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

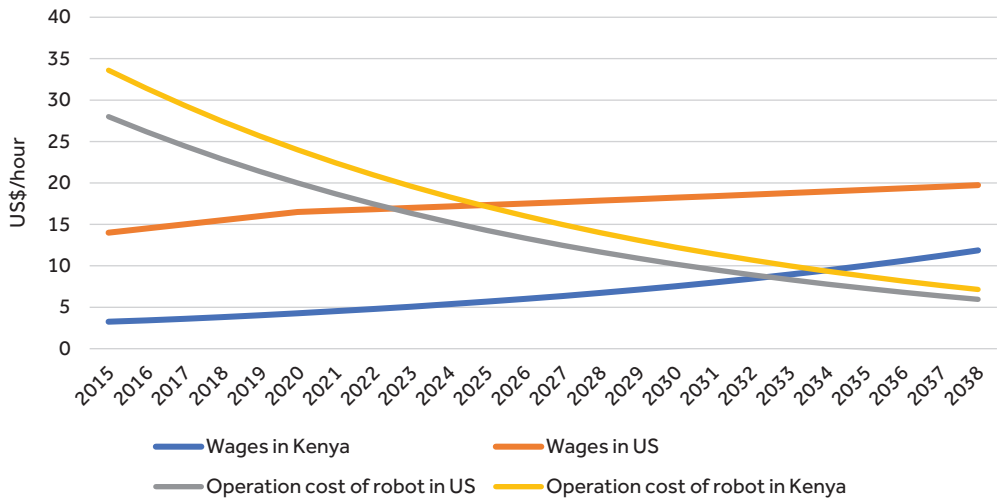
(Banga and te Velde 2018a); slower decline in the relative price of investment as compared to developed countries (Das and Hilgenstock 2018); and low elasticity of factor substitution and rigidity in the labour market (Dao et al. 2017).

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

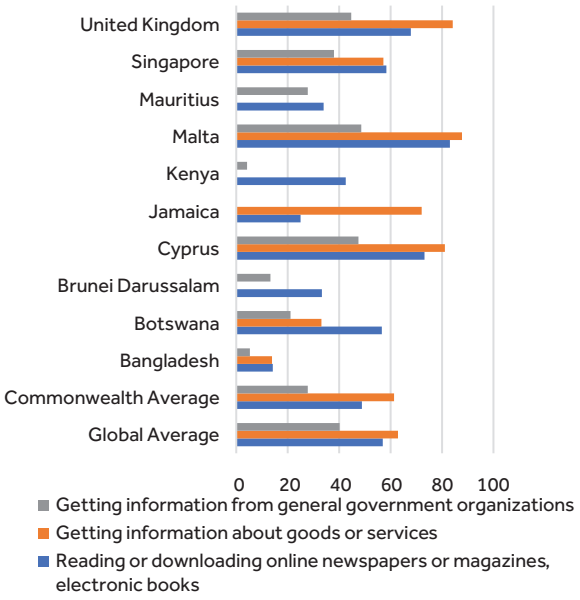
Figure 3.2 Future skill needs

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

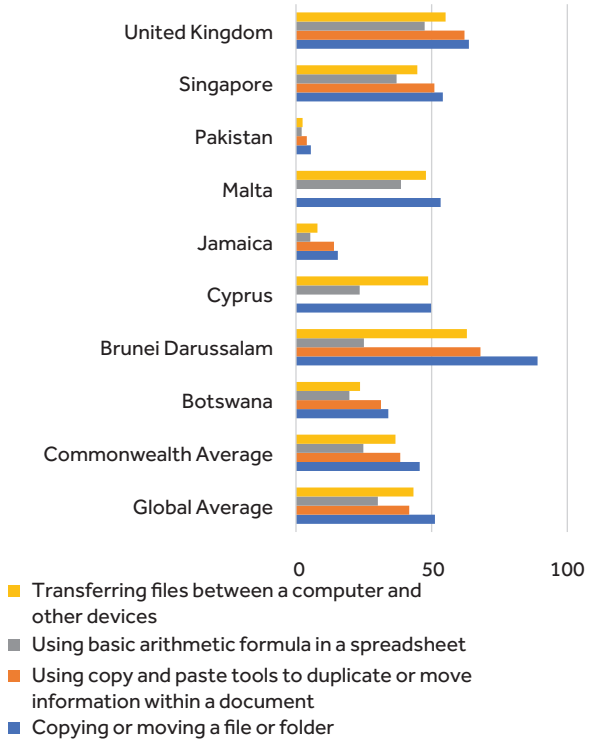
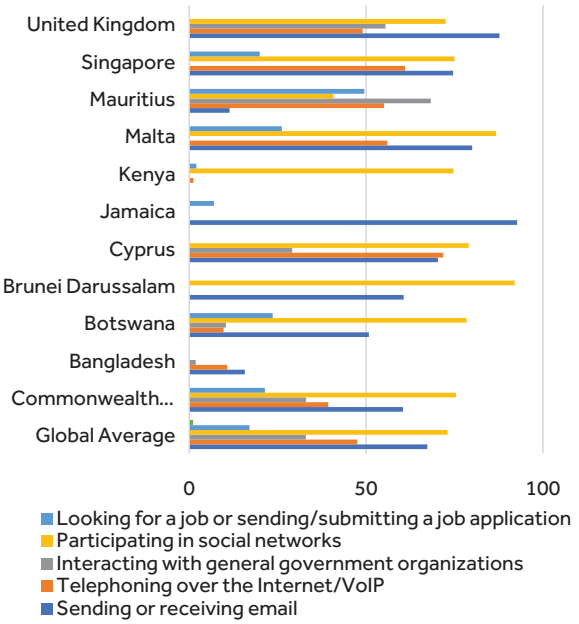


Figure 3.5 ICT for communication



Source: ITU (2018).

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

Figure 3.6 ICT innovation/commerce

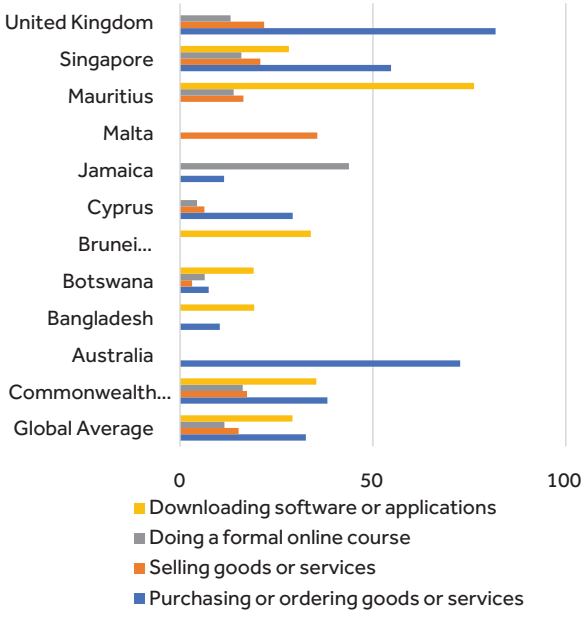
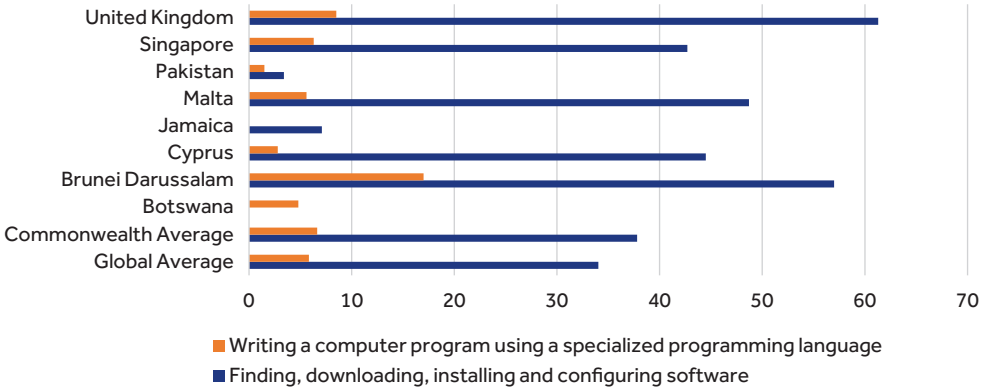


Figure 3.7 ICT skills for analytical thinking



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.

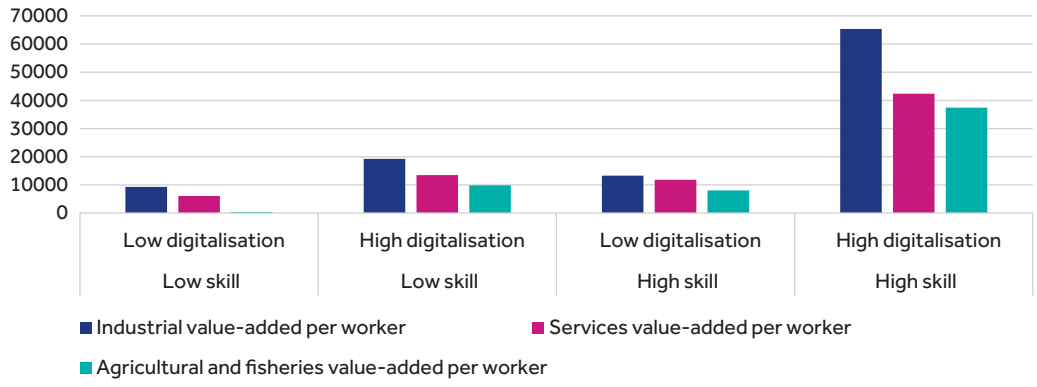
3.4 Closing the digital skills gap

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.

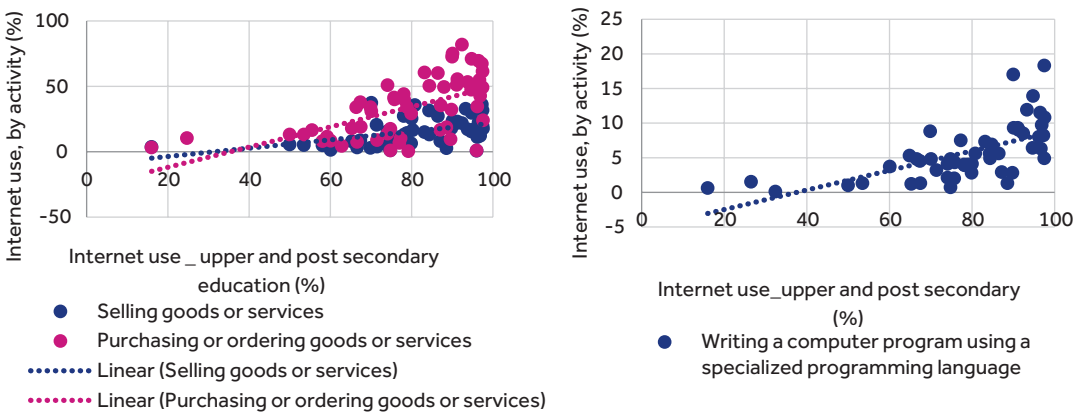
Skills development can therefore increase the productivity gains from digitalisation for Commonwealth countries. To build future-relevant skills, Commonwealth countries need to boost the provision of digital and soft skills under a more STEM (science, technology, engineering, mathematics)-focused technical 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.