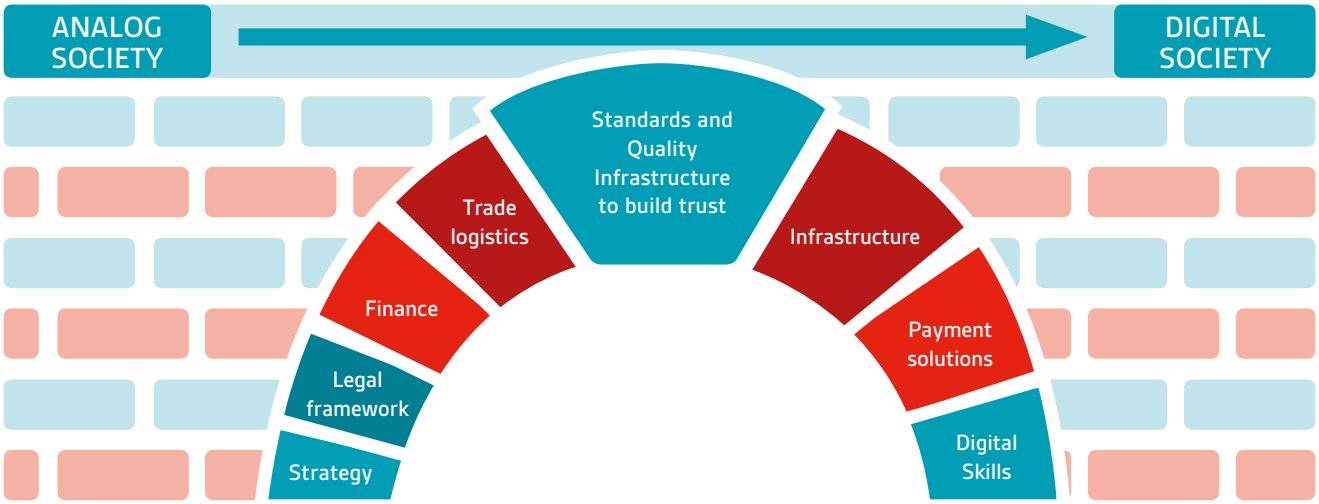


Source: Alliance for Affordable Internet[38]

[17] https://unctad.org/system/files/official-document/dtlstict2018_eTrade_overview_en.pdf
[18] https://unctad.org/system/files/official-document/dtlstict2020d10_en.pdf
[19] https://unctad.org/system/files/official-document/dtlstict2020d9_en.pdf

The reports provide a full analysis of the themes, such as physical infrastructure, human capital and the legal underpinnings of the regulatory framework which are, of course, fundamental to enabling a digital economy. However, no consideration is given to stakeholder-based vehicles, such as international standards, a widely accepted, powerful and practical tool, used to accelerate change in business processes and customer relationships, that can build trust in the digital economy. Thus, while the other key themes are essential building blocks, it is standards, certification, and conformity assessment that provide a more flexible and impactful response to the obvious concerns about trust – in effect, the keystone in the bridge to digital transformation and enhanced digital trade.

Figure 2. The bridge from an analog to a digital society



Source: BSI 2021

For, as UNCTAD has also noted (see footnote 11):

> ***"To boost confidence in an environment where the market is not able to provide adequate information on operator trustworthiness, countries may develop quality labels based on internationally recognised standards and programs and put in place certification trust mark schemes for trusted e-commerce operators, in collaboration with National Standards Bodies and private sector organisations."***

Standards

Standards encode knowledge regarding usability, quality, safety, performance or any other characteristics required by users, into technical specifications for products, services, processes and systems, as well as guidance on best practices. ISO/IEC Guide 2 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". It goes on to say that "standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits".

i. International actors in the standards arena include the IEC, ISO and ITU

ii. Regional actors include CEN and CENELEC (Europe), PASC (Asia-Pacific), COPANT (the Americas), CROSQ (Caribbean) and ARSO (Africa)

iii. National actors include ISO Member Bodies such as BSI (UK), DIN (Germany) ANSI (US), IRAM (Argentina), SAC (China) and SLSB (Saint Lucia), to name but a few.

National Standards Bodies have a critical role to play in developing networks of trust, and reliable processes in relevant sectors, to provide consumers with the assurance they need where societal concerns represent a barrier to innovation.

Trust marks /certification schemes

As the market for digital products and services has grown, not least as a result of the massive increase in the number, and diversity, of products using IoT technologies, so the risks associated with security and privacy of data have increased. Consumers need to be able to distinguish, readily and with confidence, those products and services which provide a reasonable level of security from other offerings on the market. It is not only consumers: businesses, incorporating a range of IoT devices in their products or services, may need a higher level of confidence that their offerings will not be vulnerable to attack.

For example, following the UK Government's Secure by Design review (2018), BSI developed three types of certification trust marks (Kitemark™) for IoT Devices, in collaboration with industry stakeholders, according to the device's intended use: residential, commercial or for enhanced use in residential or commercial applications, of high risk or high value. The BSI Kitemark™ is based on ISO 9001, and a series of tests to ensure performance and safety, interoperability and penetration tests which scan for vulnerabilities and security flaws. The BSI Kitemark™ requires companies to undertake regular monitoring and assessment to provide continued assurance to users, and if security levels and product quality are not maintained, the Kitemark™ is revoked until flaws are rectified. The advantage of the BSI Kitemark™ is that it is widely recognised in the UK, and internationally, across a range of sectors, and a high proportion of consumers associate it with quality, safety and reliability.

Standards as a catalyst for change

Standards, developed by knowledgeable stakeholders, can be used as a tool, together with legislation and regulation, to achieve public policy objectives. The key to success is based on:

- The inclusivity of the standards development process: a diverse set of stakeholders, including policy makers, industry, NGOs, and consumer representative bodies, participate such that the whole value chain is involved and can readily adopt the standard;
- A focus by the technical committees on ensuring integration with other standards, which provides consistency of terminology and approach across the domain and in related areas;
- Flexibility in the standards development process to permit rapid progress to be made; and
- The ability of the ISO process and methodology to result in consensus-based standards and, hence, global reach.

These attributes make standards a powerful tool for change, particularly in the fast-moving world of digital innovation, driven by data, where lack of trust is perceived to be a barrier to uptake. They enable all parties, across the value chain and regulatory bodies, to place their trust in the new digital service offerings and enable all actors to capitalize on the knowledge and expertise that is embodied in national, regional and international standards.

In addition to building trust between stakeholders, standards offer a range of benefits:

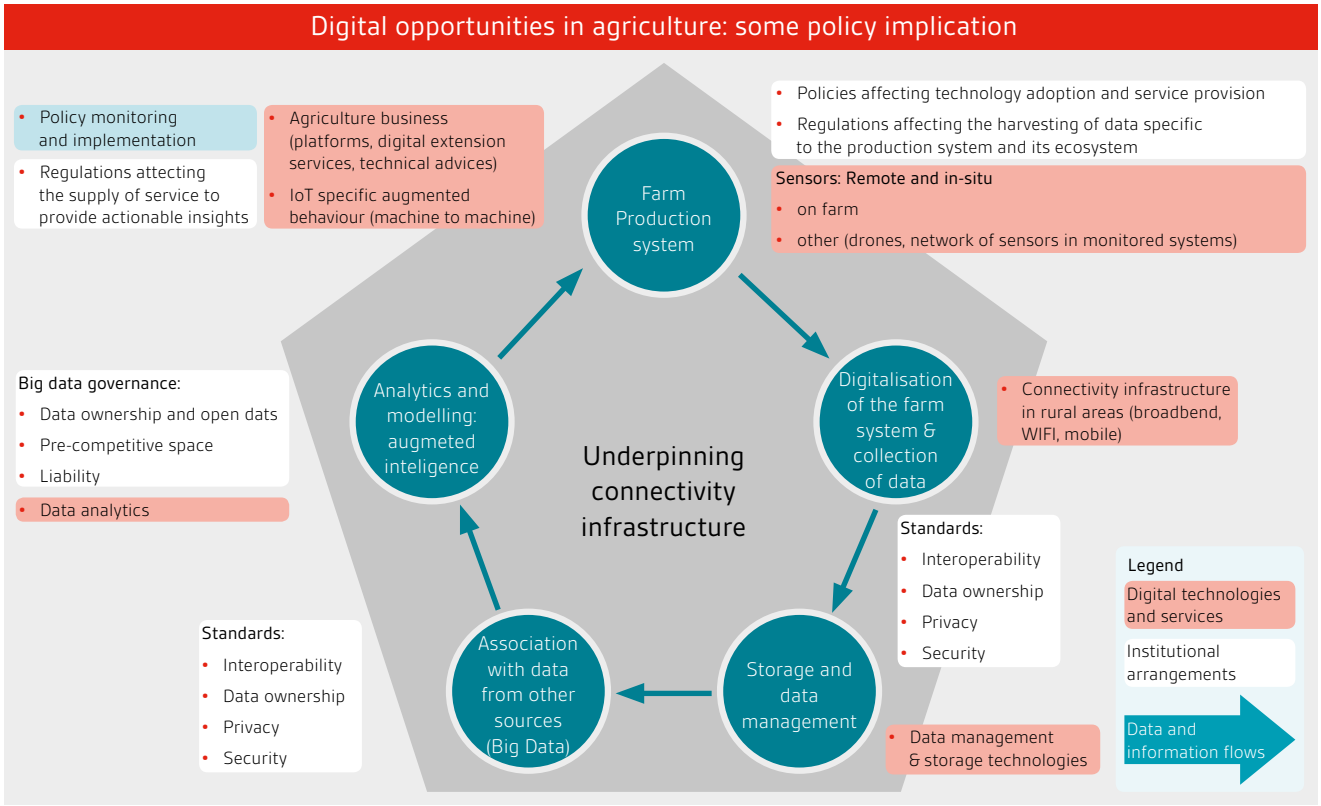
- As new technologies and innovations are introduced, standards can ensure interoperability. This is not simply technological interoperability but, of increasing importance, semantic interoperability, which will provide the basis for machines to understand the data being transmitted and to be able to respond/take intelligent decisions accordingly – an internet of services (IoS), not just an internet of things (IoT);
- Protection against cyber-crime and fraud, the provenance of goods/services throughout the value chain, and ensuring data can be shared without loss of privacy – ultimately digitalization is about trust[20] and adherence to standards provides the basis for that trust – in particular ISO/IEC 27001;

[20] www.bsigroup.com/globalassets/localfiles/en-gb/about-bsi/nsb/bsi_mountbatten-lecture.pdf

- Government can reference standards in regulations, which keep pace with industry good practice, leading to improvements in the quality of regulation and its ongoing relevance to business processes;
- As the basis for trust marks, standards enable whole sectors to promote quality or security, in a way that resonates with consumers;
- Opening markets to competition, to the benefit of suppliers and buyers alike;
- Based on the experience of leading players in the field, quality management standards, such as ISO 9001, provide a good practice guide and a risk management tool for all firms and, hence, a vehicle for institutional capacity-building and generating improvements in efficiency, sustainability and resilience;
- By building trust between private sector stakeholders and regulators, they enable smarter regulation of markets.

It is for these reasons that we believe standards should play a key role in the process of digital transformation, especially in the developing world, where Small and Medium Enterprises (SMEs) predominate and where there is a significant need for capacity-building. In the UK, an independent report carried out by Cebr[21] found that 41% of SMEs are more likely to export if they are using standards, and we believe such experience can be transferred to developing countries. Standards should be considered as part of a blended approach, which is recommended by the OECD, at least in its approach to the digital opportunities in agriculture and food[22], where technology/skills development and infrastructure investment are part of a package of policy measures. This model is worth considering in promoting digitalization worldwide, but it raises the question of whether standards are sufficiently accessible and sufficiently well-publicised to overcome the barriers to uptake, and whether capacity-building in developing countries needs to place more emphasis on the Quality Infrastructure (QI) System.

Figure 3. A blended approach to digitalization of the agri-food industry



Source: OECD 2019

[21] https://www.bsigroup.com/LocalFiles/en-GB/standards/BSI-standards-research-report-The-Economic-Contribution-of-Standards-to-the-UK-Economy-UK-EN.pdf

[22] https://issuu.com/oecd.publishing/docs/the_digital_transformation_of_the_a

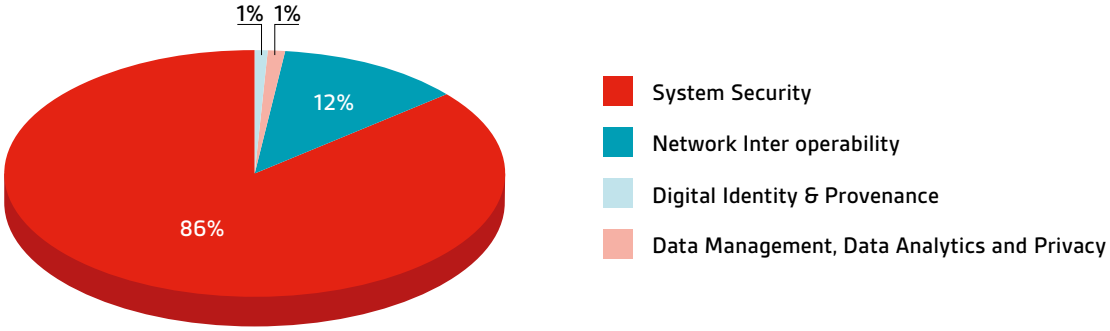
Comparisons in the use of digital standards

As digitalization in the UK has intensified, so has the growth in standards, both in number developed and uptake. For example, research commissioned by BSI estimates that there are now some 400 standards that have been developed in relation to IoT. A wider analysis of the sale of standards by BSI through individual purchase (i.e. standards mainly sold to SMEs) in four key areas of digitalization – system security, digital identification and provenance, interoperability and data privacy shows that, between 2015-2020, by far the bulk of sales lay in one area - system security - and, within that rubric, in just two standards:

- ISO/IEC 27001, which sets out the requirements for information security management systems; and
- ISO/IEC 27002, which provides a code of practice for information security controls.

The downloads of standards by subscribers to British Standards on Line (BSOL) showed a similar focus on system security and those two standards.

Figure 4. Uptake of digital standards in the UK (2015-2020)



Source: BSI 2021

In order to measure the uptake of digital standards in the Caribbean region and selected African countries, a preliminary survey was conducted with National Standards Bodies (NSBs). In contrast to the UK, the survey suggests that the uptake and market demand for such standards, in the core 4 areas of digitization, has been virtually non-existent. Further analysis needs to be undertaken to understand the barriers.

Converting strategy to action: The role of Quality Infrastructure institutions in the digital transformation process

Quality infrastructure (QI) is defined as "The system comprising the organizations (public and private) together with the policies, relevant legal and regulatory framework, and practices needed to support and enhance the quality, safety and environmental soundness of goods, services and processes." A quality infrastructure system relies on standardization as one of its key components, along with metrology, accreditation, conformity assessment and market surveillance, at the national, regional and international level.

Standards and the National Standards Body (NSB)

The NSB is at the heart of the QI and needs to be well resourced to cope with fast moving trade-related markets and technology developments, in order to contribute to the development of a dynamic, open, sustainable and innovative economy. This enables the government to achieve its full range of policy objectives, encapsulated by the UN's SDGs. Furthermore, the NSB is the national gatekeeper to international standardization and advises the government on key agreements related to standards, such as the World Trade Organizations (WTO) Technical Barriers to Trade (TBT) Agreement. Importantly, membership of the WTO TBT committee ensures that technical regulations, standards, and conformity assessment procedures are non-discriminatory, and do not create unnecessary obstacles to trade, and strongly encourages the use of international standards, where available.

Within that context, NSBs have a crucial role to play in supporting a country's digitalization strategy; the essence of digitalization is not only to transform individual product and service systems, but also to enable the different systems within an economy/society to interact through the medium of networked digital technologies. This requires compatibility, interoperability and security, and NSBs/standards play a vital role in underpinning the transformation through fostering trust in the process, creating alignment of systems, and building resilience. This is achieved at three levels:

National level:

a. Advise government that international standards can be used as a tool to establish national digital resilience, complementing legislation and regulation. There are several foundational international standards that address the core digital concerns, namely, system security, identification and provenance standards, data management and data sharing/privacy, and interoperability of the system. NSBs can advise government on how to reference standards in regulations and, moreover, provide guidance on developing a national digitalization strategy, that puts trust at the centre of the system;

b. Adopt relevant international digital standards as national standards and establish technical mirror committees for the relevant sectors;

c. Establish a capacity building department that can provide training to private sector actors on the requirements of the digital standards;

d. Establish an agile standards development process to meet the demands of the fast-paced industry;

e. Establish a public-private forum/platform per sector to raise concerns.

Regional level: participate in regional "digitalization forums" to ensure the national approach is in line with that of regional and international counterparts.

International Level: actively participate in the international standards making forums.

Certification schemes and trust marks

Although standards underpin trust, and inspire confidence in digital products and services, accredited certification schemes provide higher levels of assurance to customers. At the basic level, companies can demonstrate commitment by self-certifying their implementation of a standard and, at the highest, companies substantiate their claims to compliance through independent accredited third-party certification. Clearly, accredited certification bodies, the owners and guardians of the certification schemes/trust marks, have an important role to play in maintaining the quality and reputation of their schemes. By developing robust certification schemes (trust marks), underpinned by relevant standards, they provide users with the assurance they need. Certification, certification schemes and trust marks for digital processes, products and systems ultimately confirm to customers that the company's digital offering has been thoroughly tested and validated/assured, on a regular basis, and proven to meet a minimum quality/reliability threshold.

Standards, certification and government procurement policy

In the UK, digitalization has generated interest in the development of trust marks, certification schemes and equivalents in a number of areas, driven in part by government procurement policy demanding that firms demonstrate an ability to meet minimum requirements. For example, in the face of growing cyber threats, the government has supported the Cyber Essentials Certification Scheme[23] and, since 1 October 2014, it has required all suppliers bidding for government contracts, involving the handling of certain sensitive and personal information, to be certified against the scheme. Similarly, since 2016 the government has mandated the use of Building Information Modelling (BIM) in its procurement of construction projects e.g. schools and hospitals, and BSI has developed a Kitemark, in support of the standard BS EN ISO 19650, which distinguishes those firms that meet the international standard for effective management of information throughout the lifecycle of a construction project.

[23] www.ncsc.gov.uk/cyberessentials/overview

In areas requiring higher levels of security, such as the management of information networks, procurement frameworks require contractors to be certified to/conform to the requirements of ISO/IEC 27001, the international standard which provides the specification for a best practice information security management system; this includes independent assessment of the senior management's commitment to the standard, the data management processes, as well as the resilience of the infrastructure to cyber-attack.

In the digital world, where there is a range of security risks, standards and trust marks provide an ability to manage risk appropriately, and government procurement policy can be a powerful policy tool to promote awareness and compliance. Policy makers in the developing world will wish to consider whether the development of trust marks might provide a clear route-map to SMEs on how to qualify as a "trusted digital enterprise" and ultimately help them on the road to accessing international supply chains. Preliminary interviews conducted with Quality Infrastructure specialists in Africa and the Caribbean, indicate a market demand for the development of international certification schemes (trust marks), similar to Forest Stewardship Council (FSC) or EcoCert Schemes. Further research needs to be conducted to determine the level of demand for such a development and the accreditation processes required of an international certification scheme.

Key observations

There are six key points to note:

1. At a time when regional and global supply chains are of growing importance to sustainable economic growth, particularly for developing countries, a key role for NSBs is to harmonise standards and avoid fragmentation in the form of a multiplicity of national standards, which would only create barriers to trade and lost opportunities for aspiring SMEs;

2. The strength of the QI system is underpinned by the strength its quality infrastructure institutions, services and governance, and also to the extent of its engagement with businesses and customers, in promoting/disseminating the good practice that is encapsulated in standards as Figure 5 below illustrates;

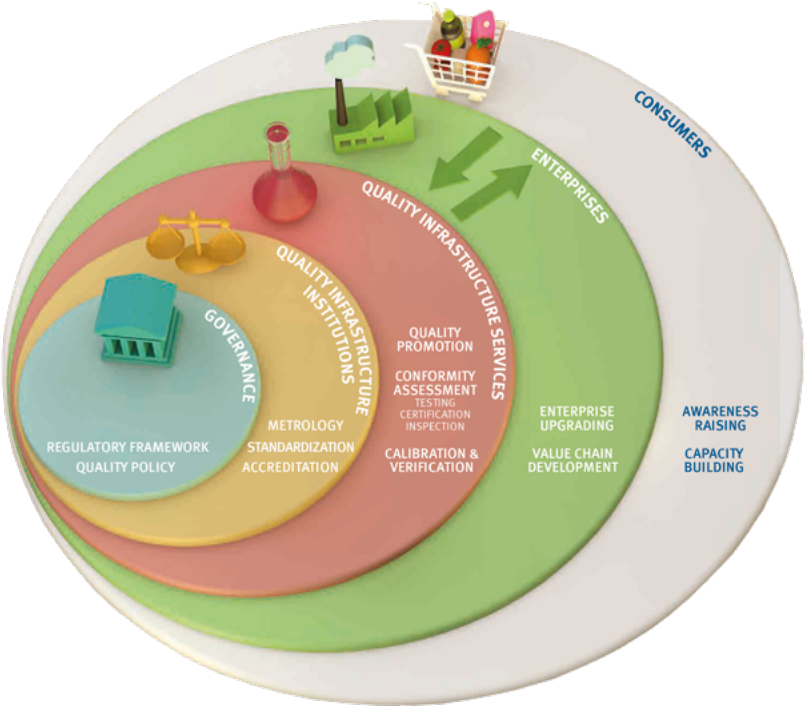
3. While institutions, such as NSBs, can be strengthened through targeted interventions, establishing an ecosystem of trust requires a concerted effort from different actors to build that intangible asset of trust. For example, experience among cash crop farmers in Africa suggests that trust in new digital services, such as mobile money, is best developed through established intermediaries – local agents – even though this comes at a price (the 5% agency fee for cashing out). But moving from mobile money to online banking and e-commerce, securing wider financial services, would represent a major step in trust (as well as digital infrastructure), and one which would involve the disintermediation of thousands of agents in countries like Ghana, Uganda, Rwanda, and Kenya. It will only be achieved if the benefits are significant and there is a cadre of farms/businesses that have made the transition, the success of which is plain for all to see;

4. Government can play an important role in building a secure digital infrastructure ecosystem by introducing procurement requirements that select suppliers who prove and demonstrate that they are secure and can be trusted. Furthermore, in developing resilient digital financial infrastructures to respond to crises, with the minimum risk of fraud, governments should insist on improved digital ID, based on standards;

5. In providing assurance of the digitalization of services to consumers, certification bodies may wish to coordinate the development of an international certification scheme that is accredited internationally;

6. In a digital world where security, performance and trust are paramount, making savings on the quality infrastructure is a false economy. Indeed, it is only by investing in the quality infrastructure and standards, and incentivising SMEs to participate, that governments can support the incipient digital ecosystem to develop the trust that is essential for its growth and success.

Figure 5. The impact of the QI ecosystem on business and consumers



Source: UNIDO 2015

Converting strategy to action: A digital toolkit based on standards

The rationale: as this paper has made clear, digitalization and the role of data are widely viewed as the key driver of change, and there is a growing number of indices and dashboards comparing the digital maturity of different countries and even city regions. A good example is the OECD's Going Digital Toolkit , which provides an excellent comparison of digital uptake and performance (mainly for its members). However, although the OECD acknowledges the critical role of standards in its work on the agri-food industry, it omits standards in its toolkit. They are the missing ingredient in promoting digitalization, particularly in the developing world, building trust in the digital products and services on offer. What is required is a programme of work that, where possible, builds on strategic assessments to date, by incorporating a standards and accredited certification strategy into the digitalization of priority sectors (or cities) to develop that confidence and trust – indeed, one which has the same branding appeal and power as, for example, "Intel Inside".

Developmental objective: to promote digitalization through a holistic approach, by developing practical guidance and a variety of tools (based on standards) for government/policy makers, the private sector, and other stakeholders at the national and/or sectoral level. To this end, we shall seek to promote trust in digitalization and digital services by providing guidance to SMEs in developing countries on the digital standards to implement. Adopting these standards will help them to demonstrate their digital maturity which, in turn, would reward the companies that commit to the process through high profile recognition and, hopefully, higher sales.

The proposed **digitalization toolkit**: comprises three elements or tiers:

1. A policy guide (the "macro" level, aimed at national governments): Establishing national digital resilience. This would follow the UNCTAD model/analysis for e-commerce and would outline good governance principles for developing an agile digitalization policy/strategy that would identify a more active role for the NSB and QI institutions;

[24] https://goingdigital.oecd.org/

2. A technical framework (the "meso" level aimed at sectors or cities): Supporting the transformation of sectors/value chains or public services in a city. This would develop guidance on how to introduce the power of networked digital technologies across supply chains, using a mandatory approach where necessary (technical regulations/laws), complemented by voluntary tools such as standards;
3. A practical guide (the "micro" level for individual organizations): Achieving digital maturity/excellence for firms and organizations. This would support those organizations who aspire to be best in class, and who wish to operate in leading global markets or be recognised as world class.

The process: The proposed transformation model is depicted through a number of steps set out in Figure 6 below.

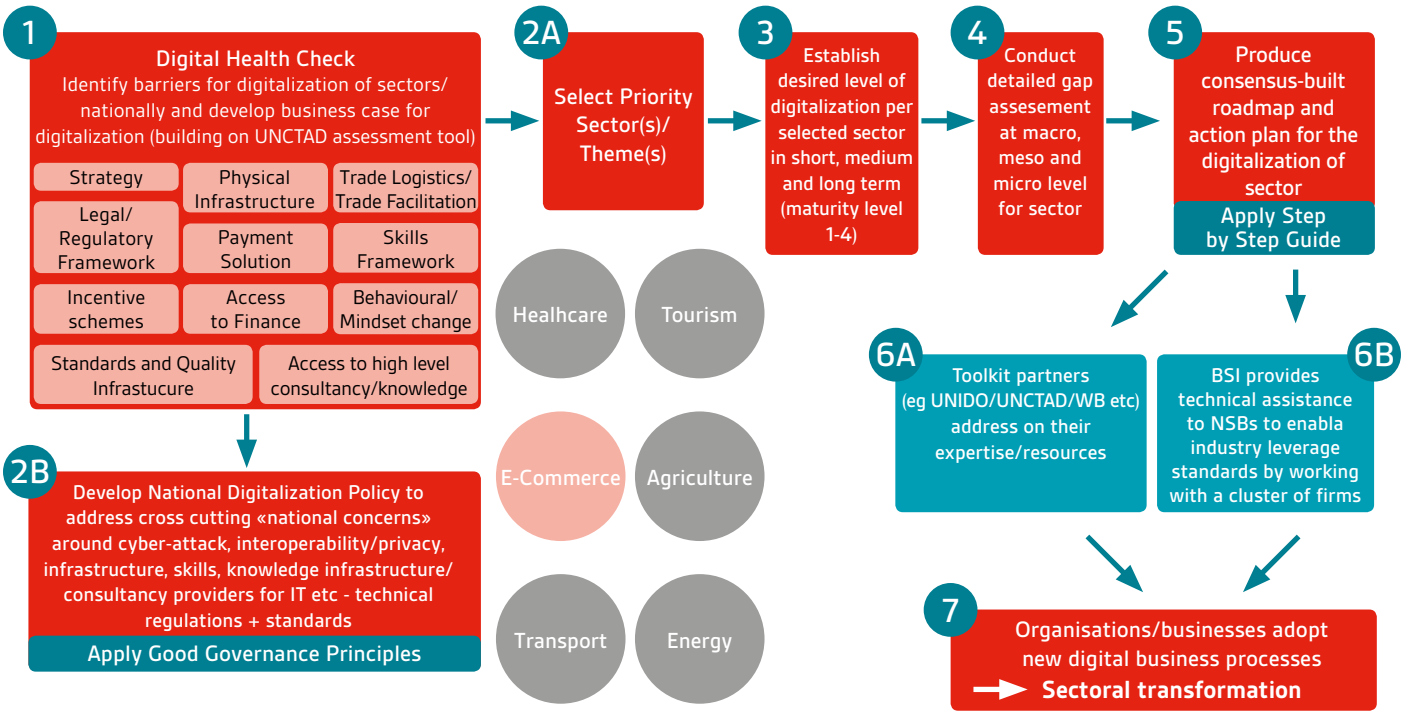
A prequel to the series of steps set out in Figure 6 would be to follow up the preliminary interviews carried out in the Caribbean and South Africa (mentioned on page 14) with a properly structured review of the role of standards in digitalization across a sample of developing countries. This would include an analysis of the needs of NSBs and how they might be met. In selecting the sample, one could choose from the 27 LDCs already assessed under the UNCTAD e-commerce programme, and build on the assessments that have been undertaken, adding standards-related activities, retrospectively, to the Action Plans already in place.

Where an UNCTAD eTrade readiness assessment has not been carried out, the first step would be to conduct a "macro" national digital health check to assess the existing capacities relevant for the digital economy. This assessment would be undertaken by applying the existing UNCTAD eTrade readiness assessment, with an additional eighth element to assess the standards and quality infrastructure capacities.

The next step would be at the "Meso" level, choosing a priority sector or city through consulting public and private sector stakeholders. The proposed toolkit envisages developing a gap assessment to measure the skills and adoption of standards to fulfil the digitalization objectives and thereby prepare a consensus-built roadmap digitalizing the relevant sector. Bespoke technical assistance would be provided to the NSB to equip and empower it to deliver the above analysis and roadmap, helping the sector see how international standards can support its digitalization. However, a sectoral framework without adherents is unlikely to gain traction, and so we anticipate demonstrating the advantages of standards through working with a cluster of firms in the sector to act as champions for digitalization.

This final step – at the "Micro" level – would be aimed at introducing SMEs to the digital standards that they need, in order to demonstrate their digital maturity to customers and suppliers alike.

Figure 6. Steps of proposed transformation model with a focus on standards.



Source: BSI 2021

The digitalization toolkit: Overview

One of the issues that needs to be addressed is the plethora of digital standards that exist. For example, for IoT there are over 400 standards available for SMEs to select from, which is overwhelming for them. SMEs would benefit from guidance on the standards they should follow, in order to "qualify" as digitally mature enterprises in a specific sector and, hence, to be able to participate in global value chains.

The core standards: There are a number of generic standards that lie at the heart of the concerns surrounding digitalization, regardless of sector. These relate to:

a. System security

b. Identification and provenance

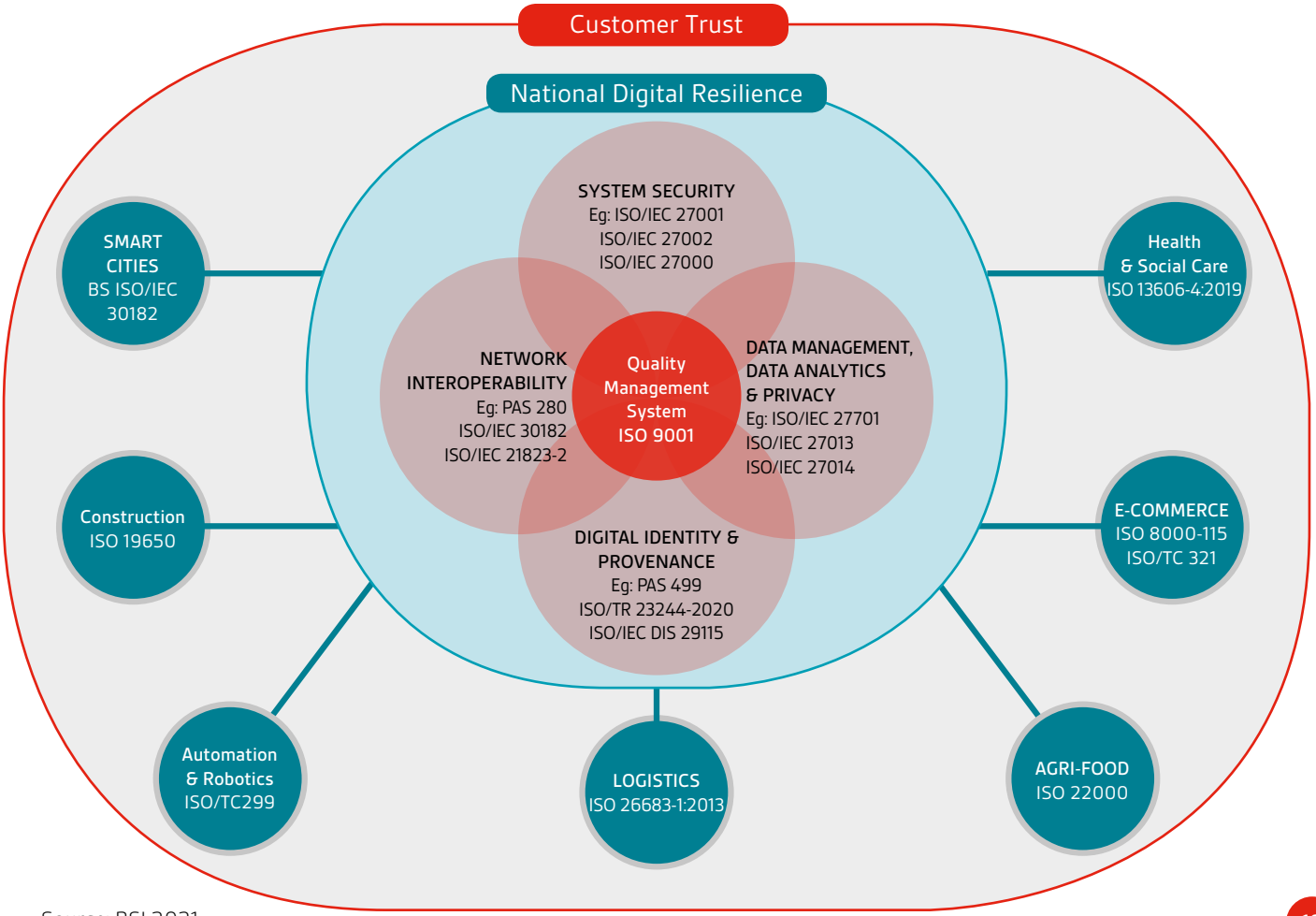
c. Data management, data analytics and data sharing/privacy

d. Interoperability of systems

Furthermore, as the Figure 7 indicates, ISO 9001 – the authoritative guide to developing quality management systems - lies at the centre of world class management processes.

In order to provide a robust and integrated framework for companies to follow in their pursuit of digital transformation, the international standards relevant to the above themes should be referenced in national digitalization strategies and regulation. These would form the core of the proposed digitalization toolkit, as shown in the schema below. For example, companies engaged in e-commerce or in the healthcare sector will wish to be sure that the digital ID system is robust, that the network is secure and that customers can be reassured of the privacy of their data. The agri-food industry will perhaps place more emphasis on the digital technologies/ standards that enable produce to be tracked from the field to the retailer.

Figure 7. Digital Standards Framework



Source: BSI 2021

Sectoral standards: In addition, at the sectoral or meso level, there are suites of standards that are relevant to the digitalization of individual sectors, which would be deployed where necessary (e.g. Building Information Modelling (BIM) standards in the construction sector) and these are depicted in the sector satellites around the core. The need for guidance for SMEs – i.e. the need to promote a culture of quality and trust in digitalization and how this relates to specific sectors – has been confirmed by preliminary interviews with standards bodies in South Africa and the Caribbean region. NSBs have a critical role to play in forming stakeholder networks as a forum for the provision of advice on relevant national sectoral standards. Where possible, NSBs should adopt international standards to facilitate trade and interoperability of the digital systems and, where international standards are needed but lacking, NSBs have an important role in facilitating their development.

The digitalization toolkit – The standards roadmap to digital maturity

The use of standards differs widely between countries and so the speed with which the standards ecosystem can be developed will also be different. The process will take time, but the aim should be to develop a programme to raise all developing countries to an intermediate status within the next three to five years (see Figure 8), as part of a wider integrated approach to digitalization, including infrastructure and skills. However, we believe that the focus on quality and standards will provide the solid base for active participation in global value chains by SMEs, and it is this virtuous circle that will lead to more confidence in digital technologies, e-commerce, higher quality jobs and improved finance for SMEs.

Figure 8. A standards roadmap to digital maturity

A STANDARDS ROADMAP TO DIGITAL MATURITY

4 Pioneering

NSB takes lead/active role in International standards development

Leading companies actively engaged In Industry 4.0 and digital trade

More companies are adopting leading edge technologies e.g. blockchain, cloud and AI;

3 Advanced

NSB recognized as key institutions promoting safety, security and trust in the process of digitalization

Widespread usage of, and demand for, standards and certification

Dynamic QIS ecosystem across all section with QIS closely linked to policy/legislative/trade developments

Procurement and service delivery in public and private sectors widely linked to International standards

Sophisticated digital ID widely adopted

Widespread cross border trade based on standards;

2 Intermediate

NSB adopt International standards

NSB proactive in disseminating and supporting SMEs in the uptake of standards

NSB coordinate with Regional standards bodies to ensure harmonization of standards

Quality infrastructures/standards ecosystem in development

Increase the number of companies certifying to standards

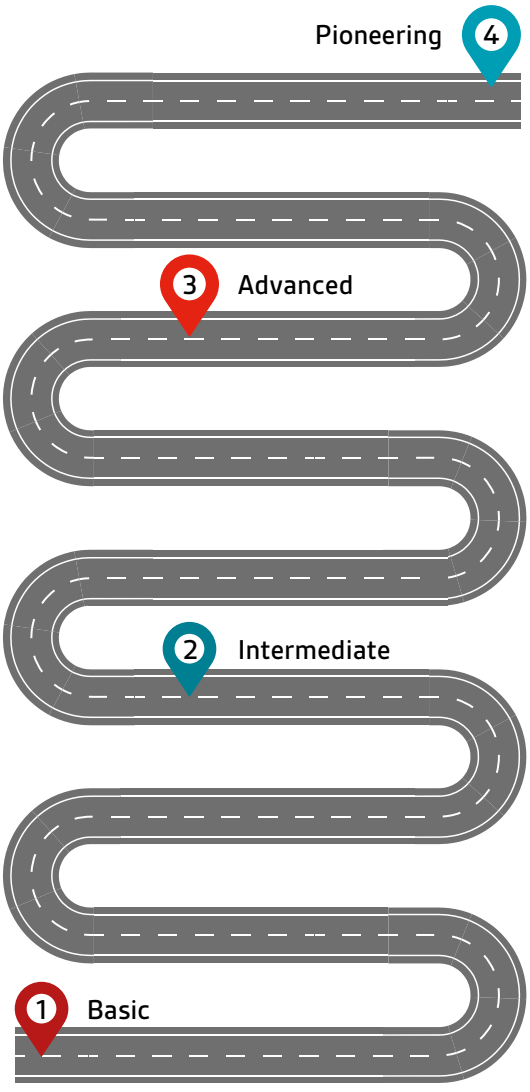
Growing local e-commerce/e-government and internet banking;

1 Basic

NSB are passive actors

Low level of SME awareness of, and commitment to, relevant standards

Impetus provided by oversea private sector organizations;



Source: BSI 2021

Converting strategy to action: partnerships and demonstrators

As the UNCTAD eTrade readiness assessments demonstrate, digitalization is multi-faceted and a holistic and integrated approach is essential for success. Furthermore, we believe that, to make the progress that is necessary in the developing world, we also need to adopt a layered approach to capacity-building, as set out in Figure 6. The first layer is addressing the needs of the key institutions with responsibilities for economic and social development, where digitalization will play such an important role in achieving their SDGs. The second layer is demonstrating the power of digitalization in key cities and sectors through "lighthouse"/demonstrator projects. However, the resource requirements of demonstrators are considerable, particularly where new infrastructure has to be installed and new skills developed. Thus, in the first instance, demonstrators or lighthouse projects need to be bounded by geography, to control development costs, and then scaled up, according to success. The third and final layer is ensuring that a sample of SMEs are included and supported as part of the demonstration project. Such a layered approach would ensure that national institutions were aligned behind the digitalization agenda, and resourced to support it, and an incipient digital ecosystem, including entrepreneurial SMEs, was in place with the potential to expand. By developing a cadre of successful digital firms (having adopted the relevant standards) we will create exemplars for their peers to follow and make the business case for change. This will attract further private investment and generate a learning experience as part of the capacity-building, which can be disseminated more widely.

This paper describes how we propose to use the power of standards to promote the confidence and trust in digitalization that is, to some extent, missing at present. We anticipate working in partnership with National Standards Bodies, especially those in the Commonwealth Standards Network, and with others, to this end. However, standards are not enough in isolation; the purpose of the paper is to approach the UNCTAD-led **eTrade for all** network, as well as the International Network for Quality Infrastructure (INetQI), to develop the more integrated approach that is required.

About BSI

BSI is a global thought leader championing business excellence, innovation and best practice. It has grown into an international research, advisory and regulatory organisation of over 3,500 staff in 80 global locations.

Whether by developing agile standards or offering quality management advisory services, BSI remains true to its original mission of 'making excellence a habit' in organizations all over the world.

International Projects - What we're here to do

BSI's International Projects (IP) division was formed with a specific goal – to help governments improve their trade policy-making processes, unlock prosperity and boost private sector competitiveness.

For over 20 years, we've been providing regular best-in-class expertise on trade promotion, regulatory compliance and export readiness on a range of aid-funded programmes in more than 100 countries.

The IP team is made up of a network of international consultants and project managers. They carry out a range of activities that includes providing policy advice and recommendations, training programmes, specialised seminars and workshops, and updating legislation and regulations.

For more information on International Projects team or on this whitepaper please contact us here.

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