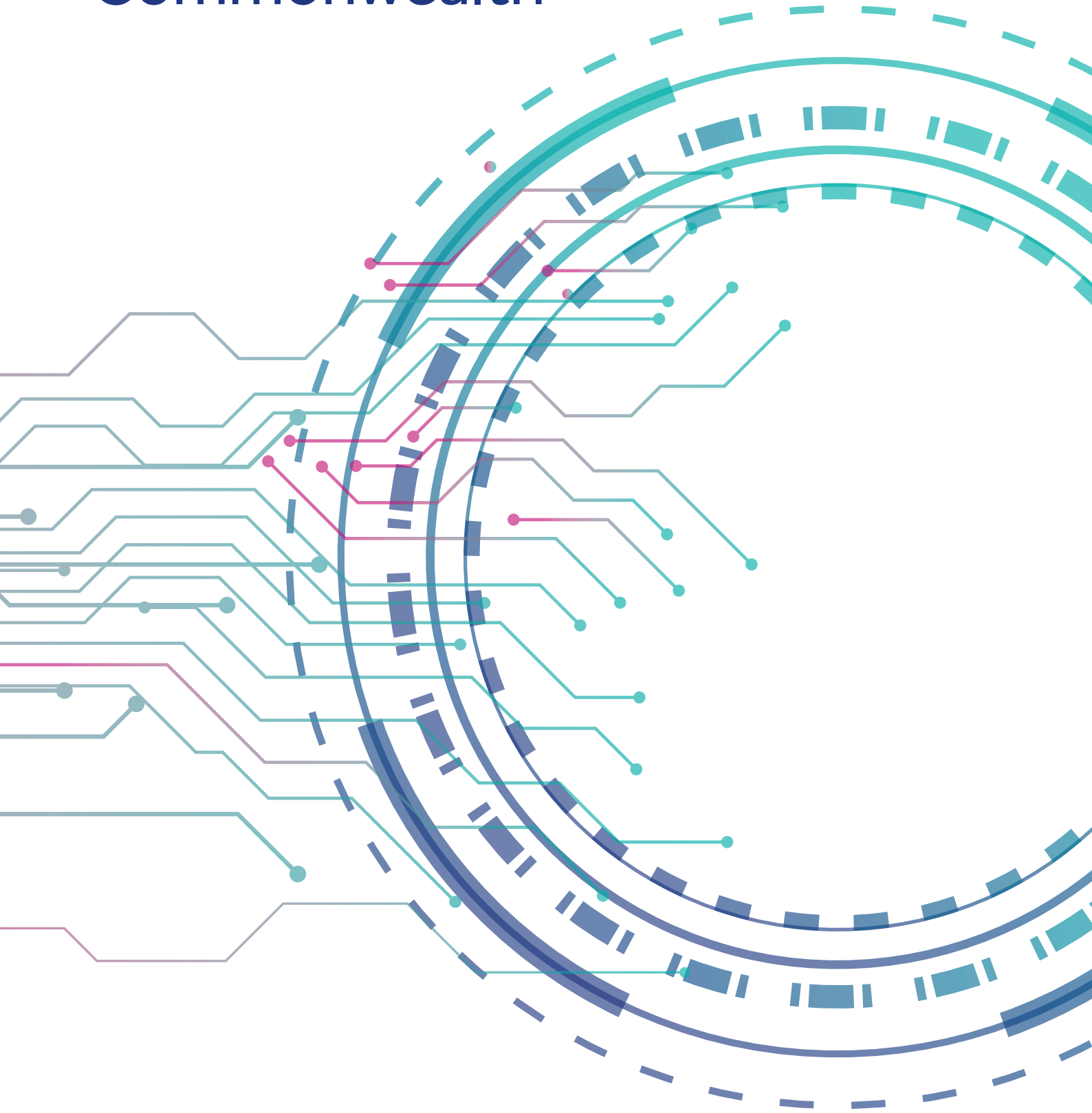
The State of the Digital Economy in the Commonwealth



The Commonwealth

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Commonwealth Secretariat
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United Kingdom

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The Commonwealth is an association of 53 independent countries, comprising large and small, developed and developing, landlocked and island economies. As the main intergovernmental body of the association, the Commonwealth Secretariat works with member governments to deliver on priorities agreed by Commonwealth Heads of Government and promotes international consensus-building. It provides technical assistance and advisory services to members, helping governments achieve sustainable, inclusive and equitable development. The Secretariat's work programme encompasses areas such as democracy, rule of law, human rights, governance and social and economic development.

Foreword

Advances in digital technologies are changing what and how we trade, lowering barriers to internationalisation and fuelling the rise of e-commerce and borderless digital trade, diversifying the content of traded goods and services, and enabling new players to engage in international trade.

Digitalisation affords opportunities for our Commonwealth to build new industries, devise new ways to deliver better services, and enhance market access through digital trade. Advanced digital production technologies create new ways to accelerate innovation, boost productivity and raise the value-added content of goods produced in Commonwealth countries. More generally, the rise of the digital economy is creating new economic pathways, livelihoods and job opportunities that support inclusive and sustainable development across the Commonwealth. It also creates new avenues to expand the role of women in trade.

Harnessing these gains within the Commonwealth requires appropriate policies and regulatory approaches that allow individuals, entrepreneurs and businesses to capitalise fully on the opportunities provided by new digital technologies. It also requires effective policy responses to manage both the perceived and actual disruptive impacts on different segments of society.

Without attention to these issues, there is a real risk that significant proportions of the population in Commonwealth countries may be left behind by digitalisation and excluded from participating effectively in the digital economy. More generally, a lack of digital readiness in many Commonwealth countries – particularly developing members and small states – is exacerbating digital divides and threatening to marginalise some Commonwealth citizens from meaningful participation in the digital economy.

There is thus an urgent need to ensure that individuals, entrepreneurs and businesses across the Commonwealth have the ability to engage and compete effectively in the digital economy. This means considerable effort and resources need to be directed to developing digital infrastructure and foundational digital systems (such as digital identities or systems and platforms for processing digital payments), building digital skills, and creating a facilitative and enabling environment to adopt and absorb digital technologies and engage effectively in digital trade. Innovative regulatory frameworks and levers can also be employed to engender greater trust in digital systems and support digital inclusion, especially in terms of the use of digital technology by women.

The long-standing spirit of co-operation in the Commonwealth can play a major role in supporting our member countries to harness the benefits of the digital economy and deal with the inherent challenges posed by rapid digital transformation. By exchanging experiences, sharing knowledge and best practices, and enhancing capacity, we can collectively create the ecosystem where inclusive and sustainable national digital economies can develop, and ensure digital transformation benefits all segments of society across the Commonwealth. No other study has focused specifically on digitalisation in the Commonwealth. The study thus fills an important gap by providing new knowledge on the state of the digital economy in the Commonwealth, the challenges posed by digitalisation, and the opportunities available for Commonwealth members to harness the benefits of digitalisation for development and to boost intra-Commonwealth trade.

The Right Hon Patricia Scotland QC
Secretary-General of the Commonwealth

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Summary

Exponential growth in new technologies and data flows are spearheading a digital transformation of the global economy, bringing major benefits as well as challenges for Commonwealth countries. Advances in digital technologies are already influencing the nature, scale, scope and speed of production and other economic activities. The expansion of the digital economy, on the back of the exponential growth of the internet and advances in information technology and massive growth in flows of digital data, is opening up new opportunities for digital trade and modifying the means of commerce in the twenty-first century. Digitalisation is an important conduit to economic growth and international trade.

In recent years, the digital economy has experienced unprecedented growth, with the internet becoming accessible to more than half of the global population in 2018 (ITU 2018) – a remarkable increase from the less than 10 per cent penetration rate in 2000 (World Development Indicators 2019). The value of business-to-consumer (B2C) online transactions has also tripled from 0.5 per cent of global gross domestic product (GDP) in 2010 to 1.5 per cent in 2017 (World Investment Report 2017). Another indicator of rising digitalisation is the increase in information and communication technology (ICT) trade; globally, ICT services grew by an impressive 40 per cent from 2010–2015 (IER 2017).

Chapter 1 maps trade trends in the digital economy in the Commonwealth. **It finds that while the contribution of ICT services to the Commonwealth's total services trade and GDP has been gradually increasing since 2012, the Commonwealth seems to be losing out on high-technology manufacturing**. The share of the Commonwealth in world high-technology exports declined from 19 per cent to 11 per cent in the period 2000–2017 (WITS 2019). In the last five years (2013–2017), manufacturing exports have been dominated by resource-based exports (equivalent to 5.3% of the Commonwealth's GDP), followed by medium-technology exports (4%), and primary product exports (3.5%) in the Commonwealth. **Moreover, just six Commonwealth countries make up 98.8 per cent of the Commonwealth's total high-tech exports as of 2017** (WITS 2019). The disparity in ICT trade participation among Commonwealth countries is also evident by income and size, with low-income countries (LICs) and small states contributing minimally to overall Commonwealth ICT trade.

Beyond ICT services, **the share of digitally deliverable export services (DDES)** – such as, insurance and financial services, intellectual property charges, telecommunications, computer and information, other business and audio-visual and related services (UNCTAD 2019) – **has increased in high-income as well as upper- and lower-middle-income Commonwealth countries, but decreased in small states and low-income countries**. Among Commonwealth countries, the share of DDES in total trade in services varies from more than 70 per cent in the United Kingdom (UK), India and Ghana to less than 10 per cent in some small states.

Chapter 2 discusses the new opportunities that digitalisation brings for Commonwealth countries through lowering the cost of, and facilitating, trade, reducing market entry barriers (including non-tariff barriers), enabling higher market access through e-commerce, supporting efficiency improvements, enabling movement into higher value-added products in the agriculture and services sectors, and raising overall export competitiveness. **If all Commonwealth countries achieve a minimum level of broadband penetration of 50 per cent (the world average), then Commonwealth GDP is expected to rise by between US$74 billion and $263 billion (Commonwealth Secretariat 2018)**. In line with this, Chapter 2 finds that **productivity in the agricultural, industrial and service sectors is positively associated with internet penetration in the Commonwealth**.

However, the discussion of new opportunities through digitalisation needs to take into account the challenges brought about by the digital divide. While digital technologies present new opportunities to expand trade, a persistent digital divide between developing Commonwealth countries and the rest of the world can increase re-shoring and limit future offshoring of digitally advanced production to developing countries. **The average share of manufacturing value-added has been gradually declining across all Commonwealth regions in the period 2000–2018**. In the face of these challenges to industrialisation, countries may look towards a more service-led development model. International Labour Organization (ILO) data shows that the average employment share of services – both public administrative services and trade, transportation and accommodation – has increased in the period 2006–2018 across most Commonwealth countries, highlighting the growing importance of services.

Knowledge-intensive services and digital trade can support development strategies for Commonwealth countries, particularly in small states, which cannot rely on economies of scale in agriculture or manufacturing production. However, new opportunities brought about by e-commerce are only being realised by a few Commonwealth countries. **In 2015, B2C e-commerce in the Commonwealth generated roughly US$354 billion in sales, representing 3.5 per cent of total Commonwealth GDP, but only six Commonwealth countries – the UK, Canada, Australia, India, Singapore and Malaysia – accounted for 85 per cent of all B2C e-commerce sales**. These countries have active legislation in four key categories relevant to data regulation: a) presence of a legal framework for electronic transactions/e-signature; b) a legal framework for data protection/privacy online; c) a legal framework for consumer protection when purchasing online; and d) a legal framework for cyber-crime prevention. The majority of the Commonwealth countries with legislation in only one or none of these areas are African countries (such as Mozambique, Lesotho, Nigeria, Tanzania and Malawi) and small states.

Chapter 3 examines how the increasing digitalisation and growing importance of services is changing the landscape of labour markets and skills in Commonwealth countries. **Productivity across sectors is found to be higher for Commonwealth countries in which both digitalisation (measured as internet penetration) and skills development (measured as secondary school enrolment) is above the median levels**, followed by countries with high digitalisation and low skills, low digitalisation and high skills and, lastly, low digitalisation and low skills. **New empirical evidence presented in this study for a sample of low- and middle-income countries shows that a doubling of the internet penetration rate, on average, increases manufacturing labour productivity by 5.3 per cent, but the impact is lower for Commonwealth countries compared to their non-Commonwealth counterparts, possibly indicating a lack of overall digital capacity in Commonwealth low- and middle-income countries in areas such as digital infrastructure, skills and general infrastructure**.

Furthermore, **a 1 per cent increase in skills, measured using a human capital index, can increase the impact of internet penetration on manufacturing labour productivity in the Commonwealth by roughly 7.4 per cent, on average**.

How do Commonwealth countries fare on future-relevant skills? The performance of Commonwealth countries is examined on five categories of skills relevant for the digital economy: *a) basic ICT skills; b) information management skills; c) ICT for communication and collaboration; d) ICT for content creation and commerce; and e) ICT for analytical thinking.* **In terms of basic digital skills and information management skills, the Commonwealth is found to be lagging behind** – for instance, compared to the global average of 40 per cent, only 27.8 per cent of the population in Commonwealth countries is using the internet to get information about general government organisations (ITU 2019). Even within the Commonwealth, there is a significant gap: more than 80 per cent of the population in the UK is using the internet to acquire information about goods or

services compared to just 14 per cent in Bangladesh (ibid). **The Commonwealth is faring better in terms of ICT skills for communication and collaboration, with the Commonwealth average (21.4%) exceeding the global average (17%) in terms of using the internet for finding/applying for a job**. However, there is significant variation within Commonwealth countries; for instance, only 2 per cent of the Kenyan population uses the internet to find, or apply for, a job (ibid).

The digital gap within the Commonwealth is also present in the case of ICT skills for innovation or commerce (ITU 2018). More than 70 per cent of the population in the UK and Australia is using the internet for purchasing goods and services compared to less than 12 per cent in Bangladesh, Botswana and Jamaica. In terms of ICT skills for analytical thinking, while 8.5 per cent of the population in the UK is using the internet for writing a computer program using a specialised computer programming language, just 4.8 per cent of the population in Botswana and 1.5 per cent in Pakistan are doing so (ibid).

Chapter 4 takes a deep dive into levels of development of digital infrastructure and the 'smart economy' in the Commonwealth. Digital infrastructure is categorised into three types: *basic* digital infrastructure, which encompasses internet infrastructure, cable and mobile networks; *intermediate* digital infrastructure, which captures the overall quality and reliability of internet infrastructure; and *advanced* digital infrastructure, referring to the use of digital technologies such as robotics and e-commerce within production systems. Additionally, soft digital infrastructure also complements the hard infrastructure. Education, training and capacity building are required to utilise digital infrastructure effectively.

In both basic and intermediate digital infrastructure indicators, the Commonwealth performance is weaker than non-Commonwealth countries. Furthermore, there is a significant digital divide within the Commonwealth. On average, 85 per cent of the population in high-income Commonwealth countries has access to the internet, compared to just 18 per cent in low-income countries in the Commonwealth. Only 5 to 10 per cent of households in Commonwealth low-income countries have access to computers and the internet, while in the small states of Kiribati, Malawi, Sierra Leone, Solomon Islands and Papua New Guinea, less than 15 per cent of the population is connected to the internet. The lower access to basic technologies in the Commonwealth's LICs may be explained by the higher cost of the internet – it costs roughly US$66 to acquire a fixed broadband internet connection in these economies, compared to the Commonwealth average of US$39 (ITU 2018).

In terms of international bandwidth per internet user, a proxy for intermediate digital infrastructure, the digital divide within the Commonwealth has increased in the period 2010–2017. On average, 63 per cent of the LIC population is covered by at least a 3G network, but the international bandwidth per internet user is roughly 40 times lower compared to Commonwealth high-income countries (HICs). Unsurprisingly, **the digital divide translates onto advanced digital infrastructure: 20 out of 31 Commonwealth countries fell below the world average score on UNCTAD's Business-to-Consumer E-Commerce Index in 2016** (UNCTAD 2018). Of these 20 Commonwealth countries, 15 are in Africa and 15 are categorised as LICs or lower middle-income countries (LMICs).

Various indicators are used to capture aspects of the 'smart' economy in Commonwealth countries, including expenditure on research and development (R&D), availability of venture capital, patent penetration and e-governance. **Commonwealth HICs (Singapore, Australia, the UK, Canada and New Zealand) and Malaysia (UMIC) continue to be the highest R&D spenders since 2009**. In terms of ICT patent penetration, Singapore ranks at the top, with 60 ICT-related patent applications filed under the Patent Cooperation Treaty (PCT) per one million people, followed by Canada, the UK, Australia and New Zealand. In comparison, among 33 Commonwealth countries with 2016 data, 10 countries have less than one ICT patent application per one million people, and 13 countries reported zero patent penetration in 2016.

While the Commonwealth performs on par with the world and non-Commonwealth country averages in e-governance, discrepancies exist among Commonwealth countries. LICs, countries in Africa and Commonwealth small states rank lower on e-governance indices. **Except for postal service penetration and customs export clearance, Commonwealth small states perform below the global average across all indicators measuring trade and logistics performance**. Of the 30 Commonwealth small states in the sample, 20 are located in either the Caribbean or the Pacific, reinforcing the reality that logistics and trade facilitation performance is especially challenging for small and remote Commonwealth countries.

Chapter 5 focuses on the role that regulatory co-operation can play in supporting the development of the digital economy within Commonwealth member countries**.** As per the ICT Regulatory Tracker, Malta, the UK, and Australia rank in the top 10 out of 193 countries in terms of ICT regulatory preparedness. Within the Commonwealth, small states fare least favourably in terms of ICT regulations, and their global rank is low, driven by low scoring performance in the regulatory authority and regulatory regime dimensions. The Chapter further identifies the different approaches undertaken by some Commonwealth countries in terms of adapting taxation and competition policies in the digital economy. **It is crucial that competition laws in the Commonwealth address standard competition issues of anti-competitive agreements, cartels, abuse of dominance, and merger control, but also extend to competition challenges within the context of an increasingly digitalised economy. Furthermore, Commonwealth governments should also consider whether current intellectual property rights frameworks strike the right balance between incentivising innovation and promoting competition**.

Chapter 6 sheds light on the scope for inclusive development in the digital economy and how new opportunities for small states, women and youth can be realised by managing digital transformation in a more inclusive manner. To realise the opportunities of digitalisation at scale, harmonisation of ICT may be key for Commonwealth countries, particularly the small states. However, leveraging e-commerce is constrained by the absence of a harmonised regulatory framework, high cost of infrastructure such as postal competence and port logistics, limited financial instruments, lack of stakeholder buy-in and poorer overall ease of doing business in some small states.

For many developing Commonwealth members, including small states, youth unemployment constitutes another serious and growing challenge. **The untapped potential of youth in Commonwealth countries is reflected in the share of youths not in employment, education or training (the NEET rate), which varies across Commonwealth members, with small states having a higher untapped potential for youths**. Trinidad and Tobago has a NEET rate of 52.1 per cent, followed by Kiribati (46.9%), Botswana and Eswatini (25.5%) and The Gambia (34%).

The gender digital divide in the Commonwealth also presents a significant challenge. Firstly, there is less parity in the use of the internet across developing countries, compared to developed Commonwealth countries such as Australia and the UK. Internet usage rates show male bias in developing countries such as Botswana, Cameroon, Malawi, Nigeria and Zambia, indicating marginalisation of women in the digital age. For countries such as Fiji, Malawi and Eswatini, the time it takes for females to start a business is also high in comparison to countries such as Australia and The Gambia, reflecting the trade facilitation constraints faced by women. Secondly, it is observed that the proportion of the male population with basic information management skills – i.e. for copying or moving a file or folder and using basic arithmetic formulae in a spreadsheet – is higher than the equivalent share of the female population in the majority of the Commonwealth countries examined. In the case of advanced digital skills for ICT programming, apart from Brunei Darussalam, other Commonwealth countries such as the UK,

Singapore, Malta, Malaysia and Botswana have gender disparities in favour of males.

In terms of sustainable development, **the chapter outlines a number of successful projects initiated in Commonwealth countries where digital technologies, particularly smart agriculture and smart fisheries, are being used to boost the *green* and *blue* economies respectively**. Nevertheless, there still remain major challenges in the adoption of technology in agriculture and fisheries for Commonwealth members, including: lack of capital in micro, small and medium-sized enterprises for adopting these technologies; lack of capacity, including in relation to human capital and know-how among farmers to utilise agricultural technology; and the absence of other key enablers for the use of agricultural technologies, such as access to the internet and broadband connectivity.

In the face of these challenges, Chapter 7 identifies possible policy initiatives for the Commonwealth to foster the digital economy, with a focus on intra-Commonwealth efforts. These initiatives are:

1. ***Facilitating best practices on internet and broadband digital infrastructure***, including through increasing internet affordability, targeting public-access solutions and digital infrastructure sharing. In this regard, information sharing and the exchange of best practice in digital infrastructure development within the Commonwealth can be particularly key for LICs and small states to enhance their digital infrastructure.
2. ***Promoting e-commerce and investments in a data-driven economy to take advantage of the next wave of manufacturing and services***, including through the formulation of a supportive legal and regulatory framework on 'data infrastructure'. In addition to the development of national data policies, devising national e-commerce policies, alongside efforts to creating an enabling environment for digital trade, that feed into e-commerce strategies within the Commonwealth, may be effective in closing the digital divide.
3. ***Exploring the use of smart agriculture and fisheries technologies*** such as blockchain in product traceability, smart phones for extension services, e-payment systems for online markets and sales, and connecting to suppliers and markets. Technology transfer and skills development in the use of such technology should be prioritised in Commonwealth countries. Such assistance can be provided through Commonwealth partnerships with member countries or bilateral donors.
4. ***Sharing experience on e-governance and smart cities***: Commonwealth initiatives by small states, coupled with knowledge sharing on both a north-south and south-south basis, by leading digital Commonwealth states, can help foster development. The sharing of lessons and best practices in e-governance can further help the process.
5. ***Promoting an enabling policy and regulatory regime*** through pro-active policies at the national level. These policies should aim to facilitate access to technology and foreign direct investment for positive spill-overs. Care should be taken, through international regulatory co-operation and the promotion of Good Regulatory Practices, to ensure the regulatory environment in Commonwealth countries promotes, rather than hinders, digital development.
6. ***Promoting digital skills development within the Commonwealth***. To build future-relevant skills, Commonwealth countries need to boost the development of digital and soft skills through: more STEM (science, technology, engineering, mathematics)-focused technical and vocational educational training (TVET); provision of workplace learning opportunities by the private sector to enhance long-term employment prospects; and expanding digital skills training in non-formal TVET for out-of-school youth and marginalised sections of society. Training capacity needs to be leveraged through better coordination across existing players and linkages with national accreditation systems, which

continue to present key challenges in many Commonwealth Asian and African countries.

7. ***Deepening co-operation for inclusive and sustainable development***. Efforts need to continue, through the Commonwealth Connectivity Agenda and other Commonwealth-wide initiatives and platforms, to mainstream gender, youth, green and blue economy considerations into Commonwealth co-operation. To assess the magnitude and impact of digital inclusivity for women, the Commonwealth needs to commission studies to collect primary data on gender gaps in different regions, develop an Economic Empowerment Index and determine the gender parity within countries and across Commonwealth regions. Boosting opportunities for youth entrepreneurship will require addressing key challenges related to a limited regulatory environment in small states; poor coordination between national and sector-based policies promoting youth entrepreneurship; and data gaps on youth unemployment and youth entrepreneurship.

Preface

In recent years, the digital economy has experienced unprecedented growth, with rising internet access, growing values of business-to-consumer online transactions, increases in information and communication technology (ICT) trade, more widespread use of robotics and increasing automation of production. The rising prominence of the digital economy has occurred on the back of huge growth in flows of digital data. Between 1992 and 2017, global internet protocol traffic, often used as a proxy for the flow of data, increased from 100 gigabytes per day to 45,000 gigabytes per second (UNCTAD 2019). The expansion of digital data flows and the increasing use of data as an economic resource has supported the emergence of digital platforms, in the process fuelling expansion of the digital economy globally. This, in turn, promises to support new jobs in digital services and new forms of digital work, while also creating opportunities for higher levels of growth, productivity and value-added.

While digitalisation is broad and all encompassing, its impact is cross-cutting as well as specific. For example, digital trade and e-commerce are extremely broad and range from online transactions or the purchase and sale of traditional goods and services, to the production and sale of increasingly advanced digital products or the use of digitally enabled platforms and the sharing economy. Digitalisation is increasingly a feature in the agriculture, manufacturing and services sectors globally, transforming business models across continents. The effect of digitalisation also has a bearing on the role of governments and institutions in instigating new regulations and policies.

If harnessed effectively, digitalisation and digital trade can accelerate economic growth, drive productivity improvements and create jobs across the Commonwealth. Digital connectivity can also help Commonwealth members overcome barriers to inclusive development. This requires leveraging digital technologies to promote entrepreneurship and innovation, empower women and facilitate access of micro, small and medium-sized enterprises (MSMEs) to markets and business services (UNCTAD 2017).

Rapid advances towards digitalisation on the back of exponential growth in technologies such as advanced robotics, artificial intelligence, the internet of things, 3D-printing and nanotechnology, have made digital connectivity an increasingly prominent feature of the global economy. This is backed by accelerating market penetration of several key technologies – such as cloud computing, the internet and mobile phones – underpinning digitalisation. At the same time, there has been enormous growth in both the volume and speed of digital data flows.

These developments have important implications for production and economic activity. Digital transformation of traditional manufacturing and production methods is already underway and advances in digital technologies are shifting manufacturing opportunities and patterns of specialisation within and between countries. Digitalisation enables greater specialisation of production processes in both manufacturing and services, facilitating fragmentation of tasks and supporting effective operation of global value chains (GVCs) (Asian Development Bank 2019). In manufacturing, the adoption of advanced technologies supports higher rates of growth in manufacturing value added (UNIDO 2019). The deployment of advanced digital technologies in manufacturing and services can support productivity improvements by minimising input requirements for scare labour and skills, automating tasks and freeing up space for workers to focus on more cognitive tasks requiring human intelligence, complementing labour and skills, assisting education and skills development, and helping to match workers to jobs and tasks more efficiently (Asian Development Bank 2019).

Advances in digital technologies are also influencing the scale, scope and speed of production (OECD 2019). The generally low marginal costs associated with digital products and services mean it is often possible to scale-up production without requiring large numbers of employees or major capital investment. Moreover, the interoperability afforded by digitalisation facilitates greater degrees of complexity and versioning and makes it easier to generate economies of scope. Digitalisation also facilitates rapid diffusion of ideas and innovation.

The potential impact of these developments is being compared with previous large-scale industrial transformations. A 'Fourth Industrial Revolution' is said to be approaching, marked by the increasing use of advanced technologies in industry. The so-called 'industry 4.0' will feature vertical networking of smart production system and technology-enabled horizontal integration across firms and countries through highly flexible and transparent GVC networks and relationships (Deloitte 2014).

The digital transformations that are underway are interacting with, and reinforcing, other mega-trends. For instance, by reducing communication and transaction costs, digitalisation supports the increasing fragmentation of production processes and growth of trade in tasks observed in the global supply chains and production networks of today. Digitalisation is also a critical element of the trend towards the 'servicification' of manufacturing, evident in the growing prominence of digital services embedded within manufactured products (Balchin et al. 2016).

While digitalisation brings new opportunities and development pathways, a persistent digital divide can exacerbate existing inequalities and/ or create new ones. Currently, Commonwealth countries are facing important development challenges, including: a) the need to promote more and better-quality jobs for the young Commonwealth population; b) pressure to achieve the Sustainable Development Goals (SDGs); and c) demands to increase access to finance and build resilience in small states. To keep up with new entrants into the Commonwealth labour market, 50,000 jobs need to be created every day (Sarwar et al. 2018). The rapid digitalisation of the global production and trade landscape is raising concerns regarding 'jobless growth' in Commonwealth countries, with automation substituting workers in various tasks across sectors. A persistent digital divide between developing countries in the Commonwealth and other countries also threatens to increase reshoring of manufacturing activities from less digitally prepared Commonwealth economies and limit future offshoring to these countries.

Several Commonwealth countries, such as the UK, Singapore and Canada are leading examples of digitalised economies, ranking high on the Commonwealth Innovation Index of 2018 (The Economic Times 2018), and some other Commonwealth countries (such as Kenya, Rwanda and South Africa) have shown significant strides in digital transformation. However, 31 out of 53 Commonwealth countries are classified as 'small states' and continue to face considerable challenges in terms of internet adoption, e-governance, the high cost of technology, lack of digital infrastructure, limited human capital and a weak private sector. According to the latest United Nations E-Government Survey (United Nations 2012), more than half of the Commonwealth's small member countries (17 out of 31 states) are ranked in the bottom half of the rankings in terms of their online government services. ICT penetration in these economies is affected by their unique geographic, demographic, social and economic challenges, and is marked by small populations spread over large geographical areas, low levels of skills, high vulnerability to natural disasters and climate change.

Deeper analysis of the benefits, risks and implications of digitalisation is therefore needed for Commonwealth countries, particularly in the context of potential opportunities to harness digital dividends, as well as growing concerns over the digital divide and risks of job losses and exclusion from the digital economy for the 53 Commonwealth member states. Despite several publications on

digitalisation, no study has focused specifically on the Commonwealth. The objective of this study is to better understand the state of the digital economy across the Commonwealth, unpack ways to address the challenges posed by digital transformation and explore opportunities to harness the benefits of digitalisation to boost intra-Commonwealth trade and investment.

The over-arching objective of this study is to assess the state of the digital economy in the Commonwealth, through;

i. identifying the different levels at which the Commonwealth countries are operating in the digital economy;

ii. scoping out the new opportunities for development of small states in the Commonwealth, including through investment in digital machinery, digital skills, e-commerce and e-government services, and identifying the challenges that a persistent digital divide poses in these countries;

iii. understanding the potential for digital technologies to boost intra-Commonwealth trade, and highlighting the role intra-Commonwealth co-operation can play in building digital capacity, particularly in small states; and

iv. identifying best practices and lessons from Commonwealth economies at different levels of development and digital transformation, such as the UK, India, South Africa, Kenya and Papua New Guinea.

The remainder of this study is structured as follows. Chapter 1 portrays the landscape of the digital economy and trade trends in the Commonwealth, while Chapter 2 analyses the implications of rising digitalisation on trade within global value chains. Chapter 3 examines the changing landscape of labour markets and skill needs in the digital future and draws out the implications of these changes for Commonwealth member states. Chapter 4 draws on the 'smart city' concept and identifies where and how Commonwealth countries can improve digital infrastructure. Chapters 5 analyses the role of international regulatory co-operation in supporting the development of the digital economy within Commonwealth member states. Chapter 6 scopes out sustainable and inclusive development in the digital economy, and highlights areas in which Commonwealth countries are supporting more inclusive and sustainable economies in the digital era. Finally, Chapter 7 concludes with policy recommendations for harnessing the benefits and addressing the challenges associated with digital transformation in the Commonwealth.

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DIGITAL TRANSFORMATION IN THE COMMONWEALTH: STATE OF PLAY

01

This chapter aims to provide a picture of global developments in the digital economy, vis-à-vis digital transformation among Commonwealth countries. There is no global consensus on the definition of the digital economy: the Organisation for Economic Co-operation and Development (OECD) (2012) notes that the digital economy covers 'markets based on digital technologies that facilitate the trade of goods and services through e-commerce', while the International Monetary Fund (2018) argues that 'all activities that use digitised data are part of the digital economy: in modern economies, the entire economy'. In this study, we conceptually define the digital economy as economic activities enabled by the interaction of digital technologies and ICT physical infrastructure (following Banga and te Velde 2018). The first sub-section presents the structure and sophistication of trade in the Commonwealth, with the second sub-section discussing the changing nature of trade in the digital economy. The third sub-section sheds light on the progress of digital transformation in the Commonwealth. Drawing from stylised evidence in prior sub-sections, the chapter concludes by identifying the bottlenecks to digital transformation faced by Commonwealth countries, and proposes approaches moving forward.

1.1 Overview of trade trends in the Commonwealth

After recovering from the global financial crisis in the period following 2008–2009, growth in world trade recorded a further decrease from 2012 to 2014, and the value of trade contracted in 2015 and 2016, followed by a recovery of 11 per cent and 10 per cent annual growth in 2017 and 2018, respectively (Figure 1.1). The Commonwealth has historically followed global trade trends, reflecting the importance of external demand in driving export production in Commonwealth member states. Thus, the Commonwealth's total trade in goods and services also recovered from the contractions associated with the global trade slowdown, experiencing annual growth of 9 per cent and 8 per cent in 2017 and 2018, respectively.

Figure 1.1 Goods and services trade (annual % growth), 2006–2018

Source: Authors' calculations, UNCTAD data.

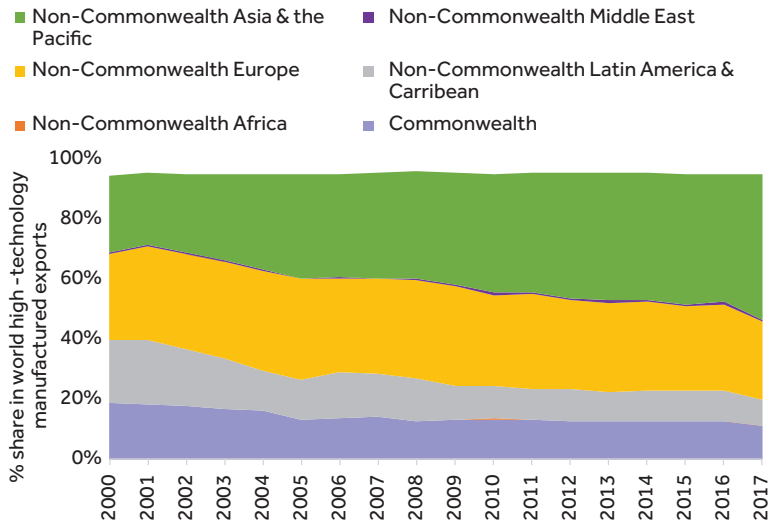
Note: Commonwealth services trade excludes Nauru (nil data).

In the period from 2014 to 2018, the Commonwealth's annual average contribution to global trade in goods and services was 15 per cent. Commonwealth manufacturing exports are dominated by resource-based exports[1] (equivalent to 5.3% of the Commonwealth's total GDP), followed by medium-technology exports (4%), and primary product exports (3.5%) (see Figure A1). Figure 1.2 reveals that the Commonwealth's share in high-tech world exports has declined in the last decade, as the share of non-Commonwealth Asia and the Pacific countries has increased. Existing high-tech exports are also dominated by just six Commonwealth countries, which together make up 98.8 per cent of the Commonwealth's total high-tech exports (see Figure A2).

The Commonwealth consists of 53 states, of which 31 are small states. Commonwealth small states, and those in the Caribbean and Pacific in particular, have experienced weaker growth (GDP and GDP per capita growth, in constant purchasing power parity terms) than other states over the past two decades (Figure 1.3). Commonwealth small states' high-technology exports are equivalent to only about 0.6 per cent of the Commonwealth small states' GDP, lower than the overall Commonwealth average of high-technology exports, the value of which is equivalent to 3.2 per cent of Commonwealth GDP. Primary products and resource-based manufactured exports have been more significant among Commonwealth small states, albeit declining more recently (Figure 1.4). We further note that high technology exports generally comprise electronic and electrical products[2] and have a relatively high share in the export portfolios of some small states in the Commonwealth, particularly Seychelles, Saint Lucia and Saint Kitts and Nevis (17%, 9% and 35%, respectively) (see Figure A2).

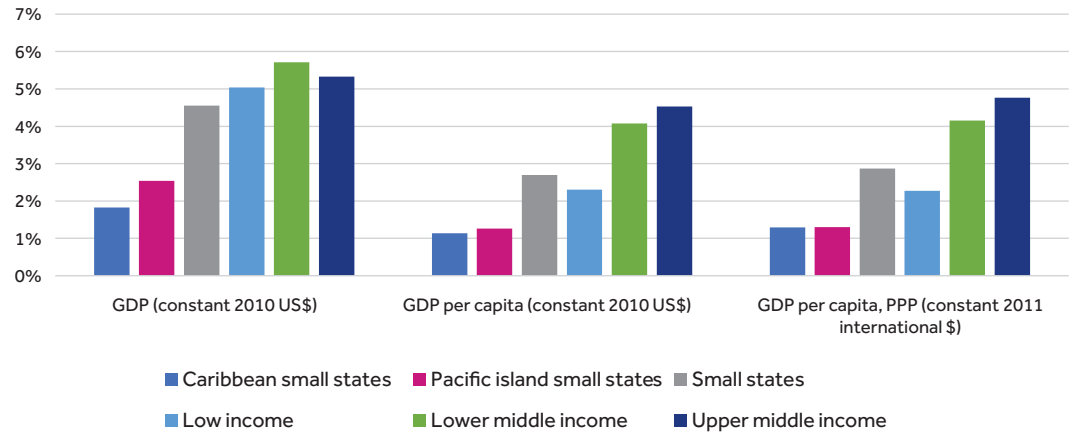
Intra-Commonwealth trade in goods has become more important to Commonwealth countries since 2004 (Figure 1.5). This is largely driven by the Commonwealth's declining share in global trade due to higher participation of large non-Commonwealth countries such as China (Commonwealth Secretariat 2018), which may also indicate that Commonwealth countries are turning inwards in the face of increasing external competition. In addition, Figure 1.6 shows that intra-Commonwealth trade has become relatively more important in small states across regions and income levels (except in

Figure 1.2 High-technology manufacturing exports (shares, in percentages), 2000–2017



Source: Authors' calculations, World Integrated Trade Solution (WITS) data.

Figure 1.3 Small (Caribbean/Pacific) states have grown more slowly than the average of LICs and MICs (average annual % change), 2000–2018

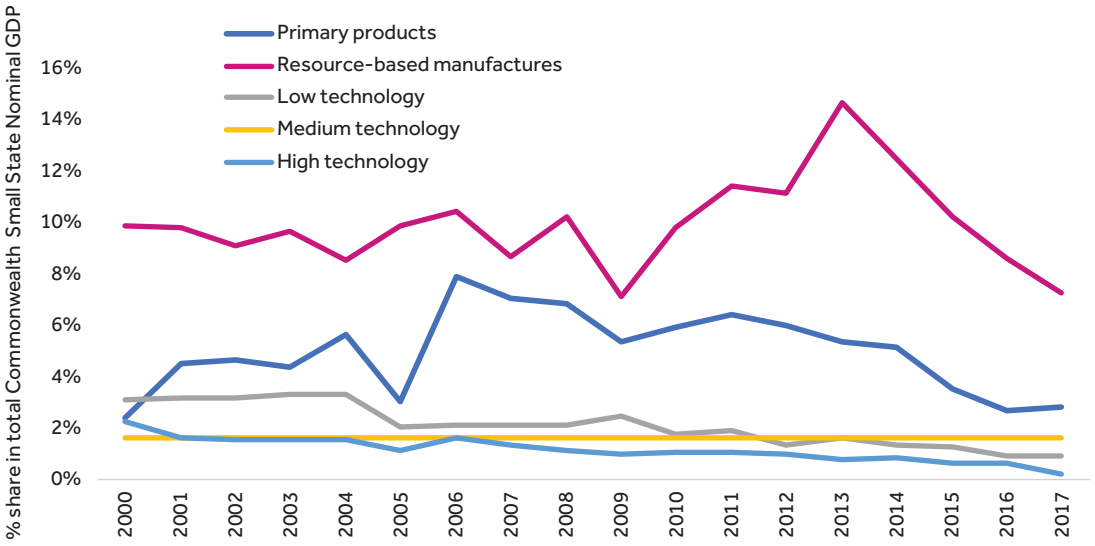


Source: World Bank (2019).

small state LICs) in recent years. From 2014 to 2018, small states in Africa and the Pacific, and those within the lower middle-income level, tended to have more than 50 per cent of their total trade in goods dependent on Commonwealth trading partners. For small states such as Eswatini, Botswana, Lesotho and Namibia, intra-Commonwealth trade makes up more than 50 per cent of their respective nominal GDP (see Figure A3).

Comparing the export sophistication of Commonwealth countries can also provide important insights into trade patterns in the digital economy. On the one hand, the ability to

Figure 1.4 Commonwealth small states' exports (% share in total Commonwealth small states GDP), 2000–2017



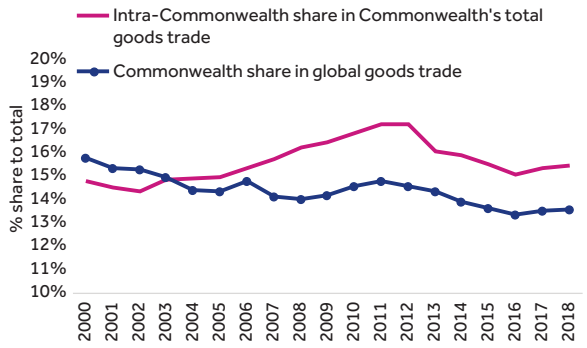
Source: Authors' calculations based on World Integrated Trade Solutions (WITS) data.

98.8%

6

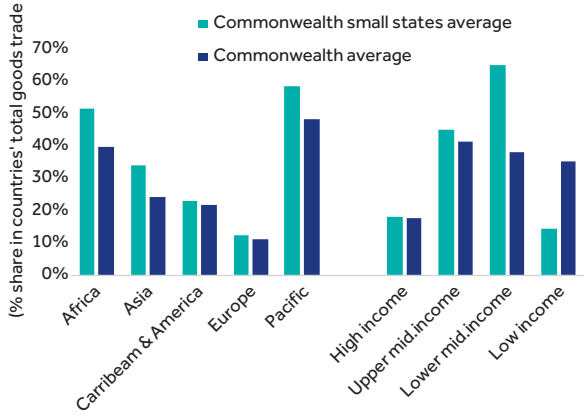
Just six Commonwealth countries **(Singapore, Malaysia, United Kingdom, Canada, India and Australia)** made up 98.8 per cent of the Commonwealth's total high-technology goods exports in 2017

Figure 1.5 Commonwealth trade in goods



Source: Authors' calculations based on UNCTAD data.

Figure 1.6 Intra-Commonwealth trade in goods



Source: Authors' calculations based on WITS data. Note: Average excludes Dominica, Grenada, Nauru, Papua New Guinea, Tuvalu and Vanuatu (nil data). (Shares represent 2014–2018 average.)

export sophisticated products, and the productive sophistication of major trading partners, may shape the type of digital knowledge and technological transfers that can be gained from trade. This is aligned with some recent evidence that exporting improves firms' technical efficiency through higher quality and productivity in production ('learning by exporting') (Atkin et al. 2017). On the other hand, investments into digital technologies by countries and firms can also have a positive impact on the sophistication level of their product basket (Banga 2019).

The export sophistication index (EXPY), which allocates weights for revealed comparative advantage and a country's income per capita,[3] estimates the level of technological sophistication embodied in a country's export portfolio (World Bank 2013). As of 2017, the Commonwealth's average EXPY index of 9.5 lagged behind its major external trading partners such as Japan (10.1), Germany (10.1), the United States (US) (10) and China (9.9) (Figure 1.7). Taking the sample of Commonwealth small states, where intra-Commonwealth trade has become more important, two of the top-three export partners are India and South Africa, which have relatively lower scores on the EXPY than non-Commonwealth trading partners (based on WITS data). Only 4 per cent of Commonwealth small states' total exports go to the US, compared with the 21 per cent share of Commonwealth non-small states' exports to that country.

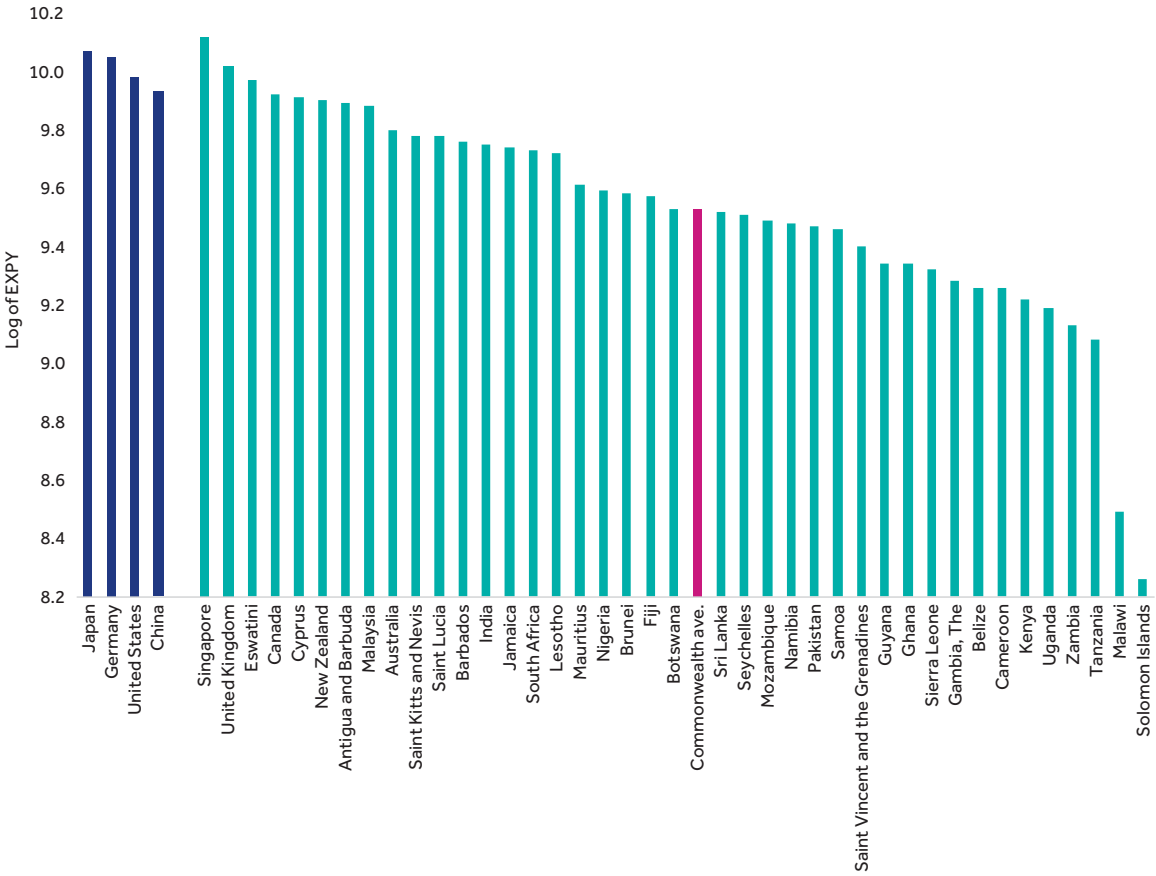
The Commonwealth is faring better in the services sector. Based on United Nations Conference on Trade and Development (UNCTAD) data from 2014 to 2018, the Commonwealth alone contributes an annual average of 18 per cent to global services trade, compared to the Commonwealth's 14 per cent share in global goods trade. While the Commonwealth is an overall net trade importer, driven by the trade in goods deficit, surpluses have been recorded in services trade in the past decade (Figure 1.8). However, this trade in services has been dominated by five Commonwealth countries (the UK, Singapore, India, Canada and Malaysia) in the last five years. In 2018, these countries contributed more than 85 per cent of the Commonwealth's total trade in services (Figure 1.9).

1.2 Digital progress and changing trade in the Commonwealth

In recent years, the digital economy has experienced unprecedented growth with the internet becoming accessible to more than half of the global population in 2018, a remarkable increase from the less than 10 per cent penetration rate in 2000 (World Bank 2019; ITU 2018). The value of business-to-

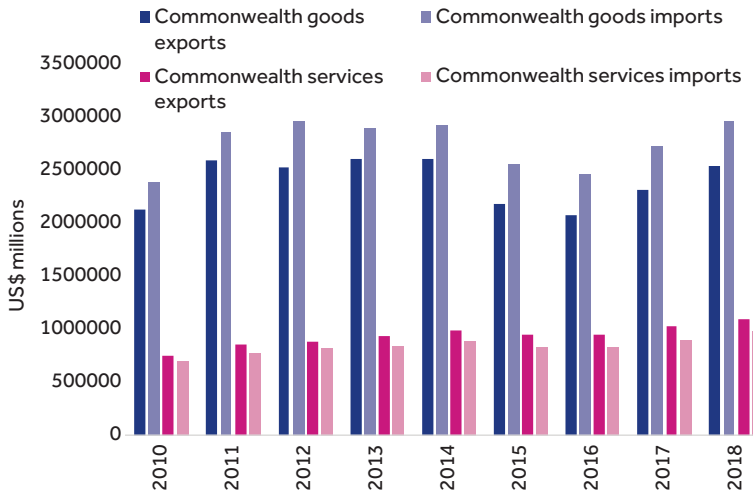
Six Commonwealth countries account for 98.8% of the Commonwealth's total high-tech exports as of 2017

Figure 1.7 Export sophistication index, 2017



Source: Authors; graph constructed based on WITS data.

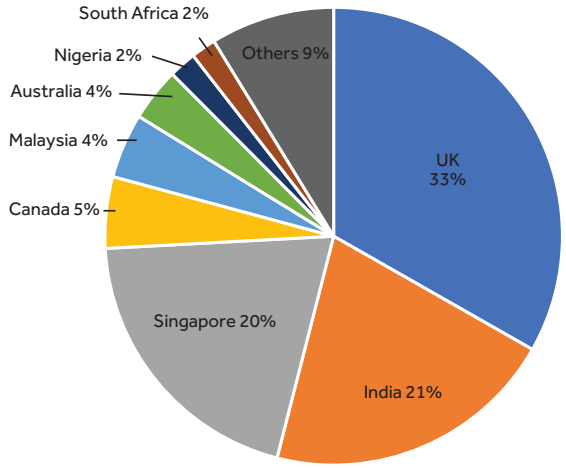
Figure 1.8 Commonwealth trade



Source: Authors' calculations based on UNCTAD data; Commonwealth services trade excludes Nauru (nil data).

Note: In US$ millions.

Figure 1.9 Commonwealth services trade share

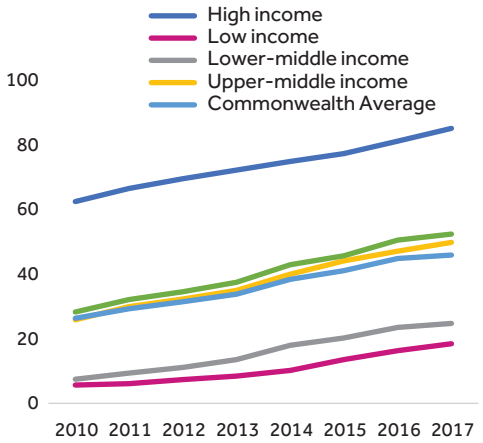


Source: Authors' calculations based on UNCTAD 2018 data; excludes Cameroon, The Gambia, Guyana, Kiribati, Nauru, Samoa, Sierra Leone and Vanuatu (nil data).

consumer online transactions tripled from 0.5 per cent of global GDP in 2010 to 1.5 per cent in 2017 (UNCTAD 2017). ICT services exports grew by 40 per cent between 2010 and 2015 (IER 2017) and, from 2016 to 2017 alone, sales of industrial robots and professional service robots grew by 30 per cent and 85 per cent, respectively (IFR 2018). In recognition of this fourth revolution – 'a transition to a new set of systems that bring together digital, biological, and physical technologies in new and powerful combinations' (Baller et al. 2016) – the top three research and development (R&D) investments in 2018 worth US$67 billion were made in the technology and digital industries (Amazon.com, Alphabet and Samsung electronics) (UNCTAD 2019a). The government sector is also catching up, with the latest e-government survey showing that all of the 140 members of the United Nations are now providing at least one transactional service online, mostly in the areas of utilities payment, submission of income taxes and registration of new businesses (UNDESA 2018).

Using International Telecommunications Union (ITU 2018) data, we plot digital progress in the Commonwealth in the period 2010–2017. In terms

Figure 1.10 Internet users (% of population)



Source: ITU (2018).

of internet-penetration (measured as internet users as a percentage of the population), we observe that, on average, 85 per cent of the population in high-income Commonwealth countries has access to the internet, compared to just 18 per cent in low-income countries (Figure 1.10). While internet penetration has increased across all income levels, the digital divide is stark when we compare international bandwidth per internet user. Figure 1.11 shows that the digital divide in terms of international bandwidth drastically increased between 2010 and 2017, with international bandwidth being roughly 40 times lower in low-income

Figure 1.11 Internet bandwidth (Mbit/s)

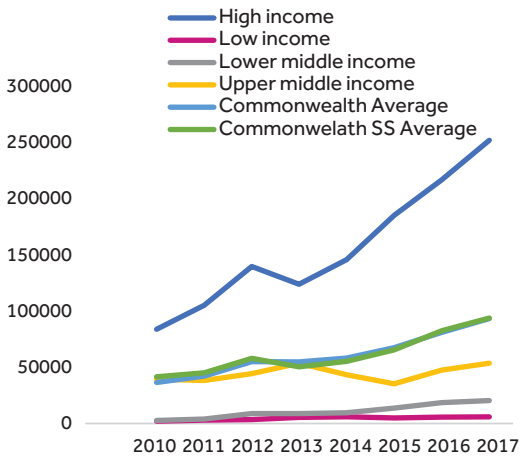
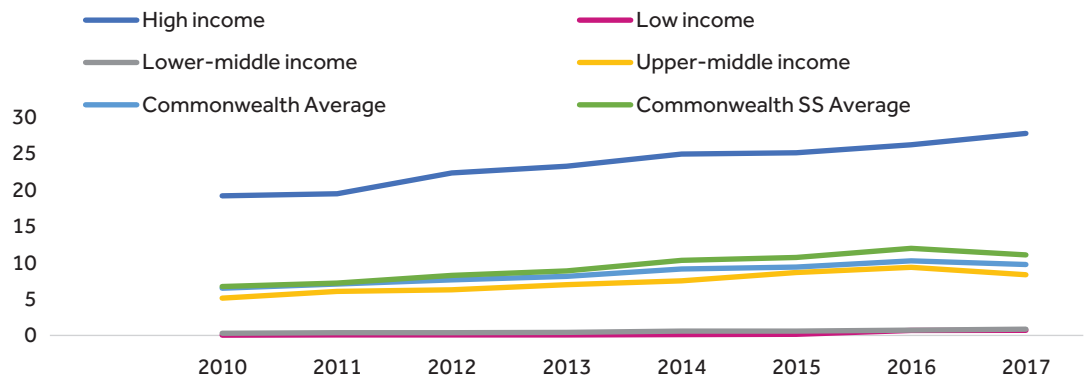


Figure 1.12 Fixed broadband subscriptions, per 100 people



Source: ITU (2018).

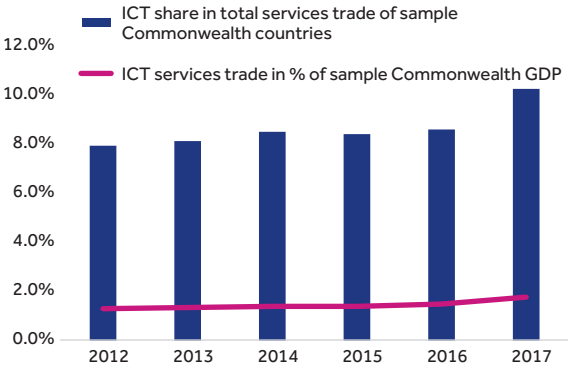
Commonwealth countries compared to high-income countries in the Commonwealth in 2017. Similarly, the share of fixed broadband subscriptions per 100 people has increased from 19 per cent to 27 per cent in high-income Commonwealth countries, while there has been a negligible increase in low-income Commonwealth member states (Figure 1.12).

The above discussion clearly highlights growing digitalisation of the Commonwealth. However, this is occurring at different rates, leading to an increasing digital divide between high- and low-income Commonwealth countries. This divide may have adverse implications for intra-Commonwealth trade in the digital era.

One indicator of digital transformation of global production is the rising importance of trade in ICT goods and services. The UNCTAD's ICT product classification[4] follows the OECD's guide wherein, 'ICT products must primarily be intended to fulfil the function of information processing and communication by electronic means, including transmission and display' (OECD 2011). Within the Commonwealth, the contribution of ICT services to the Commonwealth's total services trade, and in terms of GDP, has been gradually increasing since 2012 (Figure 1.13).

Beyond ICT services, UNCTAD identifies 'digitally deliverable services' which directly capture transactions made in digital platforms. Digitally

Figure 1.13 Commonwealth ICT services trade

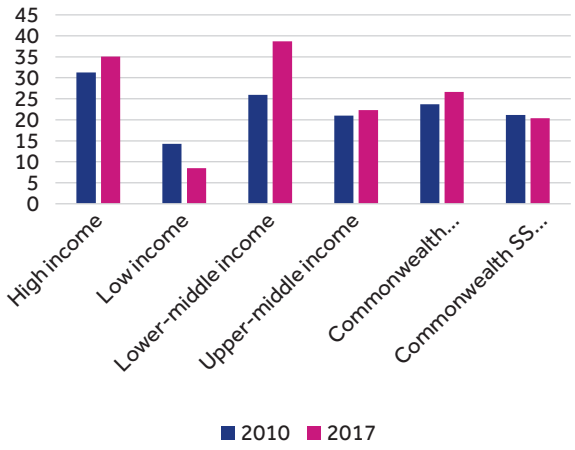


Source: Authors' calculations based on UNCTAD data.

Notes: Number of Commonwealth sample countries per year: 2012–39; 2013–40; 2014–39; 2015–38; 2016–33; 2017–18.

deliverable services are an aggregation of insurance, financial, intellectual property charges, telecommunication, computer and information, other business and audio-visual and related services (UNCTAD, 2019b). Figure 1.14 reports that the share of digitally deliverable export services (DDES) in total services trade has increased in high-, upper- and lower- middle income countries (UMICs, LMICs), but decreased in Commonwealth small states and low-income countries. Among Commonwealth countries, the share of DDES in countries' total trade in services varies from more than 70 per cent

Figure 1.14 Share of digitally deliverable export services

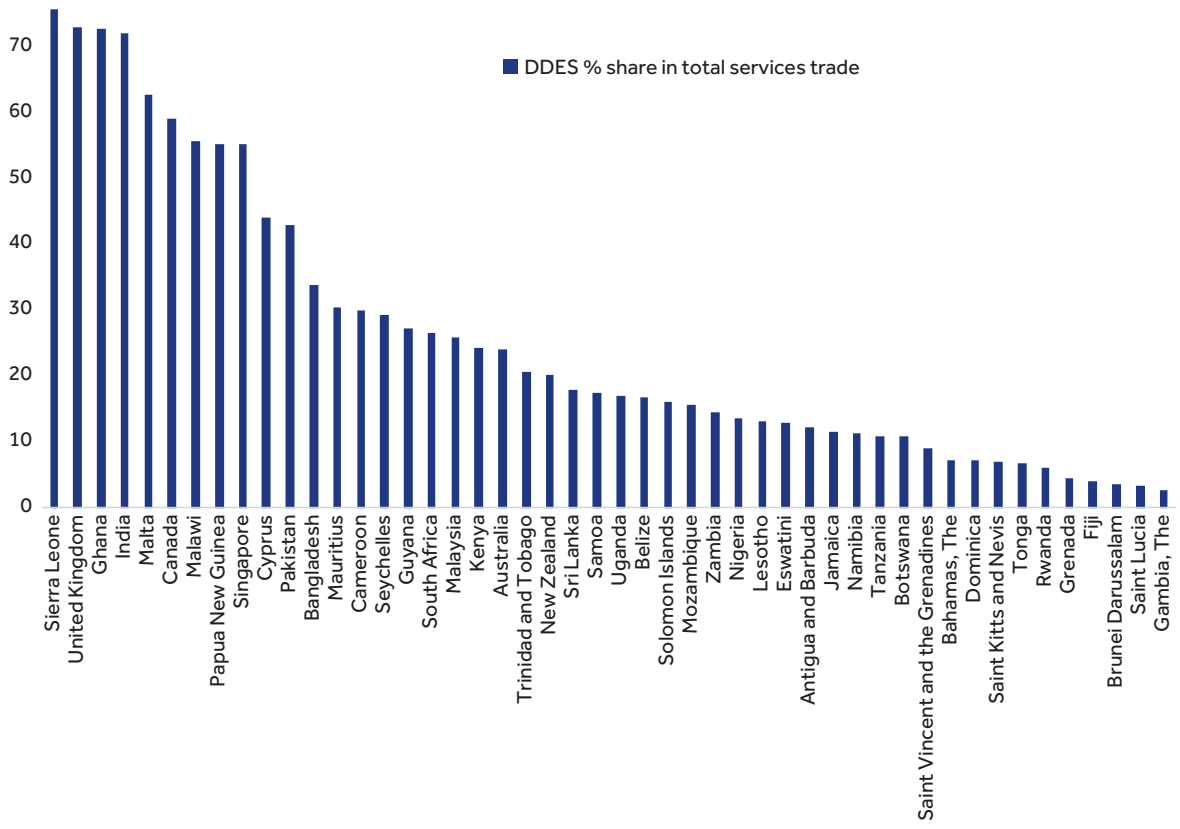


in the UK, India and Ghana to less than 10 per cent in some small states (Figure 1.15).

It is also important to note that that among Commonwealth countries, ICT trade is dominated by Asian economies (Figure 1.16), with Singapore alone contributing 61 per cent of overall Commonwealth ICT trade in 2017. The disparity in ICT trade participation among Commonwealth countries is also evident by income level and size, with LICs and small states contributing minimally to overall Commonwealth ICT trade.

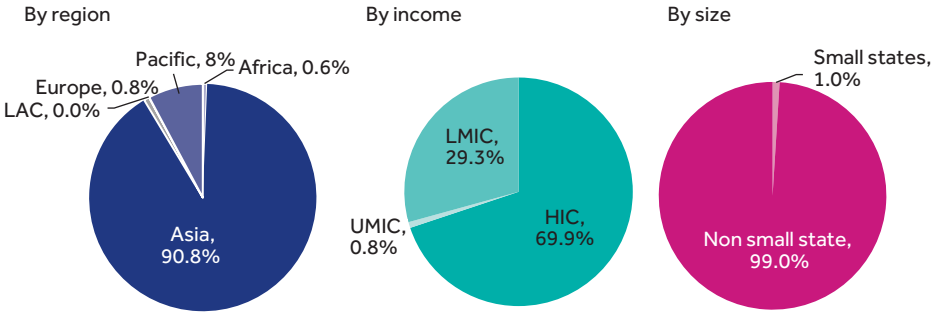
Outside of the information presented above on ICT trade in the Commonwealth, the availability of actual data on existing digital trade flows *within* the Commonwealth is generally very limited. This makes it difficult to generate an accurate picture

Figure 1.15 Commonwealth countries' digitally deliverable export services, 2016



Source: Authors' calculations based on UNCTAD and World Bank data.

Figure 1.16 Percentage (%) share in total Commonwealth ICT trade, 2017



Source: Authors' calculations based on UNCTAD 2017 ICT goods and services data.

Notes: 2017 data available for only 13 Commonwealth countries. Number of Commonwealth countries by income: Africa (3), Asia (4), Europe (1), LAC (2), Pacific (3); by income: HIC (4); UMIC (5), LMIC (4), LIC (0); by size: small states (7), non-small states (6).

of existing intra-Commonwealth trade in digital goods and services. Nevertheless, data are available with relatively wide country coverage on digitalised products traded through electronic transmissions (ET products). UNCTAD defines four categories of digitalised products as ET products: films (HS 37), printed matter (HS 49), sounds, media and software (HS 8524) and videogames (HS 9504). Trade in these products is significant across the Commonwealth (see summary Table 1.1 and Table A1). Based on the most recent available data, annual intra-Commonwealth trade (exports plus imports) in ET products is worth more than US$4.6 billion. For many Commonwealth countries, exports to other Commonwealth members constitute major shares of their total exports of these products. This was the case for all of Mozambique's exports of ET products in 2017 and more than 90 per cent of these products exported by Botswana, Eswatini, Fiji, The Gambia, Kiribati, Saint Vincent and the Grenadines, Solomon Islands, Trinidad and Tobago, and Zambia in that year (2016 in the case of Kiribati).

Likewise, many Commonwealth countries import the bulk of ET products from fellow Commonwealth members. Ghana, Samoa and Solomon Islands sourced more than 90 per cent of their imports of these products from the rest of the Commonwealth, while Botswana, Fiji, Malawi and Namibia relied on the Commonwealth for more than 80 per cent of their imports of these products.

In many respects, the disparities highlighted above in internet penetration rates, in levels of engagement in trade in ICT goods and services, and in other aspects of digital trade between Commonwealth countries are a product of variation in levels of readiness for digitalisation across the Commonwealth. This variation is evident in composite measures of digital readiness. Cisco's country-specific digital readiness scores, for instance, measure a country's digital readiness along seven components: (i) technology infrastructure (fixed telephone subscriptions, fixed broadband subscriptions, internet services, networking services); (ii) technology adoption (mobile device penetration, internet usage, cloud services); (iii) human capital (quality of math and science education, adult literacy rate, years of schooling, population aged less than 14 years); (iv) basic needs (life expectancy, mortality rate for those under five years, sanitation, access to electricity); (v) ease of doing business (overall ranking, rule of law, logistics performance, time to get electricity); (vi) business and government investment (foreign direct investment [FDI], high-technology exports, government success in ICT promotion); and (vii)

Table 1.1 Summary of selected Commonwealth countries' trade in digitalised products through electronic transmissions, 2017 (unless otherwise stated)

Largest intra-Commonwealth exporters of digitalised (ET) products (US$ value of intra-Commonwealth exports, millions)	Most reliant on Commonwealth markets for exports of digitalised (ET) products (Commonwealth share of total ET exports, %)	Largest intra-Commonwealth importers of digitalised (ET) products (US$ value of intra-Commonwealth imports, millions)	Most reliant on Commonwealth members for imports of digitalised (ET) products (Commonwealth share of total ET imports, %)
United Kingdom ($761.1)	Mozambique (100)	Australia ($340.3)	Solomon Islands (94.8)
Singapore ($309.1)	Eswatini (99.9)	South Africa ($288)	Ghana (93.6)
Australia ($215.1)	The Gambia (99.8)	Ghana ($267.9)	Samoa (91)
Malaysia ($175.7)	Solomon Islands (99.8)	Singapore ($202.9)	Botswana (88.4)
India ($118.9)	Kiribati ** (99.3)	New Zealand ($194.9)	Namibia (84.5)
Zambia ($116.3)	Fiji (96.5)	United Kingdom ($185.8)	Malawi (83.7)
South Africa ($82.6)	Zambia (96.2)	Malawi ($173.0)	Fiji (83.2)
Canada ($65.9)	Trinidad and Tobago * (95.5)	Canada ($148.2)	Brunei Darussalam (77.9)
Malta ** ($63.7)	Saint Vincent and the Grenadines (94.9)	Malaysia ($106.9)	Kiribati ** (75.4)
Mozambique ($55.2)	Botswana (92.4)	India ($97.0)	Seychelles (70.5)

Source: Commonwealth Secretariat calculations using UN Comtrade data.

Notes: Products included in this category are films (HS 37), printed matter (HS 49), sounds, media and software (HS 8524) and videogames (HS 9504). * Data used is for 2015; ** Data used is for 2016.

start-up (strength of legal rights, time to start a business, availability of venture capital). Digital readiness scores for the 23 Commonwealth countries for which data were available are compared in Table 1.2. The most digitally ready countries are predominantly developed and emerging market Commonwealth member states (the UK, Australia, Canada, Malaysia, New Zealand, Singapore and South Africa).

1.3 Conclusion

The above trends suggest that while digitalisation has expanded globally, only a few Commonwealth countries have been able to transform and participate in the digital economy. This is evident in the gaps between mostly higher-income and Asian economies and lower-income economies, predominantly in Africa, in terms of global trade integration, export sophistication, and ICT goods. Gaps are also higher between small and non-small Commonwealth countries. Meanwhile, there is noticeable progress in ICT services and usage of DDES among LIC and LMIC members.

Amid increasing digitalisation in HICs and Asia–Pacific economies, with their relatively higher shares in global trade in goods and services, particularly in ICT

Table 1.2 Digital readiness scores for selected Commonwealth members

Commonwealth Country	Score
Singapore	18.30
United Kingdom	17.84
Australia	17.34
Canada	17.11
New Zealand	16.90
Malaysia	15.19
Sri Lanka	11.56
South Africa	11.50
Rwanda	10.96
India	10.54
Ghana	9.97
Kenya	9.82
Zambia	9.61
Pakistan	8.58
Cameroon	8.57
Uganda	8.43
Malawi	8.37
Tanzania	8.26
Bangladesh	8.01
Nigeria	7.91
Papua New Guinea	7.80
Mozambique	7.19
Sierra Leone	6.40

Source: Yoo et al. (2018).

and high-technology exports, many lower-income countries in the Commonwealth are increasingly focusing on intra-Commonwealth trade. However, these countries continue to have higher shares of primary products in their total export portfolios. This trend has an important implication (especially for Commonwealth LICs) to the extent that it may slow down export sophistication – which affects the speed of technological spillovers and upscaling, and subsequently economic growth and transformation.

Promoting intra-Commonwealth trade requires a greater role for high-technology Commonwealth exporters (e.g., Singapore, Malaysia and India in Asia; South Africa in Africa) in increasing trade with Commonwealth partners. Meanwhile, we have seen some positive signs of greater participation of lower-income Commonwealth countries in ICT and digitally deliverable services in recent years, such as the more than 70 per cent share of DDES to total trade in services in Ghana, India and Sierra Leone. This is an indication of how LICs can leverage available digital platforms to increase trade in services, if opportunities to grow trade in goods (i.e., ICT, technology exports) remain relatively constrained.

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End Notes

1 According to the technological classification of exports in Lall (2000), primary products are generally composed of fresh fruit, meat, rice, cocoa, tea, coffee, wood, coal, crude petroleum and gas. Resource-based products generally entail simple and labour-intensive processing, such as prepared meats/fruits, beverages, wood products, vegetable oils, ore concentrates, petroleum/rubber products, cement, cut gems and glass. Low technology products tend to have 'stable, well-diffused technologies' with simple skill requirements, such as textile fabrics, clothing, headgear, footwear, leather manufactures, travel goods, pottery, simple metal parts/structures, furniture, jewellery, toys and plastic products. Medium technology products comprise the 'bulk of skill and scale-intensive technologies in capital goods and intermediate products', such as vehicles/motorcycles and

parts, synthetic fibres, chemicals and paints, fertilisers, plastics, iron, pipes/tubes, engines, motors, industrial machinery, pumps, switchgear, ships and watches. High technology products are described to have 'advanced and fast-changing technologies, with high R&D investments and prime emphasis on product design', such as office/data processing/telecommunications equipment, TVs, transistors, turbines, power generating equipment, pharmaceuticals, aerospace, optical/measuring instruments and cameras.

2 High technology electronic and electrical products are composed of rotating electric plant and parts, other power generating machinery and parts, office machines, automatic data processing machines, parts of accessories for machines of groups, television receivers, telecommunication equipment and parts, electric power machinery and parts, electro-diagnostic apparatus for medical sciences, cathode valves and tubes, electrical machinery and apparatus. Other high-technology products are composed of radio-actives and associated materials, medicinal and pharmaceutical products, medicaments, steam turbines and parts, aircraft and associated equipment; spacecraft, optical instruments and apparatus, measuring, analysing and controlling apparatus, photographic apparatus and equipment (Lall classification, from UNCTAD stat website).

3 EXPY computation steps: (1) summation of all the weighted averages of GDP per capita, with weights derived from revealed comparative advantage of respective products; and (2) summation of values of (1) for all export products, weighted by the respective product's share in total exports. A higher value in (1) indicates a more sophisticated product, while a higher value for (2) (or the EXPY value) indicates a more sophisticated portfolio (full details in World Bank 2013).

4 Broad-level categories of ICT goods are composed of computers and peripheral equipment, communication equipment, consumer electronic equipment, electronic components and miscellaneous ICT goods, while ICT services include manufacturing services for ICT equipment, business and licensing services, IT consultancy and services, telecommunications services, leasing and rental services for ICT equipment and other ICT services (OECD, 2009). Thus, the ICT goods and services characterise production processes that involve digital technology inputs, and product outcomes that contribute to the digital economy.

DIGITAL TRANSFORMATION: OPPORTUNITIES AND CHALLENGES

02

This chapter focuses on the rising prominence of data and its role as a building block for new and increasingly digitalised value chains. It explores digitalisation and 'datafication' of global trade, and the associated new opportunities and challenges for Commonwealth countries. The growing prominence of these trends means Commonwealth governments will need to address policy issues associated with the digitalisation of production, platform economies and e-governance.

The first sub-section explores new development models and opportunities for the Commonwealth in the digital age. The second sub-section highlights the risks and challenges facing Commonwealth countries in the context of a persistent digital divide. The third sub-section discusses regulatory frameworks for digital transformation.

2.1 Digitisation of value chains: New Opportunities

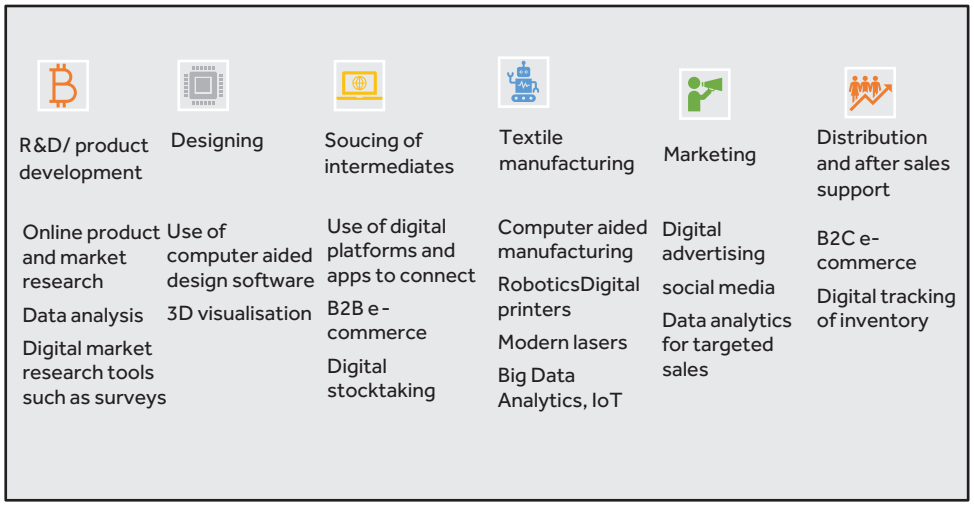
Digital technologies are being increasingly deployed across different stages of the value chain, rapidly changing the global landscape of production and trade. Figure 2.1 maps out the scope for using digital technologies across an industry-neutral value chain, which involves the use of online market research and data analysis at the R&D stage; 3D-visualisation for product design; sourcing intermediates through business-to-business (B2B) e-commerce on digital platforms; the use of robotics and automation during manufacturing; digital advertising and data analytics for targeted marketing and B2C e-commerce during point of sales. Box 2.1 provides an example of digitalised value chains in the textiles and garments industry.

This digitalisation of the value chain is opening up new pathways for development, offering Commonwealth countries new and diverse opportunities to:

- increase productivity, output, growth and employment;
- connect economically with large and dynamic diasporas;
- access global trade and financial markets;
- increase participation in global trade by taking advantage of the unbundling of production processes within larger GVCs; and
- drive down the costs of trade.

In doing so, technology – especially digital technologies and new business models that create,

Figure 2.1 Digitisation and 'datafication' of the value chain



Source: Authors.

Box 2.1 Digitisation of the value chain: the case of the textiles and garments industry

Consider the case of a textiles and apparel value chain. At the product development and R&D stage, firms carry out market and product research online, collect customer data on, for instance, apparel style and material preference, use online surveys and analyse data using online cost–benefit and data analysis tools. Firms can also use 3D-visualisation and computer-aided design for apparel, as well as logos for branding. This increases flexibility in design and reduces the cost and time required to produce new goods. In the manufacturing stage, firms use computer-aided manufacturing, modern lasers or robotics (such as 'sewbots') to automate certain tasks in apparel manufacturing, depending on the economic and technical feasibility of automation. Automation in manufacturing can make firms more efficient in production, enabling them to produce more output and exports. For instance, Banga and te Velde (2018a) highlight the case of the A-Z garments factory in Tanzania, which deployed modern lasers for cutting tasks. While this directly displaced some workers, the firm increased its overall productivity, producing higher output and exports, as well as jobs in the next stage of production i.e. stitching.

In the post-production stage, new digital technologies, particularly those associated with cloud computing and Big Data analysis, can: a) increase efficiency in business operations, logistics and inventory management; b) leverage sales data for better provision of after-sales services; and c) leverage digital advertising tools and social media applications for development of targeted sales models (Mayer 2018). Last mile delivery can also be automated – for instance, through the use of radio frequency identification (RFID) for digital tracking. For sourcing of intermediates (fibre, yarn etc.) during the manufacturing process, firms can use online B2B platforms for gaining information and access to online sellers, and also sell their products online through B2C e-commerce, i.e. using own or third-party e-commerce websites. Online exchange of intermediates is further facilitated through digital payments and online banking.

Source: Authors.

exchange and distribute value – provides untapped new ways of growing intra-Commonwealth trade and investment. This is especially true for small states, least-developed countries (LDCs) and African members that remain constrained by several barriers to trade due to their lack of connectivity, high transport costs and geographical remoteness, as well as their limited access to global trade and financial markets.

2.1.1 Productivity gains

Deployment of digital technologies by firms can increase efficiencies and enable firms to realise productivity gains. The increasing use of digital technologies in production and logistics can contribute towards reduction in production costs and increase total firm productivity, which is likely to lead to an expansion in total output, exports and employment. Several multi-country studies suggest that, on average, a 10 per cent increase in broadband penetration increases GDP growth in the range of 0.9–3.19 per cent (Quiang et al. 2009; Czernich et al. 2011; Scott 2012; Zaballos and Lopez-Rivas 2012). When applied across the Commonwealth as a whole, the implications are extraordinary; if all Commonwealth countries achieve a minimum level of broadband

penetration of 50 per cent (the world average), then Commonwealth GDP is expected to rise between US$74 billion and $263 billion (Commonwealth Secretariat 2018). The productivity-enhancing effect of digitalisation has however been observed to increase with the level of development: a 10 per cent increase in digitisation leads to a 0.5 per cent increase in GDP per capita in digitally-constrained economies, but a higher 0.62 per cent increase in GDP per capita in digitally advanced economies (Booz and Company 2012). Similarly, Banga and te Velde (2018a) find that the impact of internet penetration on manufacturing labour productivity is roughly 8 percentage points higher in middle-income countries as compared to low-income countries, but this impact can be increased in low-income countries through investment in skills development.

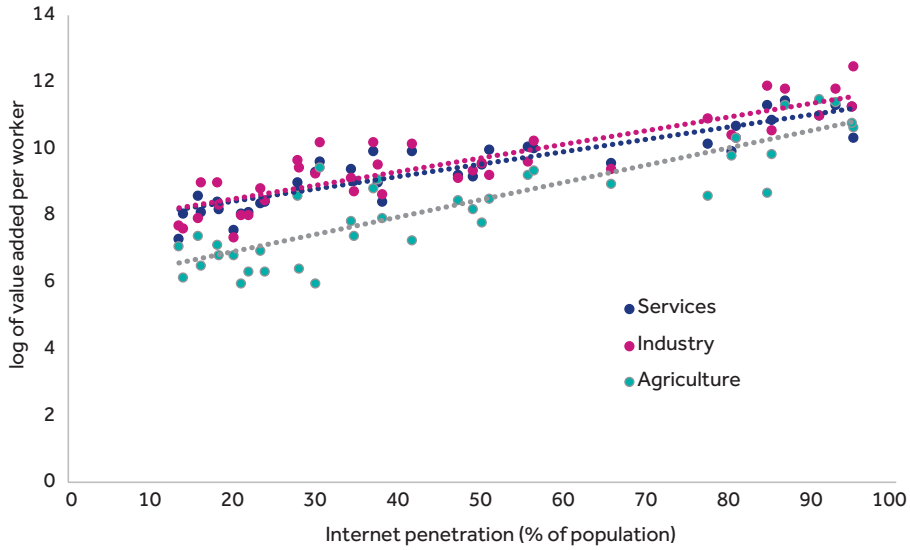
Using a sample of 38 Commonwealth countries, Figure 2.2 plots digitalisation at the country level, proxied by internet penetration, with sectoral productivity in the Commonwealth and finds that digitalisation is positively correlated with labour productivity, with the highest correlation in the services sector.

2.1.2 Diversification in production

Digital technologies also open up new opportunities for diversification of commodities and movement into more sophisticated products for some Commonwealth countries. Analysing market-related data, for instance, can help designers and producers to uncover the functionalities and features that customers particularly value, thereby identifying or even anticipating demand for specific products (Mayer 2018). Such use of market-related data for product design and development can help firms to enter sectors that they would otherwise not know whether they provided profitable sales opportunities.

Taking the case of India, Banga (2019) finds that firm-level digital capability is significantly and

Figure 2.2 Digitisation and sectoral productivity in the Commonwealth, 2017



Source: Authors' calculations based on ITU and World Bank data. Sample includes 38 Commonwealth countries.

Notes: Labour productivity is computed as log of value-added per worker in constant 2010 US$ in each sector; internet penetration is equivalent to percentage share of population with internet access.

positively affecting product upgrading of Indian manufacturing suppliers in GVCs. The author finds that the most digitally competent firms are producing 4–5 per cent more sophisticated goods than the least digitally competent firms. Ray and Miglani (2018) further bring focus to automotive firms in India such as Hyundai Motors India Limited and Mahindra and Mahindra, which initially specialised in manufacturing commercial and utility vehicles, but later on developed capabilities to serve the passenger car segment as well. Compared to traditional auto manufacturing plants, factories using digital technologies are likely to produce higher output without major changeover costs, with faster delivery time and higher quality (ibid). For Kenya, Banga and te Velde (2018b) highlight the case of Megh Industries, an automotive firm that has invested heavily in modern technologies and moved from manufacturing of transport equipment and parts to full transport seating and van conversions, which is more sophisticated and value-added in nature. Commonwealth countries can also realise product diversification through e-commerce. In Bangladesh, for instance, online trade is more diversified than offline trade (International Trade Centre 2018); the country has diversified from apparels into other products online, including agricultural products, food and beverages, and consumer electronics.

2.1.3 Expansion in trade and increased market access

Digitalisation can act as a driver of export competitiveness and increasing integration in production networks. For instance, a garment manufacturer in Kenya – New Wide garments – uses computer-aided designing (CAD) and computer-aided manufacturing (CAM) technologies, and as a result has diversified into new product lines, met international standards and expanded exports under the African Growth and Opportunity Act to the US (Banga and te Velde, 2018b). Another firm, Funkidz – a children's furniture manufacturing SME in Kenya, expanded regional markets in Uganda and Rwanda through mass production of goods with exact specifications, achieved through investment in digital technologies (ibid). For the case of Indian manufacturing firms, Banga and Banga (2019) show that an increasing share of digital assets in firm infrastructure significantly and positively impacted firm-level export intensity in the period from 2001 to 2015. In addition to digital technologies on the production side, digital technologies on the transaction side – such as digitalisation of customs, use of mobile money and e-commerce platforms – also facilitate greater trade.

2.2 Digital value chains: New Challenges

While digital technologies present new opportunities for expansion of trade in the manufacturing sector, the net impact of digitalisation on the structure of Commonwealth value chains will depend on both national and international pathways. 'National pathways' refer to the direct impact of digital investments in the Commonwealth, whereas 'international pathways' refer to the relative rate at which digitalisation is growing globally, and how that is changing comparative advantages. Herrendorf et al. (2014) argue empirically that the sectoral composition of economic activity is key to understanding economic development. National and international pathways are likely to affect employment in the Commonwealth differently across sectors, industries and tasks.

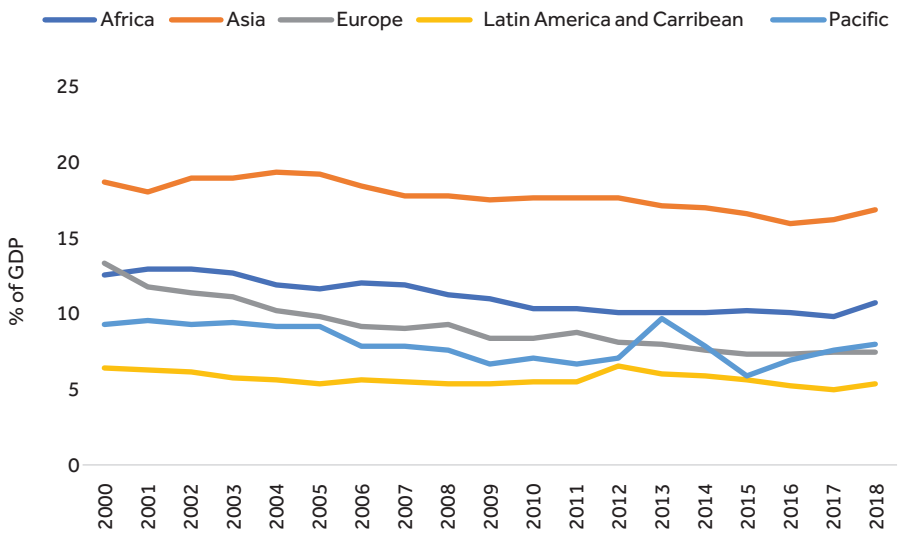
2.2.1 Digitisation and manufacturing-led development

Currently, Commonwealth countries are facing several development challenges, including: a) the need to promote more and better-quality jobs for the young Commonwealth population; b) pressure to achieve the SDGs, of which jobs form part of SDG 8; and c) demands to increase access to finance and build resilience in small states. To keep up with new entrants into the Commonwealth labour market, 50,000 jobs need to be created every day (Sarwar et al. 2018).

Many developed countries have de-industrialised; they have witnessed a declining share of manufacturing in value-added and employment. Figure 2.3 shows that the average share of manufacturing value-added has gradually declined across all Commonwealth regions in the period 2000–2018, with the largest decline in Commonwealth countries in Europe from 13.4 per cent of GDP in 2000 to 7.5 per cent of GDP in 2018. Many developing countries are experiencing 'premature de-industrialisation' (Rodrik, 2016), which refers to declining share of the manufacturing sector in value-added and employment much before the countries achieve income levels comparable to those of their developed counterparts. In Africa, for instance, the share of manufacturing value-added has declined from 12.65 per cent in 2000 to 9.88 per cent in 2017 (Figure 2.3). This has been brought about by a number of factors, including structural changes, shifts in global demand, technological changes and, more recently, digital progress. Rapid digitalisation of the global production and trade landscape is now increasing concerns regarding 'jobless growth' in Commonwealth developing countries, with automation substituting workers in various tasks across sectors.

While some digital technologies, such as cloud computing, machine learning and the internet of things (IoT), can enhance productivity in the manufacturing sector, others such as additive manufacturing and 3D-printing can lead to shortening of value chains, bringing the end market closer to the consumer. Even though deployment of 3D-printers at scale is still several years away, the cost of 3D-printing is falling rapidly in developed countries – at about 5–6 per cent per year (Banga and te Velde, 2018b). There is also a clear and persistent digital divide between the Commonwealth and the rest of the world, and between less developed countries within the Commonwealth and their more developed counterparts (as established in Chapter 1). This digital divide in 'access' and in 'use' of technologies implies that undertaking some production stages in high-wage countries will become more profitable, weakening the incentive for firms to locate production in low-wage Commonwealth member states. As extraction of 'value' becomes

Figure 2.3 Average manufacturing value-added in the Commonwealth by region, as a % of GDP, 2000–2018



Source: Authors, constructed from the World Bank's World Development Indicators (WDI).

50,000
NEW JOBS

REQUIRED EVERY DAY

to accommodate new entrants into the workforce

increasingly defined by an integrated production system in the digital age, Commonwealth developing countries may therefore lose their comparative advantage of having cheaper labour. There are related concerns over limited future offshoring of manufacturing tasks to developing Commonwealth countries. As production becomes increasingly digitalised, capital-intensive technology, skills and R&D will be required at all points along the value chain. In this sense, a minimum base of industrial capabilities is likely to be required to effectively exploit advanced digital production technologies (UNIDO 2019).

While the manufacturing sector overall is the most susceptible to automation, the rate of automation will differ across industries, depending on technological and economic feasibility. The bar of competitiveness is rising in some manufacturing sub-sectors more than others, owing to the relative magnitude of automation, export concentration, service intensity and tradability (Hallward-Driemeier and Nayyar 2017). Sectors that combine relatively high export market concentration with a relatively high robot density (number of robots per 1,000 workers) are likely to be more competitive – such as electronics, computers, and optical instruments; pharmaceutical products; transportation equipment; other machinery and equipment; and electrical machinery and apparatus. In India and South Africa, for instance, more than 60 per cent of total robot deployment is concentrated in the automotive sector alone (ibid). In comparison, the paper and paper products, wood and wood products, basic metals, food, beverages and tobacco, and textiles and garments industries are less affected by global technological changes (Hallward-Driemeier and Nayyar 2017).

Sectors also differ in terms of the type of digital technologies that hold the greatest potential to disrupt production. For instance, while robotics is increasingly automating production in the electronic and automotive industries, value chains in the garments sector are increasingly aligned with 'fast fashion', which revolves around strategies of retailers maintaining low stocks, rapidly evolving customised designs and just-in-time production (Tokatli 2008). More digitally advanced firms in garment value chains may integrate production through the use of RFID and bar codes to track goods and enterprise resource planning (ERP) tools to monitor stocks and payments (McNamara 2008), while giving trusted contractors access to internal information systems to track stock levels (Humphreys et al. 2003). This split in garment value chains between digitally integrated suppliers and subcontractors that are only 'thin-integrated' may impact the potential for suppliers to upgrade. Table 2.1 summarises the sectoral impact of different digital technologies using examples from Commonwealth countries.

2.2.2 Digitisation: in search of alternative development models in the Commonwealth

Compared to developed countries, developing economies generally have a larger agricultural sector, lower employment and value-added shares in industry and manufacturing, as well as a large informal service sector (Schlogl and Sumner 2018). If the prospects for manufacturing-led industrialisation begin to look increasingly challenging in these countries due to reshoring of outsourced production in value chains or limited future offshoring (see Banga and te Velde 2018b), countries may look towards a more service-led development model. In line with this, Newfarmer et al. (2019) point to industries without 'smokestacks' as the new driver of economic growth – services such as transport, communication and finance can promote productivity growth at least as much as manufacturing activities (e.g. Ghani and O'Connell 2014; Berg et al. 2018). Services, including those related to businesses – such as call centres and data centres – and those related to manufactured products – such as design, marketing and distribution – can be particularly important for services-dependent small states in the Commonwealth.

Table 2.1 Sectoral impacts of specific technologies in the Commonwealth

Technology adoption	Sectors with most potential to be disrupted	Impacts	Commonwealth examples
Basic ICT	All	'Thin-integration': small gains in terms of improved communication and productivity	e.g. East African firms in tea GVCs: firms are using email and online search (Foster et al. 2018). e.g. Tourism in East Africa: small hotels and travel agents use ICT to research tourism sights, co-ordinate and send e-mail confirmations of bookings (Foster and Graham 2015).
Digital platforms	All	Online information exchange B2C e-commerce platforms	e.g. Kenyan tea auction (Waema and Katua 2014). e.g. Online exchange platforms: Chopal (India), Esoko (Ghana), mFarm (Kenya) and Novus Agro (Nigeria). e.g. Jumia (Nigeria), Bzzworld (PNG).
Automation/ robotics	Electronics/ automotive	Increasing robot deployment in more digitally prepared countries to meet international standards and quality; but can increase reshoring and limit offshoring in less digitally prepared countries catering to developed country markets.	e.g. Hero MotoCorp in India uses robotic arms and computerized warehouses to make almost 7 million motorbikes a year in three factories, with hopes of expanding to 20 world markets by 2020 (UNCTAD 2017).
3D-printing	Automotive, electronics, machinery	Increasing modularity of production, creating opportunities for new entrants, but resulting in shortening of the value chain as production shifts closer to end markets. Firms with knowledge of local preferences gain more.	e.g. In the United Republic of Tanzania, recycled plastic bottles are being used as the printing material for 3D-printers, for example, to 3D-print prosthetics (UNCTAD 2017).

(*Continued*)

Table 2.1 Sectoral impacts of specific technologies in the Commonwealth (*Continued*)

Technology adoption	Sectors with most potential to be disrupted	Impacts	Commonwealth examples
IoT	Manufacturing sector, energy	Smart factories can allow scaling up on interconnected manufacturing, leading to more ICT services being embedded within manufacturing processes, particularly data processing services – such as cloud computing and advanced data analytics. Predictive maintenance using IoT can reduce maintenance costs of factory equipment by 10–40 per cent (Manyika et al. 2015).	e.g. Makino – one of the largest machine tool manufacturers in the world – launched its smart factory in Singapore in 2019. The facility consists of an existing assembly factory and a new state-of-the-art machining factory, designed with Industry 4.0 and Industrial Internet of Things (IIOT) capabilities to increase productivity and connectivity between its systems. The revamp is expected to nearly double the facility's machine production capacity.
Software as a service SaaS	Agriculture	Boosts overall value-chain efficiency by helping to improve the management and tracking of goods and payments in complex value chains, reduce costs and open up export opportunities for more farmers.	e.g. Value chains of nuts using SAP software in Ghana e.g. ERP software, SAGE, in Kenya (Franz et al. 2014)
Blockchain	Agriculture, mobile tech, financial services	Increases logistical efficiency and transparency.	e.g. The Satoshi Centre, Botswana's blockchain hub, is incubating a programme deploying blockchain technology in the small-scale agriculture sector. e.g. PLAAS in South Africa, is a full-spectrum farm management system and a robust e-commerce system to enable marketing but also to manage, record and transparently communicate daily agricultural production and stock for individual farmers and co-operatives (PLAAS 2018).

Source: Authors.

The academic literature and policy community have long discussed growth and development models. The Solow model explained growth through a build-up in factors of production, such as capital and labour, and an unexplained residual, which was interpreted as total factor productivity change. The endogenous growth models of Romer, Grossman and Helpman, Aghion and others explain how technological change happens, fuelled by capital investment, innovation, R&D and learning by doing. Growth in these models is path-dependent and uneven development is possible across countries depending on choices, exogenous factors and idiosyncratic issues. Many of these discussions do not consider the size of countries. However, small states face a range of additional challenges affecting their growth prospects, including the impact of their size on the viability of activities with increasing returns to scale, their generally high concentration in commodity exports and their often-remote locations (see Box 2.2 for more details).

The development of digital technology could provide a new opportunity for small states and

Box 2.2 Challenges to development in small states

Size affects the viability of activities with increasing returns to scale (e.g. agricultural and manufactured goods production). Small states cannot reap returns to scale in agriculture (as Brazil can) or returns to scale in manufacturing (as China or Mexico can). Small states also suffer from high utility and infrastructure costs. Winters and Martins (2004) argue that small is beautiful but costly, leading to the conclusion that small states are permanently disadvantaged in agriculture and manufacturing.

Remoteness (especially Pacific island states) and lack of integration raise transport costs and hence constrain value-chain participation. In the past, countries would try to develop whole sectors, but in the modern world of value chains, it is now possible to develop capabilities in specific niches within the value chain. However, if logistics costs are high, this affects both imports and exports, and hence the ability of small states to take part in GVCs.

Small states have a high concentration in the exports of commodities, which leads to increased volatility because of high exposure to volatile world commodity prices. Diversification supports growth in small states (e.g. McIntyre et al. 2018), but unfortunately most small states have struggled to diversify their economies. Small states also tend to face greater impacts from disasters such as hurricanes. Such disasters slow growth and can have immediate and long-term effects.

Governance can be better or worse in small states. On the one hand, small states have less state capacity and hence might govern less well, but on the other hand, small states could be more flexible and overcome other factors through better governance. For example, Mauritius has managed its economic transformation from a sugar-dependent economy, to one with significant textiles and garments production, to tourism and financial services in recent decades. Singapore managed its economic transformation using FDI from light manufacturing to a service-oriented economy. Botswana used its natural resource revenues well to invest in education and infrastructure, although it has achieved limited diversification compared to countries such as Indonesia.

Source: Authors.

provide a new development path for them. Digital services are much less constrained by hard borders or remoteness. IT-enabled services could be exported as long as the country has strong digital infrastructure and appropriate digital skills. Such services could include tourism, call-centre services, back office services for financial firms or software development. In the Caribbean, for instance, tourism supports some 700,000 direct jobs and 2.2 million indirect jobs – together accounting for 17 per cent of all jobs in the region (WTTC 2015). In addition, growing digitalisation is likely to increase demand for workers in ICT services and related industries, such as maintenance and repair. Overall, knowledge-intensive services and digital trade can support development strategies for small, landlocked and remote Commonwealth states that cannot rely on economies of scale in agriculture or manufacturing production and lack decent physical access to other countries (ODI 2018; Baldwin 2019).

See Box 2.3 for more discussion on e-commerce as a development pathway for the Caribbean.

Digitalisation can further support better governance and some Commonwealth countries are champions of e-governance. For example, Malta's e-government services are rated the best in Europe. However, not all of the small island state challenges listed above can be overcome. For example, disasters could still demolish telecommunications infrastructure, but while this could be rebuilt, a demolished crop cannot be recovered.

However, the problem with a services-led development model is that highly productive and tradeable services are skills-intensive, while non-tradeable services (such as social care, personal services) are not (yet) highly value-adding and may not be sufficiently scalable. Rodrik (2016) points out that the essential problem with services-led development is that services tend to require

Box 2.3 E-commerce led development: a new growth strategy for the Caribbean?

Electronic commerce is broadly defined as the production, marketing, sale, and/or delivery of goods and services via electronic means (OECD 1997). Given the small size of most Caribbean firms and their very limited capital base, the potential of e-commerce and the use of the electronic marketplace provides them with opportunities for reaching customers in distant markets without the costs of establishment or the use of intermediaries (Broome 2016). It also enables increased trade with traditional trade partners such as the US and Canada, where a large number of Caribbean migrants live and work; thus creating new opportunities particularly for entrepreneurs and new entrants. A number of Caribbean countries are in the process of drafting national e-commerce legislative frameworks. However, leveraging e-commerce is constrained by the absence of a harmonised regulatory framework, the high cost of infrastructure services such as postal competence and port logistics, limited financial instruments, a lack of stakeholder buy-in, and poorer overall ease of doing business in the Caribbean. Moreover, many instances of development strategies have been marred due to the lack of an integrated approach, which leads to policy instability and, inevitably, a lack of commitment by policy planners to implement them.

Source: Broome (2016).

relatively high skills, particularly IT services, which further needs long-term, steady investment into education, infrastructure, institutions and governance. While growing services liberalisation, combined with information technologies, can allow for online 'gig' work[1] to emerge as a new export-led development strategy (Baldwin 2016), there seems to already be a massive over-supply of workers on some digital labour platforms in Commonwealth countries (see Table 2.2).

In agriculture, fully digitally integrated systems often start with the collection of agricultural data (e.g. on the weight or quality of crops). Data-integrated devices include mobile data collection apps (Brugger 2011), tracking based on bar codes and RFID (World Bank 2011), as well as field collection devices (Foster and Graham 2015). Such devices seamlessly integrate with computerised information systems that can enable tracking of information on every transaction in great detail. As goods move along the value chain, additional segments of the information system rely on digital solutions for different purposes: tracking and facilitating payments (including with mobile money), tracking goods in processing factories, enabling agribusinesses to manage exporting by smallholders, improving data management in value chains (Armstrong et al. 2011), and sending specific information messages to farmers through short message service (SMS) (Technoserve 2016).

Agriculture Technology is already having a significant impact in the East African Community (EAC) (Krishnan et al. 2019). Uganda's AgroMarketDay app, for example, allows farmers to upload pictures of their produce, which is then auctioned to the highest bidder. Uganda's Technical Centre for Agricultural and Rural Co-operation is piloting data-capturing devices (sensors, video imaging) with the National Union of Coffee Agribusinesses and Farm Enterprises and IGARA Tea to capture geo-spatial data for customised farmer profiles (ibid). Farm Africa in Tanzania is improving access to farm inputs and providing best practice advice for crop growth. Blockchain is being used to secure farmers' land titles in Rwanda, while in Tanzania blockchain technologies are used to protect the country against counterfeit food. Research by Precision Agriculture for Development (2019) also concludes that sending SMS messages with agricultural advice to smallholder sugar cane farmers in Kenya has increased yields by 11.5 per cent, while the introduction of a low-cost mobile phone-based agricultural extension system among 1,200 farmers in the state of Gujarat in India increased farmers'

Table 2.2 Oversupply of Commonwealth workers on upwork.com

Commonwealth countries	Potential workforce	Successful workers	Oversupply (%)
India	249,698	22,772	90.8
Pakistan	66,681	6,032	90.9
UK	56,644	2,924	94.8
Kenya	18,508	898	95.1
Malaysia	13,385	317	97.6
South Africa	2,723	593	95.3
Nigeria	8,032	297	96.3
Ghana	1,656	50	96.9
Uganda	1,176	21	97.3

Source: Graham and Anwar (2019).

Notes: Potential workforce estimated by total searchable worker profiles, successful workers identified as those with at least one hour worked and $1 earned.

marginal net income by $100 a year per farmer and increased yields by 8.6 per cent for cotton (ibid).

In conclusion, digitalisation can serve-up new pathways for growth and development in Commonwealth countries. But this will be contingent on a regulatory and governance framework that fosters innovation, encourages skills development, builds digital infrastructure and co-ordinates the various aspects of the digital economy in a cohesive and effective manner. In the last sub-section of this chapter, we map out key aspects of the regulatory framework to support digital transformation.

2.3 Regulatory framework for transformation

With digitalisation and 'datafication' of the value chain, the benefits from linking global networks and digital trade are likely to be increasingly dependent on the development of 'soft' digital infrastructure, which includes the formulation of a supportive legal and regulatory framework for the digital economy. In 2015, B2C e-commerce in the Commonwealth generated roughly US$354 billion in sales, representing 3.5 per cent of GDP, but only six Commonwealth countries – the UK, Canada, Australia, India, Singapore and Malaysia – accounted for 85 per cent of the B2C e-commerce sales (Table 2.3). Although an increasing number of Commonwealth citizens are online, only 6 per cent of the Commonwealth population is shopping online, indicating the potential to increase both domestic and cross-border sales in the future, especially by tapping into the large and dynamic diasporic community (Commonwealth Secretariat 2018).

In the case of African businesses, benefits from e-commerce have been particularly limited to date. Sellers from very few Commonwealth developing economies (India and South Africa are notable exceptions) can register to sell on third party platforms such as Amazon. Similarly, eBay allows registration for business in only 21 countries (UNCTAD 2015), while Jumia caters only to the

Table 2.3 B2C e-commerce sales, 2015

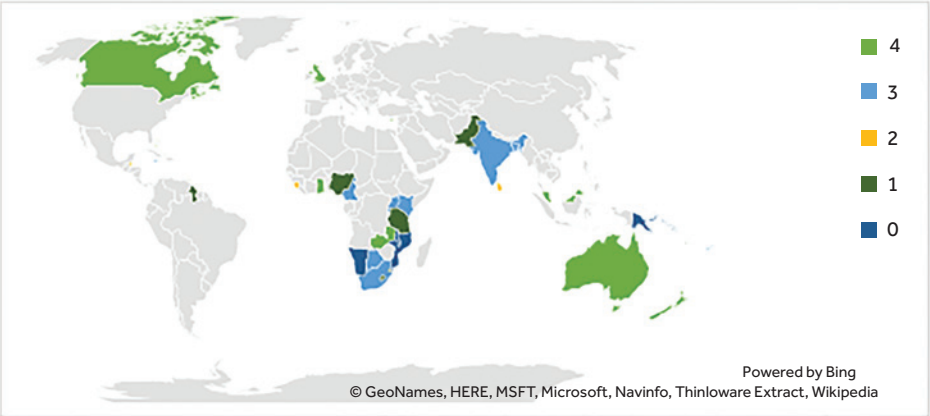
Countries	B2C e-commerce sales (US$ Billion)	% of GDP
Commonwealth countries		
UK	199.8	7
India	19.6	0.9
Canada	47.9	3.1
Australia	27.8	2.1
Singapore	2.7	0.9
Malaysia	1.5	0.5
Sub-total (Commonwealth six)	*299.3*	*3.5*
Commonwealth estimate (all countries)	354	3.5
World	2904	

Source: Commonwealth Secretariat (2018).

domestic market for African businesses plus imported goods from competitive producers. Many small states, LDCs and African Commonwealth countries therefore still have a long way to go to catch up and improve their e-commerce ecosystems to benefit from new digital trade opportunities. This includes improving access to, and affordability of, digital technologies, but importantly also requires formulating policies on 'data infrastructure'– broadly defined as the ability to collect, process and use data. Figure 2.4 uses the UNCTAD policy monitor to map the state of data legislation across 50 Commonwealth members, tracking whether each member has a legal framework for: a) electronic transactions/e-signature; b) data protection/privacy online; c) consumer protection when purchasing online; and d) cyber-crime prevention.

It is observed that Commonwealth developed countries such as Australia, Canada, the UK, New Zealand and Singapore have active legislation across all four categories, along with some Commonwealth developing countries such as

Figure 2.4 Prevalence of data legislation across Commonwealth countries



Source: Authors, constructed from WITS e-trade indicators.

Notes: Four areas of legislation include: a) electronic transactions/e-signature; b) data protection/privacy online; c) consumer protection when purchasing online; and d) cyber-crime prevention.

Ghana, Malaysia, Zambia and Trinidad and Tobago. The majority of the Commonwealth countries with legislation in only one of these areas, or for none of them, are African countries (such as Mozambique, Lesotho, Nigeria, Tanzania and Malawi) and small states such as Papua New Guinea (PNG), Solomon Islands and Vanuatu. Some small states such as The Bahamas, Lesotho, Mauritius, and Trinidad and Tobago have data protection legislation in place, while others such as Guyana, Botswana and all small Commonwealth states in Asia and the Pacific have not enacted comprehensive data protection laws. Box 2.4 presents a case study of PNG and highlights key policy gaps, including in relation to data, that need to be addressed to leverage the benefits of digital transformation.

Across the Commonwealth, data protection is governed by domestic legislation. To aid with harmonising national legislation, the Commonwealth Secretariat has developed the Commonwealth Model Law on Computer and Computer Related Crime, which contains provisions on data protection, privacy, cyber security and cybercrime. The Model Bill embodies core principles of data protection; setting limits on the collection of personal information or data; restricting the use of personal information or data for openly specified purposes; ensuring the right of individual access to personal information relating to that individual and the right to have it corrected if necessary; and identifying the parties who are responsible for compliance with relevant data protection principles.

The development of 'national e-commerce platforms' can make an important contribution in Commonwealth countries by improving the domestic and international market access of their producers. Public-private partnerships (PPPs) could be encouraged to form national e-commerce platforms to boost domestic as well as cross-border e-commerce, and use the data analytics of the engaged customers to forecast future demand and changing tastes and preferences. Linking domestic producers to national e-commerce platforms could also be made part of national trade promotion schemes. While many developing countries are striving to develop their national e-commerce policies/ strategies for linking their domestic producers and

Box 2.4 Regulatory challenges in leveraging the digital economy in PNG

Interviews conducted across a range of stakeholders in PNG reveal some key, but common, obstacles to the development of the digital economy in PNG. These include a lack of basic and technical skills to adapt technologies; lack of adequate legislation for new economic activities (e.g. platforms) and the new manifestations of traditional activities (e.g. e-commerce) in the digital era; lack of policies to adapt supporting services (e.g. financial) to the reality and needs of the digital economy; and inadequate basic hard infrastructure to sustain the digital economy, such as telecommunications and data networks. Being a small state, PNG also deals with specific challenges, associated with its geography and its cultural heritage; high investment and connectivity costs; and high infrastructure and operating costs due to poor electricity penetration. In addition, with more than 800 languages spoken in the country, there is a major challenge in designing digital solutions that can reach and benefit the whole population.

While there is a critical need to address all of these challenges, there are also constraints that affect policy design and implementation in general. Budget, policy and political constraints limit the space for policy action, making the simultaneous solution of barriers very difficult to address. Moreover, some constraints cannot be addressed until other barriers have begun to be lifted. Consequently, a sequential approach is more promising: addressing the most immediate and binding constraints may generate instant benefits by unlocking some projects for which that barrier was the only binding one.

The majority of the policy actions taken in PNG are focused on addressing the immediate constraints associated with the infrastructure and the accessibility of the internet. As soon as these barriers are lifted, it will be necessary to tackle new binding constraints. This requires preparation and policy design alongside the current work in lifting infrastructural barriers. In this sense, PNG must work to develop a comprehensive digital economy policy, while also updating legislation and improving the capability of its population to make use of digital products and platforms in the digital economy. For instance, while PNG is in the process of enacting an Electronic Transactions Act, there is still a complete lack of comprehensive legislation on digital issues such as data protection, cyberterrorism and/or data localisation. The latest National Trade Policy 2017–2023 does not reserve a prominent space for the digital economy. There is no comprehensive programme aiming to develop the digital economy. Moreover, PNG is struggling to accommodate existing policies and legislation in several sectors currently affected by the digital economy. For example, electronic payment systems remain very underdeveloped. This constitutes a serious hindrance to the development of many internet-based businesses. In other cases, it leads them to operate using relatively unreliable solutions based on blockchains, such as bitcoins.

Source: Authors, based on interviews with a range of stakeholders: National ICT Authority (NICTA); Ministry of Education; Ministry of Foreign Affairs; Ministry of Trade and Industry; National Research Institute (NRI), Customs Service; Ministry of Agriculture, Telikom PNG; State Solicitor; Central Bank; and Business Council of PNG.

Box 2.5 SADC e-commerce framework

Pillar	Examples of planned activities
Pillar 1: Enabled e-commerce environment	• Development of country-specific e-commerce strategies • Harmonising of cyber legislation through the identification of best practice legislation in the region • Setting up of a regional label to increase trust and confidence in websites used for e-commerce
Pillar 2: A capacity development programme for e-commerce in each member state	• Engaging with various stakeholders including legislators, the financial sector, logistics actors, SMEs, IT companies and end users, including through the establishment of knowledge-sharing platforms which would allow SADC member states to benefit from each other's experiences • Human development activities
Pillar 3: Strengthening e-commerce sub-regional and national infrastructures	• Promotion of sub-regional broadband backbones and Internet Access Points • Cost-effective, affordable and secured ICT infrastructure and broadband network access • Deployment of ICT infrastructure beyond major cities and towns • PPP protocol to support local and external investment in ICT infrastructure • Elaboration of a universal access strategy to connect those who are unconnected • Establishment of a regional electronic payment gateway and associated on-line and m-payment banking services
Pillar 4: Institutionalised framework to implement, evolve and govern the current strategy at regional level	• Establishment of a SADC Observatory for e-Commerce with representatives from the various member states which would undertake capacity-building activities, support data collection and set up a database • Establishment of a structure that would oversee regional dispute resolution relating to e-commerce

Source: UNECA et al. (2019).

consumers to e-commerce platforms, there is a need to recognise the associated risks, especially if these platforms are international. The 'network effects' of some international platforms can allow them to gather huge amounts of data on the connected economies, which can then be used by these international platforms to predict market trends, flood consumers with products associated to their tastes and preferences based on their personal data analytics, and effectively reorganise national production and sales. This would require re-examination of fiscal and competition policies in Commonwealth countries, which is discussed further in Chapter 5.

Within the Commonwealth, cross-country co-operation can help to build digital economies, develop cloud computing infrastructure, strengthen broadband infrastructure, promote e-commerce, develop digital payment solutions, share experiences on e-government, forge partnerships for building smart cities, promote digital innovations and technologies, and collect statistics for measuring digitalisation. The EAC, for example, is working towards establishing: cross-border broadband ICT infrastructure; an EAC legal framework for cyber laws to promote development of e-commerce services; and a regional framework for harmonisation of national ICT policies and regulations (EAC 2019).

The eSADC Strategic Framework is another great example of cross-country collaboration to support digital transformation. Undertaken as part of the e-SADC Initiative, SADC has developed a regional e-commerce strategy aimed at developing regional trade through e-commerce (See Box 2.5).

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End Note

1 The gig economy refers to labour market activities that are coordinated via digital platforms (Hunt and Samman 2019).


B15
B12
B7

DIGITAL SKILLS AND THE FUTURE OF WORK

03

This chapter covers the changes in employment patterns and shifts in resource allocation (labour and capital) across Commonwealth member countries resulting from digitalisation and technological disruptions. It also highlights policy considerations for preparing the workforce in Commonwealth countries for the digital future.

3.1 Changing landscape of labour markets

Most studies examining the consequences of digitalisation on employment relate to developed countries. Of these studies, some find automation to have a labour-substituting effect – that is, automation can displace jobs and substitute labour, affecting overall employment negatively (see for instance, Frey and Osborne 2013; Bowles 2014; Acemoglu and Restrepo 2017). Assuming that occupations as a whole can be automated away, Frey and Osborne (2013) examine the impact of computerisation on employment to find that 47 per cent of the jobs in the US are at risk. Using the same methodology, Oxford Martin School (2016) finds that 57 per cent of jobs in the OECD, 69 per cent in India, 77 per cent in China, and 85 per cent in Ethiopia are at risk of being automated, while technological change can displace roughly 40–60 per cent of the labour force. These high estimates have, however, been criticised for not being able to account for variability in tasks within each occupation (Autor and Handel 2013). Analysing the ability of robots in 'sensory perception, cognitive capabilities, natural language processing, social and emotional capabilities, and physical capabilities' in roughly 2000 work activities, rather than whole occupations, across China, Germany, Japan, India, the US and Mexico, Bughin et al. (2017) find that less than 5 per cent of occupations can be fully automated, although roughly 50 per cent of work activities in almost all occupations can be automated using current digital technologies.

At the same time, the job-creating potential of digitalisation cannot be ignored. As discussed in Chapter 2, digitalisation opens up new pathways for development through opportunities to increase productivity and product sophistication, expand trade, improve market access, and raise product demand and profits; all of which can lead to new and more productive jobs. The labour displacement by digital technologies in some sectors is also likely to be absorbed into other sectors that are producing these technologies, as well as into tasks that are complementary to automation and robotics, such as services industries focused on repair and maintenance. Cross-country studies documenting a positive employment impact from automation include Booz and Company (2012) and Muro and Andes (2015), as well as Gregory et al. (2016) for the European Union.

Not all types of tasks are equally automatable. Developed country evidence points to a 'hollowing-out' of middle-skilled workers as a result of digital technologies. Labour markets are becoming polarised due to increasing demand for high-skilled and low-skilled workers relative to middle-skilled workers (see Autor et al. 2006; Goos and Manning 2007; Autor and Dorn 2013; Goos et al. 2014; Beaudry et al. 2016). The key explanation for this polarisation is 'routinisation'– middle-skilled workers are engaged in occupations that consist of routine tasks which can be more easily automated. In contrast, high-skilled workers perform non-routine tasks that can complement technology – for instance, R&D, managing or designing (Beaudry et al. 2016), while low-skilled workers perform non-routine manual tasks that are harder to automate, such as nursing and child-care.

Evidence of job polarisation in developing Commonwealth countries remains mixed, with some developing economies having experienced this trend, including Malaysia, Mauritius, Uganda and India (World Bank 2016). India, in particular, has witnessed a proliferation of low-paid service jobs in activities which are, at least for now, difficult to automate (Turner 2018). However, other countries, such as Ghana, do not seem to have experienced such polarisation as a result of digitalisation (World Bank 2016), possibly due to labour being more concentrated in low-skilled, low-routine occupations

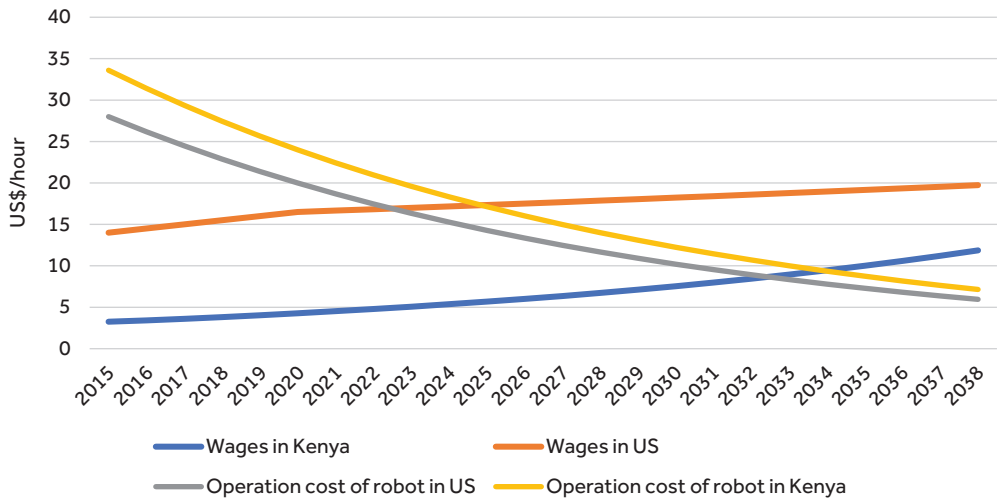
(Banga and te Velde 2018a); slower decline in the relative price of investment as compared to developed countries (Das and Hilgenstock 2018); and low elasticity of factor substitution and rigidity in the labour market (Dao et al. 2017).

3.2 Sectoral changes in employment in the Commonwealth

Chapter 2 showed the declining share of manufacturing value-added in GDP across different Commonwealth regions, as a result of structural changes, changing global demand and technological progress. Compared to the services and agriculture sectors, the manufacturing sector is more intensive in 'routine' tasks (OECD 2016), which are more easily codifiable and therefore easier to automate. In line with this, the World Economic Forum (WEF) Job Survey (2016) predicts an overall decline of 1.6 per cent in manufacturing and production employment in the period 2015–20, largely driven by labour-substituting technologies (across developed and developing countries), with 3D-printing expected to reduce employment by 3.5 per cent, followed by the changing nature of work (−3%), new energy supplies and robotics. However, these estimates need to be treated with caution since these they do not account for labour-complementing productivity improvements through digital technologies, such as robotics. The job-creating potential of the manufacturing sector in the Commonwealth is also likely to be affected by international pathways: a persistent digital divide between Commonwealth member states and other countries, and within the Commonwealth, is likely to increase reshoring of manufacturing and limit future offshoring to developing countries, adversely affecting trade and employment in the sector.

Taking the case of the US and Kenya, Banga and te Velde (2018a) demonstrate this in the case of furniture manufacturing – a low-skilled, labour-intensive tradable sector with a relatively high robot density. The authors find that operating a robot in the US furniture industry becomes cheaper than Kenyan formal labour in the year 2033, reproduced in Figure 3.1, suggesting that around this time companies in the US might find it more cost efficient to reshore production back to their advanced factories. While evidence of large-scale reshoring is limited to date, data from the Reshoring Initiative shows that 250,000 jobs in total has been reshored

Figure 3.1 Comparing labour and robot costs in furniture manufacturing: the case of the US and Kenya



Source: Banga and te Velde (2018a).

from developing countries to the US since 2010 (see Table 3.1). However, within the manufacturing sector, industries are being automated at different rates, with the paper and paper products, wood and wood products, basic metals, food, beverages and tobacco, and textiles and garments industries being less affected by global technological changes (World Bank 2017).

Some studies such as Lin (2012) argue that reshoring in African countries will be offset by increased offshoring from China, as a response to rising wages in the country. However, Xu et al. (2017) survey more than 600 Chinese light manufacturing firms and find that the majority of the firms prefer to upgrade their technology as a response to rising wages, rather than offshoring; and even if the latter is chosen, it is mainly to other Asian economies rather than African countries.

As per the WEF (2016) Job Survey report, technology such as cloud computing, IoT and robotics is expected to increase overall employment by 2 per cent in the period 2015–2020, largely driven by an increase in employment in services sectors such as computer and mathematical, sales and related, architecture and engineering, management, business and financial operations. In line with this, Table 3.2 demonstrates the rising importance of services sectors in employment for the Commonwealth. In all Commonwealth countries considered, the share of agriculture in total employment has gone down, especially in Asian and African economies. The share of manufacturing, on average, has also declined, particularly in developed Commonwealth countries (the UK, New Zealand, Malta, Cyprus and Australia). Some small states such as Jamaica and Trinidad and Tobago have also recorded negative growth or negligible growth in the manufacturing employment share. In selected African and Asian economies, manufacturing appears to be doing better: Bangladesh, Ghana and Pakistan record an increase in manufacturing employment share, while Malaysia records a decline. The average employment share of services – both public administrative services and trade, transportation and accommodation – has increased across most Commonwealth countries, indicating the growing importance of services. However, in some services sectors, certain digital technologies can be employment reducing. For instance, mobile internet and cloud technology is predicted to reduce employment by roughly 3.9 per cent in installation and maintenance, and by 5.82 per cent in office and administrative work (WEF 2016). Tasks in financial services – such as data entry and accounting, as well manual, clerical and logistical tasks in transportation and storage – also face high exposure to routinisation (ibid).

Table 3.1 Reshoring from selected Commonwealth countries

Country	Jobs reshored (2010–2018)	Number of companies reshored	Job losses per company reshored
Canada	5,900	62	95
Singapore	4,320	5	864
UK	975	11	89
Sri Lanka	373	5	75
India	267	19	14

Source: Reshoring Initiative (2018).

3.3 Future skill needs in the Commonwealth

The changing employment structure in the digital economy will also impact skills needs in the future, particularly raising the demand for non-routine skills. Within non-routine skills, five types of skills are likely to be increasingly demanded: a) job-neutral basic digital skills, such as accessing the internet and browsing online; b) job-neutral intermediate digital skills, such as e-marketing, using social media and data analysis; c) job-specific digital skills, such as coding, app development and technology design; d) soft cognitive skills, such as management, analytical thinking and teamwork; and e) soft socioemotional and interpersonal skills such as empathy, presentation and communication (Banga and te Velde 2018b). Since the 2000s, the

Table 3.2 Percentage point change in employment share, 2006–2018

Country	Agriculture	Construction	Manufacturing	Mining and quarrying; Electricity, gas and water supply	Pubic admin services	Trade; Transportation, Accommodation and food; and Business and administrative services
Australia	–0.81	0.39	–3.10	1.15	4.96	–2.59
Bangladesh	–7.48	2.42	3.38	0.09	1.15	0.43
Cyprus	–1.96	–2.73	–3.38	0.38	–0.83	8.76
Ghana	–26.30	3.23	2.33	1.29	6.13	13.56
Jamaica	–2.02	–1.52	0.04	–0.17	–3.32	7.17
Malaysia	–3.27	–0.01	–3.39	0.63	–0.52	6.55
Malta	–1.13	–1.54	–5.68	–1.79	5.05	5.76
New Zealand	–1.36	0.59	–3.67	0.45	4.02	0.46
Pakistan	–5.96	1.64	2.39	0.24	–2.34	4.06
South Africa	–1.60	0.71	–4.80	–1.20	9.74	–2.68
Sri Lanka	–6.12	7.79	0.08	–6.06	2.93	4.22
Trinidad and Tobago	–1.17	–1.71	–1.89	–0.05	3.37	1.46
UK	–0.29	–0.85	–3.95	0.82	0.88	3.08
Average	–4.57	0.65	–1.67	–0.32	2.40	3.86

Source: ILO occupation data by sector.

Note: Change is percentage point difference between 2006 and 2017/2018. In some cases, data for 2017 is used due to unavailability of employment data in 2018.

employment share of occupations intensive in non-routine cognitive skills (such as analytical and critical thinking) and socioemotional skills has increased from 19 per cent to 23 per cent in emerging economies, and from 33 per cent to 41 per cent in advanced economies (World Bank 2019).

The interaction of soft and digital skills in shaping country-level competitiveness is shown in Figure 3.2. Functioning in the digital economy requires, at a minimum, basic ICT skills i.e. the knowledge and use of hardware and software necessary to operate in a digital economy, such as the use of mobile phones or accessing the internet. The next level comprises intermediate digital skills for information management, which are required to use ICT for effectively searching, organising and using electronic information. This includes the ability to judge the usefulness of the acquired information and the ability to coherently collate and analyse information and data from different sources (Laar et al. 2017).

The third category of skills is ICT for communication and collaboration i.e. using ICT to communicate information effectively through social media and online platforms (such as digital marketing), and managing and collaborating by digitally exchanging information or sharing ideas on online platforms

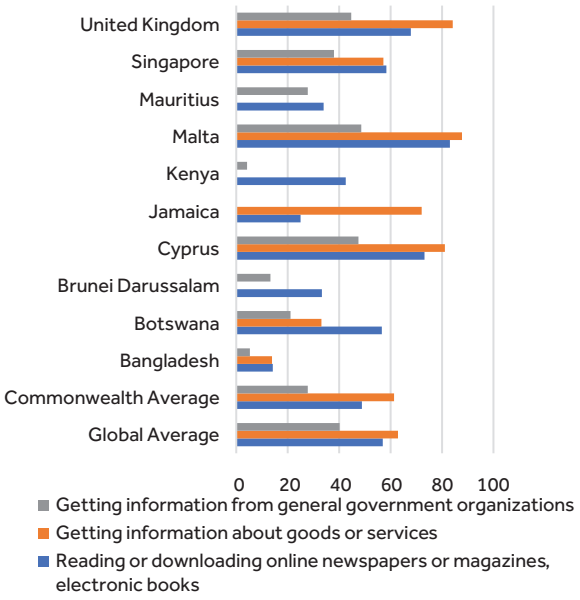
Figure 3.2 Future skill needs

Source: Adapted from Banga and te Velde (2018b).

(for example, using online project management software such as Trello and Zoho). This category requires both intermediate digital skills and soft skills for communication and collaboration. Similarly, using ICT to create new content and knowledge requires intermediate to specialist digital skills and soft skills for creative and innovative thinking (for instance, advanced technology design). At the top is ICT for analytical thinking i.e. using ICT for making informed decisions, negotiating, understanding and solving problems in a digital context. This involves specialist digital skills as well as soft skills. For instance, the digital technology of 3D-printing involves knowledge of computer-aided design and 'additive manufacturing', which requires advanced digital skills of 3D-modelling as well as soft skills of problem-solving, critical thinking and creative designing.

We use ITU data on the use of internet, by activity, to examine how Commonwealth countries are faring on this nexus. For measuring basic digital skills, we examine information on the percentage of the population using the internet for accessing information about goods and services, as well as government organisations and reading or downloading online newspapers. Figure 3.3 shows that in terms of basic digital skills, the Commonwealth average[1] is lower than the global average across the indicators considered. There is also a significant gap between countries in basic digital skills within the Commonwealth: more than 80 per cent of the population in the UK is using the internet to acquire

Figure 3.3 Basic digital skills



Source: ITU (2018).

Note: measured as percentage of population using internet across different activities.

information about goods or services as compared to only 14 per cent in Bangladesh. Similarly, the Commonwealth, on an average, fares below the global average on all indicators used for measuring information management skills (see Figure 3.4), driven by a lack of information management skills in Pakistan and Jamaica.

The Commonwealth is faring better in terms of ICT skills for communication and collaboration, with the Commonwealth average exceeding the global average in terms of participating in social networks and using the internet for finding/applying for a job (Figure 3.5). However, there is wide variation in country performance across indicators. For instance, while 74 per cent of the population in Kenya uses the internet to engage in social networks, only 2 per cent of the population is using the internet for finding or applying for a job. The digital gap between countries within the Commonwealth is again re-enforced when we look at ICT skills for innovation or commerce (Figure 3.6). More than 70 per cent of the populations in the UK

Figure 3.4 Information management skills

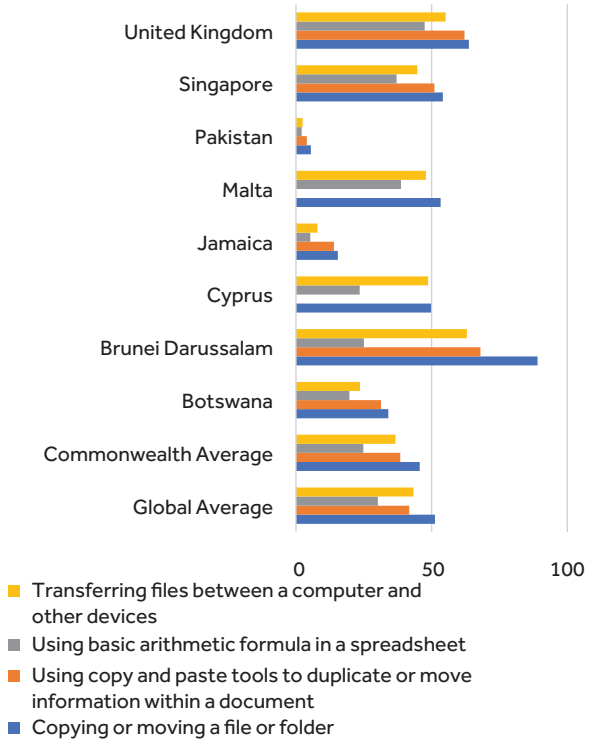
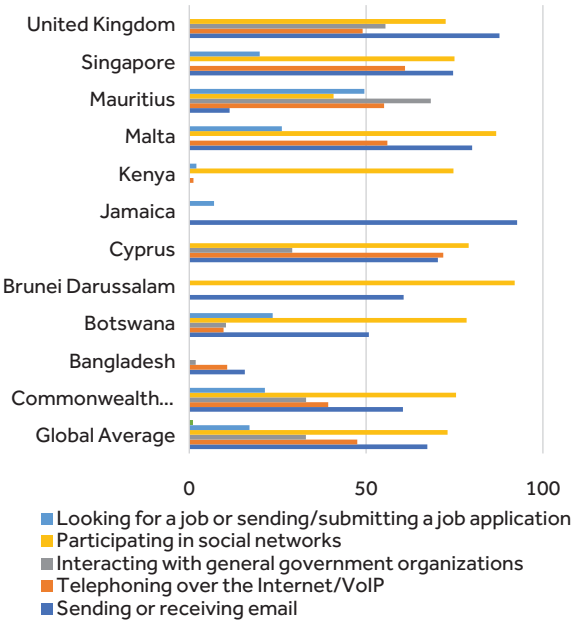


Figure 3.5 ICT for communication



Source: ITU (2018).

Note: measured as percentage of population using internet across different activities.

Figure 3.6 ICT innovation/commerce

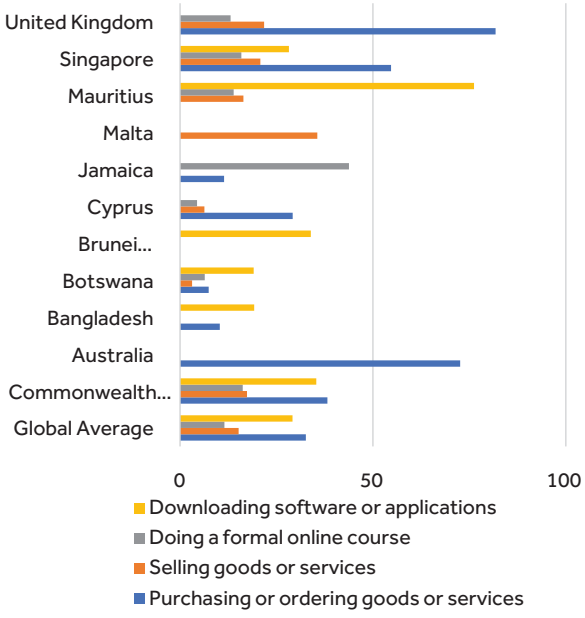
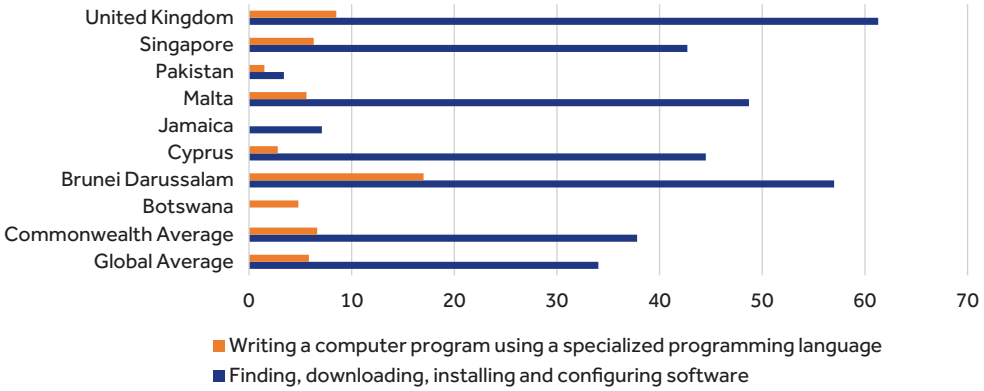


Figure 3.7 ICT skills for analytical thinking



Source: ITU (2018).

Note: measured as percentage of population using the internet across different activities.

and Australia are using the internet for purchasing goods and services, compared to less than 12 per cent in Bangladesh, Botswana and Jamaica.

Lastly, in terms of use of ICT for analytical thinking (Figure 3.7), we observe that more than 40 per cent of the populations in the UK, Singapore, Malta, Cyprus and Brunei Darussalam are using the internet to find, download, install and configure software, while less than 8 per cent of the population in Jamaica and less than 4 per cent in Pakistan are doing so. Compared to 8.5 per cent of the population in the UK which is using the internet for writing a computer program using a specialised computer programming language, just 4.8 per cent of the population in Botswana and 1.5 per cent in Pakistan are doing so.

The lack of basic and information management digital skills as well as more advanced digital skills in less developed Commonwealth countries can be traced to the use of the internet by age and education group. It is clear from Table 3.3 that internet use is mainly concentrated in the age group 15–24 in the Commonwealth, following global trends. It is noted that across all age categories, Commonwealth ICT use lags behind the global average, particularly in the use of the internet in the below-15 age group, which is in line with the lack of basic digital skills in the population. Compared to the global average of 54 per cent and the Commonwealth average of 25 per cent, internet penetration in the below-15 age group is just 4.5 per cent in Pakistan, 1.5 per cent in Bangladesh, 1.3 per cent in Kenya and 1.6 per cent in Nigeria.

Across education levels, internet use is most prevalent in the tertiary category, in which Commonwealth less developed countries have internet penetration rates comparable to the levels in developed countries, barring Pakistan where roughly half of the population in tertiary education is using the internet. The gap is more pronounced in terms of internet penetration at the level of upper-secondary and post-secondary non-tertiary education: 25 per cent in Bangladesh, 26 per cent in Pakistan and 35 per cent in Kenya compared to 90 per cent or more in Australia, the UK and Singapore. The IDI Skills Index, presented in the final column of Table 3.3, captures overall skills development in the country, using information on mean years of schooling, secondary and tertiary enrolment. It is observed that countries with lower levels of internet use across educational categories rank lower on the IDI Skills Index, indicating lower digital skills development. Countries with low ranks on the index lag behind in human capital development. In terms of occupations, non-manual occupations are more

INTERNET PURCHASING – goods and services

More than **70%** of the population in the United Kingdom and Australia use the internet for purchasing goods and services compared to less than **12%** in Bangladesh, Botswana and Jamaica

Table 3.3 Use of the internet in the Commonwealth across age, education and occupation

Economy name	Internet penetration									IDI Skills Index
	By age group				By education level			By occupation		
	Below 15	15–24	25–74	75 or above	Primary and lower secondary	Upper-secondary, Post secondary, non-tertiary	Tertiary	Manual	Non-manual	
Australia		97.5	89.1	35.3	68.3	90.0	96.7	88.2	96.4	9.28
Bangladesh	1.5	11.8	7.7	1.1	2.0	24.7	68.1	3.5	24.5	3.72
Botswana	16.8	59.6	34.2		17.1	66.6	87.2	20.5	64.2	5.67
Brunei Darussalam		90	90		90.0	90.0	90.0			6.23
Cyprus		99.1	71.3		45.1	79.9	94.0			7.93
Jamaica	27.9	71.4	40.6		22.5	59.2	91.7	33.9	56.9	5.78
Kenya	1.3	29.7	23.6	0.9	5.3	35.5	79.0	20.1	23.2	3.79
Malta		100	77			80.8	97.0	80.2	96.6	6.94
Mauritius	53.3	86.8	45.8	5.1	36.3	80.3	93.7	36.7	56.3	6.42
Nigeria	1.6	4.6	4.6	3.6						3.53
Pakistan	4.5	18.5	12	2.7	9.3	26.5	52.6			2.95
Singapore	95.7	99.3	85.5	14.7	71.8	96.7	99.4			8.14
United Kingdom		99.8	93.9			92.4	97.4			8.17
Commonwealth average	*25.32*	*66.77*	*51.94*	*9.05*	*36.77*	*68.55*	*87.23*	*40.44*	*59.72*	*5.34*
Global average	54.25	85.97	67.55	15.91	51.70	76.69	89.77	59.88	78.01	5.85

Source: ITU (2018).

Notes: Data is available for only 13 Commonwealth countries, but covered a good range of countries across regions and income levels: Australia, Bangladesh, Botswana, Brunei Darussalam, Cyprus, Jamaica, Kenya, Malta, Mauritius, Nigeria, Pakistan, Singapore and the UK.

digitalised in the Commonwealth, which is in line with the above discussion.

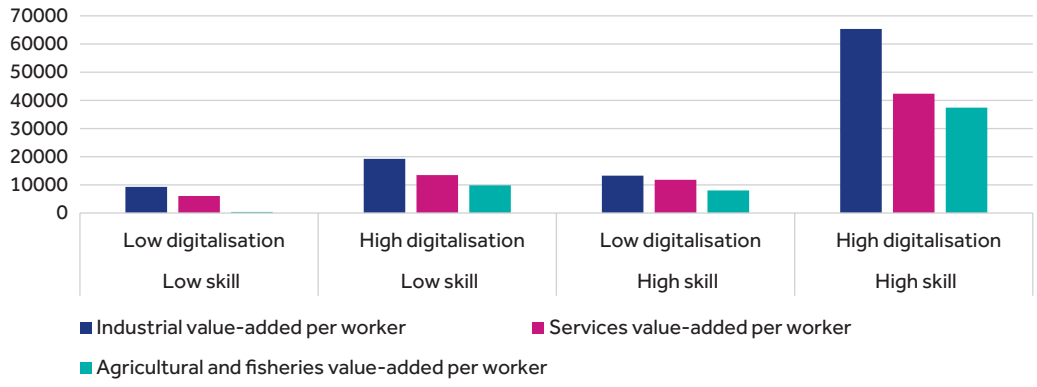
3.4 Closing the digital skills gap

Closing the digital skills gap can enable Commonwealth member states to fully realise the benefits of the digital economy. For instance, recent evidence from G20 countries suggests that if they fail to adapt to meet the skill-needs of the new technological era, they could be in line to miss out on as much as US$1.5 trillion in GDP growth over the next ten years (Accenture 2018). By modelling GDP losses associated with skills gaps, Korn Ferry (2018) predicts GDP losses in South Africa (US$2 billion), Singapore (US$2.74 billion), Malaysia (US$0.394 billion), Australia (US$15.65 billion) and the UK (US$28 billion), largely driven by shortages of high-skilled workers.

For Commonwealth countries, Figure 3.8 confirms the importance of investment in both digitalisation and digital skills development for productivity gains. Across all sectors, productivity is higher in Commonwealth countries in which both digitalisation (measured as internet penetration) and skills development (measured as secondary school enrolment) is above the median levels, followed by countries with high levels of digitalisation but low skills, low digitalisation and high skills and, lastly, low digitalisation and low skills.

Empirical estimates in Table A2 in the Appendix confirm the importance of skills development as complementary to digital infrastructure investment, using a sample of low- and middle-income countries.[2] It is observed that the impact of digitalisation (proxied by internet penetration) on manufacturing labour productivity is positive and significant, with a doubling of the internet penetration rate leading to a 5.3 per cent increase in manufacturing labour productivity, ceteris paribus. However, the impact of internet penetration is roughly 5 per cent lower in Commonwealth countries as compared to their non-Commonwealth counterparts, possibly indicating a lack of overall digital capacity in the Commonwealth's low- and middle-income countries in areas such as digital infrastructure, skills and general infrastructure. We further find that a 1% increase in the human capital index, a proxy for skills, increases the impact of internet penetration on manufacturing labour productivity in the Commonwealth by roughly 7.4 per cent, on average.

Figure 3.8 Commonwealth sectoral productivity, average 2010–2017



Source: Authors, constructed from ITU (2019) and World Development Indicators databases.

Notes: Low skills level refers to secondary enrolment below the median level. Similarly, low digitalisation level refers to internet penetration below the median level. Sectoral productivity is measured as value-added per worker in real USD terms.

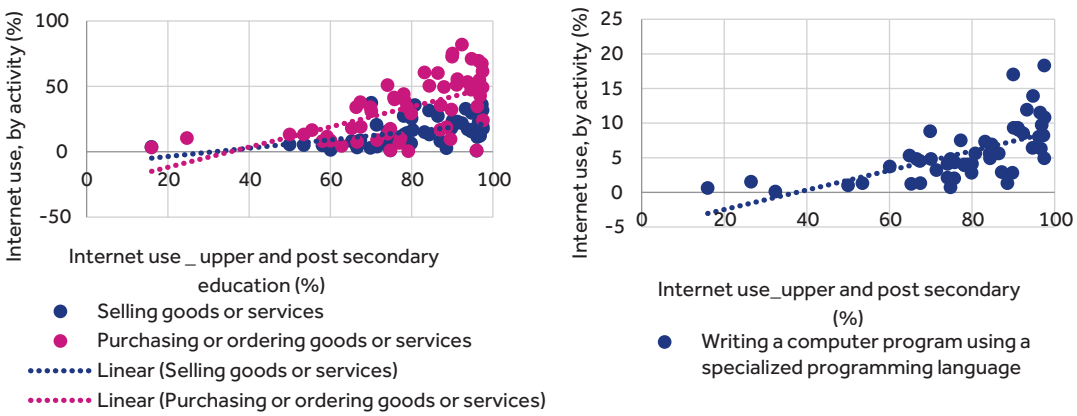
Skills development can therefore increase the productivity gains from digitalisation for Commonwealth countries. To build future-relevant skills, Commonwealth countries need to boost the provision of digital and soft skills under a more STEM (science, technology, engineering, mathematics)-focused technical and vocational education and training (TVET) system. There is an urgent need to incorporate digital literacy and basic ICT skills at primary and lower-secondary education levels in the case of both formal education and TVET. Beyond increasing secondary TVET enrolment – which is below 6 per cent in low- and lower-middle income countries globally – there is a need to re-orient TVET at the upper-secondary and tertiary level to increase provision of intermediate-to-advanced digital skills and soft skills. This can be achieved by revising learning frameworks through mapping transformative competencies.

Using ITU's data on ICT skills across countries, Figure 3.9 further observes that internet use in secondary and post-secondary education is positively correlated with the use of the internet for both online buying and selling of goods and services, classified as ICT skills for innovation and commerce on the skills nexus. Internet use in secondary education is also positively correlated to the proportion of people with advanced digital skills in a country (i.e. the proportion of people that can write computer programs using specialised computer programming languages).

Beyond increasing access to TVET and changes in the curricula, effective and quality provision of digital and soft skills training may require continuous professional development of TVET trainers, availability of resources to meet the relatively high cost of teaching STEM, building ICT capacity in education and teacher training, and investment into digital infrastructure and linkages, with a dynamic private sector to align skills taught with industry needs. There is a need to establish standard-setting bodies, which can grade digital and soft skills as per different types and levels; define them in terms of outcomes achieved through both formal and non-formal TVET; provide skills certification that is recognised by employers and higher education institutions; and recognise prior learning in digital and soft skills (Banga and te Velde 2019).

It is key to note that budgetary limitations may mean Commonwealth countries are forced to consider trade-offs when prioritising digital and soft skills, particularly in relation to the type of digital skills and between different groups. For instance, some countries that are at a more advanced stage of digitalisation may focus policy interventions

Figure 3.9 Internet use by education and skills level



Source: ITU (2018).

Note: Data in this sample include Commonwealth and non-Commonwealth countries.

in re-orienting secondary and tertiary education towards a more private sector-led dynamic TVET programme. These countries may prioritise the development of intermediate- (such as data extraction and analytics) to-advanced digital skills (computer programming) in order to realise the economic value of 'data' to upgrade into higher value-added industries with larger incumbent rivals. Other Commonwealth countries, where a large portion of the population lacks basic ICT skills, such as Pakistan, may focus on strengthening basic digital literacy, while others may take a more hands-off approach by supporting private sector firms to provide digital skills training.

This chapter has highlighted the importance of both digital and soft skills for increasing the competitiveness of the workforce in Commonwealth member states. It is observed that, compared to the global average of 54 per cent, the average internet penetration rate in the Commonwealth for those aged below 15 years is just 25 per cent; and the average internet penetration rate in primary and lower education in the Commonwealth is just 36 per cent, compared to the global average of 51 per cent. In line with this, the chapter finds that the Commonwealth, as a group, is currently lagging in basic digital skills (i.e. the use of the internet for going online to access information about goods and services, reading and downloading materials). Less developed Asian economies in the Commonwealth and small states are falling behind in digital skills-readiness, suggesting there is an urgent need to develop ICT-focused skills within education systems and re-orient TVET and standard-setting bodies to focus more on the development of digital and soft skills.

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End Notes

1 This average is based on roughly 10–13 Commonwealth countries per indicator for which data is available.

2 This is a sample of 121 low- and middle-income countries, with 36 Commonwealth countries, in the period 1991–2013.

UNLOCKING INVESTMENT FOR DIGITAL INFRASTRUCTURE AND SMART CITIES

04

This chapter discusses the extent of dispersion and gaps in digital infrastructure among Commonwealth countries. The discussion will then proceed with investigating the presence of digital infrastructure enablers that help transform the economy into 'smart cities'. The last section concludes with a discussion of the regulatory and governance framework necessary to support digital infrastructure investments moving forward.

4.1 Overview of digital infrastructure

This section maps the digital infrastructure landscape in the Commonwealth, comparing progress in developing digital infrastructure across Commonwealth countries. We distinguish between basic, intermediate and advanced digital infrastructure in the discussion below, while Table 4.1 summarises indicators under each category.

Basic digital infrastructure refers to internet infrastructure, cable networks etc. captured by proxy variables related to ICT access and affordability. On average, the Commonwealth performs less well than non-Commonwealth countries in access to basic digital infrastructure. On average, 89 per cent of the population in low-income Commonwealth countries is covered by a mobile-cellular network, but only 16 per cent of the population in these countries has access to the internet; and the average proportion of households in Commonwealth LICs with access to computers and internet is between 5 and 10 per cent. The lower access to basic technologies in LICs may be explained by the higher cost of the internet: it costs roughly US$66, on average, to acquire a fixed broadband internet connection in these countries.

On average, Commonwealth countries reached 48 per cent internet penetration in 2017. Brunei, United Kingdom, Canada and New Zealand rank the highest within the Commonwealth, with more than 90 per cent of the population having internet access, while more than half (28) of the Commonwealth member states fall below the world average on this measure (Figure 4.1). In Kiribati, Malawi, Sierra Leone, Solomon Islands and PNG, less than 15 per cent of the population are connected to the internet. Box 4.1 highlights some of the recent initiatives undertaken in PNG to improvise access to basic digital infrastructure.

Globally, mobile connectivity is an increasingly important way for individuals to access the internet. This is no different in the Commonwealth, where mobile phones are a widely used technology for online activities. However, the digital infrastructure supporting mobile connectivity varies significantly across the Commonwealth. Digital divides in mobile connectivity remain significant among members. According to the GSMA mobile connectivity index (MCI, see Table 4.2),[1] Australia ranks the top country in the world, with a MCI score of 88.4 in 2018. Singapore ranks second, with a MCI score of 86.6, and New Zealand is third with a MCI score of 85.2. At the other end of the spectrum, a number of Commonwealth African countries (Eswatini, The Gambia, Malawi, Sierra Leone and Zambia), along with Pakistan and Solomon Islands, perform poorly on the MCI, suggesting key enablers of mobile connectivity are deficient in these countries.

On average, Commonwealth countries reached 48 per cent internet penetration in 2017. Canada, Australia, New Zealand and The Bahamas rank the highest within the Commonwealth, with more than 90 per cent of the population having internet access, while more than half (28) of the Commonwealth member states fall below the world average on this measure (Figure 4.1). In Kiribati, Malawi, Sierra Leone, Solomon Islands and Papua New Guinea, less than 15 per cent of the population are connected to the internet.

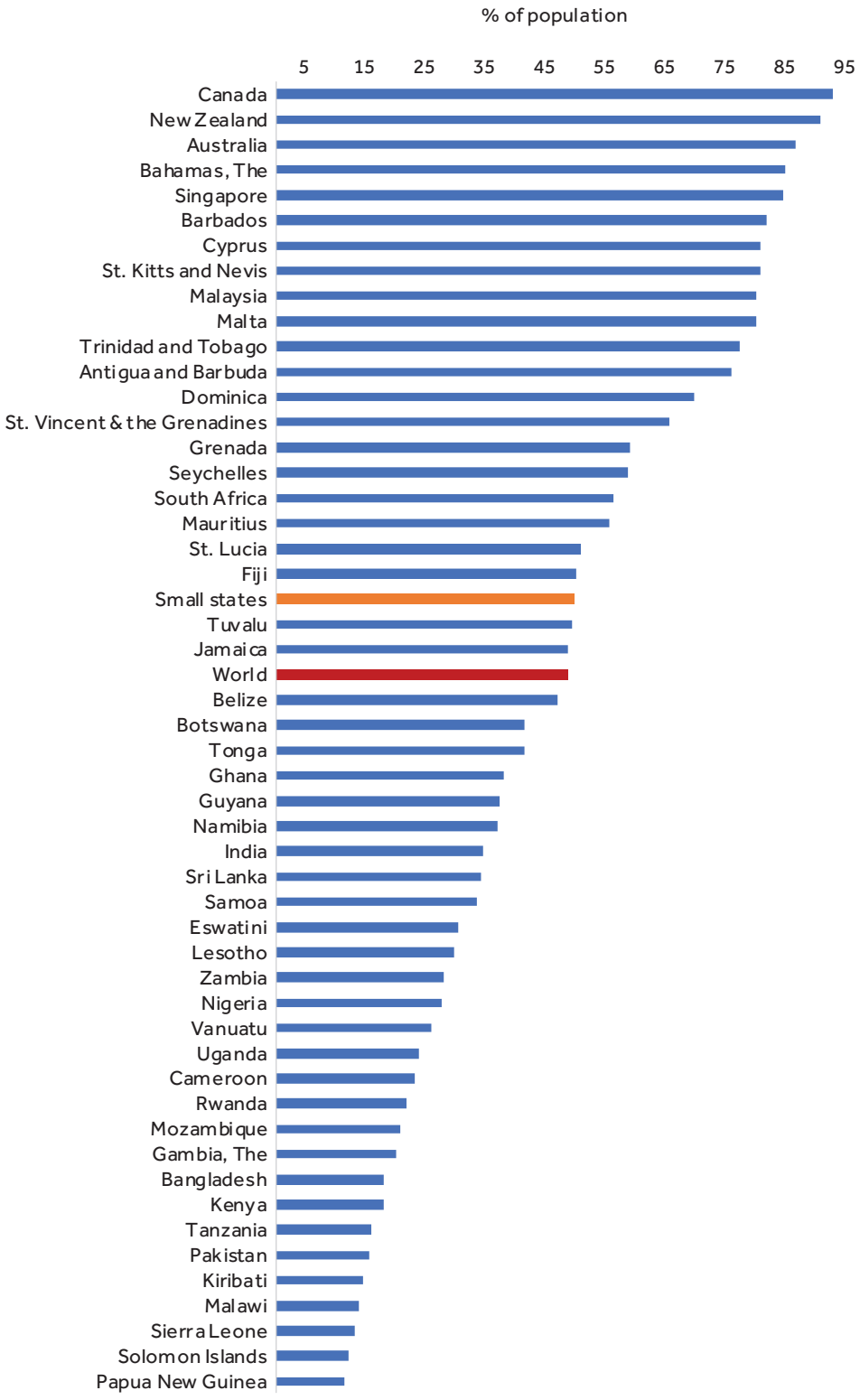
For intermediate digital infrastructure, Table 4.1 uses indicators to capture the quality of internet – such as internet bandwidth and 3G mobile penetration – and shows that Commonwealth countries are lagging behind their non-Commonwealth counterparts. In Commonwealth countries, on average, 63 per cent of the LIC population is covered by at least a 3G network, but the international bandwidth per internet user is roughly 40 times lower compared to Commonwealth HICs. Across regions, international

Table 4.1 Digital infrastructure in the Commonwealth, by income level, 2015–17

	Common-Wealth	Non-Common-wealth	Commonwealth			
			High income	Upper middle income	Lower middle income	Low income
Basic digital infrastructure						
Access to electricity (% of population)	78.07	86.89	100.00	91.99	63.35	27.86
Percentage of the pop ulation covered by a mobile-cellular network	91.69	93.87	99.32	91.60	85.26	89.56
Fixed-telephone subscriptions per 100 inhabitants	14.61	19.75	34.74	14.68	1.45	0.52
Mobile-cellular subscriptions per 100 inhabitants	100.45	109.95	130.08	105.36	77.75	73.94
Fixed broadband subscriptions per 100 inhabitants	10.37	14.93	26.53	8.49	0.71	0.52
Internet users (% of population)	45.15	54.32	80.15	47.29	21.46	16.10
Estimated proportion of households with internet access at home	40.65	51.33	76.19	42.68	18.99	10.12
Estimated proportion of households with a computer	37.63	48.63	77.29	39.89	11.85	5.82
Connection fee for residential telephone service (US$)	42.60	89.00	73.80	37.54	31.41	21.21
Mobile-cellular prepaid connection charge (US$)	3.74	14.69	7.16	3.71	1.50	0.45
Mobile-cellular prepaid price of a one-minute local call (peak; on-net) (US$)	0.15	0.41	0.23	0.16	0.10	0.08
Installation fee for business telephone service (US$)	46.98	258.73	70.15	41.75	35.10	17.40
Fixed broadband internet connection charge (US$)	39.37	39.03	53.36	24.89	34.73	66.69
Intermediate digital infrastructure						
Secure internet servers (per 1 million people)	3,290.51	3,683.10	11,088.56	909.09	44.40	9.66
Percentage of the population covered by at least a 3G mobile network	77.05	81.23	96.13	80.81	60.66	63.07
International internet bandwidth; in Mbit/s	830,659.14	1,077,280.83	2,318,801.00	116,977.30	619,893.80	16,233.26
International internet bandwidth per internet user	80,255.45	172,371.92	217,973.30	45,674.60	17,488.66	5,507.49
Advanced digital infrastructure						
Robot shipments	**data available only for limited countries*					
UNCTAD Business-to-Consumer E-Commerce Index score (2016)	53.00	54.35	88.26	57.25	33.90	28.00

Source: Authors' computations based on ITU, IFR and UNCTAD data. Averages are unweighted.

Figure 4.1 Internet penetration rates (%) in the Commonwealth, 2017



Source: Authors (constructed graph based on World Bank data).

Notes: Internet penetration is measured as % of population with access to the internet.

Box 4.1 Improving access to basic digital infrastructure in PNG

In the area of infrastructure PNG has taken decisive action to increase the quantity and quality of data transmission as well as improve access to the service. First, internet speed and reliability are expected to increase substantially once the two main cables connecting PNG with China and Australia are operational. This is expected to occur at the end of 2019. Once these cables are operational, PNG will have the capability to receive more than 20 terabytes per second of data – 20 times its current capability. Frequently, operators tend to limit the upload speed with the aim of maximizing the download speed. As the interaction with online services requires a bi-directional exchange of data, their operation suffers when the upload speed is limited. The new cables will allow companies based in PNG to operate internet-based services (e.g. data cloud) and the online and almost immediate synchronization of financial operations among others as a result of the improvement of the bi-directional exchange of data. Second, the price of internet access has declined significantly. Whilst the cost of accessing the internet had been falling over the last few years, data prices were still quite high. Earlier in 2019, one gigabyte of data cost around 20 Kinas (USD 5.9). Recently, however, the government-owned operator (although only capturing 10 per cent of the market) has slashed its prices offering one gigabyte for 5 Kina (USD 1.5). This constitutes a reduction between 70 and 80 per cent. Unfortunately, the reduction in prices has been too recent to be observed in data related to the use of internet.

Nevertheless, it is expected that the declining cost will intensify the use of the internet by existing users rather than constituting a decisive factor in the expansion of accessibility. This is driven largely by two elements. On the one side, although PNG is working towards improving last mile access, encouraging operators to build the necessary infrastructure, only 26 per cent of the population has access to 4G connectivity. The Universal Access Programme funds the expansion with a levy to support direct investment by NICTA. However, a lack of access to the energy grid in many parts of the country significantly increases investment and operational costs associated with mobile antennas as a result of requiring electric generators or solar cells. At the same time, only 15 per cent (1 million) of the population has smartphones that can make effective use of the internet. High tariffs and duties (40 per cent) applied to smartphones make these essential devices unaffordable to most of the population. The importance of smartphones is critical as mobile internet is the dominant form of access to internet. Fixed broadband subscriptions total around 50,000.

Source: Authors, based on stakeholder consultations in PNG.

internet bandwidth (IIB) available per user is much more limited in countries in Commonwealth Africa (14 kilobyte per second per user) (Figure 4.2). The high IIB per user among the three European countries in the Commonwealth is driven by Malta, a small state, with 1,179kb/s per user compared with the 356kb/s rate among European countries. IIB can be deployed either by satellite or by submarine or land optical fibre, and thus limited economies of scale and/or remoteness may have restricted

Table 4.2 Commonwealth countries' performance on the mobile connectivity index

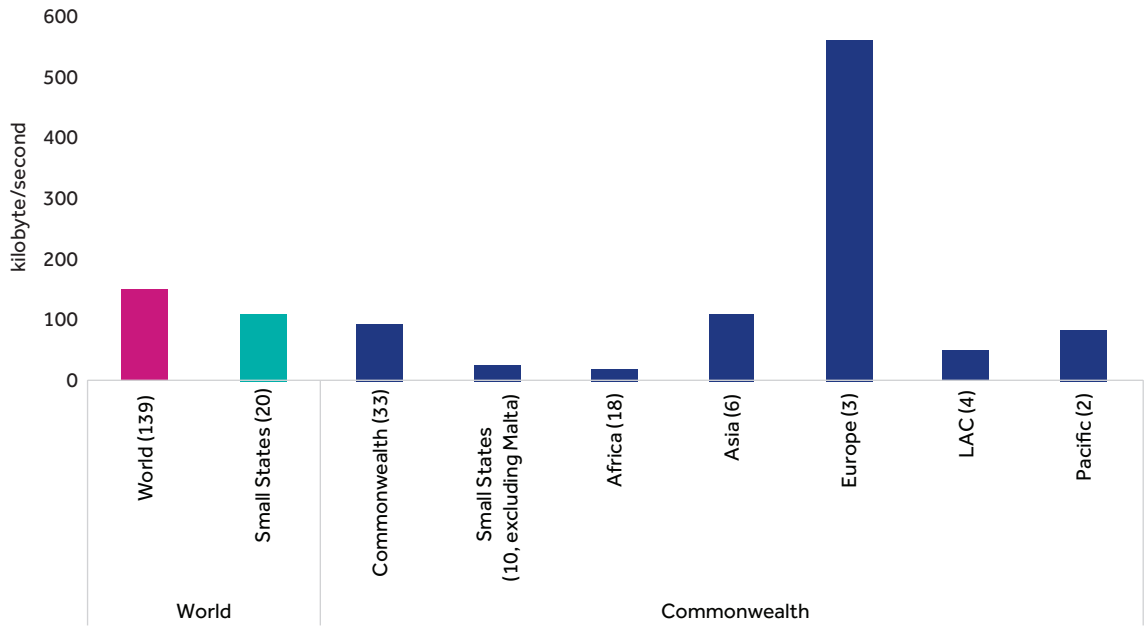
Countries	Mobile connectivity index score	Countries	Mobile connectivity index score
Australia	88.4	Sri Lanka	54.3
Singapore	86.6	Ghana	51.2
New Zealand	85.2	Kenya	50.8
United Kingdom	83.1	Vanuatu	50.5
Canada	82.2	Botswana	49.4
Bahamas	70.3	Bangladesh	48.0
Barbados	67.9	Nigeria	47.7
Malaysia	67.4	PNG	47.0
Trinidad and Tobago	67.4	Namibia	45.2
Brunei Darussalam	67.3	Rwanda	43.0
Mauritius	65.5	Senegal	41.7
Jamaica	59.6	Tanzania	41.0
South Africa	59.5	Uganda	40.0
Dominican Republic	57.6	Pakistan	39.8
Fiji	57.5	Sierra Leone	37.9
Samoa	57.2	Solomon Islands	37.5
Saint Lucia	57.2	Eswatini	35.9
India	55.6	Zambia	33.8
Tonga	55.0	The Gambia	32.7
Guyana	54.9	Malawi	25.4

Source: GSMA 2018.

the bandwidth available in small states. The ten Commonwealth small states (excluding Malta) in the sample only have an average of 27kb/s per user. With many African and small state members, the Commonwealth as a group fell below the world average IIB per user in 2018.

We categorise advanced digital infrastructure as that embedded in actual production (e.g., automation in manufacturing) and business transactions made and settled in digital platforms. While there is good coverage of Commonwealth countries on proxy indicators for basic and intermediate digital infrastructure, proxy indicators on advanced digital infrastructure – such as the use of robotics or e-commerce – suffer from some data gaps. The UNCTAD Business-to-Consumer E-Commerce Index reflects the processes in an online shopping B2C transaction, comprising an enabling digital platform (i.e., web presence) to place an order, electronic payment method (e.g., mobile banking, credit card) and postal delivery of digital products (UNCTAD 2017). Based on 2016 data, 20 out of 31 Commonwealth countries in the sample fell below the world average index score of 54 (Figure 4.3). Out of these 20 Commonwealth countries, 15 are in Africa, and 15 are LICs or LMICs. Only Commonwealth HICs and UMICs were able to

Figure 4.2 International internet bandwidth (kb/s per user, 2016)



Source: Authors' calculations based on WEF data.

Notes: Figures in parentheses indicate number of countries included in the group.

obtain e-commerce indices above the world average index.

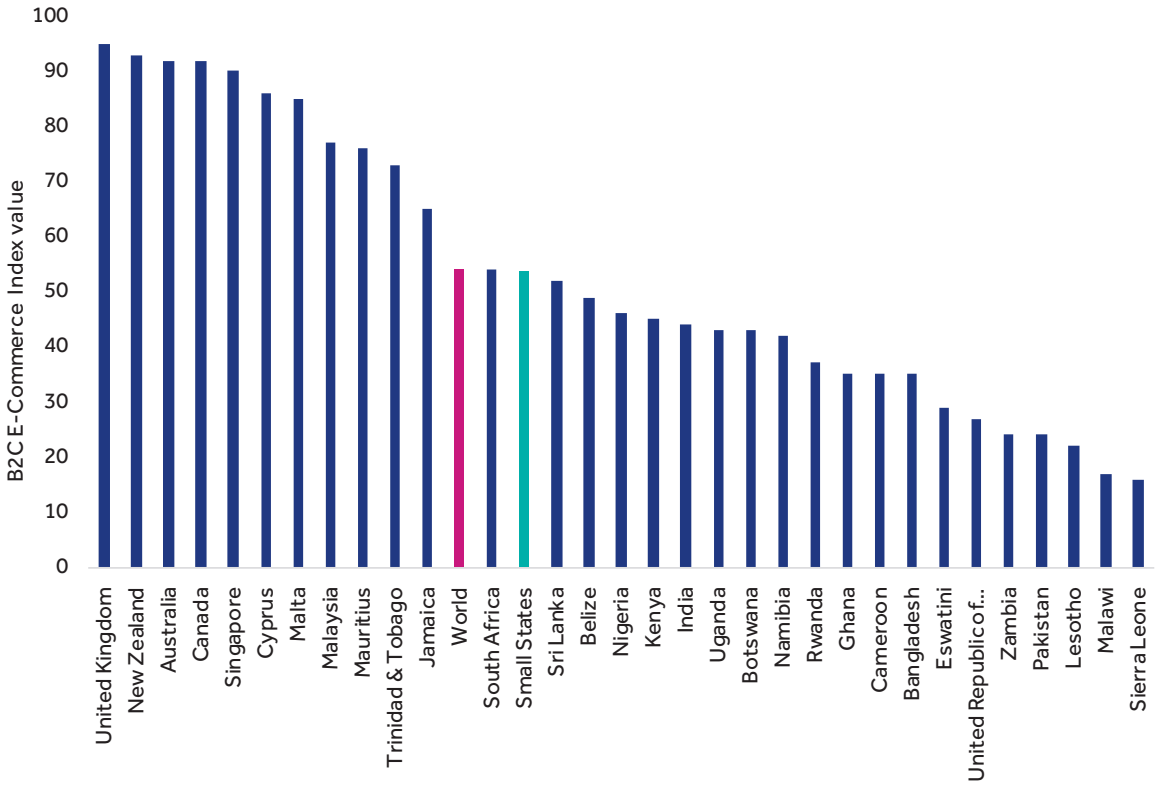
'Robotisation' of production illustrates countries' absorption of high-technology smart machines to increase productivity and further upscale outputs. Among Commonwealth countries with available data,[2] the strongest growth in robot unit shipments in the period 2013-2017 was recorded in Singapore (an increase of 281 per cent to 4,559 units), while on the opposite pole, robot shipments to South Africa contracted by 50 per cent (to 451 units) (Figure 4.4). According to the latest IFR data, 68 per cent of the 381,640 robot units sold worldwide in 2017 went to Southeast Asia, wherein more than a third of the total supply (36 per cent) were shipped to China, 12 per cent to Japan and 10 per cent to Korea.

Among the sample of eight Commonwealth countries,[3] digitalisation via robotics is more intensive in the manufacturing sector – with all countries utilising the robots procured in 2017 in manufacturing industries, except in Canada where a small number of robots (27 units) were used for education and R&D (based on IFR data). In terms of robot density (i.e., units of industrial robots installed per 10,000 employees in the manufacturing industry), only Singapore, Canada and Australia have robot density above the world average (74 units). India's manufacturing sector stands to be the least digitalised with only 3 robots installed per 10,000 employees, followed by South Africa with robot density of 28 (Figure 4.5).

4.2 Where and how to improve digital infrastructure in the Commonwealth

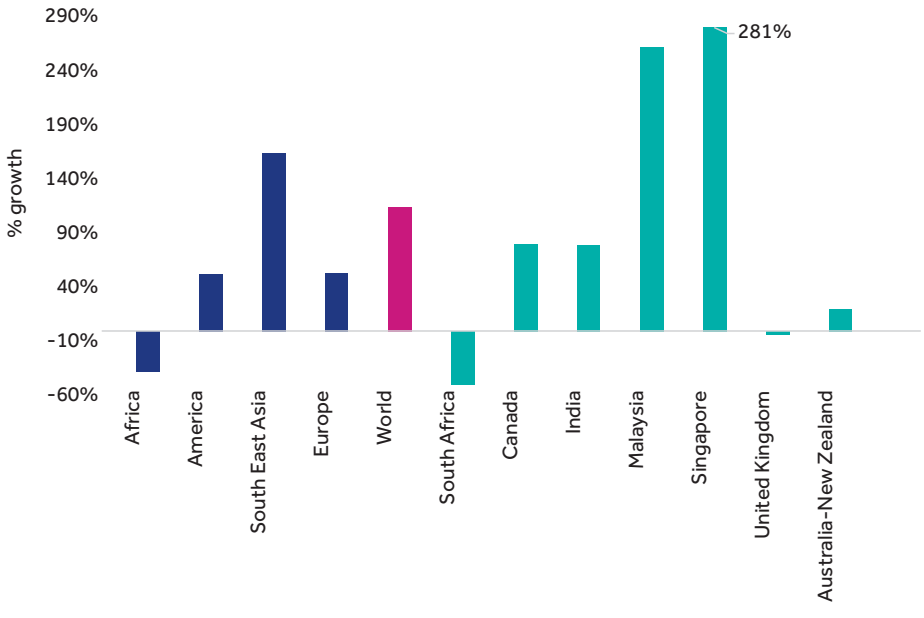
The previous sub-section provided a picture of the Commonwealth's progression in terms of digital infrastructure and highlighted the persistent divide between high income and lower income Commonwealth countries. The heatmap of the WEF Networked Readiness Index (NRI) below

Figure 4.3 Business-to-Consumer E-Commerce Index Value, 2016

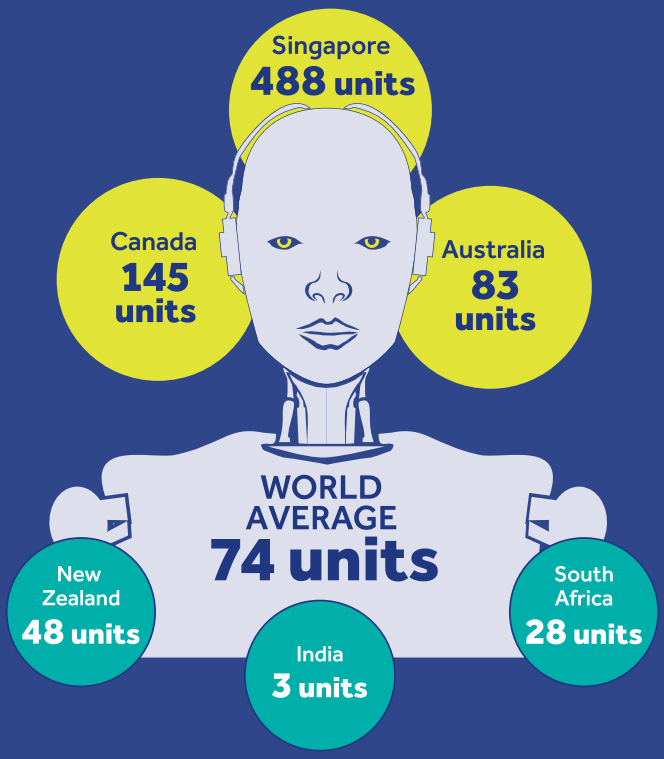


Source: Authors (constructed graph based on UNCTAD data).

Figure 4.4 Robot unit shipments



Notes: Percentage growth rate from 2014 to 2017.



The number of **industrial robots** installed per 10,000 employees in the manufacturing industry is above the world average (**74**) in Singapore (**488**), Canada (**145**) and Australia (**83**), but lower in New Zealand (**48**), South Africa (**28**) and India (**3**)

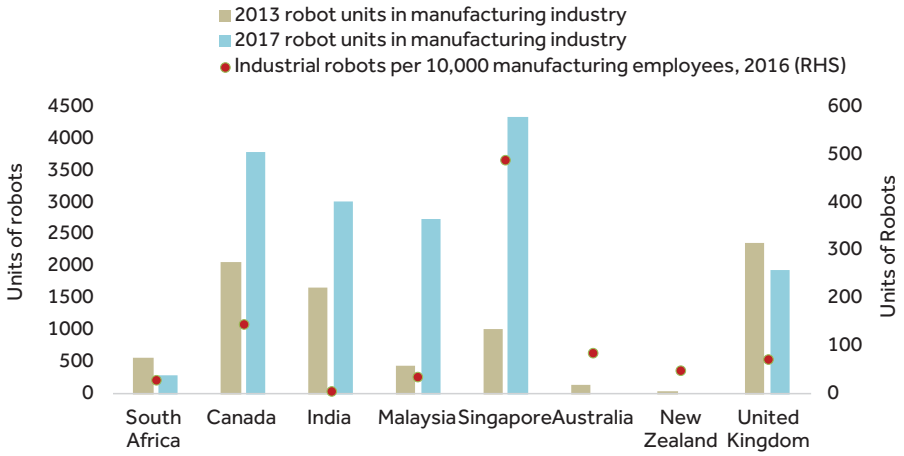
HIGH INCOME Commonwealth Countries

85% of the population has access to the internet

18% of the population has access to the internet

LOW INCOME Commonwealth Countries

Figure 4.5 Units of robots in manufacturing



(Table 4.3) shows the digital preparedness of 33 Commonwealth countries, with indices ranging from 1 to 7 (7 as best/most prepared). NRIs in darkest red indicate the lowest scores across indicators and among Commonwealth countries (i.e., 1.11 score for infrastructure in Cameroon), median scores shaded in yellow, and the highest scores in darkest green (6.96 index for infrastructure in Australia and Canada).

The heatmap affirms the divide between HICs and LICs that we observed in individual digital infrastructure indicators, and further highlights that among the 10 composite indices of digital preparedness, digital infrastructure together with digital penetration are the biggest hurdles for Commonwealth LICs and countries in Africa.

For example, the heatmap shows that even if Rwanda has a conducive regulatory environment and high government digital usage comparable to Australia, the limited digital infrastructure coupled with the low level of digital penetration – a common challenge among Commonwealth LICs – may restrict the economic gains from digitalisation. This resonates with the conclusion of a World Bank study (Qiang et al. 2009), where a 10 percentage point increase in fixed broadband penetration has the potential to increase the GDP of developing countries by 1.35 per cent.

Additionally, even if digital access is more affordable on average in South Asia (Bangladesh, India, Pakistan and Sri Lanka) than European and Caribbean Commonwealth countries, the region is heavily constrained by the lack of digital infrastructure for development and use of digital platforms. For example, based on WEF data for 2016, fixed broadband internet tariffs in Bangladesh (at 12.8PPP$/min) are lower than in the UK (14.12PPP$/min) and Canada (37.5 PPP$/min). However, the lower price can be utilised by only the 9.6 per cent of Bangladesh's population that has access to the internet. In terms of internet quality, only 6.6kb/s international internet bandwidth is available per user in Bangladesh, compared with 129.2kb/s per user in Canada and 429.8kb/s per user in United Kingdom.

The speed of global digitalisation is putting pressure on economies to catch up and fulfil the facilitating conditions for digital transformation. However, Table 4.3 highlights the critical need to address basic digital infrastructure needs in relation to access to electricity before LICs can access, absorb and participate in basic aspects of the digital economy. Additionally, it is tempting to focus on areas where improvements can be made easily – such as in the case of the digital regulatory environment in Rwanda or affordability of internet access in Bangladesh. However, the Commonwealth countries that consistently perform relatively better in terms of digital infrastructure (e.g., Singapore, the UK, Canada, Australia and Malaysia) are also

Table 4.3 WEF Networked Readiness Index sub-components for Commonwealth countries, 2016

Country	Income Level	Region	Political & regulatory environment	Business & innovation environment	Infrastrue ture	Affordability	Skills	Individual usage	Business usage	Government usage	Economic impacts	Social impacts
Gambia	Low	Africa	4.16	3.45	2.71	2.96	3.25	2.58	3.48	3.70	2.86	3.55
Malawi	Low	Africa	3.46	3.36	2.66	1.97	2.66	1.53	3.14	2.80	2.45	2.72
Mozambique	Low	Africa	3.21	3.48	1.87	4.78	2.11	1.90	3.18	3.28	2.72	3.15
Rwanda	Low	Africa	5.41	4.36	2.83	3.59	3.48	1.94	3.69	5.30	2.89	4.83
Tanzania	Low	Africa	3.62	3.37	2.55	2.32	2.94	1.72	3.08	3.40	2.35	3.26
Uganda	Low	Africa	3.74	3.62	2.66	3.31	2.90	1.90	3.27	3.43	2.60	3.12
Cameroon	Lower middle	Africa	3.27	3.67	1.11	2.77	3.79	1.97	3.56	3.29	2.95	2.98
Eswatini	Lower middle	Africa	3.19	3.45	2.50	2.21	4.18	2.35	3.15	2.65	2.32	2.69
Ghana	Lower middle	Africa	3.96	4.01	2.22	4.19	4.10	3.46	3.51	3.41	2.65	3.50
Kenya	Lower middle	Africa	3.71	4.00	3.07	4.31	4.24	2.61	3.86	4.40	3.43	4.47
Lesotho	Lower middle	Africa	3.97	3.88	2.42	5.01	3.78	2.10	3.09	2.91	2.40	3.08
Nigeria	Lower middle	Africa	3.16	3.69	2.61	4.34	2.41	2.51	3.47	3.25	2.94	3.02
Zambia	Lower middle	Africa	3.87	4.78	1.96	2.54	3.62	1.97	3.58	3.33	2.69	3.31
Botswana	Upper middle	Africa	4.12	4.06	3.11	2.92	4.61	3.17	3.41	3.58	2.78	3.43
Mauritius	Upper middle	Africa	4.56	4.74	4.27	5.50	5.33	4.26	3.77	4.31	3.21	4.23
Namibia	Upper middle	Africa	4.48	3.86	3.91	3.17	3.77	2.99	3.73	3.52	2.89	3.49
South Africa	Upper middle	Africa	4.99	4.33	4.88	5.20	4.37	3.90	4.20	3.32	3.40	3.30
Bangladesh	Lower middle	Asia	2.51	3.73	2.75	6.42	3.14	2.13	3.09	3.76	2.84	3.38
India	middle	Asia	3.69	3.70	2.61	6.60	4.12	2.15	3.55	4.05	3.12	4.12
Malaysia	Upper middle	Asia	5.09	5.21	4.18	4.68	5.44	5.05	4.73	5.48	4.08	5.21
Pakistan	Lower middle	Asia	2.96	3.93	2.09	6.92	2.84	2.09	3.23	3.33	2.83	3.41
Sri Lanka	Upper middle	Asia	3.79	4.10	3.00	6.02	5.67	2.83	3.87	5.04	3.20	4.70
Guyana	Upper middle	LAC	3.59	4.12	2.93	4.22	4.94	2.70	3.54	3.40	2.91	3.66
Jamaica	Upper middle	LAC	4.02	4.40	3.15	5.37	4.62	3.54	3.66	3.62	3.14	3.52
Seychelles	High	Africa	3.90	3.94	4.75	4.50	5.01	4.35	3.59	3.68	3.15	3.77
Singapore	High	Asia	5.93	5.97	6.57	5.29	6.48	6.36	5.42	6.26	5.89	6.25
Cyprus	High	Europe	3.94	4.83	5.47	6.31	5.95	4.95	3.77	3.73	3.60	4.11
Malta	High	Europe	4.48	4.49	6.30	4.80	5.46	5.92	3.97	4.31	4.03	4.89
United Kingdom	High	Europe	5.73	5.48	6.32	5.69	5.80	6.64	5.18	5.40	5.31	5.91
Canada	High	LAC	5.38	5.48	6.96	5.55	6.06	5.73	4.88	5.10	5.19	5.60
Trinidad and Tobago	High	LAC	3.28	4.14	5.22	5.87	5.47	4.73	3.52	3.48	3.13	3.67
Australia	High	Pacific	5.40	5.09	6.96	5.59	5.98	6.33	4.79	5.03	4.66	5.67
New Zealand	High	Pacific	5.86	5.43	6.85	4.55	6.19	6.11	4.98	5.36	4.59	5.45
World Average			**3.93**	**4.31**	**4.17**	**4.97**	**4.73**	**4.13**	**3.85**	**3.96**	**3.48**	**4.15**

Note: The darkest red represents the lowest score across ten components and among countries, yellow is the median score, and the darkest red is the highest score.

the countries that have high NRI scores across all digital preparedness indicators in Table 4.2. This highlights the importance of broadly addressing digital preparatory needs across the regulatory and business environment, infrastructure, affordability and skills for countries to fully utilise and harness the gains from basic to advanced digital infrastructure.

It is important to note that the digital infrastructure divide among Commonwealth countries may emanate from access to electricity – a basic prerequisite for the functioning of digital devices and equipment – wherein only 28 per cent of the Commonwealth LIC population, on average, have access to electricity, as seen from Table 4.1.

4.3 Digitalisation and smart cities

The impact of digitalisation affects a range of economic activities with implications for the overall functioning of cities and the well-being of their populations. There is no universal definition of a 'smart city' in the literature. However, the European Commission (2019a) defines a smart city as 'a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business'. Meanwhile, McKinsey (2018) identifies three layers that make up a smart city: (i) 'technology base', which includes a critical mass of smartphones and other sensors connected by high-speed communication networks, as well as open data portals; (ii) 'specific applications', which translate raw data into alerts, insight and action; and (iii) 'public usage' that can lead to better decisions and behavioural change. In the sections that follow, we explore the intersection of digital progress and smart cities as indicators (or proxy indicators) that enable the emergence of smart cities in Commonwealth countries.

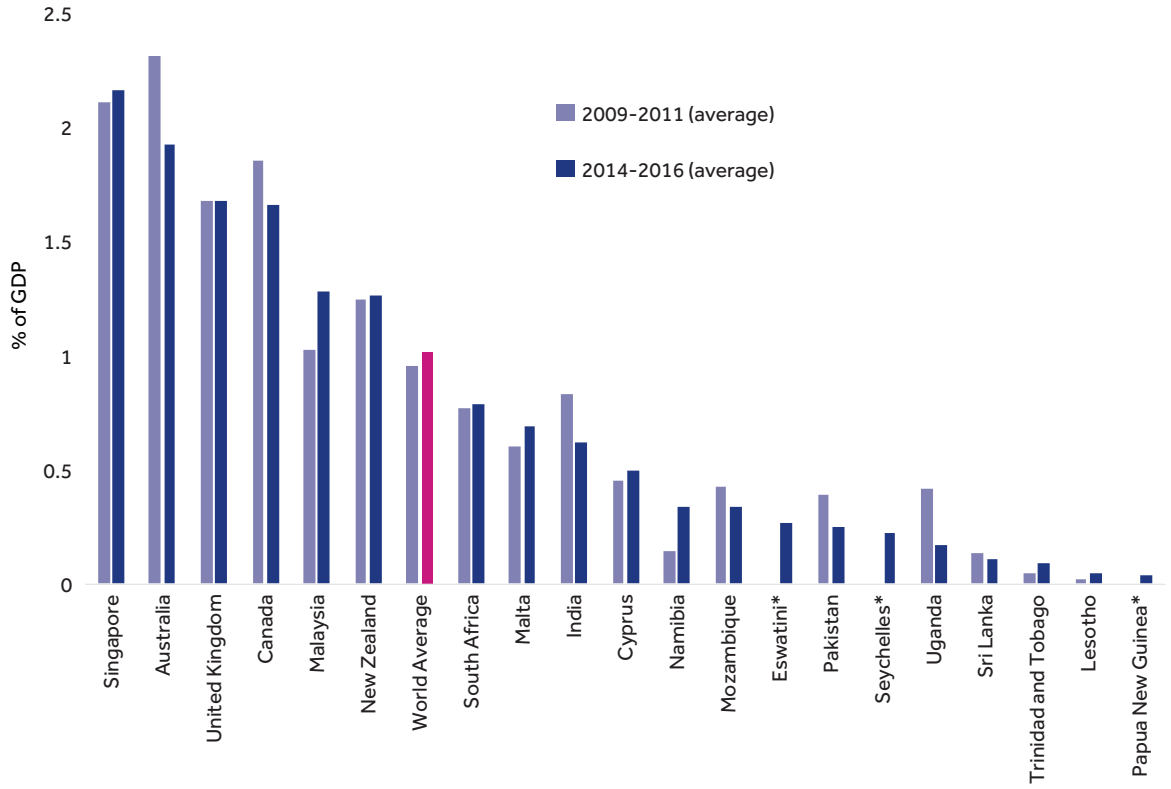
4.3.1 Smart economy

R&D can make a significant contribution in revolutionising digitalisation of business models, value chains, services and product portfolios (Strategy& and PWC 2016). At the same time, digitalisation (e.g., extracting data from raw material to prototype phase, Big Data analysis) can also make firms' R&D processes more efficient and affordable (ibid). For example, Huawei's (in China) strategy focusing on local R&D and reverse engineering, and Samsung's (in the Republic of Korea) shift from importing knowledge to building in-house design competencies, helped these companies become global leaders in the production of smartphones (cited by Mayer 2018 from Kang 2015, and Yoo and Kim 2015).

As a proxy for innovative capacity in the digital economy, we look at countries' overall R&D expenditure as a share of GDP. Figure 4.6 shows that Commonwealth HICs (Singapore, Australia, the UK, Canada and New Zealand) and Malaysia (UMIC) have continued to be the highest R&D spenders since 2009. Among 21 Commonwealth countries with available data from 2014 to 2016, more than half fell below the world average, and five countries (India, Mozambique, Pakistan, Uganda and Sri Lanka) experienced a contraction in average R&D spending in 2014–16 compared to 2009–11 levels.

Patents that give exclusive rights for an invention or a new technical solution (WIPO 2019) represent a traditional output measure of innovation (WEF 2016). As of 2016, the World Intellectual Property Organization (WIPO) reported that the highest share of published patent applications worldwide was recorded in computer technology (7.5%), electrical machinery, apparatus, energy (7%) and digital communications (5.1%). Among Commonwealth countries, Singapore has the highest ICT patent penetration, with 60 ICT-related patent applications filed under the Patent Cooperation Treaty (PCT) per 1 million people, followed by Canada, the UK, Australia and New Zealand. Meanwhile, HIC small states in the Commonwealth (Seychelles and Malta) recorded an increase in ICT patent penetration in 2016 (Figure 4.7). However, among 33 Commonwealth countries with 2016 data, 10 countries had less than one ICT patent application

Figure 4.6 Research and development expenditure (% of GDP)



Source: Authors' calculations based on World Bank data.

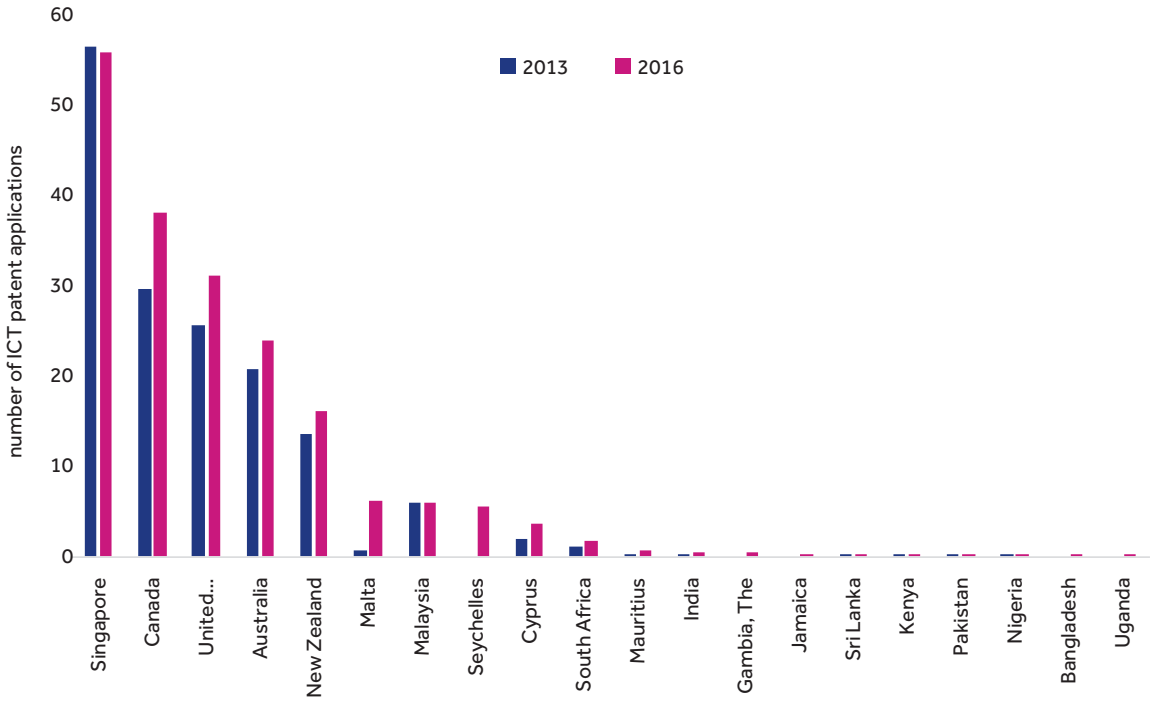
Notes: No available 2009–11 data for eSwatini, Seychelles and Papua New Guinea.

per one million people, and 13 countries reported zero patent penetration in 2016. While there are several factors affecting the emergence of patents, the almost null patent penetration in lower-income Commonwealth countries may be related to cost and scale challenges as cited by Mayer (2018) – since patent applications are generally costly, developed country firms usually apply for patents in jurisdictions that cover large economies.

A friendly ecosystem for start-ups is also a key feature of a smart city. A World Bank study (Mulas et. al. 2015) suggests that a rise of ICT start-ups in cities creates new business and employment categories that are becoming new sources of employment and economic growth. Mulas et. al. (2015) observed, through various World Bank studies, that creating and supporting a community of tech entrepreneurs (e.g., assets and mentoring), providing incentives to kickstart the ecosystem (e.g., competition, challenges) and providing skills programmes often leads to a growing and sustainable technology innovation ecosystem.

For Commonwealth countries, we use the WEF indicator of availability of venture capital and the speed of starting businesses as a proxy for the conduciveness of the ecosystem for technology start-ups and innovation in general. Figure 4.8 shows that higher availability of venture capital and fewer days required to start a business are common features in Singapore, Australia, Canada, the UK, New Zealand and Malaysia, although LIC Rwanda is performing on par with Australia. More generally, countries with higher venture capital availability also have faster processing times to start a business.

Figure 4.7 ICT PCT patent applications per 1 million people



Source: Authors (constructed graph culled from World Bank data based on WEF reports).

However, there are a number of variations among countries. For example, among UMICs, starting a business usually takes 66 days in Namibia, while it only takes four days in Malaysia and three days in Jamaica.

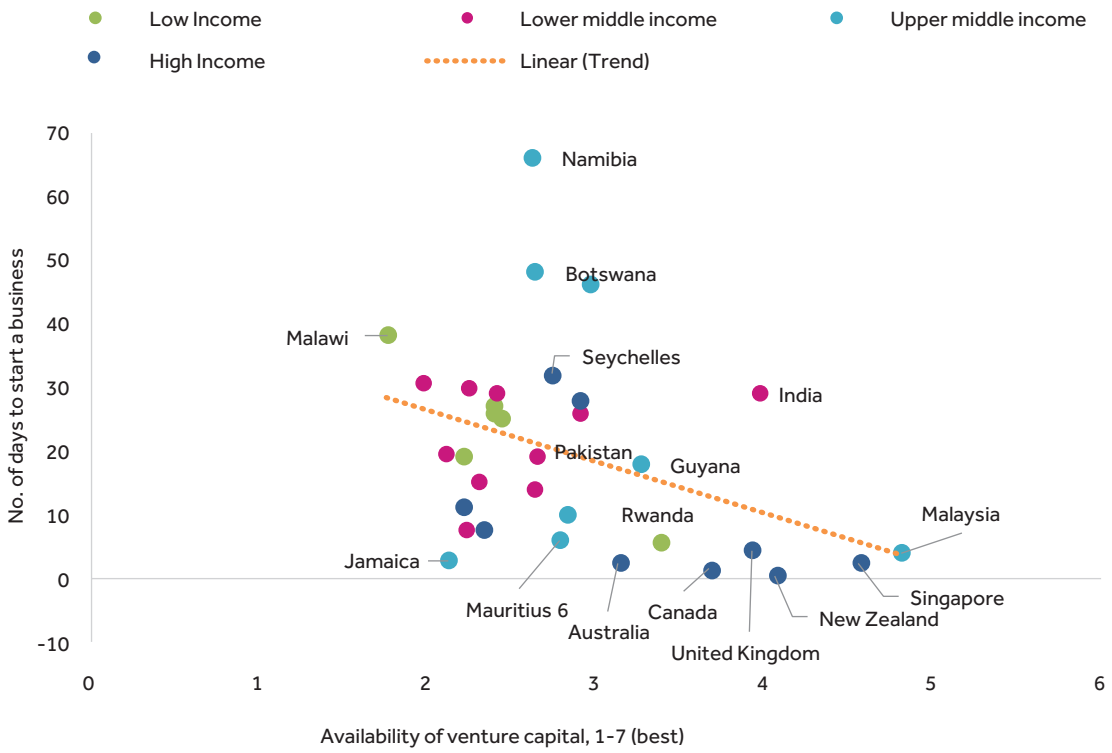
The availability of accessible and widely adopted smart applications can change the nature of city dwelling, which may translate into improvements in well-being. McKinsey (2018) looked at relevant smart applications in cities up to 2025 across many quality-of-life dimensions, such as for security (e.g., real time crime mapping), healthcare (e.g., first aid alerts), mobility (e.g., private and pooled e-hailing), energy (e.g., smart streetlights), water (e.g., leakage detection and control), waste (e.g., digital payment for waste disposal), economic development and housing (e.g., digital business tax filing, peer-to-peer accommodation platforms), and community engagement (e.g., local civic engagement platforms). They found that smart applications can improve quality-of-life dimensions by 10–30 per cent and noted that about half of the applications affect more than one aspect of the quality of life.

For Commonwealth countries, we examine mobile money service penetration as an indicator of availability and adoption of smart applications. Figure 4.9 shows that while the HICs lead the Commonwealth countries in this financial technology service, Kenya, India and Uganda have made significant progress in increasing mobile money service penetration – by about 40 percentage points from 2011 to 2017.

4.3.2 Smart governance

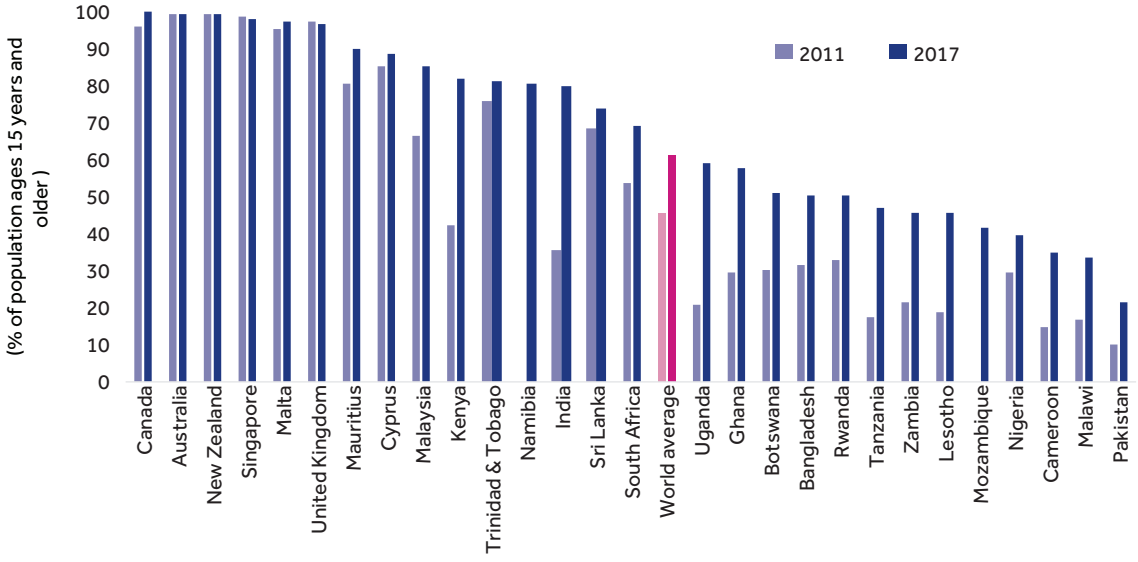
The availability of digital technology provides an opportunity for governments to improve efficiency and increase the reach of public services, as well as facilitate citizens' participation in public discussions/feedback and civic duty compliance

Figure 4.8 Business and venture capital support



Source: Authors' calculations based on 2016 WEF data.

Figure 4.9 Account ownership at a financial institution or with a mobile-money service provider (% of population ages 15+)



Source: Authors' calculations based on World Bank data. No 2011 data available for Namibia.

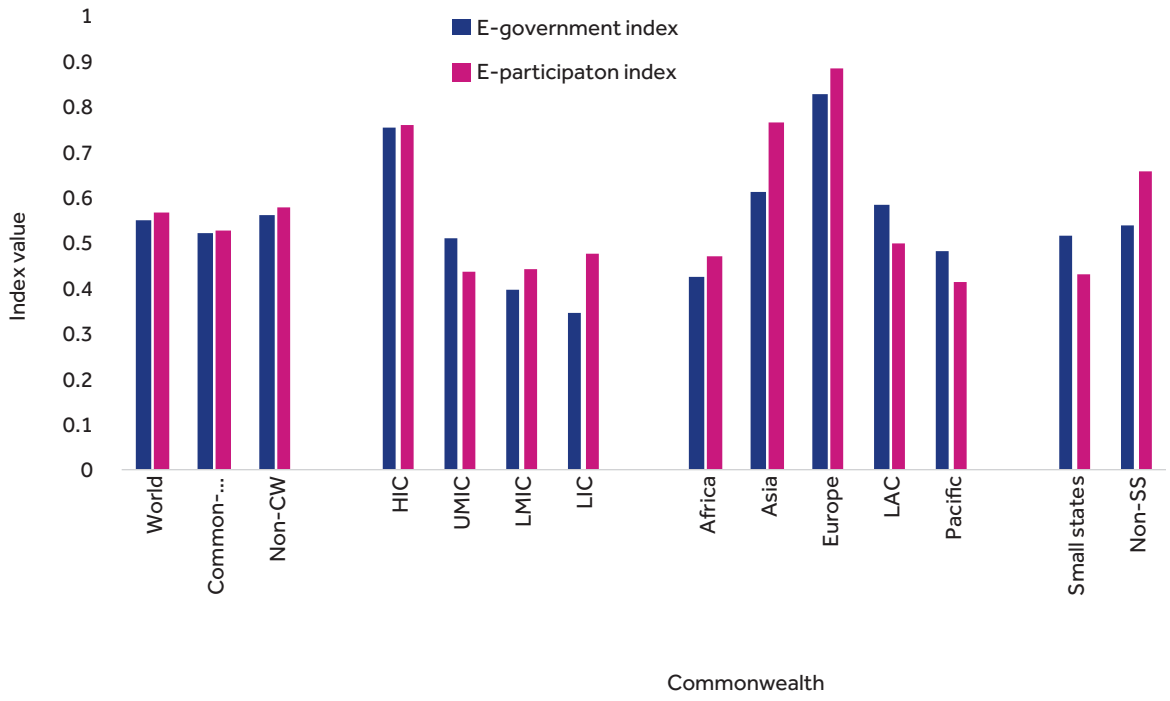
(e.g., digital business permit application, tax payments). We utilise the 2018 UN E-Government Survey e-government development index (EDGI) and e-participation index (EPI), which cover all 53 Commonwealth countries. The EDGI assesses the capacity and preparedness (e.g., in terms of human capital, telecommunication infrastructure and online services) of national agencies to leverage ICT in the delivery of public services. Meanwhile, the EPI assesses the availability of online information, online public consultation and involvement in decision processes.

Figure 4.10 shows that while the Commonwealth performs on par with the world and non-Commonwealth country averages in e-governance, variances exist among Commonwealth countries by income, region and size. LICs and countries in Africa and the Pacific have the lowest EDGI and EPI scores, while e-governance and e-participation is relatively less developed among Commonwealth small states. This mirrors the digital divide risk flagged by the 2018 UN E-Government Survey, wherein it cited that while online use increases opportunity for e-inclusion, it also risks creating a new digital divide due to the lack of digital infrastructure in LICs (United Nations, 2018). This is consistent with the Commonwealth HIC–LIC divide we observed in earlier sub-sections.

4.3.3 Smart transport and logistics

An integrated and digitally tractable public transport system is a key feature of smart cities. An intelligent transport system applies ICT to make passenger and freight transport safer, more efficient and sustainable (European Commission 2019b). The London Transport System, for instance, exemplifies integrated digital payments through bank cards, mobile phones and Oystercards for train and bus fares. Similarly, in the city of Mysuru in Karnataka, India, a GPS-enabled Intelligent Transport System (ITS) is being employed to monitor speed and co-ordinates of more than 400 city buses

Figure 4.10 E-government and citizens' public engagement through ICT



Source: Authors' calculations based on UN data.

(World Bank 2017). Through the ITS, passengers can track the arrival time of buses online or through mobile phones. More generally, by using smart applications, commuting times in cities are expected to be cut by 15–20 per cent (Mckinsey 2018).

In the absence of data directly measuring smart transport indicators for Commonwealth countries, we use proxy indicators such as the trade logistics and facilitation indicators from the World Integrated Trade Solutions (WITS) database covering postal services, international shipment and customs. Table 4.4 shows that Commonwealth HICs and countries in Asia and Europe have all performed above the world average across all indicators. Conversely, all Commonwealth LMICs and LICs, and countries in Africa, performed worse than the Commonwealth and world averages across indicators. Except for postal service penetration and customs export clearance, Commonwealth small states have performed worse than the average across all indicators. Of the 30 Commonwealth small states in the sample, 20 are located in either the Caribbean or the Pacific, reinforcing the reality that logistics and trade facilitation performance is especially challenging for relatively small and remote Commonwealth countries.

4.4 Regulatory and governance framework

To bridge the digital divide across and within Commonwealth countries, there is a need for a supportive regulatory and governance framework targeting improvements and investments in digital infrastructure.

Standard challenges – such as poor trade logistics, unreliable electricity and inadequate road infrastructure – continue to present obstacles

Table 4.4 Logistics and trade facilitation

	(1) Percent of population having mail delivered at home – UPU Database	(2) Postal reliability index – UPU Database	(3) Percent of the population without postal services – UPU Database	(4) LPI international shipments score	(5) LPI tracing and tracking score	(6) LPI timeliness score	(7) Days to clear direct exports through customs – Enterprise Survey	(8) Burden of customs procedures – World Economic Forum
World	63.35	50.15	11.16	2.87	2.86	3.27	7.71	4.06
Commonwealth (CW)	49.41	41.85	13.10	2.87	2.87	3.26	7.95	4.11
Non-CW	68.33	53.34	10.47	2.87	2.86	3.27	7.62	4.05
By income								
CW HIC	87.96	56.74	0.94	3.14	3.21	3.58	6.60	4.84
CW UMIC	47.07	41.12	3.20	2.86	2.90	3.28	7.59	4.20
CW LMIC	27.36	32.48	25.86	2.61	2.61	3.00	8.05	3.50
CW LIC	21.44	32.51	33.13	2.86	2.70	3.15	9.85	3.93
By region								
CW Africa	25.73	38.23	24.68	2.75	2.70	3.15	8.61	3.81
CW Asia	96.14	59.69	0.71	3.24	3.24	3.56	7.62	4.42
CW Europe	99.30	74.13	0.00	3.22	3.26	3.91	(no data)	4.83
CW LAC	58.25	36.55	0.93	2.75	2.86	3.10	7.25	3.83
CW Pacific*	31.69	33.10	21.13	2.62	2.67	2.97	7.65	5.50
By size								
CW small states	46.01	31.31	8.75	2.58	2.54	3.06	7.06	3.97
CW non-small states	53.40	54.69	18.21	3.04	3.07	3.39	9.16	4.19

Source: Authors' calculations based on WITS data. Green circles represent better than world average performance/score and red circles represent below world average performance/score.

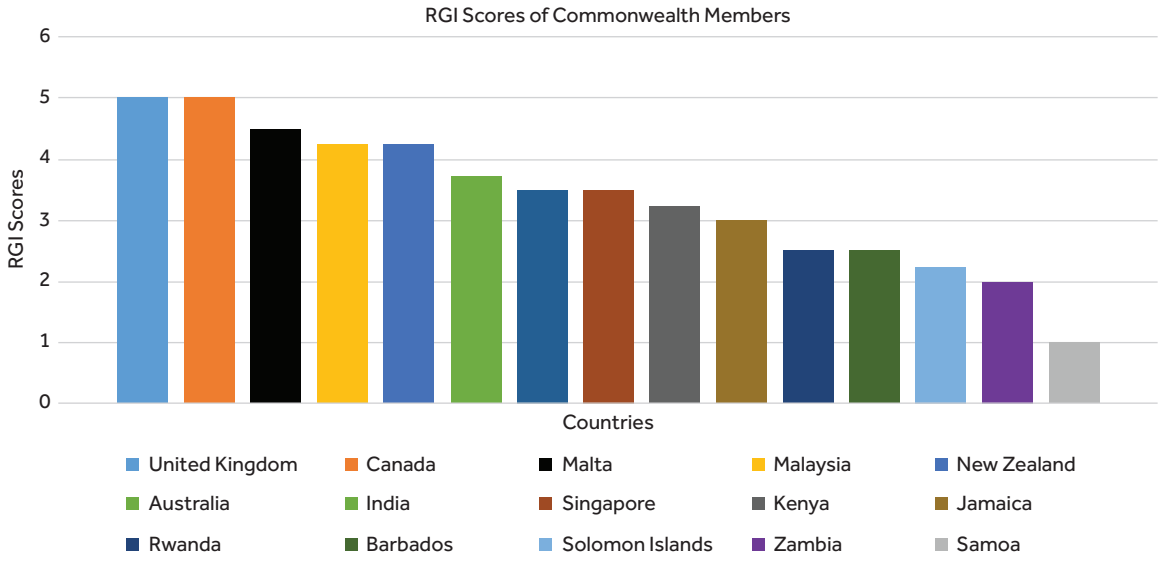
Note: That in indicators (3) and (8), lower than world average percentage and days mean better performance than world average.

for leveraging digitalisation in less-developed Commonwealth countries. Nigeria, for example, has an international broadband backbone by terabytes of data-laden cables at the country's shores – typically in Lagos – but there remains a significant connectivity gap inland due to a lack of wider adoption of infrastructure sharing. As per the World Bank's Ease of Doing Business indicators, many Commonwealth countries (38 out of 51 countries in the sample) also continue to lag behind the world median Ease of Doing Business index score, reflecting the challenges faced by lower-income countries and small states that largely comprise the Commonwealth. In comparison, Rwanda, Kenya and India have significantly increased their Doing Business scores since 2016 and are now performing above the world median.

According to the regulatory governance index (RGI) for Commonwealth member countries, it is evident that each of the countries is at a different stage of regulatory performance. Figure 4.11 shows the RGI scores for a selection of Commonwealth member countries. Variation in the RGI reflects differences in the development of quality and effective regulations. The RGI scores among the Commonwealth member states vary significantly. Member countries such as the UK, Canada, Malta, Malaysia and New Zealand have RGI scores between 4 and 5. For these countries, the processes adopted for the development of quality regulations are better and more transparent than those for the other member countries. There countries are in the upper quartile for RGI scores and thus for good regulatory practices (GRPs). Countries that are in the middle quartile are those with RGI scores between 3 to 3.75. These include Australia (3.75), India (3.5), Singapore (3.5), Kenya (3.25), and Jamaica (3). The rest of the Commonwealth member countries have RGI scores of below 3. These include countries such as Barbados, Rwanda, Solomon Islands, Zambia, Samoa and Seychelles.

In addition to general investment in physical infrastructure and creating a supportive business environment, targeted investments are needed in the Commonwealth to build digital infrastructure. First, there is a need to improve access to good quality internet across developing Commonwealth countries. To make internet more affordable in Commonwealth countries, policies need to target public-access solutions including through free

Figure 4.11 Regulatory governance index among Commonwealth countries



Source: https://rulemaking.worldbank.org and authors' own compilation.

or subsidised access to public/open areas such as educational institutions, local and community centres, and public WiFi; close digital urban-rural divides through, for example, reductions in taxes on ICT services and equipment supplied to rural areas; provide incentives to network operators to expand coverage to marginal areas; and reduce import duties for local content suppliers. One country that has significantly improved its internet affordability is Botswana through rules enabling technology and service neutrality, without restricting operators from holding several types of licenses such as network and services licenses (Alliance for Affordable Internet 2017). The Botswana government has also used its Universal Access Fund (USAF) to increase the number of public WiFi hotspots in hospitals, bus stops and shopping malls across seven towns.

On top of the higher cost of capital in these economies, the cost of financing also remains an obstacle to digital transformation, often as a result of market and co-ordination failure. In the case of Kenya, for instance, Kenya Association of Manufacturers (2018) confirms that there is limited access to technology among Kenyan manufacturing industries due to the high cost of financing innovation and digital technologies, particularly in the textiles and apparel industry, where the cost of financing manufacturing investments and trade financing is very high compared to global rates. Box 4.2 highlights successful initiatives taken by the Kenyan government to increase access to the internet, which include targeted digital investments, improvements in the ease of doing business and 'digital infrastructure sharing' with India (see Box 4.2).

Second, there is a need to build data infrastructure in the Commonwealth to support member states to collect, process and analyse data. UNCTAD (2018) highlights Rwanda's pioneering National Data Revolution Policy (2017), from which important principles can be adopted and adapted in other Commonwealth countries. Rwanda's data revolution policy focuses on: (i) classification of data into sensitive and non-sensitive sets, following which sensitive data is protected; (ii) national data sovereignty, whereby Rwanda retains exclusive sovereign rights on national data but is open to hosting its data in local or international data centres as per Rwandan laws; (iii) increasing access to non-sensitive data by public consolidation and publication of data with granularity, completeness, accuracy and open licensing; (iv) recognition of the author of data, as per data intellectual property rights (IPRs); and (v) PPPs as an investment model in the data industry.

Thirdly, support from the government needs to be extended to digital manufacturing and services start-ups and also to ecosystem enablers such as technological and innovation hubs. Policies launched by the Indian government under Startup India, a flagship initiative under the wider Digital India programme, can provide useful insights into how start-ups, particularly digital start-ups, can be promoted. The Startup India initiative offers tax exemptions, exemptions from inspection requirements (such as those related to the labour environment), a roughly 80 per cent reduction in patent costs, easier regulations for businesses and procedures for licenses, easier exit (within 90 days) and funding support. It is also important to focus support on the development of hubs that can provide a manufacturing ecosystem in the form of technical support (internet and ICT services), manufacturing maker-space (manufacturing equipment and shared spaces), skills development (training in hardware engineering, coding, digital fabrication, IoT and blockchains), and at the same time act as incubators (support for product formation, conceptualisation of ideas, business development, networking and funding support). Good examples of initiatives in this area include the government's susAso Villa Demo Day in Nigeria, and corporate initiatives by EcoBank and GE Garage, which fund and integrate innovations into the economy. Effective public-private collaboration is needed to support such technological and innovative hubs. Box 4.3 summarises some important policies and lessons that can be drawn from across Commonwealth countries in building digital infrastructure.

Box 4.2 Digital transformation in Kenya

A number of initiatives have been taken by the Kenyan Government to catapult Kenya into being a digital leader in Sub-Saharan Africa. In recent years, *Kenya has invested in an enabling environment* by moving towards a more open trade regime, targeting increased overseas market access for Kenyan services and further global integration. These policy objectives have been pursued through regional and bilateral trade negotiations, particularly with other African countries, and also through Kenya's participation at the World Trade Organization (WTO). Kenya has undertaken many steps to improve the investment climate and to become more attractive for foreign investors. The World Bank Group's Doing Business (2017) assessment ranks Kenya as the third most reformed country – it has moved up 21 places to reach 92nd position out of 190 economies on the overall ease of doing business. In the last 5-6 years, important reforms have been made in the following areas: starting a business, access to electricity, registration of property, protecting minority investors and resolving insolvency. The Kenyan Investment Authority (KenyaInvest) and the Business Environment Delivery Unit also continue to make progress in reducing bureaucracy and simplifying the process of registering a business in Kenya, while recent laws such as the Bribery Act (2016) and the Access to Information Act (2016) are targeted towards fighting corruption and improving transparency in business.

Kenya has also made a number of targeted digital investments. It has opted for a national fibre backbone that connects different towns and leverages alternative service providers such as the network available from Kenya Power and Lighting Company. The Kenya Economic Survey (2018) records significant improvements in Kenya's digital economy: the value of ICT output increased by 12.9 per cent between 2017-2018, while ICT value added rose by 6.6 per cent over the same period. The number of internet service providers (ISPs) increased by 17.4 per cent from 219 in 2017 to 257 in 2018, partly attributed to demand for fibre optic cable in most parts of the country that created the need to supply internet to businesses and residential buildings. In addition, Kenya has invested in digital infrastructure sharing by granting Mobile Virtual Network Operating (MVNO) Licenses. These MVNOs do not have their own infrastructure, but rather practice 'infrastructure sharing' with already established telecom providers, who have excess network capacity. Each MVNO then sells services, such as data for accessing the internet, at its own price. Kenya has granted MVNO licenses to three companies offering mobile money and data services, and all three MVNOs depend on infrastructure supplied by Airtel, an Indian telecommunications company (Kenyan Wall Street 2018).

Source: Authors.

Box 4.3 Building digital infrastructure: lessons from the Commonwealth

Rwanda: Key digital infrastructure was put in place in the country between 2006–2011, including the national fibre optic backbone, the Kigali Metropolitan Network and the Tier-III National Data Centre. The government also launched a Broadband Policy to increase the accessibility, affordability, reliability and usage of broadband services throughout Rwanda. Since then, the government has entered into a joint venture with Korea Telecom to provide an open-access wholesale 4G-LTE network, the first in Africa. The Rwanda Utilities Regulatory Authority was set up an as autonomous regulatory body overseeing internet governance. The Rwanda Internet Community and Technology Alliance is now working on the Rwanda Web Hosting project to support local hosting of local content through engagement across stakeholders.

India is pioneering a digital identity infrastructure, Aadhar, and has issued IDs to over 1.15 billion residents. It is one of the world's largest biometric-based digital identity systems, creating opportunities for the government and the private sector to transform citizen-centric services, and to provide innovative platforms for digital transactions. Biometric data collection needs collaboration between the government and various ecosystem partners (including state governments, registrars, enrolment agencies, authentication service providers, user agencies, logistics provider and project management units) to be successfully rolled out, and the establishment of an enabling legal and regulatory framework recognising digital identity, data privacy and other important elements at the start of the programme.

Singapore has expanded its broadband infrastructure, with 100 per cent of homes connected (up to up to 10 bytes) and a 150 per cent device penetration rate. It has adopted an open innovation model through partnerships, which includes engaging and incentivizing start-ups in the innovation process and creating a collaboration model (e.g. open key performance indicators). It has upgraded internal capabilities to align with new technologies and hired externally from other sectors.

Source: WEF (2017).

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End Notes

1 The overall MCI score is made up of four enablers representing – what are commonly agreed to be – the key determinants of mobile internet access and usage: infrastructure, affordability, content and services, and consumer readiness. These are themselves built upon 35 discrete indicators.

2 Includes Australia-New Zealand (combined), Canada, India, Malaysia, Singapore, South Africa and United Kingdom.

3 Includes Australia, Canada, India, Malaysia, New Zealand, Singapore, South Africa and United Kingdom.

BUILDING TRUST TO PROMOTE REGULATORY CO-OPERATION AND COHERENCE

05

This chapter provides an overview of the role that regulatory co-operation can play in supporting the development of the digital economy within Commonwealth member countries. The first section discusses the synergies between data regulations, Open Government Data, e-commerce and digital trust. It also describes the existing models for data protection and flows, and the potential scope for the Commonwealth to collaborate in these areas. The second section maps out the need to update the taxation policies of Commonwealth countries to adapt to the changing economic landscape in the digital age. The third section explores issues of competition and intellectual property laws in the digital era.

5.1 Regulatory practices and digital trust

To manage the rapid progress of digital technologies in a more inclusive manner, there is a need for evolution of the ICT regulatory environment, in terms of legal and regulatory frameworks as well as the quality of ICT regulations and the coherence of these regulations across different levels. Regulations can be applied at the: a) national level – for instance, the introduction of a national law in a country; b) regional level, as in the European General Data Protection Regulation (GDPR); and c) international level – governed by bilateral or multilateral trade agreements such as those at the WTO.

The ITU has developed an ICT Regulatory Tracker that identifies trends in ICT legal and regulatory frameworks. While it does not measure the quality or the level of implementation or performance of regulatory frameworks, it helps progress and identify gaps in **national regulatory frameworks** using four dimensions: **regulatory authority, regulatory mandate, regulatory regime and competition framework**. The regulatory authority dimension includes indicators measuring, for example, the presence of a separate ICT regulator, autonomy of the regulator in decision-making, accountability, enforcement power, dispute resolution and the presence of a competition authority. Regulatory mandate examines who has control in the country for regulating the following: licensing, quality of service obligations measures, radio frequency allocation, universal access, broadcasting and internet content. In turn, regulatory regime captures the existence of regulations in major areas, including types of licensing, use of Voice over Internet Protocol (VoIP) services, mandated infrastructure sharing and co-location, and presence of a national plan that involves broadband. Lastly, the competition framework measures the level of competition in the main market segments within the ICT sector, i.e. existence of competition in local and long distance fixed line services; 3G, 4G and other services, as well as foreign ownership or participation in facilities-based operators; spectrum-based operators; local service operators/long-distance service operators; international service operators; and ISPs.

Using this ICT Regulatory Tracker, Table 5.1 compares Commonwealth countries across the four different dimensions. It is observed that Malta, the UK and Australia rank in the top ten countries out of 193 countries globally. Within the Commonwealth, small states are performing least favourably in terms of ICT regulations, and the regulatory authority and regulatory regime dimensions.

In addition to putting in place appropriate ICT regulations – such as those related to ICT access, barriers to entry and exit in the communications sectors, foreign participation in internet services provision, privacy and data protection, and mergers – it is also necessary for them to be coherent and complementary across national and international levels. At the national level, better and targeted dialogue is needed among the government, private sector players and educational institutions in order to understand the challenges facing industrialisation and find innovative solutions to address them.

Rwanda, with its aim to create a comprehensive legal framework for regulating ICT activities, serves as a good example among developing Commonwealth member states – Rwanda's score on the regulatory authority and regulatory mandate indicators in Table 5.1 is the same as that of the UK. Since 2006,

Table 5.1 Ranking of Commonwealth countries on ITU's ICT regulatory Tracker

Name	Regulatory authority	Reg. mandate	Reg. regime	Competition framework	Rank
Malta	19	20	28	28	5
United Kingdom	20	20	28	27	5
Australia	19	21.5	26	28	8
Singapore	17	21.5	26	27	26
Bahamas, The	19	18.5	26	25.33	35
Ghana	18	21	22	27	42
Pakistan	20	19	22	27	42
Kenya	18	21.5	21	27	45
Malawi	18	22	20	27	47
Malaysia	18	22	24	23	47
Uganda	17	20	22	27	52
Cyprus	18	16	28	23.67	57
Canada	19	16.5	30	20	58
Trinidad and Tobago	18	19	22	26.33	61
Botswana	18	22	19	26	62
Saint Lucia	16	18	24	27	62
Tanzania	20	21	19	25	62
Rwanda	20	20	18	24.33	73
Mauritius	18	20.5	15	27.33	81
New Zealand	17	13.5	22	28	83
Saint Vincent and the Grenadines	17	18	18	27	85
Jamaica	19	12.5	19	28	90
Nigeria	17	20	20	21.33	91
India	18	14.5	20	23	94
Bangladesh	17	20	15	22.67	96
Grenada	14	17	20	23	99
Gambia, The	20	19	16	18.67	103
Dominica	11	15.5	20	26	106
Zambia	19	18	15	19.67	109
South Africa	17	17	24	13.33	112
Vanuatu	17	14.5	14	25.67	114
Namibia	19	17	22	12.67	116
Barbados	17	12.5	18	21	123

(*Continued*)

Table 5.1 Ranking of Commonwealth countries on ITU's ICT regulatory Tracker (*Continued*)

Name	Regulatory authority	Reg. mandate	Reg. regime	Competition framework	Rank
Lesotho	16	17.5	16	18.33	126
Samoa	14	17	22	13.33	130
Cameroon	17	18	16	13	135
Fiji	13	14	19	17	138
Belize	17	18.5	20	7.33	141
Sri Lanka	18	20	15	9.33	142
Guyana	18	18	15	11	143
Seychelles	6	12	16	28	143
Brunei Darussalam	15	17	17	12.33	148
Eswatini	19	19	14	7.33	150
Papua New Guinea	16	19.5	12	11	151
Mozambique	16	10.5	16	15.17	156
Sierra Leone	16	19	14	7	157
Nauru	10	11.5	6	23	163
Tonga	1	11	15	22.67	165
Kiribati	13	18.5	4	12	167
Saint Kitts and Nevis	5	15	6	20	168
Antigua and Barbuda	8	11.5	8	13.33	174
Solomon Islands	9	14	8	3.67	177
Tuvalu	0	4.5	0	5	189

Source: ITU (2018b).

government efforts have been directed towards privatisation of state-owned enterprises to reduce the government's non-controlling share in private firms and to attract FDI, particularly in ICT services (US Department of State 2019). In 2016, the Rwandan government adopted the ICT Act, which institutes an ICT regulatory authority responsible for implementing the country's international obligations in ICT, as well as promoting fair competition in the sector, and applies to all electronic communications, information society, and the broadcasting and postal sectors.

Data regulations, which are separate from regulations in the ICT sector, are becoming increasingly important to foster online consumer trust in the digital economy. Historically, national data protection authorities have monitored issues relating to privacy and regulated the use of data through privacy and data protection laws, cybercrime legislation, rules pertaining to privacy and sharing of specific types of data (e.g., health or financial data), and now rules about electronic transactions (ITU 2018b). Currently, 74 countries across the world have established a separate data protection regulator, while in 63 countries data protection is under the broad mandate of the ICT regulator, including in Commonwealth countries such as Rwanda and Saint Kitts and

Nevis. However, Chapter 2 showed that the majority of the Commonwealth countries with legislation in only one of the four data legislation areas – a) electronic transactions/e-signature; b) data protection/privacy online; c) consumer protection when purchasing online; and d) cyber-crime prevention – are African countries (such as Mozambique, Lesotho, Nigeria, Tanzania and Malawi) and small states such as PNG, Solomon Islands and Vanuatu. This poses questions about how active a role the ICT regulatory authority is playing in regulating data in these Commonwealth countries. See Box 5.1 for a case-study on ICT regulations in Kenya.

The development of a comprehensive legal and regulatory framework on data can in fact be the key to unlocking digital trust for e-commerce in many developing Commonwealth countries. CIGI-Ipsos (2017) conducted a survey of 24,225 internet users in 24 countries, including the Commonwealth countries of Australia, Canada, Kenya, India, Nigeria, Pakistan, South Africa and the UK, and found that 49 per cent of the those

Box 5.1 ICT regulations in Kenya

A key challenge to digital transformation in Kenya is poor management of ICT regulations. Regulations for the ICT services sector are spread out between the central government and state entities in Kenyan counties, leading to unclear division of responsibilities and overlapping roles (Waema and N'dungu 2012), and resulting in higher transaction (compliance) costs for private players. Fragmentation makes it more difficult: a) for regulatory institutions to prosecute cybercrime such as software piracy, which deters foreign investment; and b) to fully align regulations with international standards. Kenya does not currently have a national data protection authority. However, there is draft legislation in the Senate, the Data Protection Bill 2018, that aims to establish such an authority. This bill bears some similarities to the UK's Data Protection Act 2018, which incorporates and supplements the provisions of the GDPR. It embraces the basic principles of data protection: the necessity of collecting information, the right of subjects to access information, imposition of duty to ensure that the information is updated, complete and correct (Okal 2017). In addition, Section 31 of the bill prohibits the transfer of personal data out of Kenya unless: the third party is subject to a law or agreement that requires putting in place adequate measures for the protection of personal data; that the data subject consents to the transfer; that the transfer is necessary for the performance or conclusion of a contract between the agency and the third party; or that the transfer is for the benefit of the data subject.

Kenya launched the National ICT Master Plan in 2017 to harness the power of ICT, increasing Kenya's regional and global competitiveness. To prevent copyright and digital content piracy, the Kenya Copyright Board is working on the Copyright Amendment Bill 2016 (Okal 2017). This bill will facilitate protection of creative works on online platforms, enabling greater digital trade. Moreover, Kenya launched the Cyber Security and Protection Bill in 2016 to provide increased security in cyberspace, enabling greater information sharing, protection of life and national security (Okal 2017).

Source: Authors, Ogletree Deakins (2019).

who never shopped online cited a lack of trust as the primary obstacle. Among those worried about their privacy, top sources of concern included cybercrime (82%), internet companies (74%) and governments (65%) (CIGI 2017). The survey further provides some country-level insights into the importance of different regulations or protection in determining engagement in online shopping, which are outlined in Table 5.2. In an e-trade assessment for LDCs, UNCTAD (2019) confirms that lack of trust is a critical barrier to the uptake of e-commerce payments – low levels of digital trust prevent consumers from moving from cash on delivery towards e-payments.

Updating e-commerce legislation and regulations, including in the field of data privacy, consumer protection, cyber-law and dispute resolution can build online consumer trust and facilitate inclusion of developing Commonwealth countries in digital trade. Models for data protection, however, vary and can be tailored to the nature of the local market (CIPE 2018). For instance, some economies such as those in the EU and Ghana have adopted more comprehensive over-arching regulations on open data protection, while others have implemented sector-specific laws. Within consumer protection, CIPE (2018) highlights dispute resolution as a key area to be addressed. Dispute resolution is crucial for enterprises and consumers alike, given that merchant-customer disputes frequently arise in electronic transactions at the post-sale phase. To streamline enforcement, governments and businesses alike are increasingly turning to alternative means of dispute resolution, especially online dispute resolution (ibid).

Within data regulations, cross-border flows of data, source-code sharing, and data localisation are contentious issues between Commonwealth countries. One of the channels through which free flow of data is operationalised is through no requirements of data localisation i.e. foreign firms collecting data from a country have the freedom to move it across the border and store it in any part of the world. The decision to locate data centres by global private sector players can be based on cost-efficiencies, geographical reasons, legal frameworks and political factors (Meltzer 2015). On the one hand, forced data localisation may increase economic costs (Bauer et al. 2014); but on the other hand, many developing countries see data localisation measures as the exercise of national sovereignty and protection of their consumer data, which can strengthen the position of domestic firms and local digital ecosystems, enabling catch-up (Azmeh et al. 2019; UNCTAD 2018).

Table 5.2 Percentage of internet users considering regulations 'important' for e-commerce engagement

Country	Online consumer protection	Data privacy	Protection against data breaches	Protection against cyber-crime	Online or offline cross-border dispute resolution mechanisms
Kenya	99	99	96	98	94
Nigeria	90	87	88	87	86
South Africa	96	96	95	95	90
India	97	92	91	92	88
Canada	97	97	96	96	88
Australia	94	95	94	95	87
Global (24 countries)	94	94	93	94	87

Source: CIGI-Ipsos (2017).

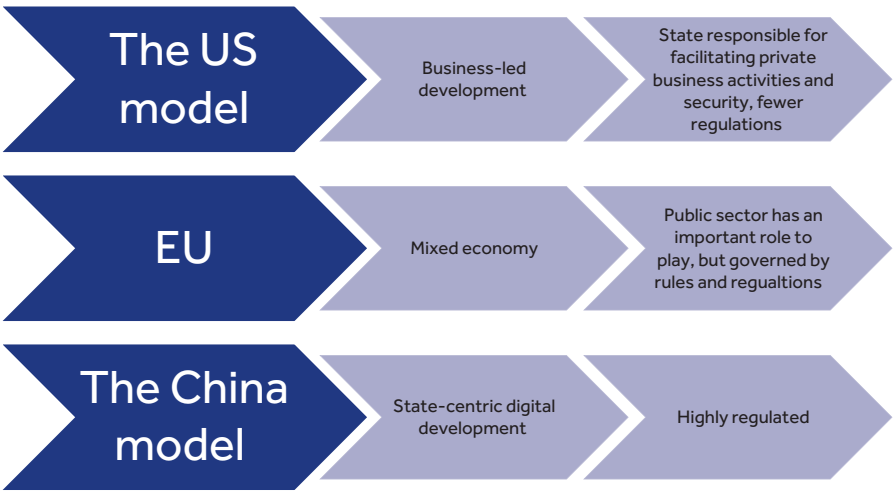
Singh (2018) suggests the issue of data protection and data flows can be examined under three distinct models, summarised in Figure 5.1. On the one end, there is the US model propagating free flow of data, driven primarily by businesses, while at the other extreme there is China's digital protectionist policies. China restricts data imports and has in place localisation policies that broadly require personal data, critical data related to internet infrastructure and user/business information to be stored locally on servers within China (Cory 2017). China also has sector-specific rules – for instance, in the financial sector, both local storage and local processing of data are required.

In between the US and Chinese models lies a mixed-economy approach, being adopted by the EU, where the public sector has an important role in building the necessary digital and data infrastructure, supporting efficient and open data markets, and undertaking regulation of the digital sector to prevent monopolistic, anti-trust tendencies or regulate areas of critical importance to the economy and society. Under the EU's new GDPR, there is one Data Protection Authority for the single market and a common digital security architecture. The GDPR has very stringent data protection provisions: it takes a consumer-centric approach to data protection that requires enterprises to provide more control and a range of rights to consumers. For instance, it requires data portability, which means that people can seek access to their data in portable forms, making it easier to switch between service providers and platforms. The GDPR takes a hybrid approach towards localisation: it does not restrict the flow of data to third countries but imposes conditions and extends its jurisdiction to any personal data processing, in the EU or abroad, that originates in the EU. However, it recognises only 12 countries to have adequate data protection regimes under the GDPR (Patel and Lea 2019).

For developing Commonwealth countries with localisation laws – such as India and Nigeria – attracting foreign investment will increasingly depend on domestic digital infrastructure, in the form of data centres, and a comprehensive and enforceable legal framework around issues of data flows, data privacy and protection. For other Commonwealth countries still in the process of drafting data legislation (see Table 5.3), Rwanda's pioneering National Data Revolution Policy (2017) provides important principles that can be adapted to its specific contexts (See Box 5.2).

Rwanda's example also brings forth the importance of 'open data'. The International Open Data Charter

Figure 5.1 Regulating the digital economy – three approaches



Source: Singh (2018).

Countries ranked in the Top 10

Malta, the UK, and Australia rank in the **top 10** out of **193** countries globally

ICT REGULATIONS

Several Commonwealth small states such and Tuvalu (189th), Solomon Islands (177th), Antigua and Barbuda (174th) and Saint Kitts and Nevis (168th) rank near the bottom

Table 5.3 Status of data legislation in Commonwealth countries

	Legal framework for electronic transactions/ e-signature?	Legal framework for data protection/ privacy online?	Legal framework for consumer protection when purchasing online?	Legal framework for cybercrime prevention?
Antigua and Barbuda	Yes	Draft	No	Yes
Australia	Yes	Yes	Yes	Yes
Bahamas, The	Yes	Yes	Yes	Yes
Bangladesh	Yes	No	Yes	Yes
Barbados	Yes	Draft	Yes	Yes
Belize	Yes	No	Yes	No
Botswana	Yes	No	Yes	Yes
Cameroon	Yes	No	Yes	Yes
Canada	Yes	Yes	Yes	Yes
Cyprus	Yes	Yes	Yes	Yes
Fiji	Yes	No	Yes	Yes
Gambia, The	Yes	Yes	Yes	Yes
Ghana	Yes	Yes	Yes	Yes
Grenada	Yes	Draft	No	Yes
Guyana	Draft	No	Yes	No
India	Yes	Yes	No	Yes
Jamaica	Yes	Draft	Yes	Yes
Kenya	Yes	Draft	Yes	Yes
Kiribati	No	No	No	Yes
Lesotho	Draft	Yes	No	No
Malawi	Draft	Draft	No	No
Malaysia	Yes	Yes	Yes	Yes
Malta	Yes	Yes	Yes	Yes
Mauritius	Yes	Yes	No	Yes
Mozambique	Draft	No	No	No
Namibia	Draft	Draft	No	Draft
Nauru	No	No	No	No
New Zealand	Yes	Yes	Yes	Yes
Nigeria	Draft	Draft	Draft	Yes
Pakistan	Yes	Draft	No	Draft
Papua New Guinea	Draft	No	No	No
Rwanda	Yes	Draft	Yes	Yes

(*Continued*)

Table 5.3 Status of data legislation in Commonwealth countries (*Continued*)

	Legal framework for electronic transactions/ e-signature?	Legal framework for data protection/ privacy online?	Legal framework for consumer protection when purchasing online?	Legal framework for cybercrime prevention?
Samoa	Yes	No	No	Yes
Seychelles	Yes	Yes	No	Yes
Sierra Leone	No	Yes	Yes	No
Singapore	Yes	Yes	Yes	Yes
Solomon Islands	No	No	No	No
South Africa	Yes	Draft	Yes	Yes
Sri Lanka	Yes	No	No	Yes
Tonga	Yes	No	No	Yes
Trinidad and Tobago	Yes	Yes	Yes	Yes
Tuvalu	No	No	No	No
Uganda	Yes	Draft	Yes	Yes
United Kingdom	Yes	Yes	Yes	Yes
Vanuatu	Yes	No	No	No
Zambia	Yes	Yes	Yes	Yes
Brunei Darussalam	Yes	No	Yes	Yes
Saint Kitts and Nevis	Yes	Draft	No	Yes
Saint Lucia	Yes	Yes	No	Draft
Saint Vincent and the Grenadines	Yes	Yes	No	Yes
Tanzania	Yes	Draft	Draft	Draft

Source: UNCTAD cyber-law tracker.

defines 'open data' as 'publicly available data that can be universally and readily accessed, used and redistributed free of charge. It is structured for usability and computability. Open Government Data (OGD) is a subset of open data, and comprises open data generated and released by local or regional government ministries, departments and agencies. In Commonwealth countries, OGD can lead to improvements in government efficiency, effectiveness, transparency and accountability. It can also lead to more inclusive policy making and government services, as well as having an impact on the economy. Australia serves as a good example of this – the Australian Government released its Public Data Policy Statement in December 2015, formalising its commitment to open data and data-driven innovation (Australian Government 2019). Geoscience Australia and the Australian National University, for instance, are using valuable Landsat satellite data for detailed mapping and analysis of Australia's land and water. With the Landsat images, Geoscience Australia has made maps of Australia's surface water patterns, providing unique information for flood risk assessment and ecosystem management.

The Kenya Open Data Initiative (KODI) is another example of a government portal that makes

Box 5.2 Rwanda's Data Sovereignty Policy

Rwanda's Data Revolution Policy has eight key principles:

i. data should be easily accessible and usable, with all non-sensitive data being open, discoverable, publicly consolidated and published on a central national data portal or other forums;

ii. raw data should be published with the highest possible level of granularity;

iii. data published should be accurate and complete;

iv. data will be published in machine-readable, modifiable format which can be openly licensed and reused, including for commercial aspects;

v. data users will recognise the author of the data throughout the process of sharing and reusability;

vi. development of an adequate legal, policy, infrastructure and privacy environment for offering data hosting services to other external governments or private data owners;

vii. exclusive sovereignty on national data but provision of hosting data in a cloud or collocated environment in data centres within or outside Rwanda, under agreed terms, and governed by Rwanda; and

viii. PPPs for building Rwanda's data industry.

Source: UNCTAD (2018).

government developmental, demographic, statistical and expenditure data available as open data, mostly in accordance with open data principles. KODI is managed by the ICT Authority, a government agency under the Ministry of Information, Communications and Technology (Kenya ICT Authority 2018). OGD was also a key enabler of the fight against corruption in Botswana; demonstrated to be an efficient tool in tracking mining revenues in Ghana; and responded to the public demand of greater accountability for the school system in Tanzania (Van Belle et al. 2018).

The case of Asia illustrates the emergence of a growing number of actors in the open data space. These include, for instance, the Open Knowledge non-profit in Bangladesh, Centre for Internet and Society non-profit in India and DataKind in Singapore (OpenData 2019) working on different issues and concerns related to transparency and accountability, public service delivery and innovation in a range of thematic sectors, such as education, health, environment, transport and economic development. New cross-regional partnerships have emerged, including the Sinar Project in Malaysia working with Phandeeyar in Myanmar to develop an app for monitoring legislative activities. However, unlike in developed Commonwealth countries such as Canada, countries in Asia demonstrate relatively few examples of open data initiatives that have originated at the state or local government levels. For example, only four of 29 states and seven union territories in India have an official open data portal. Similarly, the Bangladesh Open Data Strategy, approved in 2016, focused only on the release and publication of data at the national level (OpenData 2019).

5.2 Updating taxation policies in the digital age

The issue of taxation of digital services and content remains a 'work in progress' in many countries (ITU 2018a). On the one hand, taxation of the telecom/

ICT sector serves as an important stream of revenue for developing countries. However, on the other hand, it should not stall digital transformation and innovation within the sector. Taxation of digital services is particularly complex: digital services and content flow across borders, with countries encountering difficulties in determining where business profits should be taxed. As a result, digital giants such as Amazon and Google can exacerbate tax base erosion by transferring their intangible assets (e.g. data; intellectual property) across tax jurisdictions. Data show that only 11 per cent of countries globally apply digital services and content taxes (ITU 2018a).

Given this, UNCTAD (2018) calls for tighter regulation of restricted business practices; the break-up of large firms responsible for market concentration; regulating digital platforms as a public utility, with direct public provision of the digitised service; and strong monitoring and administration at the international level as options to regulate super-platforms. Taxing these firms where their activities are based, rather than where they declare their headquarters, can help in redistributing their rents and increase government revenues, i.e. taxing where value is created (OECD 2019). Currently, the G7 countries are in the process of discussing how taxation and fiscal policies can be revised to ensure that the benefits of the digital economy are not monopolised by the few. The G7 has agreed on a two-pronged solution to be adopted by 2020 – confirming the principle of companies being able to accrue revenues outside their legal base but also with minimum taxation, to be agreed internationally, of their activities (Rossignol 2019). For developing Commonwealth member states, requirements on data localisation may be one solution to ensure enterprises with real interests, but only virtual presence, in each country can be made to pay taxes that reflect the revenues from the economic activities they undertake within these countries (Mayer 2018).

More direct approaches have been adopted by some Commonwealth countries. For instance, in South Africa, a review of taxation in the digital economy by the Davis Committee concluded that the South African tax law provided an opportunity for foreign e-commerce suppliers to avoid taxation (Davis Tax Committee 2014). In response to the recommendations made by the Davis Committee, South Africa amended its VAT Act in 2014 to better capture the digital economy and foreign and local digital suppliers. The amendments require foreign suppliers of e-commerce services such as music, electronic books, internet games, electronic betting and software, among others, to register as VAT vendors and account for output tax provided their turnover in South Africa meets the threshold of 50,000 rand (ibid).

Australia provides another interesting case to learn from within the Commonwealth. In 2017, the Australian government passed new legislation on goods and services tax (GST) to ensure that both Australian goods and foreign low-value products were subject to the same tax regime (Australian Taxation Office 2019). There are two main kinds of taxes: a) GST on low-value imported goods, which applies to imported goods worth less than 1,000 Australian dollars ($), sold by Australian retailers or overseas retailers; and b) GST on digital products and services, which applies to digital goods and services such as music bought online or digital streaming services (ibid). Under the former type of GST, non-Australian e-commerce platforms are affected. For instance, Alibaba and Amazon may have to adjust prices for consumers in order to take into account this new tax. The latter type of GST applies to imports of digital products and services and affects merchants who sell imported services or digital products to Australian consumers and to the operation of online marketplaces. Examples of other approaches to digital taxation taken by Commonwealth countries are provided in Box 5.3.

5.3 Fostering competition in the age of digital platforms

Globally, Commonwealth countries are also facing important regulatory challenges with the rising monopolistic nature of giant e-commerce

Box 5.3 Approaches to taxation in the digital economy

1. **Singapore**: From 1 January 2020, foreign-supplied digital services will be subject to Singapore's GST. The Singapore government has already confirmed that it will likely levy 7 per cent VAT on goods and electronic services provided to consumers by non-resident companies. (Source: Quaderno.io)
2. **UK**: In October 2018, it was declared that the UK would impose a digital services tax of 2 per cent of global revenues of 500 million pounds sterling (£) from April 2020. The first £25 million of UK revenues is not taxable. The UK is currently working with the G20 and the OECD to consider how best to tax digital companies.
3. **Lesotho**: Starting from April 2018, Lesotho's Ministry of Finance decided to equate communication services VAT to that of general goods and services, which is now 15 per cent. However, this increase was staggered and not applied all at once. As such, from April 2018 communication services VAT was increased from 5 per cent to 9 per cent. Other increases will be implemented in subsequent years. (Source: ITU Tariff Policies Survey 2018)
4. **Uganda**: In 2018, the Ugandan government introduced an excise duty on over-the-top services, which is charged at a rate of 200 Uganda shillings (USh) per user per day of access. Users of any communications apps, not provided by their mobile operator, will have to pay a tax of USh200 (US$0.05) per day.
5. **Kenya**: Under the Finance Act 2018, Kenya's Excise Duty tax applicable on voice, SMS and data services was hiked from 10 per cent to 15 per cent, in addition to the existing VAT of 16 per cent applicable to mobile services.

Source: ITU (2018b).

platforms, such as Amazon and Alibaba. There are some distinct features which make it easier for a more digitalised firm to become competitive over its non-digital counterparts. Pierre and Romain (2017) highlight three such pathways. First, information and e-commerce platforms enable more efficient connection between products offered and demand, which increases transparency, facilitates information flows and results in higher consumption of goods and services. Second, the digital economy lowers barriers to entry, addresses issues of traditional non-tariff barriers and facilitates expansion in the market, increasing market contestability of digitalised firms. Third, digitalisation reinforces network effects between user groups located and interacting at different levels of the value chain.

The standard anti-competitive policies followed by many Commonwealth countries are therefore no longer able to maintain fair competition, requiring fiscal and competition policies in the digital age to be re-examined. Moreover, as digitalisation increases, investment in infrastructure that supports e-commerce will be required to successfully connect and integrate Commonwealth countries through value chains, particularly in the case of small states.

Consider the case of digital giants, which are leveraging the power of Big Data and emerging as critical intermediaries integrating across business lines and slowly taking over essential infrastructure upon which competitors depend. The extent of economic re-organisation triggered by

digital platforms is evident from how they extend themselves not just horizontally, as a connecting platform or marketplace, but also vertically (Singh 2018). For instance, Amazon is increasingly controlling the infrastructure of online commerce through its massive Amazon Marketplace, which it uses as a laboratory to sell and test sales of new goods. The Marketplace allows independent merchants to use its site to both sell goods as a retailer and host sales by other retailers, and in the process gathers massive amounts of data on other merchants, giving it a tremendous competitive advantage (Khan 2016). Furthermore, it not only charges a hefty commission fee (which goes up to 40 per cent on some products such as electronics) but also pushes its own products 75 per cent of the time, decreasing the 'visibility' of products supplied by developing country firms listed on these platforms (*The Guardian* 2016).

Contrary to many developed countries in both the earlier and current phases of digitalisation, most developing countries lack policies governing the collection and use of data (as discussed in Section 5.1), increasing the risk of their data being controlled by whoever gathers, stores and has exclusive rights on the data. The resulting increases in market concentration of digital giants and e-commerce monopolies will further focus financial power in the hands of a few leading firms in developed countries and cause increased rent seeking, anti-competitive practices and attempts to block actual or potential competitors. As a result, certain established competition and antitrust policies may no longer be adequate to address the threat posed by e-commerce giants to market competition. These policies are based on the short-term interests of consumers, and view low consumer pricing as indicative of the existence of competition. However, competition can no longer be measured primarily through pricing and output since this runs the risk of ignoring the adverse effects of 'predatory pricing' and the prospect that integration across business lines can be anti-competitive.

It is crucial that competition laws in the Commonwealth address the standard competition issues of anti-competitive agreements, cartels, abuse of dominance, and merger control, but also extend to competition challenges within the context of an increasingly digitalised economy. It is important to:

a. build capacity within competition authorities in Commonwealth countries to deal with the rising power of digital platforms and the changing landscape of competition; distinguish predatory practices from innovation-driven price reductions; and understand the power of network effects on competitiveness;

b. revise and update competition laws based on new definitions of 'market shares', which go beyond asset control to capture intangible assets such as reputation and digital control; and

c. define the relevant market in the context of digital apps and platforms that are increasingly penetrating across industries – for instance, classification of Uber as a taxi provider or technology service will facilitate the process of regulating it (ibid).

Moreover, it has become important for competition authorities to take data into account in their work – whether in terms of reviewing mergers of firm datasets that could generate durable market power, or in preventing abuse of data by dominant firms to exclude their competitors from the market (OECD 2019).

In addition to policies managing the effects of international e-commerce platforms, policies that support domestic e-commerce players are also important for African economies, which are at relatively nascent stages in terms of digitisation.[1] Therefore, more focus needs to be diverted towards enabling firms and suppliers in African countries to link up with domestic, regional and international platforms. Collaboration within the Commonwealth can help. For instance, a study by Mendez-Parra et al. (2019) on Nigeria–UK trade and investment relations highlights e-commerce as a major opportunity to overcome many of the trade barriers between the two economies in terms of both goods

Box 5.4 Jumia – opportunities and challenges to e-commerce in Nigeria

The current level of e-commerce spending in Nigeria is estimated at US$12 billion, and is projected to reach US$75 billion in revenues per annum by 2025 (Export.gov 2019). Jumia is one of the largest e-commerce platforms in Nigeria, operating in 14 African countries. In April 2019, it was listed on the New York Stock Exchange (NYSE) at a valuation of US$1.1 billion. Regionally, the largest countries for Jumia's business are Nigeria and Egypt, with overall 4 million active users at the end of 2017. The rise and success of Jumia has been complemented by government efforts in building a digitally enabling environment in Nigeria. Nigeria's economy is gradually becoming cashless, as digital payment and electronic banking are implemented in phases across most states of the federation. The adoption of electronic transactions is continuously increasing, with ATM transactions dominating the volume of electronic transactions and the Nigerian Inter-Bank Settlement System Instant Payment dominating in terms of value. This has led to increased foreign investment from Europe and Asia in Nigerian electronic infrastructure projects. Online commerce and financial technology in Nigeria is further strengthened by fast growing youth populations, expanding consumer power and increased smartphone penetration. Most customers are mobile users, which comprised 81 per cent of all traffic in 2018. To expand its supplier base, Jumia regards 'a data-driven score' as a key indicator of seller performance. It supports third-party financial services for its sellers, using this score as a way to demonstrate creditworthiness.

The government is also building a legal and regulatory framework to support e-commerce development in Nigeria. In 2015, the Federal Government signed the cybercrime bill into law to prohibit and prevent fraud in electronic commerce. The purpose of the Cybercrimes Act of 2015 extends beyond prohibiting, preventing and criminalising online fraud, but also prescribes punishments and sets the institutional framework for enforcement. The goal is to protect e-business transactions, company copyrights, domain names and other electronic signatures in relation to electronic transactions in Nigeria. In 2019, Nigeria's National Information Technology Development Agency issued the Nigeria Data Protection Regulation 2019 (the 'Regulation'), adopting several concepts from the EU's GDPR. Key elements include: a) personal data processing principles; b) requirement of consent from users for collection of data; c) that organisations must issue an easily understandable privacy policy that contains specified content; d) data security measures for protection of personal data; e) third-party contracts; f) data subject rights such as access to their personal data, getting their data corrected and restricting processing of personal data; and f) data transfers.

However, Jumia is a loss-making firm; 90 per cent of sales are from third-party sellers, and it also faces high operating costs related to warehousing, delivery, sales and advertising. Moreover, cash payments on deliveries still continue to be the dominant model of payment in Nigeria, perhaps

(*Continued*)

due to low digital trust, contributing to failed deliveries, excessive returns and late collection (ICT4D 2019). Rules on cross-border data flows also form a key issue. On the one hand, Nigeria is one of the few African countries which is a signatory to WTO e-commerce negotiations calling for harmonising e-commerce rules globally in order to support cross-border digital trade by firms such as Jumia. On the other hand, Nigeria has signed the African Continental Free Trade Agreement, in which discussions on e-commerce are at a nascent stage. The majority of African governments are keen to ensure that they are able to operate their economies appropriately, including collecting taxes and nurturing local firms, in the face of e-commerce imports.

Sources: ICTs for Development (ICT4D) 2019; City Press 2019.

and services trade. In the UK, eBay and Amazon Market Place constitute the main internet-based B2C platforms. In turn, Jumia, developed in Nigeria, constitutes the main platform to commercialise products through the internet in Nigeria (see Box 5.4 for a more detailed case study on Jumia). However, currently there is limited trade between the UK and Nigeria commercialised through e-commerce; the bilateral trade through e-commerce is generally limited to products imported through traditional channels that are commercialised through internet platforms in the respective countries. Products are sent from warehouses and other storage facilities located in the respective countries, with very little genuine direct imports from consumers. Despite the presence of a sizable British Nigerian community in the UK, Jumia has not opened a UK version of its website to allow UK-based customers to buy directly from Nigerian companies. It is important not to underestimate the role of Nigeria as a foreign investor – Nigerian firms and conglomerates like Dangote are increasingly becoming major regional and continental investors, even in the area of e-commerce.

5.4 Intellectual Property Rights in the age of digital platforms

Moreover, Commonwealth governments should consider whether current IPR frameworks strike the right balance between incentivising innovation and promoting competition. On the one hand, governments may be incentivising innovation by granting IPRs for a temporary exclusive use (i.e., a temporary monopoly), but on the other hand IPRs may be slowing the pace of technological diffusion, contributing to the decline in global convergence in labour productivity, as noted in Banga and te Velde (2018) for the manufacturing sector. Mayer (2018) argues that in the digital age, the distribution of value-added between developed and developing countries is less likely to be an issue of differences in wage rates than one of the high profit rates of mainly Northern firms that reflect rents arising from intellectual property and/or barriers to entry.

To facilitate industrialisation and reverse engineering of digitalised manufacturing in the Commonwealth, policies on data, technology transfer, source-code sharing and intellectual property will emerge as key issues. It was noted in Chapter 4 that among Commonwealth countries, Singapore has the highest ICT patent penetration, with 60 ICT-related patent applications filed under the PCT per one million people, followed by Canada, the UK, Australia and New Zealand. Meanwhile, 10 out of 33 Commonwealth small states had less than one ICT patent application per one million people in 2016, and while the other 13 countries reported zero patent penetration (World Bank data). This mirrors broader trends globally: just 10 economies account for 90 per cent of global patents and contribute 70 per cent of the world's exports of advanced digital production technologies (UNIDO 2019).

Some developing Commonwealth economies, such as India, have witnessed growth driven, in part, by reverse engineering in areas that were less patent-protected (Dahlman 2007). India successfully established a local generic pharmaceutical industry in the absence of foreign patent protection. Important lessons can also be learnt from China's growth in the digital economy – it has placed requirements for technology transfer on international firms in exchange for market access, including in some cases the transfer of source-code as a condition to sell to the Chinese government or to gain relevant licenses to trade in the country. A number of foreign companies are now engaging with Chinese companies in terms of technology transfer. For instance, IBM has shared certain intellectual property and parts of source code with China, while Microsoft has opened a subsidiary in China called Microsoft Open Tech Shanghai which participates in existing open-source and open-standard efforts. For small states in the Commonwealth which do not have enough market power to negotiate, regional strategies can be more useful, but this requires harmonised policies on data protection, privacy and stronger enforcement of IP laws to be effective.

Particularly for Commonwealth African countries and small states, intellectual property forms a key issue. However, Commonwealth countries have different levels of obligations in intellectual property treaties beyond the WTO, including participation in multilateral intellectual property treaties and commitments arising from bilateral trade agreements. Given that digitalisation may bring about entirely new products, as well as enable new functionalities and ways of use, it would appear that existing IPR protection leaves scope for active design-oriented innovation policy in developing countries (Mayer 2018).

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End Note

1 However, it is increasingly difficult to understand what it means to be 'domestic' in the case of digital platforms. For instance, Jumia, which is usually seen to be "African", is owned by foreign entities, including American banks, French insurance companies and German tech firms (according to its SEC filing) and, in Jumia Kenya, around 80 per cent of the listed products are Chinese. Similarly, Alibaba is 30 per cent "African", in that South Africa's Naspers owns about 30 per cent equity.


ASIA
EUROPE
NORTH AMERICA
MIDDLE EAST
AFRICA
SOUTH AMERICA

BUILDING INCLUSIVE AND SUSTAINABLE DIGITAL ECONOMIES

06

This chapter scopes out sustainable and inclusive development in Commonwealth countries and focuses on the impact of digital technologies and changing dynamics of international trade on inclusive development and green growth.

The first section explores the impact of digitalisation on inclusive development in terms of opportunities for small states, youth empowerment and women, respectively. The section will show the gender gaps which exist among the Commonwealth countries and how these gaps could be addressed using digital technologies. The second section focuses on prospects for sustainable development in the digital age, and the implications of rising digitalisation on environmental and social standards.

6.1 Impact of digitalisation on inclusive development in the Commonwealth

The previous chapters highlighted several new opportunities presented by digitalisation and discussed associated challenges and risks. The sub-sections below discuss the scope of inclusive development in the digital economy and how new opportunities for small states, women and youth can be realised by managing digital transformation in a more inclusive manner.

6.1.1 Digitalisation and inclusion of Commonwealth small states

As discussed in Chapter 2, many of the existing debates and discussions on growth and development models do not account for variation in the size of economies. However, small states in the Commonwealth face a range of additional challenges that affect their growth prospects, including in relation to the viability of activities with increasing returns to scale.

Winters and Martins (2004) argue that small states are permanently disadvantaged in agriculture and manufacturing and cannot reap returns to scale in these sectors. Moreover, the remoteness of some Commonwealth member states, particularly in the case of the Pacific island states, raises transport costs and constrains participation in global networks and value chains. The exports of small states are also mostly concentrated in commodities, which increases these countries' exposure to volatile global commodity prices.

Digitalisation may provide new opportunities for Commonwealth small states to address some of these challenges. Knowledge-intensive services and digital trade can support development strategies for small, landlocked and remote Commonwealth member states that cannot rely on economies of scale in agriculture or manufacturing production and lack decent physical access to markets in other countries (Sarwar et al. 2018). IT services (such as data processing and software development) and IT-enabled services (such as tourism, call-services and back-office services for financial firms) are much less constrained by hard borders or remoteness and can be exported as long as the country has strong digital infrastructure and appropriate digital skills.

However, to realise the opportunities of digitalisation at scale, regional co-operation will also be key for Commonwealth small states. Consider for instance, the case of the Caribbean Community (CARICOM). Given the generally small size of Caribbean firms and limited capital base, there is significant potential for e-commerce to reach customers in distant markets, without requiring heavy investment in capital or the use of intermediaries (Broome 2016). However, leveraging e-commerce is constrained by the absence of a coherent regional regulatory framework, the high cost of infrastructure such as postal competence and port logistics, limited financial instruments, a lack of stakeholder buy-in and generally challenging business environments in the Caribbean.

Some regional efforts are underway to digitally transform the Caribbean. For instance, a plan to create a Single ICT Space was approved in February 2017, aimed at strengthening legal and regulatory convergence in telecommunications (UNECLAC 2018). The components of the plan include: a) regional harmonisation of ICT policies, legal and regulatory frameworks; b) strong national and

regional broadband infrastructure; c) common frameworks for governments, service providers and consumers; and d) effective and safe technology and management systems.

McClauren (2017) further highlights the scope for a CARICOM e-commerce strategy that addresses issues related to taxing e-commerce and Custom Duty Memorandum (WTO), competition law and policy and consumer protection issues, protecting intellectual property, regulations and enforcement and cyber security. The development of a CARICOM Single Market and Economy has also been given a boost with the launch of four new online platforms aimed at promoting trade and improving the ease of doing business: the CARICOM Online Companies Registries; Labour Market Information System; Community Public Procurement Notice Board; and the CARREX Platform and On-Line Public Portal (Kendol 2017). Such regional initiatives by Commonwealth small states, coupled with knowledge sharing by leading digital Commonwealth small states, can help foster inclusive development. Sharing of lessons and best practices in e-governance can further help the process. For instance, Malta is a champion of e-governance in the Commonwealth (see Box 6.1).

6.1.2 Digitalisation and inclusion of youth

For many developing Commonwealth members, youth unemployment poses another serious and growing challenge. These rates are even higher among young women, who face barriers to receiving

Box 6.1 Malta's e-governance initiatives

In 2010, Malta's Information Technology Agency (MITA) diverted its efforts towards ensuring that all Government services are accessible online and improving the quality and delivery of e-Government services. MITA created a central platform to enable the rapid implementation of services. This encompassed the creation of three important components: eForms, MyBills and eProcurement. **eForms** is a new platform which allows the creation of online forms, enabling the whole process – from the creation of forms by a department to the filling-in and sending process by citizens or businesses – to be done completely online in a secure environment. **myBills** is the Maltese government's online billing solution, supported by the Hosted Payment Page (HPP), which directs users to make electronic payments through a central PCI-certified environment. By the end of 2010, 93 per cent of online transactions were taking place through the HPP. **eProcurement** enables the use of electronic communications and transaction processing by the public sector, in order to purchase supplies and services, or tender public works.

The success attained by the Government of Malta in the context of e-Government can be partly attributed to the pivotal role of the underlying set of service enablers. These services provide the building blocks which enable a common authentication/ authorization, mobile messaging, electronic payments, online forms and common data registers throughout all e-Government Services. The e-Government Benchmark 2018 reveals that Malta's e-government services are the best in Europe, on the basis of the number of services available online and on mobile phones. It ranked the highest in four priority areas: user centricity, transparency, accessibility by other EU citizens and technological infrastructure.

Source: MITA (2018).

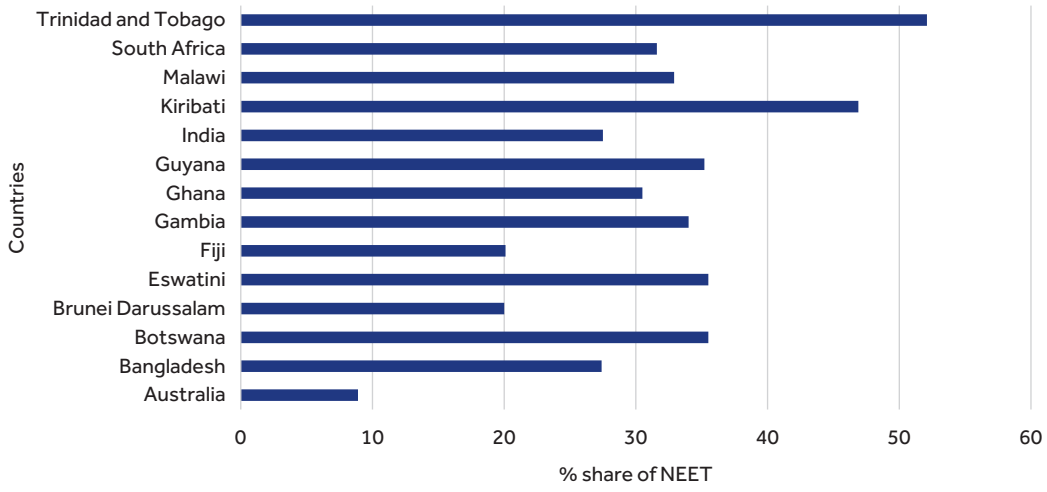
a quality education in the form of cultural norms and practices, poor infrastructure, violence, and fragility. Youths, however, do not comprise a homogenous group – young people's circumstances vary widely by age cohort, gender and education level and geographical location, among other socio-economic factors. Unemployment is also a critical challenge confronting young people in small states, particularly in the Pacific region, where the youth unemployment rate stands at an alarming 23 per cent (ILO 2013). Young people in the Pacific are 4.5 to 6 times less likely to secure decent jobs relative to older people (ILO 2017); and jobs in the formal sector are limited, while the informal sector seldom provides decent jobs (Commonwealth Secretariat 2017).

Figure 6.1 highlights the untapped potential of youth in Commonwealth countries, reflected in the share of youths not in employment, education or training (the NEET rate). The NEET rate varies across Commonwealth members, with small states having more untapped potential for youths. Trinidad and Tobago has a NEET rate of 52.1 per cent, followed by Kiribati (46.9%), Botswana and Eswatini (25.5%) and The Gambia (34%).

In the fast-changing landscape of the digital economy, both digital and soft skills are going to be increasingly demanded. In such a scenario, the problem of youth unemployment will be compounded by a lack of job-relevant digital skills among Commonwealth youths. On the one hand, young people are "early adopters" of ICT-based technologies and can drive growth and innovation in the sector, but on the other hand, the majority of young people do not possess job-relevant digital skills (ITU 2018). Chapter 3 confirmed that youth (15–24 years) are also at the forefront of internet adoption in the Commonwealth: on average (unweighted), 66.77 per cent of the population in the 15–25 age group in Commonwealth countries has access to the internet. However, compared to the Commonwealth average, internet adoption by youth in Asian economies such as Bangladesh and Pakistan is significantly lower – at just 11.8 per cent and 18.5 per cent, respectively. Similarly, in Nigeria, only 4 per cent of the population in the 15–24 age group has access to the internet. These economies are also found to score lower in terms of digital skills (see Chapter 3).

To boost the inclusion of youth in the future workforce, Commonwealth governments can design national strategies to develop young people's digital skills and build an enabling environment for innovation, entrepreneurship and job creation in the digital economy. Beyond increasing access

Figure 6.1 Share of youths not in employment, education and training in selected Commonwealth countries



Source: ILO Database and authors' own depiction.

The gender digital divide in the Commonwealth presents a significant challenge.

to secondary and tertiary education as well as STEM-focused TVET, this will require changes in the curricula, effective and quality provision of digital and soft skills training, continuous professional development of TVET trainers, investment into digital infrastructure and linkages with a dynamic private sector to align skills taught with industry needs. As the major employer of digitally skilled young people, the private sector can provide workplace learning opportunities to enhance the long-term employment prospects of young women and men.

For out-of-school youth, marginalised sections of society and adult learners in Commonwealth countries, access to digital and soft skills training can be expanded through non-formal TVET. However, training capacity needs to be leveraged through better co-ordination across existing players and linkages with national accreditation systems, which continue to present key challenges in many Asian and African countries. An excellent example of non-formal TVET delivering future-relevant skills is the Digital Ambassadors Programme (DAP), a joint initiative by the WEF's Internet for All, Digital Opportunity Trust and Rwanda's Ministry of Youth and ICT, which is mounting a three-pronged push for boosting internet access, skills training and jobs in Rwanda. DAP aims to employ 5,000 young Rwandans, with 50 per cent participation of young women and girls, as digital skills trainers. These Young Digital Ambassadors will receive training in essential digital skills and soft skills, which they will then draw on to provide hands-on training across the country (WEF 2017).

Boosting opportunities for youth entrepreneurship will require addressing key challenges related to the limited regulatory environment in small states; poor co-ordination between national and sector-based policies promoting youth entrepreneurship; data gaps on youth unemployment and youth entrepreneurship; insufficient and ineffective business services for young entrepreneurs, including the lack of financial access and services such as e-commerce platforms; limited incentives and investment opportunities for young entrepreneurs; inadequate ICT infrastructure and capacity including high costs, low coverage and connectivity; and the absence of entrepreneurship education and training for young people in formal and non-formal education, including as a result of insufficient funds to support educational development in this area (Commonwealth Secretariat 2017).

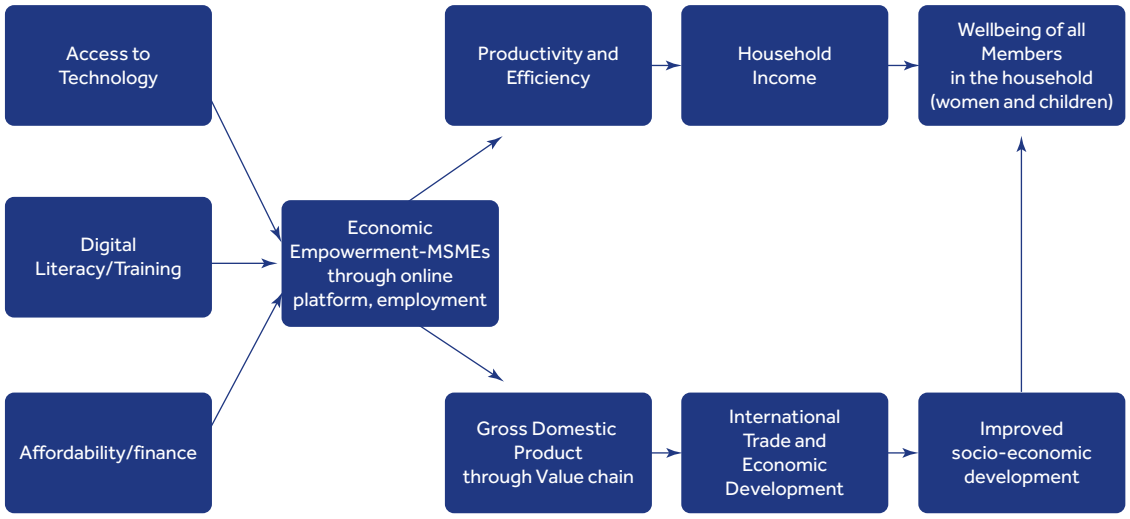
6.1.3 Digitalisation and inclusion of women

Digital technologies can help reduce gender gaps in labour force participation in the Commonwealth through a number of channels (Herbert 2017), including by creating new opportunities in services sectors; lowering barriers for MSMEs to enter markets; creating new opportunities in online work, e-commerce and the gig economy; and making work arrangements more flexible (World Bank 2016, 134; UNCTAD 2017). Figure 6.2 provides an illustration of the link between digitalisation and women's economic empowerment.

The on-demand economy for domestic work, for instance, is growing rapidly in developing countries, and is largely dominated by women (making up 80 per cent of the 67 million domestic workers globally). On-demand platforms offer some benefits to domestic workers, such as choice over working times, tracking of hours worked and wages earnt, and potentially better remuneration compared with other forms of domestic work (Hunt and Machingura 2016, 6).

While digitalisation does hold potential for inclusion of women in economic activities, a much more nuanced view is needed to understand whether these opportunities are being realised. For instance, Chapter 3 discussed how automation is: a) displacing mid-level jobs, which are routine and cognitive; b) creating more jobs for low-skilled workers, performing non-routine non-cognitive work such as nursing and caring; and c) creating more jobs for high-skilled workers, preforming non-routine, cognitive tasks such as ICT professionals and managers. Evidence suggests that, on the one hand, women tend to dominate mid-level jobs, while,

Figure 6.2 The link between digitalisation and women's economic empowerment



Source: Authors own depiction.

on the other, they form a very low share of those employed in advanced technology jobs. The latter require advanced digital skills, and employment and wages in these jobs are increasing at a rapid rate (IT for Change n.d.). Therefore, the occupational re-structuring that is currently happening as a result of the digital economy may not be beneficial for the employment of women.

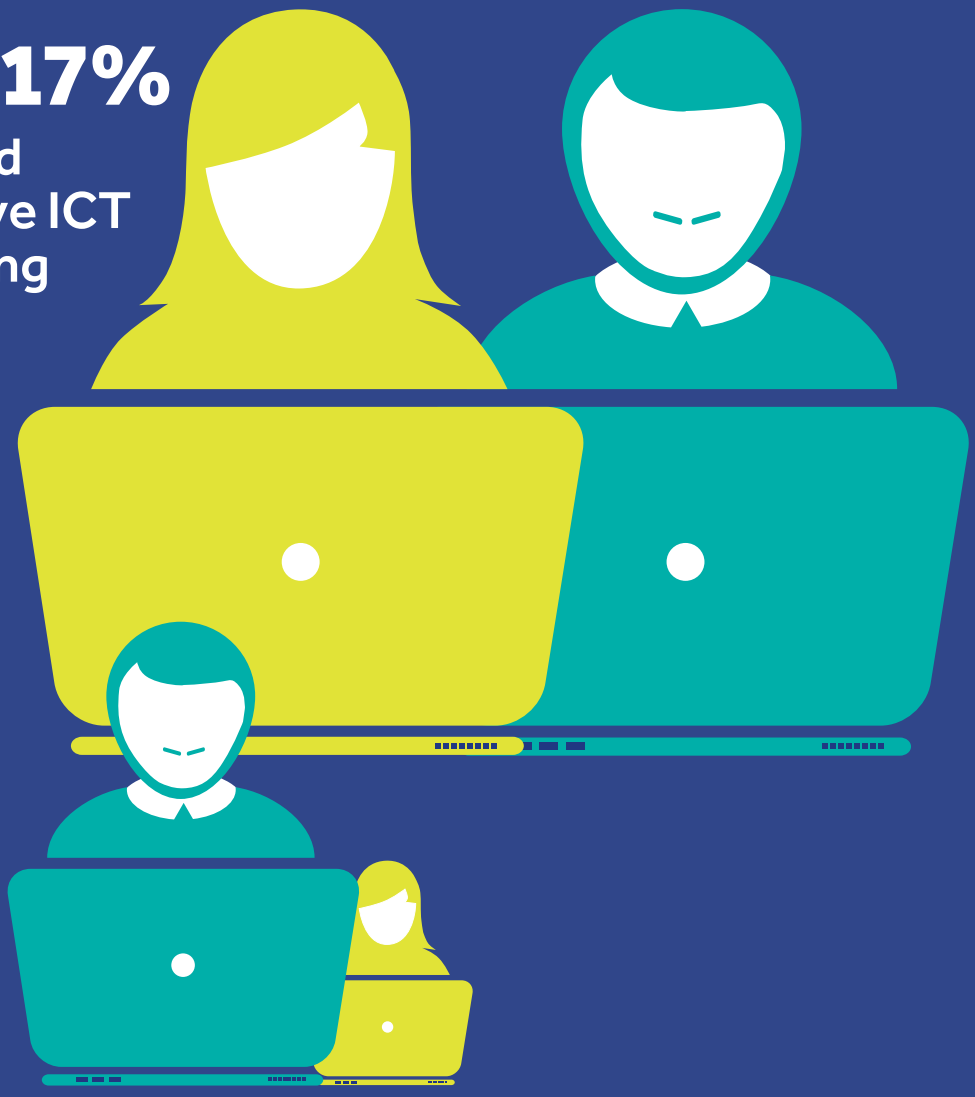
Secondly, the 'gig' economy has been growing rapidly, with ICT companies developing digital platforms to link clients (service purchasers) with work (service providers) (Hunt and Sarwar 2017, 13). Evidence suggests there is a high degree of occupational segregation on gig platforms (Hunt and Samman 2019). For example, in the UK, on the Hassle platform, which provides cleaning services, 86.5 per cent of workers are women, while on the food delivery platform Deliveroo and private transport platform, Uber, 94 per cent and 95 per cent of workers, respectively, are men (Balaram et al. 2017). While overall the gig economy has improved flexibility for both workers and employers, this work is often low paid, insecure and ad hoc, especially for less-skilled workers and marginalised/discriminated groups (Hunt and Sarwar 2017, 13).

Digitalisation has also seen to disproportionately impact the informal sector, which historically is highly feminised (IT for Change n.d.). 'For every new job that digitalisation has opened up, ... (we) may not realise what job opportunities are being taken away, because in the first place, the majority are in the informal sector and may not be easily visible. A squeeze on the informal sector will not really take the form of outright 'job' losses; indeed, in most cases there are not 'jobs' as such, to be lost, but livelihoods. What would happen is a steady compression of incomes, making survival precarious' (Pratap and Bose 2017 in IT for Change and DAWN 2018).

Persistent gendered digital divides are further compounding digital exclusion of women and keeping them from realising the full benefits that the digital economy has to offer. Compared to men, women entrepreneurs in developing economies tend to be disadvantaged in accessing finance, and in terms of time constraints, mobility, and access to skills and training. Figure 6.3 provides an illustration of the time required to start a business (in female days) across Commonwealth countries. For countries such as Fiji, Malawi and Eswatini, the time for females to

In some Commonwealth countries there are significant gender disparities in ICT programming skills

Brunei 17%
of males and females have ICT programming skills

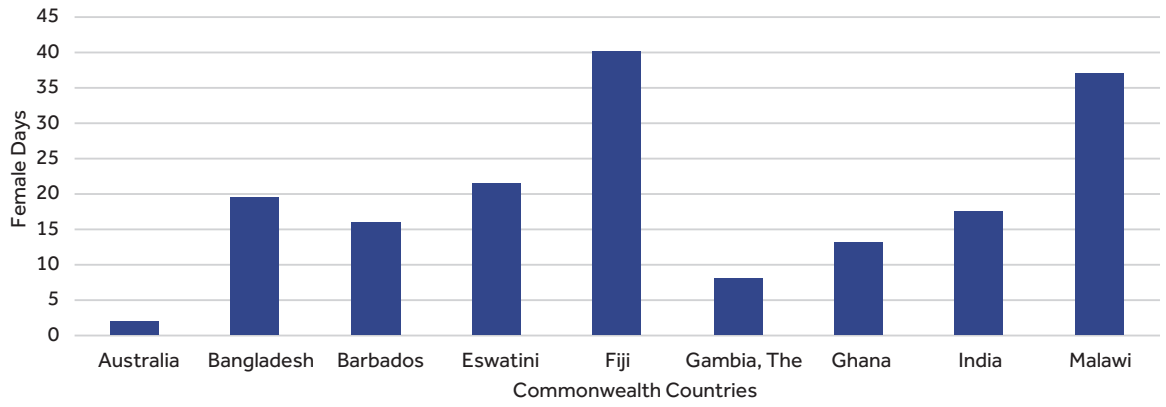


UK
10.6%
vs 5.2%

Singapore 8.9% vs 3.9%
Malta 7.7% vs 3.4%
Botswana 5.9% vs 3.9%

Pakistan 2% vs 0.9%

Figure 6.3 Time required to start a business (female) days in selected Commonwealth countries

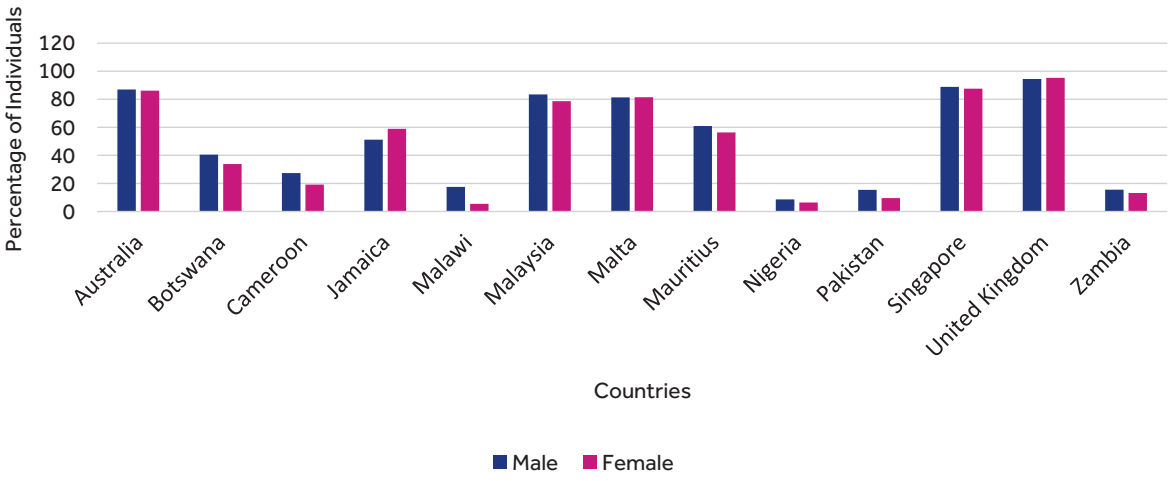


Source: World Bank Database.

start a business is high in comparison to countries such as Australia and The Gambia. The difference in the time required to start a business reflects the trade facilitation constraints faced by women.

While e-commerce and digital solutions can help overcome some of these barriers – e.g. via cloud services and crowd financing on online platforms (UNCTAD 2017, 45), women are less likely to access the internet. Figure 6.4 shows the percentage shares of males and females using the internet across a selection of Commonwealth member countries. There is greater parity in the use of the internet across developed Commonwealth countries such as Australia and the UK. On the contrary, the use of internet is biased toward males in developing countries such as Botswana, Cameroon, Malawi, Nigeria and Zambia. This disparity indicates how women are further marginalised in the digital age. Women are also less likely to access financial services, and

Figure 6.4 Percentage share of males and females using the internet in selected Commonwealth countries



Source: ITU Database.

particularly less via mobile technology (Hunt and Samman 2016, 19). Women on average are 14 per cent less likely to own a mobile phone than men, which translates into 200 million fewer women than men owning mobile phones in low- and middle-income countries; and this gender gap in mobile phone ownership is most pronounced in South Asia (GSMA Connected Women 2015). While cost remains the greatest barrier overall to owning and using a mobile phone, security and harassment also emerged as one of the top five barriers, and a key concern for women (Herbert 2017).

Figure 6.4 shows the percentage shares of males and females using the internet across a selection of Commonwealth member countries. There is greater parity in the use of the internet across developed Commonwealth countries such as Australia and the UK. On the contrary, the use of internet is biased toward males in developing countries such as Botswana, Cameroon, Malawi, Nigeria and Zambia. This disparity indicates how women are further marginalised in the digital age.

Women and girls also tend to have lower levels of literacy, education and digital skills, which can be key in enhancing the ability of women to access technology and engage in digital trade. Table 6.1 shows the percentage of the population with different ICT skills, by country and gender. It is observed that the proportion of the male population with basic information management skills – for copying or moving a file or folder and using basic arithmetic formulae in a spreadsheet – is higher than that of the female population in the majority of the Commonwealth countries examined. The same is true for more advanced digital skills associated with finding and downloading software or writing a computer programme using a specialised language (ICT programming). In Jamaica, the share of the female population with information management skills, and with advanced digital skills for finding, downloading and configuring software, is higher than the equivalent share of the male population. Across the Commonwealth, the available data suggests there are disparities that exist among males and females in relation to ICT programming skills. Table 6.1 shows that apart from Brunei Darussalam,

Table 6.1 Individuals by ICT skills, by gender

		Copying or moving a file or folder		Using basic arithmetic formula in a spreadsheet		Finding, downloading, installing and configuring software		Writing a computer program using a specialized programming language	
		Male	Female	Male	Female	Male	Female	Male	Female
Botswana	2014	37.1	31.6	21.1	18.5			5.9	3.9
Brunei Darussalam	2016	89	89	25	25	57	57	17	17
Jamaica	2016	13.2	17.6	4.6	6	6.9	7.2		
Malaysia	2017	59.9	50.7	25.7	23.8	36.5	30.7	7.9	7.1
Malta	2017	54.5	52.1	41.4	35.8	53.4	43.9	7.7	3.4
Pakistan	2016	8.1	2.9	2.9	1.3	4.9	2.1	2	0.9
Singapore	2017	57.1	51.3	37.8	36.5	46.8	38.9	8.9	3.9
United Kingdom	2016	66.4	59.4	48.5	45.6	63.8	57.5	10.6	5.2

Source: ITU data.

other Commonwealth countries such as the UK, Singapore, Malta, Malaysia and Botswana have gender disparities in ICT programming skills in favour of males.

Furthermore, ICT skills are critical in enhancing the ability of women to access technology and engage in digital trade. Across the Commonwealth, the available data suggests there are disparities that exist among males and females in relation to ICT programming skills. Figure 6.5 shows that apart from Brunei Darussalam, other Commonwealth countries such as the UK, Singapore, Malta, Malaysia and Botswana have gender disparities in ICT programming skills in favour of males.

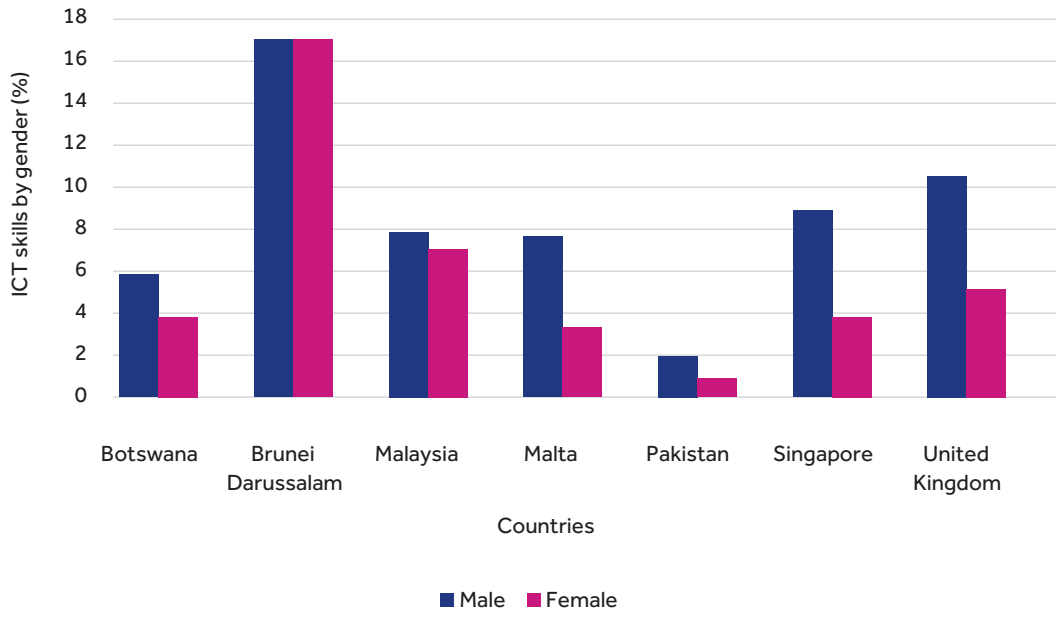
For technology to be truly transformative, it is imperative to bridge the gender gap in mobile phone access and usage, digital connectivity and employment in ICT sectors in low- and middle-income Commonwealth countries. Some of the more digitally connected Commonwealth member countries, such as Australia and the UK, have experience in developing inclusive digital strategies.

There is an opportunity for greater knowledge sharing within the Commonwealth, to enable fellow Commonwealth members to draw on these experiences to foster and accelerate inclusive and sustainable development by closing the digital gender gap and harnessing the transformative potential of ICTs for women's empowerment (Commonwealth Secretariat 2018).

6.2 Sustainable development in the digital age

Digital technologies have significant potential in boosting sustainable development for Commonwealth countries. The discussions on sustainable development are discussed in relation to the 'green' and 'blue' economies. For the green economy, the focus of the Commonwealth Connectivity Agenda (CCA) is in the area of smart agriculture and the use of such technologies to leverage inclusive and sustainable development across the Commonwealth. For the blue economy,

Figure 6.5 Share of individuals with ICT programming skills, by gender, in selected Commonwealth countries



Source: ITU Database.

the CCA's focus is on smart fisheries and the use of technology in the sector to leverage sustainable development.

6.2.1 Digitalisation and the green economy in the Commonwealth

Given the growth impediments typically encountered in the agriculture sector, to leverage growth and development and equitable welfare gains for countries, including Commonwealth small states and LDCs, the application of technology and its integration into agriculture would greatly benefit the sector. The technology involved in smart agriculture ranges from sensing technologies, software applications, communications systems (e.g. cellular, telematics), positioning technologies, hardware and software systems, data analytics solutions and sensing technologies. Smart agriculture (see Figure 6.5) can be applied to a number of areas including fleet management, arable farming, livestock monitoring, indoor farming, fishing, forestry and storage.

The use of different technologies will assist in the improvement of farming systems and ultimately boost agricultural production. With the use of new digital services such as Global Satellite Systems machine guidance, sensors and cloud portals, traditional suppliers will be able to create value and market advantage for their products. The use of new digital solutions through the internet or via smart phones allows access to services which was previously not possible. For example, e-payments using mobile systems in agriculture.

Technology also enables farmers in rural remote areas to access agricultural extension services and provides access to market information on inputs and production prices, connecting to suppliers and receiving online training on farming techniques to boost agricultural productivity and the quality of production. For smallholder farmers, including MSMEs, which operate in unorganised farming sectors, the integration of technology will enable them to organise the sector and solve issues in relation to supply-side constraints. For instance, the use of virtual market places to co-ordinate and bring together traders and farmers in one place is a promising way for isolated farmers in remote areas to connect to markets. This positive spillover also increases farmers' livelihood opportunities and benefits in accessing untapped trade markets.

In agriculture, the control of pests and diseases is a major concern and an issue that also impedes trade in agricultural products. The 'behind the border' sanitary and phytosanitary (biosecurity) measures are extremely important in agriculture. Meeting biosecurity standards is critical in order to export agricultural products to importing member countries. Machine learning technology can support the identification of pests by simply using an application and smart phone camera. It uses farm-specific data to provide insights which farmers can act upon, for example, information on the pace of water in an irrigation system and variable application rate of pesticides.

The utilisation of digital technology can also aid farmers in addressing technical barriers to trade and information asymmetries. The use of digital technology can facilitate traceability, food integrity and assist in certification. Digital technology enables the capacity to transfer data from 'farm to fork' in secure and trusted ways and makes it possible for consumers to access information and act on their preferences. Digital technology can also provide data and information to non-food downstream sectors to which the agriculture sector supplies primary products, including textiles and leather. Such technology also provides tools to enable those sectors to perform life cycle assistance. In other words, it aides in GVC additions in agriculture. Box 6.2 presents some examples from Commonwealth African countries which are leveraging the benefits of digital technologies to boost the green economy.

Use of technology in agriculture in Commonwealth countries

Commonwealth members are at different levels of development. For Commonwealth developing

Box 6.2 Digitalisation and green economy in Tanzania, Kenya and Uganda

In relation to the green economy, Flying Labs, an organisation by We Robots prevalent in Tanzania, Kenya and Uganda, uses robots and drones to collect data on regional servers. These data are then used to improve efficiency and provide access to information across several industries. They work across the agriculture and agro-processing sectors and monitor forest coverage. Kenya is also a hotspot for agricultural apps and the use of digital technologies to support agricultural activity. For instance, Precision Agriculture for Development (PAD), a global non-governmental organisation, is focused on integrating greater precision into digital smallholder advisory extensions with the support of remote sensing data, other data such as weather patterns and soil types, behavioural science techniques (for solution design and testing), and rigorous evaluations (i.e., randomised control trials (RCTs) of resulting advisory outcomes). Satellite imagery analytics are the cornerstone of PAD's precision advisory solutions in Africa. The information is frequently transmitted to farmers through SMS, thereby allowing for greater penetration.

In Uganda, the Ministry of Agriculture and ICT supported E-voucher and Akello Banker apps provide packages of inputs (fertilizers, chemicals and seed) to farmers. E-voucher uses a subsidy system that partially covers the cost of inputs for the growing season. Akello Banker provides discounts to farmers via its dashboard if farmers purchase inputs from its partners, while also getting working capital loans to do so.

Source: https://flyinglabs.org/kenya/ and https://precisionag.org/

countries, the use of technology in the agricultural sector is slowly evolving. It is evident that there are different levels of use of technology in agriculture across the Commonwealth. A number of different applications are used by countries depending on their varied needs and also the stage of development of their agricultural sector. Table 6.2 provides some examples of the technology used by developing Commonwealth members in agriculture.

Challenges in the use of smart agriculture

There still remain major challenges in the adoption of technology in agriculture for Commonwealth members. The agriculture sector in most Commonwealth members depends on traditional methods of farming and most of the farms operate as MSMEs. The adoption of high-end technologies requires capital investment: such technologies could be affordable to large-scale farmers, but MSMEs may face significant financial costs for business remodelling to acquire such technologies.

Furthermore, a lack of capacity – including in relation to human capital and know-how – among farmers to utilise agricultural technology is an impediment. The absence of other key enablers for the use of agricultural technologies, such as access to the internet and broadband connectivity or physical infrastructure such as energy (electricity) in rural areas, can also derail the use of SMART agriculture technology. In addition, the use of data and the lack of regulations on data co-operation and sharing among the various stakeholders can also be an impediment. Most Commonwealth countries do not have regulations for businesses related to digital data sharing and use.

Table 6.2 Examples of the use of technology in agriculture in Commonwealth countries

Country	Application	Description
India	Agropedia	This is a wiki type of website developed as a collaborative project by seven consortium partners. It offers a crop-specific library, blog and chat.
Pakistan	Pakissan	Pakissan.com is the largest agricultural web portal in Pakistan, providing a platform where the entire agri-community can connect with one another, sharing ideas, experiences and information.
Bangladesh	Jigyasha	This is a mobile-based ago-information service in Bangladesh.
India	Kisan Call Centre	The purpose of these call centres is to respond to agricultural and related issues by farmers.
Kenya	Kenya Farmers' Helpline-m Kilimo	Call centre provides agricultural and horticultural information, advice and support. The service primarily targets individual farmers and is accessible to agriculture extension facilities.
India	IFFCO Kisan Sanchar Limited (IKSL)	This is provided by a mobile operator in India partnered with the Indian Farmer Fertilizer Cooperative Ltd. The company provides information on market prices, farming techniques (including dairy and husbandry), weather forecasts and fertiliser availability. It also answers farmers' queries.
Kenya	Corn Variety SMS Service	Kenyan farmers can get an SMS for the recommended corn verities in their division by sending text messages with key word 'MAIZE'.
Uganda	Farmers Friend	Farmers can search for agricultural tips through an SMS-based database covering crop and livestock, pest and disease control information, planting, storage and harvesting tips and weather forecasts.
India	Digital Green	Information is disseminated to small-scale farmers through digital videos. It provides structure to traditional, informal peer-peer training and improves the efficiency of extension programmes.
West Africa	SIBWA – Seeing is Believing West Africa	This project is intended to demonstrate the value of high-resolution imagery (VHRI). The SIBWA team provides farmers with very high-level imagery of their land. The information gives farmers an understanding on soil fertility and accurate land size to plan and manage their crops for the coming growing season.

(*Continued*)

Table 6.2 Examples of the use of technology in agriculture in Commonwealth countries (*Continued*)

Country	Application	Description
Uganda	Community Knowledge Worker	The community knowledge workers can help experts identify disease and pest outbreaks. The system uses both mobile phones and Geographic Information Systems (GIS) technology to link local community knowledge workers networks to scientists, in order to enable them to identify, map, monitor and control banana diseases within farming communities.
Senegal	Xam Marse	This provides information on the prices and availability of fruits, vegetables, meat and poultry at all the country's markets.
Benin	Info Prix	This provides market prices of the 25 most important staple foods via SMS.
Ghana, Benin, Burkina Faso, Cameroon, Ivory Coast, Madagascar, Mali, Togo and Afghanistan	Esoko/Trade Net	This initiative is similar to eBay for agricultural products. With Esoko, market information can be delivered automatically to mobile phones, specified by days, markets and commodities for which to receive prices, or commodities and locations from which one would like to receive offers.
Kenya	Kenya Plant Health Inspectorate (KEPHIS)	The Kenya Plant Health Inspectorate has established a simple SMS service that allows farmers to check whether the seed seller is duly licensed. The farmer texts the dealer's license number to the KEPHIS short code and gets the SMS confirmation on the seed seller's status.
Kenya	Agri Managr	This is a mobile solution for the Kenyan tea industry. It is used to accurately record growers green leaf weights from the buying centre through to the factory. It is useful for small-scale farmers.

Source: Syngenta Foundation (2011).

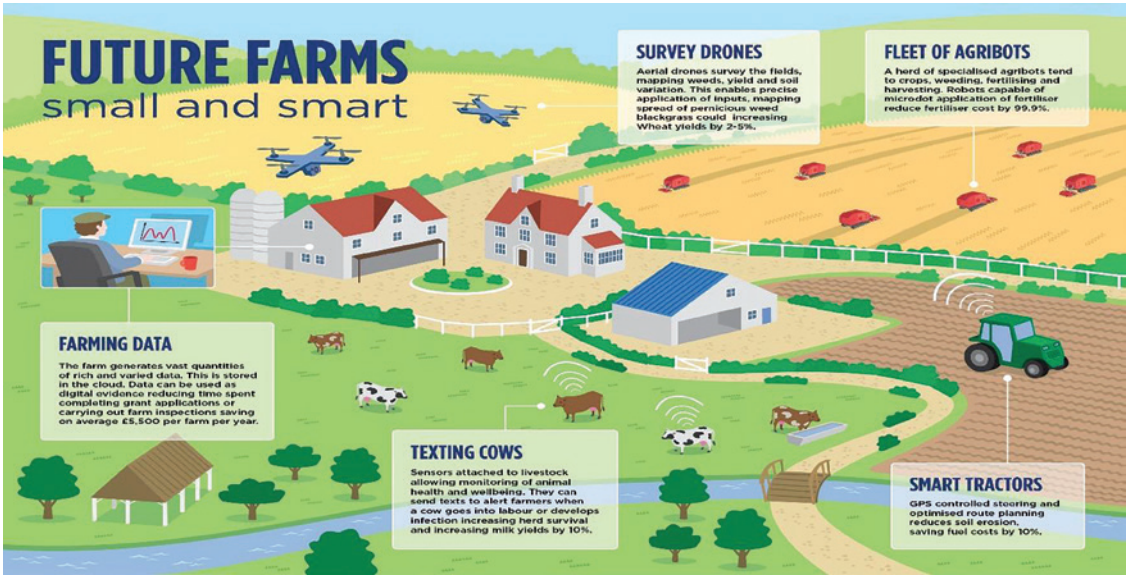
6.2.2 Digitalisation and the blue economy in the Commonwealth

The fisheries sector is of particular importance to the blue economy. 'Fish is a major source of protein for a large portion of the world's population. Fish is a renewable resource however it can perish if not managed properly. For developing and least developed countries, fish is not just for human consumption, it similarly creates jobs and value addition by producing processed products.' (Kumar et al. 2019). The integration of technology in the fisheries sector will enable the sustainable management of fisheries resources for Commonwealth members, while ensuring maximum returns. Smart fisheries are, therefore, an important component of the blue economy which, in turn, is a focus of the CCA. Figure 6.6 provides an example of how satellite technology is used to monitor vessels.

Smart fisheries technology

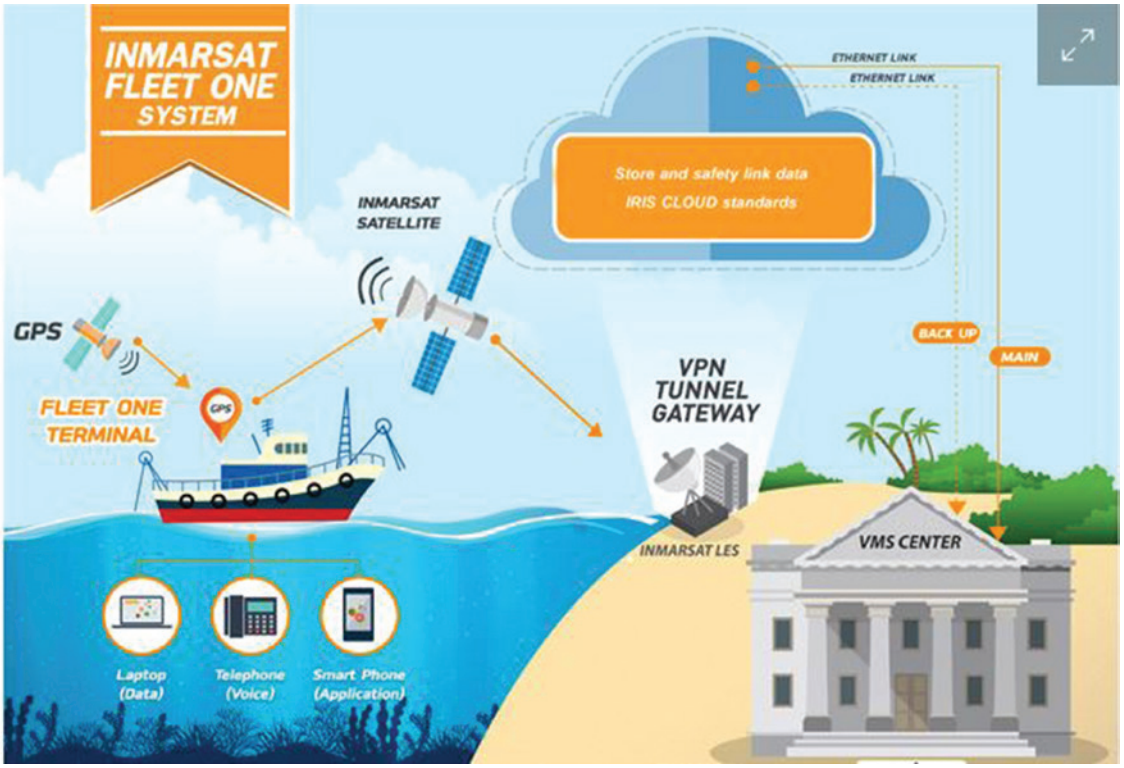
The following are some examples of smart technologies used in the fisheries sector (see Figure 6.7):

Figure 6.6 Illustration of smart agriculture



Source: NESTA (2015).

Figure 6.7 Smart fisheries technology



Source: https://ec.europa.eu/fisheries/sites/fisheries/files/img/body/vessel_monitoring_system_en.jpg.

a. **Vessel monitoring device**: The device collects data on the movement of vessels. This is used to improve management and compliance with government fisheries policies and enables them to collect near real-time observations of fishing vessel positions.

b. **Automatic Identification System (AIS)**: This is a device which was initially developed to prevent vessel collision by Vessel Traffic Services. However, the communication system can be used to detect the speed and location of the vessel and also alert the authorities whether a vessel is operating in a specific area or is in transit.

c. **Electronic log books**: This keeps track of catches (origin and volume) and the type of gear used. It also collects information on species, volume and the area of catches. The system makes it possible to trace catches back to the individual fishing operation, improves knowledge of fisheries and, thus, enhances the efficiency of the sector.

d. **Smartphone for monitoring**: Global Systems Mobile Communication smart phones with vessel monitoring system transceivers can be used to collect data from fishing vessels and transmit this data to satellite operators. The data can be used for monitoring information. Some satellite operators also use software which shows a vessel's location, the estimated time of arrival and its course over 24 hours.

e. **Big Data technologies for monitoring of fisheries**: Big Data can assist in sorting information on vessel traffic intensity and also detect suspicious fishing activity in Marine Protected Areas around the globe.

f. **Blockchain technologies**: These can be used in the seafood industry by combining collaborative technologies to increase the traceability of fish products, targeting illegal, unreported and unregulated (IUU) fishing products mixed within the value chain of legal products. The technology can be used in both marine capture and in aquaculture. However, the issue of data sharing among competitors has been contentious.

g. **Smart weighing system at sea**: This system is used by large fishing vessels at sea. The system monitors the movement of boats at sea and calculates the weight of catches. The data is then sent to fish markets and ports by satellite support to update landing forecasts. Some of these weighing systems also integrate tagging systems on fish boxes to have traceability features.

h. **Drones**: These can be used for surveillance and locating illegal fishing and may be deployed in Marine Protected Areas.

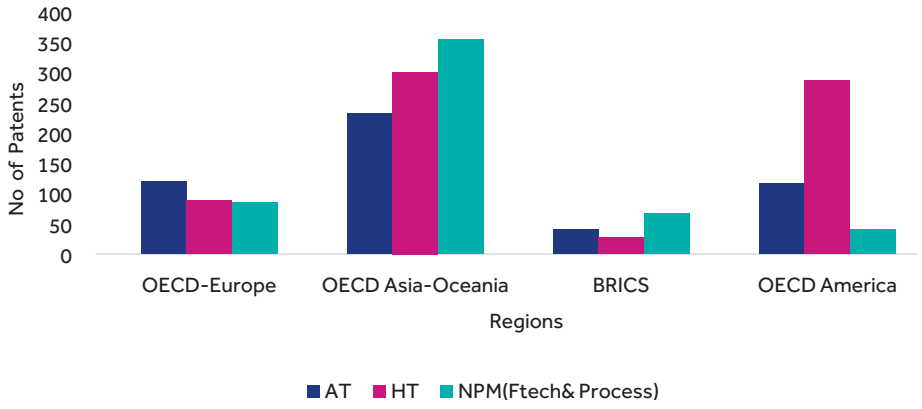
i. **On board survey cameras and electronic monitoring**: Electronic monitoring consists of a closed video or photographic system, integrated with a sensor system that can be used to view changes in fishing activity and to trigger or co-ordinate detailed viewing. The camera and sensor systems do not allow external or manual inputs or manipulation of data. The cameras may identify interactions with bycatch species and are useful when recording bycatches of protected species. The viewed data can also provide a secondary source of information, for example, to validate catch and bycatch log sheets.

Use of technology in fisheries in Commonwealth countries

Figure 6.8 shows the development of fisheries technologies by region, including OECD and BRICS (Brazil, Russia, India, China, South Africa) countries in aquaculture technology (AT), harvesting technology (HT) and new products and markets technology, which includes food technology and processing (NPM & Processing). The OECD Asia–Oceania countries are the top developers of fisheries technology in all three categories. This is followed by OECD America, OECD Europe and the BRICS countries, which include two Commonwealth members (India and South Africa).

It is evident that the development of fisheries technology is available to an extent and countries are utilising such technology and moving towards digitalisation. For example, New Zealand has

Figure 6.8 Fisheries technology development by region



Source: OECD fisheries database.

launched a digital monitoring system which includes electronic catch and reporting, electronic positioning to verify fishing and on-board cameras. The Western Central Pacific Fishing Commission has adopted standards specification procedures for fishing vessel monitoring systems (Kumar 2017). These have become effective in New Zealand, Australia, Tuvalu, Samoa, Tonga, Nauru and Solomon Islands. Some of these countries are small states and members of the Commonwealth. The Indian Ocean Tuna Commission has also adopted the vessel monitoring system programme.

There are already some excellent examples within the Commonwealth of how digital technologies are being successfully used by countries to move towards more sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and a healthier ocean ecosystem, i.e. a blue economy. These developments include formulation of a Blue Lab in the Caribbean (Box 6.3), electronic monitoring of fisheries in Australia (Box 6.4), digitalisation of tourism and fishing in Mauritius (Box 6.5) and the use of digital technologies for disaster management in small states (Box 6.6).

Box 6.3 Caribbean – Blue Lab/IADB Blue-Tech Challenge

A new Accelerator Lab is being hosted within the UN Development Programme (UNDP) Sub-Regional Office for Barbados and the Organisation of Eastern Caribbean States focusing on the blue economy through the construction of a Blue Lab. This Blue Lab is critical to countries like Antigua and Barbuda, Barbados and Dominica, which have maritime space between 200 and 400 times larger than their land space and are heavily reliant on ocean resources to support the tourism and fishing industries, as well as access to imported products through seaport activity.

TEN Habitat, a company from Barbados began implementation of a 'Totally Traceable Tuna' blockchain product in 2019 under the Inter-American Development Bank (IADB) Blue-Tech Challenge accelerator, an element of the Blue Lab. The aim is to use blockchain technology to enhance the tuna supply chain which could, in turn, support the expansion of the fisheries sector by reducing imports and increasing exports.

Sources: Simpson and Small (2019); IDB (2019); FOMIN (2018).

Box 6.4 Electronic monitoring of fisheries in Australia

Australia is another Commonwealth member state investing heavily in digital technologies. Fishing is an important sector within Australia – approximately 3.4 million Australians are regular fishers. Over the last two decades, there has been heavy investment in data collection, and electronic monitoring to provide timely, reliable and independent data that equips fisheries managers and other parties with improved capacity to make well-informed management decisions. Electronic monitoring consists of a sensor system linked to a closed video or photographic system that can be used to view fishing activity (AFMA 2016). The EM system generally consists of a control centre connected to an array of peripheral components including CCTV cameras, a GPS or AIS receiver, gear activity sensors, and a communications transceiver. The sensors transmit real-time positions and record when a change in fishing behaviour occurs, while the camera and sensor system do not allow external or manual inputs, or manipulation of data. The footage is transmitted to the Cloud, where the Australian Fisheries Management Authority (AFMA) collects, stores and analyses the data to provide real time support. This is done within the Tuna and Billfish Fishery and Scalefish and Shark Fishery.

Source: Australian Government Department of Agriculture (2017).

Box 6.5 Mauritius: Digitalisation of tourism and fishing

Digitalisation, both in terms of hardware and software is also pervasive in Mauritius. For instance, there has been significant uptake of ICT, which has permeated into tourism and fishing among small-scale farmers. Mauritius has been an early adopter of mobile technology, including by launching 3G mobile services in 2007 and 4G services in 2012, well ahead of most other African countries (WDR 2016). The use of ICT has allowed for online booking and payment of hotel stays in coastal regions, and the use of GPS navigation by mariners and RFID/barcode tracking of catches by fisheries has allowed for improvement in catchment. Furthermore, the Mauritian government, has extended mobile coverage offshore, which is particularly useful for casual or leisure mariners, as well as for fisheries operating in coastal waters. This could also supplement existing maritime safety services (ibid). Mauritius already has a high level of mobile phone subscribers, with 1.76 million subscribers at the start of 2016, equivalent to a 140 per cent penetration rate (World Bank 2017). The Mauritius Ocean Authority has been pushing for the creation of an Integrated Ocean Database and to set up the Mauritius Ocean Observatory for detailed analysis to support decision-making. The ocean database for Mauritius and the Indian Ocean can be used for modelling the movement of fish, and improving the overall productivity of fishing, while maintaining ocean biodiversity.

Source: World Bank Group (2017); Kenna et al. (2018).

Box 6.6 Blue economy and disaster management in small states

Ocean acidification is occurring at a fast pace. Coral reefs are estimated to be worth approximately US$9.9 trillion and provide circa US$325,000/ha/year to local communities through tourism/recreation, fish habitats and the protection of coastal regions against storm damage, especially in small island states. The Natural Environment Research Council of the UK, through the National Oceanographic Centre, worked with the governments of Belize and Dominica, Papua New Guinea and Fiji in 2017 to install a self-contained, autonomous monitoring system capable of measuring pH (climate level quality), dissolved oxygen, salinity, temperature and nitrate levels. The system includes a satellite telemetry unit for relaying data offshore to a shared server, enabling the measurements to contribute to global observational systems. The autonomous digital systems aim to reduce complexity, as they can be attached to the seabed or other permanent structures and need very little maintenance, while also operating with rechargeable batteries (ibid).

For instance, in Vanuatu, Oxfam International just spent a month testing MakerDAO's stablecoin DAI as a vehicle for helping disaster victims. The pilot was conducted in partnership with Australian technology firm Sempo and ConsenSys, a startup providing Ethereum blockchain solutions to real-world problems. Vanuatu routinely faces a high risk of tsunamis, cyclones and volcanic eruptions, while poverty levels in the country are high. In the pilot, named the UnBlocked Cash, 200 residents in the villages of Pango and Mele Maat on the island of Efate were given tap-and-pay cards, each loaded with about 4,000 vatu ($50) in DAI. The cards could be used for payments across a network of local stores and schools, with 32 vendors in total.

Source: National Oceanography Centre n.d.; CoinDesk 2019.

Challenges to smart fisheries technology

The integration of technology in both agriculture and fisheries is essential for improving productivity and efficiency in these sectors. Both sectors are important for food security, livelihoods and socio-economic development of Commonwealth member countries. The technology applied in both these sectors is similar in nature but varies in its application. The adoption of technology varies across the Commonwealth countries depending on the nature of production and the capacity of countries. The most commonly used technology is mobile phones, which depend on access to high-speed internet. In the fisheries sector, vessel monitoring systems and electronic logbooks are some of the ways in which information is captured. Some of the new technologies can also act as a barrier for fisheries and countries that lack the capacity and the financial resources to fully adopt them. Additionally, barriers to access to new technologies by fishers and fish farmers also have to be addressed. The lack of capacity and know-how for fishers and the industry as a whole to utilise disruptive technologies is a challenge. For MSMEs in aquaculture, the adoption of such technologies comes with a high cost. Most of these sectors employ women who are further marginalised with poor access to technology.

6.2.3 Digitalisation and outcomes for the green and blue economy in the Commonwealth

Maintaining and mitigating are key outcomes for the green and blue economies. Maintaining

Table 6.3 Digital technologies supporting the blue and green economies in the Commonwealth

Digitalisation product name	Sector	Country/ countries	Type of tech	About the product	Expected outcomes	Key actors
Totally Traceable Tuna	Blue economy – tuna value chains	Barbados	Blockchains	Improve traceability, payments and quality of the tuna supply chain in Barbados	Maintain: improving productivity, reducing wastage Mitigate: improving eco-design	IADB, UNDP, Ten Habitat Barbados
Electronic Monitoring	Blue economy – tuna, scale fish and shark	Australia and New Zealand	Big Data, GPS, electronic monitoring with IoT, automatic identification systems	Improve the decision-making of fishery managers and maximise yield without disturbing habitat	Maintain: increasing productivity, de-materialisation of resources, increasing energy efficiency Mitigate: investment in technology; improving eco-design	Tuna and Billfish Fishery and Scalefish and Shark Fishery, Australian Fisheries Management Authority
ICT uptake and Ocean Observatory	Blue economy – fishing	Mauritius	Radio frequency identification, GPS, barcode tracking, internet	Traceability of standards, green communication of best practices via mobile, data collection and dissemination of wave patterns	Maintain: improving productivity, reducing wastage Mitigate: improving eco-design	Mauritius government, World Bank, Ocean Observatory

Autonomous ocean acidification sensor kit	Blue economy – ocean acidification	Belize, Dominica, Papua New Guinea, Fiji	Self-contained, autonomous monitoring system, rechargeable batteries, data servers	Monitor and maintain ocean pH levels, monitor fish activity	Mitigate: improving eco-design and increasing use of green chemistry; improving resource recovery	National Oceanography Centre, UK and Governments of Belize, Dominica, Papua New Guinea and Fiji
UnBlocked Cash	Disaster management	Vanuatu	Blockchains through Ethereum stable coin	Payment of cash for relief during disasters	Mitigate: climate change and risk to livelihoods	Sempo and Ethereum start-up ConsenSys
Flying Labs	Green economy – aerial mapping, decision analysis	Kenya, Uganda, Tanzania	Drones, AI and data analytics	Land mapping, remote sensing	Maintain: improving productivity, reducing wastage Mitigate: improving eco-design	Flying Labs, We Robotics, regional companies
E-Voucher and Akello Banker apps	Green economy – apps	Uganda	Smart phone-based apps, agri- and fin-tech support	Tech support for crop production and sale	Maintain: improving productivity, reducing wastage	Ministry of ICT, Ministry of Agriculture Uganda, Standard Bank, Akello
Precision Agriculture for Development (PAD)	Green economy – farming app	Kenya	SMS-based crop information, fin-tech support	Tech support for good practices, weather information	Maintain: improving productivity, reducing wastage, increasing efficiency	PAD, J-PAL, Acre, World Bank

Source: Authors, compiled from various sources.

means improving resource efficiency and productivity of natural capital; while mitigation involves larger asset-specific investments for prevention or reduction of emissions, wastage and promotion of circularity within the green and blue economies.

Technological advancement has been identified as a key process for maintenance and mitigation in the context of the green and blue economies, especially as it relates to digitalisation through ICT, Big Data analysis, the use of blockchains, IoT and 3D-printing (Halkos 2018). While much research suggests that digitalisation has positive implications on industry and growth (Niehoff and Beier 2018), some question the net effect of increased pollution caused by intensive use of mobile phones, laptops and servers, which contributed almost 3 per cent of total emissions in 2017 (Halkos 2018). This sub-section unpacks the role of digitalisation in mitigation and maintenance of the green and blue economies in Commonwealth countries. The impacts of different digital technologies on the green and blue economies are discussed below and summarised in Table 6.3.

There are also major challenges to the adoption of digital technologies for both the blue and green economies. These include a lack of internet infrastructure, inadequacies in energy supply, limited capacity and industry knowledge, and the high cost of some of these technologies, which creates a barrier to access for MSMEs. For instance, even though new technologies offer the fisheries sector the opportunity to improve fishing practices and, thereby, increase efficiency and income, if these technologies are not used properly, they can further exacerbate illegal, unreported and unregulated fishing or, if mismanaged, increase the overexploitation of resources. Despite these challenges, some Commonwealth member countries are utilising smart technologies in both the agriculture and the fisheries sector. Further exchange of experiences and knowledge between Commonwealth member states in smart agriculture and fisheries is therefore imperative.

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DEVELOPING DIGITAL ECONOMIES – POLICY RECOMMENDATIONS

07

This chapter provides policy recommendations for harnessing the benefits and addressing the challenges associated with digital transformation in the Commonwealth. Informed by the digital co-operation agenda laid out by UNCTAD (2018) and Banga and te Velde (2018), the chapter identifies strategic actions for Commonwealth countries to facilitate development in the digital age. It particularly explores the scope of intra-Commonwealth co-operation.

7.1 Facilitating best practices on internet and broadband digital infrastructure

Chapter 1 highlighted the significant digital divide that exists within the Commonwealth: the average internet penetration in the Commonwealth is 52 per cent (unweighted), with the average internet penetration in low-income Commonwealth being just 18 per cent. Moreover, the digital divide in terms of international bandwidth drastically increased between 2010 and 2017, with international bandwidth being roughly 40 times lower in low-income Commonwealth compared to high-income Commonwealth countries in 2017. Similarly, the proportion of fixed broadband subscriptions per 100 people has increased from 19 per cent to 27 per cent in high-income Commonwealth countries, but with negligible increases in low-income countries.

Developing Commonwealth countries not only need to focus on the quantity of digital infrastructure but also need to put in place policies increasing internet affordability and accessibility, such as those targeting public-access solutions, including free or subsidised access to public/ open areas. This is crucial to bridge digital divides within and between Commonwealth countries. Cross-country collaboration can help. Efforts should continue to support sustainable investment in digital infrastructure in the Commonwealth. Commonwealth members should continue to engage on how to develop digital infrastructure and share experiences, case studies and best practices. This should extend to how countries can improve access to digital infrastructure to bridge digital divides and promote inclusive growth.

Such information sharing and the exchange of best practice in digital infrastructure development within the Commonwealth can be especially beneficial for LICs and small states to enhance their digital infrastructure. Some countries grant mobile virtual network operator (MVNO) licenses to telecom companies. Such MVNOs do not have their own infrastructure, but rather practice 'infrastructure sharing' with already established telecom providers, who have excess network capacity. Each MVNO then sells services, such as data for internet, at its own price. A good example of collaboration in digital infrastructure within the Commonwealth is between India and Kenya. Kenya has granted MVNO licenses to three companies which offer mobile money and data services (The *Kenya Wall Street 2018),* with all three MVNOs depending on the Indian telecom company Airtel's infrastructure.

7.2 Promoting e-commerce and investments in a data-driven economy

Chapter 2 discussed the potential of e-commerce as a new development pathway for developing countries in the Commonwealth, and particularly for the Commonwealth's small state members. However, it also highlighted the current gap in e-commerce activity within the Commonwealth: while B2C e-commerce in the Commonwealth generates roughly US$354 billion in sales annually, representing 3.5 per cent of total Commonwealth GDP, only six Commonwealth countries – the UK, Canada, Australia, India, Singapore and Malaysia – account for 85 per cent of B2C e-commerce sales. Many developing Commonwealth countries, as well as LDCs, are unable to gain much from these new emerging trade portals due to a lack of ICT infrastructure, poor postal and addressing systems, low digital capacities, and a lack of e-commerce-related regulations and infrastructure.

There is a significant digital divide in terms of development of 'data infrastructure' in the Commonwealth – broadly defined as the ability to collect, manage, process and use data. Chapter 2 finds that currently within the Commonwealth only Australia, Canada, New Zealand and the UK have advanced data protection regimes in place, in line with the OECD Guidelines on the Protection of Privacy and Transborder Flows of Personal Data (OECD 2019). These countries have active data legislation across all four categories: a) the presence of a legal framework for electronic transactions/e-signature; b) a legal framework for data protection/privacy online, c) a legal framework for consumer protection when purchasing online; and d) a legal framework for cyber-crime prevention. The majority of the Commonwealth countries with only one piece of legislation in this framework, or no relevant legislation whatsoever, are African member states (such as Mozambique, Lesotho, Nigeria, Tanzania and Malawi) and small states such as PNG, Solomon Islands and Vanuatu.

The development of national e-commerce policies in developing Commonwealth countries that feed into broader e-commerce strategies, alongside efforts to create an enabling environment for digital trade in the Commonwealth, may be effective in closing the digital divide. National e-commerce strategies aim at developing the e-commerce sector in a country by providing the required infrastructure, developing complementary skills and putting in place rules and regulations governing e-commerce.

Promoting e-commerce, and ensuring all Commonwealth countries can engage effectively in e-commerce and digital trade, will require enabling digital infrastructure (e.g. a system of digital payments across borders, digital identity). However, UNCTAD (2018) warns that developing digital infrastructure to facilitate e-commerce can be difficult. Success in widespread use of digital payments requires a strong regulatory framework to supervise commercial banks, financial institutions and other e-money institutions and rules around consumer data protection and competition issues, as well as legal provisions around payment clearing and settlement systems, making international co-operation in digital payments challenging.

7.3 Exploring the use of smart agriculture and fisheries technologies

The Commonwealth can explore the use of smart agriculture and fisheries technologies, such as block chains for product traceability, smart phones for extension services, e-payment systems for online markets and sales, and connecting suppliers and markets. In the fisheries sector, the use of digital technologies such as monitoring control and surveillance, e-log books and electronic observation systems will aid in combatting IUU fishing and also enhance sustainability by preventing overexploitation of fisheries resources. For the Commonwealth, technology transfer and skills development in smart agriculture and fisheries should be prioritised. Such assistance can be provided through various Commonwealth partnerships with member countries or through bilateral donors.

7.4 Sharing experience on e-governance and smart cities within the Commonwealth

Chapter 4 shows that within the Commonwealth, low-income countries and small states lag behind in terms of e-governance and e-participation. Rwanda was found to have a conducive regulatory environment and a high level of digital usage within government, comparable to Australia. However, limited digital infrastructure coupled with low levels of digital penetration – a common challenge among Commonwealth LICs – restricts the economic gains from digitalisation in Rwanda. Furthermore, logistics and trade facilitation performance are especially challenging for relatively small and remote Commonwealth countries.

Exchanging knowledge and experience on digital policies and regulations across the Commonwealth, including in relation to e-government, represents a useful starting point. This can help to facilitate the identification of common approaches and best practice policies and regulations to support digitalisation.

India, in particular, can share its experiences and lessons from launching initiatives under the National e-Governance Plan (Government of India 2018). This is a progressive plan which promotes e-governance in a holistic manner. There are various policy initiatives and projects to develop core and supporting infrastructure. The major core infrastructure components are State Data Centres, State Wide Area Networks, Common Services Centres and middleware gateways, i.e. the National e-Governance Service Delivery Gateway, State e-Governance Service Delivery Gateway, and the Mobile e-Governance Service Delivery Gateway. Important support components include core policies and guidelines on security, human resources, citizen engagement and social media, as well as standards in areas related to metadata and interoperability. New initiatives include G-I cloud, an initiative which will ensure the benefits of cloud computing for e-governance projects. These initiatives involve sustained efforts at multiple levels to improve the delivery of public services to citizens and simplify the process of accessing them.

E-governance has also played an important role in building digital trust in Kenya (AfDB, 2013). In 2007, the Kenyan government embarked on a connectivity and e-services delivery project supported by the World Bank under the Kenya Transparency Communications and Infrastructure Project. The goal was to boost ICT connectivity in Kenya, improve service delivery to citizens, increase the type and quality of information and enhance the government's ability to ensure transparency and support anti-corruption efforts. The targeted areas include support to pension administration, drivers licence registration, land information and registration systems, a high court registrar, public servant's wealth declaration, company registration and improvements in e-procurement. To make the government a leader in ICT applications, e-applications and e-content development, and aggressive promotion of the use of the internet in learning, social and government institutions in all levels of service delivery in the country have been initiated. This has seen digitisation of several government registries and records and the introduction of mobile services to citizens.

In terms of smart transport, the UK has made significant strides. The London Transport System, for instance, exemplifies integrated digital payments through bank cards, mobile phones and Oyster cards for train and bus fares. Among developing countries in the Commonwealth, smart city initiatives are being undertaken by India and Malaysia. These member states can share their experiences with other developing countries as well as provide their expertise to jointly build smart cities in other developing countries. Commonwealth members should continue to discuss ways to encourage and upgrade existing infrastructure using smart technologies to respond to their current and future demands.

7.5 Promoting an enabling policy and regulatory regime

The Commonwealth is a major contributor to science and innovation: it is home to 12 per cent of the world's researchers and accounts for around 10 per cent of global research and development expenditure (Hogben 2018). At the national level, developing Commonwealth countries need to put in place pro-active innovation policies with the aim of facilitating technology transfer and FDI for positive spillovers (Mayer 2018; De Marchi et al. 2017). Singapore, for instance, has made significant progress in developing its science, technology, and innovation capability in the more than 50 years since political independence in 1965. Initially, this effort was based on an evolving national system that emphasised attracting and leveraging multinational companies to transfer increasingly advanced technological operations to

Singapore and developing infrastructure and human resources to absorb and exploit new technologies rapidly. In the 1990s, Singapore started to shift towards a more balanced approach, with increasing emphasis on developing its indigenous R&D and innovation capability. The government started to invest in R&D to develop capabilities, infrastructure, and talent, with 'Research, Innovation, and Enterprise' becoming the theme of Singapore's national system to support the continuum from research to value capture (Lim 2018).

Intellectual property is of key importance to innovation in the digital age. Industrial design rights may cover appearance, but they usually do not extend to functionality and ease of use (WIPO 2017).[1] Moreover, 3D-equipment in the digital age can scan a non-patented physical object and create a computer aided design (CAD) file that will reproduce the object (Osborn 2016). The CAD file can subsequently be used as a starting point for creating objects that have new functionalities or other novel characteristics. Given that digitalisation may bring about entirely new products, as well as enable new functionalities and ways of use, it would appear that existing IPR protection leaves scope for active design-oriented innovation policy in developing countries (Mayer 2018). Moving towards a digital world may also broaden the scope for developing-country firms to engage in cross-licensing arrangements with developed-country firms (ibid). Laws on the use of data and source-code sharing are increasingly integral to digital innovation. Within the domestic economy, it is important to encourage and support domestic open-source code sharing that will allow innovating firms in Commonwealth countries to push forward their inventions into the market, enabling faster roll-out and cost-savings. This can create a 'ripple effect' for innovation and foster spillover effects in other domestic firms and skills development in effectively using these open-source platforms for innovation. Important lessons can be learnt from Australia's experience. The Austrialian Government's Open Source Software Policy (2011) requires all agencies to consider open source software in relation to any approach to market to acquire software. This includes approaches to market for new services but only where the approach specifically details the software (AGIMO 2013).

While it is important for developing countries to attract foreign investment in ICT/IT services, and R&D, it also important to enable these foreign investments to facilitate positive technology and skills spillovers to the host firm. An important enabler of China's growth in the digital economy, for instance, has been requirements for technology transfer on international firms in exchange for market access, including in some cases the transfer of source-code as a condition to sell to the Chinese government or to gain relevant licenses to trade in the country. For small states and LDCs in the Commonwealth that do not have enough market power to negotiate, Commonwealth arrangements can help to foster technology transfers and innovations, if they allow source-code sharing and encourage tailoring of the digital technologies from open-source codes to specific country needs and requirements (UNCTAD 2018).

Effective public–private collaborations at the national level in Commonwealth countries are needed to support the creation of technology and innovation hubs. It is important to focus support on the development of hubs that can provide a manufacturing eco-system in the form of technical support (internet and ICT services), manufacturing maker-space (manufacturing equipment and shared spaces), skills development (training in hardware engineering, coding, digital fabrication, IoT and blockchains), while at the same time acting as incubators (providing support for product formation, conceptualisation of ideas, business development, networking and funding). It is also crucial to ensure that such hubs do not operate in silos, but rather are integrated and linked with the rest of the manufacturing sector. Good examples of government initiatives include susAso Villa Demo Day in Nigeria, while examples of corporate initiatives include EcoBank and GE Garage, both of whom fund and integrate innovations into the economy.

Private sector investment therefore needs to be directed towards well-integrated hubs, with telecom providers offering subsidised internet and digital services to these hubs. More generally, care should be taken, through international regulatory co-operation and the promotion of Good Regulatory Practices, to ensure the regulatory environment in Commonwealth countries promotes, rather than hinders, innovation that supports digital development. Commonwealth governments could offer tax exemptions and incentives for R&D with reduced patent costs, as well as simplified regulatory practices for establishing a business and for obtaining licences. For example, policies launched by the Indian government under Startup India, a flagship initiative under the wider Digital India programme, can provide useful insights into how start-ups, particularly digital start-ups, can be promoted. The Startup India initiative offers tax exemptions, exemptions from inspection requirements (such as those related to the labour environment), roughly 80 per cent reductions in patent costs, easier regulations for businesses and procedures for licenses, easier exit (within 90 days) and funding support. State support to venture funds and incubators is also increasing. For instance, state support in Hyderabad to T-Hub or the Telangana Hub in India anchors the entire Hyderabad start-up eco-system.

A number of initiatives are already in place between Commonwealth members aimed at improving the innovative capacity of developing countries. For instance, Nauru partnered with Australia to improve education by 2015 (Government of Australia 2008). Similarly, Newton Bhabha Fund is a joint UK–India flagship programme supporting UK and Indian scientific research that provides solutions to challenges affecting India's economic development and social welfare (UK India Business Council 2018). In India, the fund is worth £50 million and is championed by both the UK and Indian governments through a ministerial agreement that has identified three priority areas: sustainable cities and rapid urbanisation; public health and well-being; and an energy-water-food nexus, together with capabilities in high-value manufacturing and Big Data. Other examples of UK–India innovation collaboration relevant to the digital economy include operations of the UK company Renishaw, which has built on its already strong presence in India by establishing an additive manufacturing solution centre that allows local Indian companies to access revolutionary 3D-printing equipment without high levels of capital investment. Moreover, Renishaw is adopting an open-source approach to collaborations and is in discussions with a number of Indian Institutes of Technology (IITs) to generate ideas regarding 3D-printing product development and manufacturing. Another example is that of IoT, in which BT is collaborating with the Indian Institute of Technology Delhi and Indraprastha Institute of Information Technology, Delhi to develop new uses of Quantum Key Distribution to identify security breaches in virtual networks.

At a Commonwealth-wide level, the Commonwealth Innovation Hub focuses on displaying and promoting innovation across the Commonwealth (Commonwealth Secretariat 2018). The Innovation Hub offers data and data analysis tools for evidence-based policy and innovative solutions; acts as a laboratory for new ideas, concepts and pilot projects; and works with partners to make innovation a key engine of sustainable development.

7.6 Promoting digital skills development within the Commonwealth

Chapter 3 showed that there is huge variation in the skills-readiness of Commonwealth countries to adapt to changes in the digital economy. In terms of basic digital skills, there are major divides across the Commonwealth: more than 80 per cent of the population in the UK is using the internet to acquire information about goods or services compared to just 14 per cent in Bangladesh. The Commonwealth is faring better in the case of ICT skills for communication and collaboration, with the Commonwealth average exceeding the global average in terms of participating in social networks and using the internet for finding/

applying for a job. However, there is wide variation in country performance across indicators. While 74 per cent of the population in Kenya uses the internet to engage in social networks, only 2 per cent of the population is using the internet for finding or applying for a job. The digital gap within the Commonwealth is also re-enforced in the case of ICT skills for innovation or commerce: more than 70 per cent of the population in the UK and Australia are using the internet for purchasing goods and services, compared to less than 12 per cent in Bangladesh, Botswana and Jamaica. In terms of advanced digital skills, Chapter 3 finds that the share of the population in the UK using the internet for writing a computer program using a specialised computer programming language (8.5%), exceeds the equivalent shares in Botswana (4.8%) and Pakistan (1.5%) by notable margins.

To build future-relevant skills, Commonwealth countries need to boost the development of digital and soft skills under more STEM-focused TVET. In the realm of formal education and TVET, there is an urgent need to incorporate digital literacy and basic ICT skills at the primary and lower-secondary level of education. Beyond increasing access to TVET and changes in the curricula, effective and quality provision of digital and soft skills training may require continuous professional development of TVET trainers, the availability of resources to meet the relatively high cost of teaching STEM, building ICT capacity in education and teacher training, investment into digital infrastructure, and linkages with a dynamic private sector to align skills taught with industry needs. There is also a need to establish standard-setting bodies which can grade digital and soft skills as per different types and levels; define them in terms of outcomes achieved through both formal and non-formal TVET; provide skills certification that is recognised by employers and higher education institutions; and recognise prior learning in digital and soft skills (Banga and te Velde 2019). Efforts should continue within the Commonwealth to deepen understanding and develop the evidence base on policies that enable digital skills development.

Important lessons can be learnt from India's targeting of skills development. In 2015, the Indian National Skill Development Policy was set up to improve societal attitudes towards TVET through awareness campaigns and the introduction of certificates in education. Special focus is also being given to assessing and certifying prior learning and experience, along with short-term training for the unemployed or school/ college dropouts.

However, limitations in budgetary resources may necessitate trade-offs in the prioritisation of digital and soft skills in Commonwealth countries, as well as in the type of digital skills prioritised and their intended recipients. For instance, some countries that are at more advanced stages of digitalisation may focus policy interventions in reorienting secondary and tertiary education towards a more private-sector-led dynamic TVET programme. These countries may prioritise the development of intermediate- (such as, data extraction and analytics) to-advanced digital skills (computer programming) in order to realise the economic value of 'data' to upgrade into higher value-added industries with larger incumbent rivals. Other Commonwealth countries such as Pakistan, where large portions of the population lack basic ICT skills, may focus on strengthening basic digital literacy, while others may take a more hands-off approach by supporting private sector firms in providing skills training.

In addition to the above-mentioned digital co-operation agenda, sharing of best practices within the Commonwealth in dealing with other issues of the digital economy is also important. For instance, while digital technologies and apps can reduce labour informality in many developing Commonwealth countries by connecting labour demand and supply – for instance, Nigeria-based Jumia employs 3,000 people across Africa, but has signed up 100,000 commission-based affiliates who help customers make orders through the platforms – there is rising precarity of work on these online platforms, suggesting re-thinking of social protection laws is required. Similarly, sharing of best practices and laws on competition and taxation

policies in the digital age and innovative financing mechanisms can help developing countries in shaping their policies to maximise the benefits from the digital economy. Digital technologies can also be used to further skills development in the Commonwealth. For instance, the Commonwealth of Learning (CoL) – an intergovernmental organisation established by Commonwealth Heads of Governments to encourage the development and sharing of open learning and distance education knowledge, resources and technologies – can offer online digital skills development courses and training classes to facilitate e-leaning, which will be particularly useful for small states given their remoteness.

7.7 Deepening co-operation for inclusive and sustainable development

Work must continue, through the CCA and other Commonwealth initiatives, to mainstream gender, youth, green and blue economy considerations into Commonwealth co-operation. In the context of inclusive development and digitalization within the Commonwealth, gender disparities exist in favour of males over females in relation to access to, and use of, technology (including the internet) and associated training for the digital era. The gender divide exists at different levels and includes both developed and developing countries in the Commonwealth. While there are limited available data on this issue, it is nevertheless evident that digital empowerment for women and girls in the Commonwealth will result in positive economic empowerment by way of greater engagement of women in online activities such as e-commerce and MSMEs contributing to socio-economic development. Increases in digital skills for women and girls, through education initiatives, can support efforts to close the digital gender gap. In this regard, to further assess the magnitude and impact of digital inclusivity for women, the Commonwealth needs to commission studies to collect primary data on gender gaps in different regions, develop an economic empowerment index and determine the gender parity within countries and across Commonwealth regions.

A strong focus on the green and blue economies is required in the context of sustainable development and digitalisation. Both of these sectors are important for the social and economic development of Commonwealth countries, especially small states. The use of digital technologies can raise yields and productivity and enhance efficiency in these sectors, while also supporting sustainable development initiatives.

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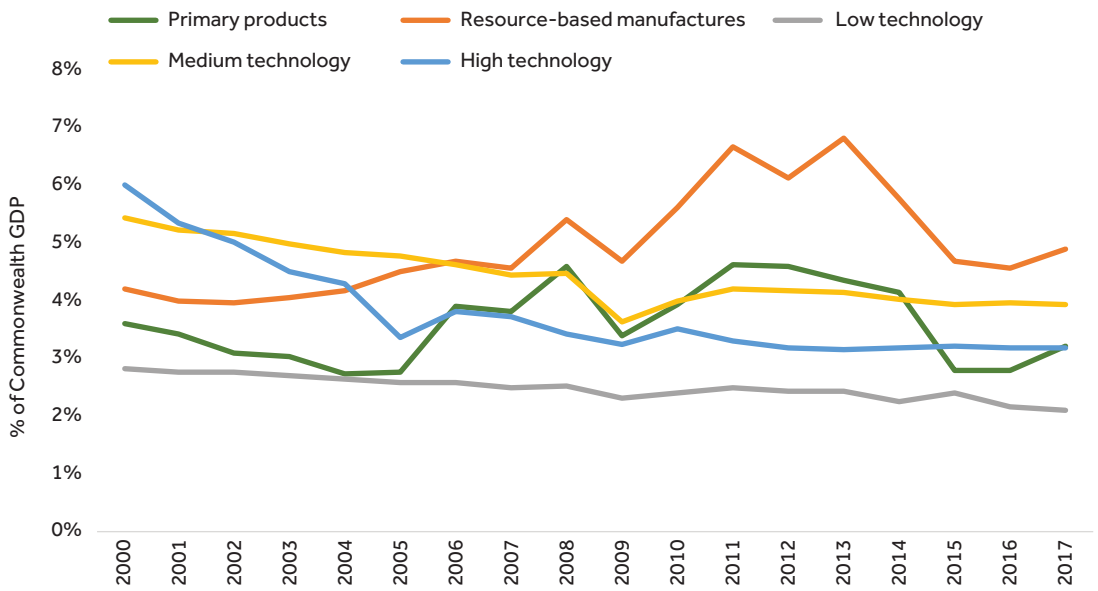
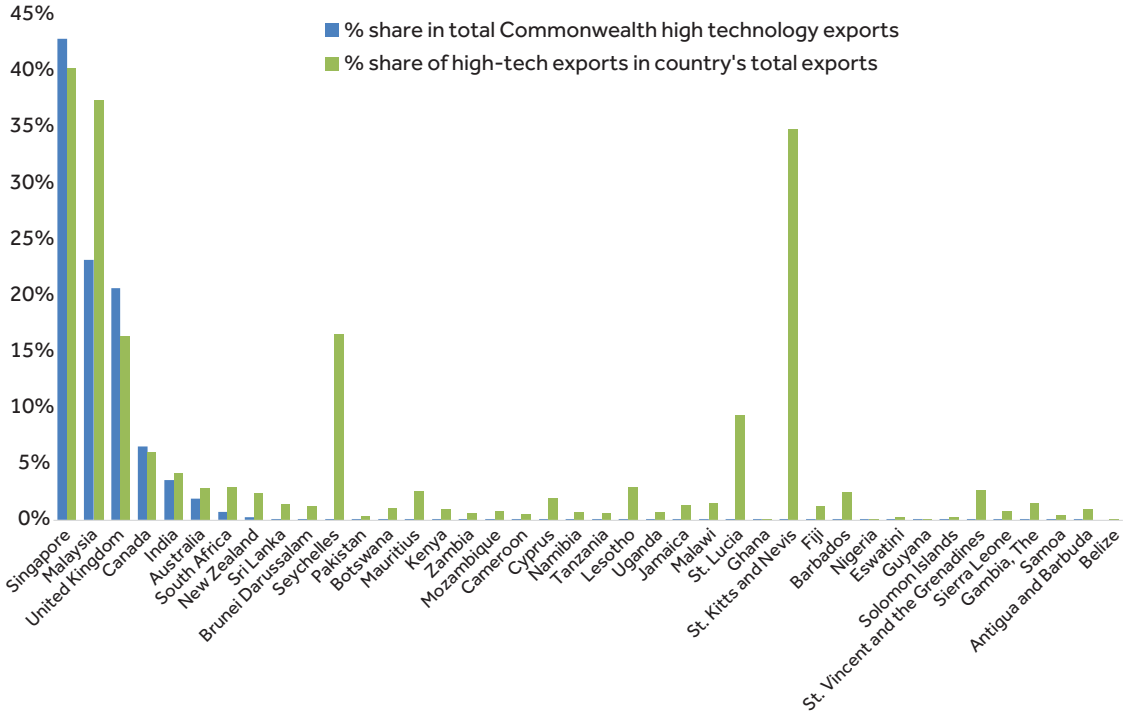
APPENDIX

Figure A1 Commonwealth Exports by Technological Category *(as % of Commonwealth GDP)*



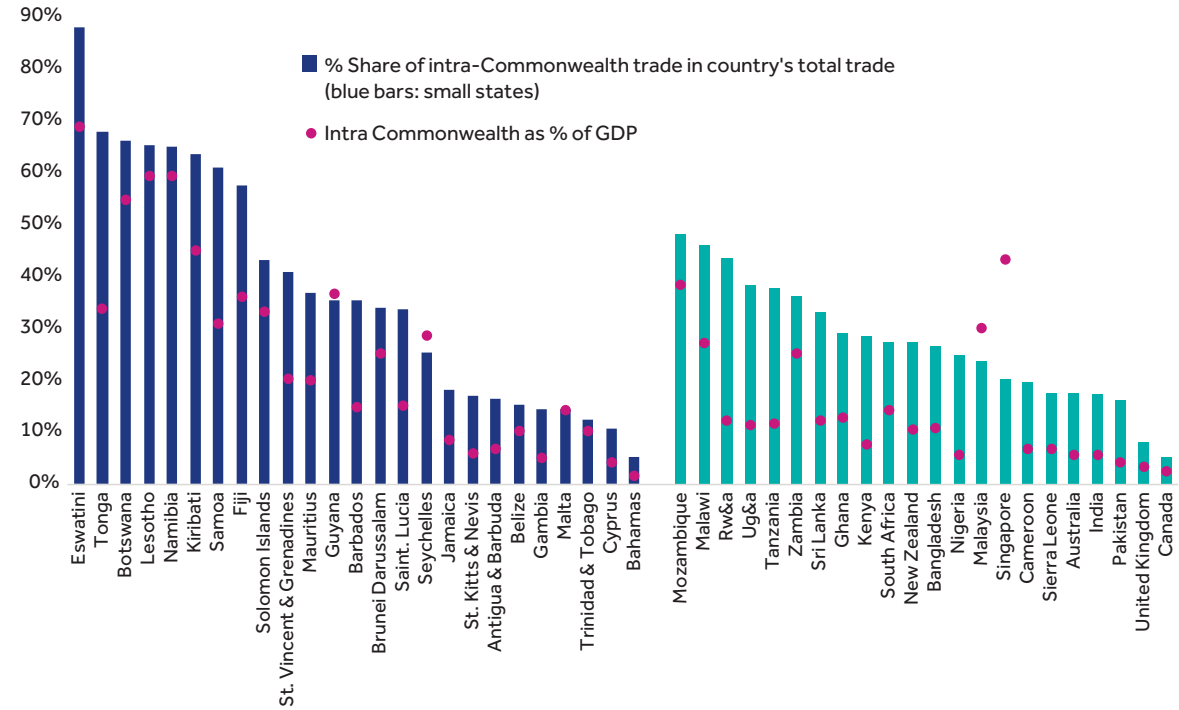
Source: Authors' calculations based on WITS and World Bank data.

Figure A2 Commonwealth High-Technology Exports, 2017



Source: Authors' calculations based on WITS data.

Figure A3 Intra Commonwealth Trade in Goods *(2014-2018 average)*



Source: Authors' calculations based on World Integrated Trade Solution data.

Note: Average excludes Dominica, Grenada, Nauru, Papua New Guinea, Tuvalu, and Vanuatu (nil data).

Table A1 Commonwealth countries' trade in digitalised products through electronic transmissions, 2017

Commonwealth country	Exports of digitalised products to Commonwealth members (US$)	Commonwealth share of total digitalised product exports to the world (%)	Share of digitalised products in total goods exports to the world (%)	Imports of digitalised products from Commonwealth members (US$)	Commonwealth share of total digitalised product imports from the world (%)
Antigua and Barbuda	42,332	43.0	0.2	1,488,709	35.9
Australia	215,105,532	49.1	0.2	340,284,745	22.1
Bahamas*	9,171	0.5	0.4	1,554,960	4.8
Bangladesh*	564,806	59.6	0.0	25,090,016	7.6
Barbados	1,181,623	78.4	0.3	4,248,173	33.0
Belize	125	0.0	0.1	1,591,719	24.6
Botswana	820,854	92.4	0.0	15,327,277	88.4
Brunei Darussalam	156,735	38.7	0.0	8,170,695	77.9
Cameroon	190	0.2	0.0	5,063,657	24.2
Canada	65,864,420	6.3	0.2	148,175,080	4.3
Cyprus	27,595	2.7	0.0	7,814,975	22.5
Dominica					
eSwatini	11,055,730	99.9	0.6	11,494,802	68.2
Fiji	2,024,921	96.5	0.2	12,000,617	83.2
Gambia	68,826	99.8	0.3	479,707	40.1
Ghana	6,741,272	71.6	0.1	267,887,497	93.6
Grenada					
Guyana	67,025	66.4	0.0	4,716,039	53.4
India	118,906,280	41.1	0.1	96,980,476	17.5
Jamaica	325,289	53.1	0.0	3,465,382	8.7

(*Continued*)

Table A1 Commonwealth countries' trade in digitalised products through electronic transmissions, 2017 (*Continued*)

Commonwealth country	Exports of digitalised products to Commonwealth members (US$)	Commonwealth share of total digitalised product exports to the world (%)	Share of digitalised products in total goods exports to the world (%)	Imports of digitalised products from Commonwealth members (US$)	Commonwealth share of total digitalised product imports from the world (%)
Kenya	21,947,586	36.0	1.1	18,089,598	21.4
Kiribati **	1,093	99.3	0.0	480,229	75.4
Lesotho	234,804	76.1	0.0	10,732,514	66.2
Malawi	151,138	24.4	0.1	173,028,950	83.7
Malaysia	175,713,874	32.1	0.3	106,864,333	25.8
Malta **	63,661,940	60.4	2.6	19,523,150	68.9
Mauritius	10,630,098	48.8	1.0	8,342,583	26.8
Mozambique	55,213,420	100.0	1.2	12,700,152	36.9
Namibia	1,680,680	87.3	0.0	32,558,012	84.5
Nauru					
New Zealand	39,474,243	82.8	0.1	194,944,843	55.2
Nigeria	–	–	–	48,910,829	41.0
Pakistan	1,483,778	31.2	0.0	25,380,999	28.5
Papua New Guinea					
Rwanda **	95,179	44.8	0.0	8,575,771	67.7
Samoa	23,770	57.2	0.1	6,265,501	91.0
Seychelles	16,954	61.6	0.0	4,289,728	70.5
Sierra Leone	7,266	15.0	0.0	1,834,746	35.5
Singapore	309,084,531	27.0	0.3	202,940,605	20.9
Solomon Islands	404	99.8	0.0	9,188,435	94.8
South Africa	82,633,012	72.8	0.1	288,022,019	43.4

(*Continued*)

Table A1 Commonwealth countries' trade in digitalised products through electronic transmissions, 2017 (*Continued*)

Commonwealth country	Exports of digitalised products to Commonwealth members (US$)	Commonwealth share of total digitalised product exports to the world (%)	Share of digitalised products in total goods exports to the world (%)	Imports of digitalised products from Commonwealth members (US$)	Commonwealth share of total digitalised product imports from the world (%)
Sri Lanka	16,051,361	32.5	0.4	23,116,774	36.1
St. Kitts and Nevis	2,371,386	58.8	12.1	1,071,340	34.1
St. Lucia	74,433	54.5	0.1	2,339,032	47.1
St. Vincent and the Grenadines	35,248	94.9	0.1	1,831,880	54.1
Tonga					
Trinidad and Tobago *	8,486,285	95.5	0.1	8,938,698	29.7
Tuvalu					
Uganda	230,449	15.1	0.1	12,600,385	49.5
United Kingdom	761,064,511	16.5	1.0	185,807,885	4.0
United Republic of Tanzania	1,319,102	79.1	0.0	12,429,830	48.3
Vanuatu					
Zambia	116,269,621	96.2	3.0	37,397,876	41.4

Source: Commonwealth Secretariat calculations using UN Comtrade data.

Notes: * 2015 data; ** 2016 data. Digitalised products traded through electronic transmissions are those included in the following HS categories: 37 (films), 49 (printed matter), 8524 (sounds, media and software) and 9504 (videogames). Data not available for Dominica, Grenada, Papau New Guinea, Tonga, Tuvalu and Vanuatu.

Table A2 Fixed effects regression results; dependent variable log (manufacturing labour productivity), 1991–2013

Sample	All	All	All	All	All	Commonwealth only
VARIABLES	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
L. log real wage	0.165**	0.141**	0.208***	0.187***	0.133**	0.221*
	(0.0650)	(0.0602)	(0.0523)	(0.0606)	(0.0577)	(0.109)
Log IPR	0.0530*	0.0139	0.0245	0.0154	–0.118*	–0.112*
	(0.0292)	(0.0245)	(0.0268)	(0.0255)	(0.0649)	(0.0569)
Time trend	0.0203**	0.0198**	0.0235	0.0342	0.0161	
	(0.00834)	(0.00798)	(0.0153)	(0.0207)	(0.0160)	
Non-CW#log IPR		0.0556**	0.0491*	0.0505*		
		(0.0277)	(0.0277)	(0.0279)		
Log K/L ratio			–0.0420	–0.0594	0.0461	0.222**
			(0.160)	(0.172)	(0.131)	(0.0937)
HCI				–0.453	–0.558	0.197
				(0.537)	(0.523)	(0.407)
Import share				0.00287	0.00383	–0.00177
				(0.0027)	(0.0025)	(0.00193)
HCI #log IPR					0.088**	0.0741*
					(0.0342)	(0.0366)
GFCF_gdp						0.00644
						(0.00399)
Constant	7.785***	7.864***	8.116***	9.132***	8.608***	5.051***
	(0.231)	(0.215)	(1.512)	(2.220)	(1.799)	(0.861)
Observations	728	728	641	598	598	167
R-squared	0.303	0.317	0.348	0.314	0.347	0.591
Number countries	71	71	59	54	54	15

Notes: Only low- and middle-income countries are included in analysis. HCI is based on years of schooling and returns to education from Penn World Tables, 9.0. 'Non-CW' is a dummy variable for non-Commonwealth countries. 'GFCF_gdp' is gross fixed capital formation as a share in GDP.