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Digital Skills *Insights*
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Foreword

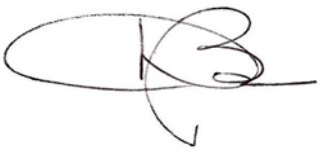
More than a year after the onset of the COVID-19 pandemic, the demand for digital skills development and better connectivity is greater than ever before. Re-building a safe, healthy and efficient working and social environment is a challenge that will require a collective global effort. Lack of digital skills and access to digital networks are barriers that not only slow down this joint effort, but exacerbate an already existing and stark digital divide.

The fifth edition of Digital Skills *Insights* offers a timely and pertinent collection of articles that tackle these issues, while examining the future digital skills ecosystem and the importance of digital skills in a world shaped by the pandemic. The 2021 edition features eight articles written by international experts, who provide original perspectives on several topics. The focus of the articles can be classified into two broad categories.

The first set of articles offer a thought-provoking discussion on the different types of digital skills required in the context of the COVID-19 period, as well as those anticipated for a post-pandemic period. It also features an article that looks at humanitarian assistance and how digital skills training can help communities affected by crisis. The discussion in this set is enriched by an analysis of what existing digital skills frameworks offer and what skills acquisition would look like in a post-pandemic world.

The second set of articles presents concrete examples of digital skills policies, programs and initiatives from countries across different regions and shares lessons learnt. These articles take the reader on a journey which covers the learning experience of indigenous communities in Latin America, the interdependency of digital inclusion and digital literacy in India, the digital development priorities in the State of Qatar, and the most effective training methods to design student-centered distance learning classes in Mexico.

It is clear that in this period of continued uncertainty, a global collective effort is required to ensure that everyone everywhere has the digital skills and access to digital networks needed to adjust to a 'new normal', and come out stronger. I believe this publication will inspire and enrich ongoing discussions of what the 'new normal' means for the future of digital skills development.



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About this publication

"Digital Skills *Insights"* is an online publication which puts together scholarly articles with a focus on the impact of digital transformation on capacity and skills development. It covers a wide range of topics that may affect people and their skills development. The publication seeks to provide a body of knowledge that will facilitate academic research and innovation exploring the linkages between emerging technologies and capacity development. It features current and new thinking that will contribute to informed policy debates and decisions among policymakers and regulators, as well as help the private sector to anticipate and plan for human capital requirements and skills development in order to remain competitive in a rapidly changing digital environment. The publication, which is released annually, features contributions from academic scholars and other researchers from all over the world. The purpose of the articles is to share views and scholarly opinions that will stimulate debate among its readers. Articles published are subjected to a quality assurance process through a peer review exercise. This publication is available on the ITU Academy platform. The published articles will also be subject to discussion at forums organized from time to time for members of ITU. Those interested in submitting an article for consideration in future editions of "Digital Skills *Insights*" should contact the ITU Capacity and Digital Skills Development Division at hcbmail@itu.int.

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Introduction

By Susan Teltscher

Digital skills in the context of the ongoing pandemic

At the time of publishing this new edition of Digital Skills *Insights*, the COVID-19 pandemic will have disrupted the world for close to two years. In the 2020 edition, the research, policies and initiatives presented in the articles made an early attempt to consider the impact of the pandemic on digital skills and capacity development. Since then, almost every article, policy or programme published or launched on the topic has made reference to COVID-19. Indeed, there has been a surge in new studies and projects in the field of digital development because of the pandemic. With many activities moving online and people confined to home, good Internet connectivity became a top priority in countries around the globe. Furthermore, gaps in the availability of high-speed Internet infrastructure were revealed, prompting policymakers, private companies and other stakeholders to take action to close them.

However, digital connectivity was not the only challenge that emerged during the pandemic. Moving activities online requires a digitally skilled population. The pandemic prompted a boom in the supply and use of digital tools, platforms, products and services (and companies providing such technologies and services emerged as major beneficiaries of the crisis). That in turn required workers and citizens to develop their skills in the use of digital technologies.

A surge in digital skills projects and initiatives

The past year has thus seen a steep increase in the amount of attention paid to the topic of digital skills – from researchers taking a more analytical and empirical approach (looking at digital skills requirements and digital skills gaps), to policymakers and providers of training programmes and skills development initiatives taking a practical approach (launching new programmes). Digital skills or capacities are now seen as a key enabler of countries' digital transition and indispensable for its success. Strengthening digital skills has therefore become an integral part of national digital transformation strategies.

In light of this, the international community reinforced its focus on digital skills through the launch of partnerships, reports and other initiatives. Some examples are listed below.

- The United Nations Educational, Scientific and Cultural Organization (UNESCO) Global Education Coalition was established in March 2020. Its objective is to mobilize support to ensure the continuity of learning around the world during the pandemic, and it serves as a platform for collaboration and exchange for this purpose. This multi-stakeholder partnership brings together 175 institutions working in more than 100 countries on the topics of connectivity, gender and teachers.[1]
- A report launched by the United Nations Children's Fund (UNICEF) and the International Telecommunication Union (ITU) in December 2020 revealed that two thirds of school-age children (or 1.3 billion children aged 3–17 years old) have no Internet access at home. Because of school closures during the COVID-19 pandemic, these children were effectively left without education (UNICEF and ITU, 2020).
- At the end of 2020, the European Union published a post-COVID-19 Digital Education Action Plan 2021–2027. The plan defines guiding principles and strategic priorities for digital education and includes actions that will be undertaken to address

and bridge the digital skills gap in the European Union.[2]

- A new study released by the International Finance Corporation (IFC) found that the high demand for digital skills will create 57 million jobs over the next decade and will result in the creation of about 114 million training opportunities across the five African countries they studied (IFC, 2021). This amounts to an estimated USD 11.1 billon in training opportunities through 2030, half of which are in reskilling existing workers and the other half in training the new workforce.
- The ITU–Cisco Digital Transformation Centre Initiative completed its pilot phase, in which more than 100,000 citizens in local communities and from marginalized groups received basic and intermediate-level digital skills training through nine Digital Transformation Centres in Africa, Asia-Pacific and Latin America. The second phase of the Initiative was launched in July 2021 and will focus on expanding and scaling the network.[3]

Several new digital skills training initiatives have also been initiated at the global level by large private sector players since the pandemic started. The following examples, which are not meant to be exhaustive, illustrate these trends.

- In 2020, Microsoft launched a global skills initiative to bring more digital skills to 25 million people worldwide. Through the initiative, it provides free access to content in LinkedIn Learning, Microsoft Learn and the GitHub Learning Lab. In March 2021, Microsoft announced that it had succeeded in helping 30 million people gain access to digital skills. The courses offered cover a wide spectrum and include topics such as customer service, project management and data analysis.[4]
- In December 2020, Amazon announced that it will help train 29 million people by 2025 through Amazon Web Services by offering free cloud computing skills training. Training will be provided through existing Amazon Web Services programmes as well as the development of new courses.[5]
- Huawei's Information and Communication Technology (ICT) Academy, working in collaboration with local universities, moved many of its classes online as a response to the pandemic. This has enabled students around the world to be trained in core ICT skills. In addition, Huawei launched the Learn ON programme to work with Huawei ICT Academies worldwide. The programme provides high-quality resources, builds open platforms and offers necessary financial support.[6]
- The World Economic Forum included the topic of digital skills as part of the Davos Agenda 2021. They highlighted, among other points, that for organizations to fully benefit from technology they must develop a digitally skilled workforce. They argue that in the future economy, human talent will become the most important factor of production. They identify four essentials to addressing the skills gap: equal access to education, training, inclusive Internet access and committed leaders.[7]
- In July 2021, Facebook announced a partnership with Coursera to offer two new career certificate courses focusing on market analytics and software development. This will build on its existing courses on digital marketing and a digital skills course for minority communities in the United States already offered with Coursera, which were launched in 2020.[8]

These are but a few examples that illustrate the increased attention that is directed towards skills and education in a post-COVID scenario. In addition to these global initiatives and projects, many country-level studies and projects were carried out looking at the impact of COVID-19 on learning and education. Several of the articles included in this publication make reference to, or provide further details on, such studies, programmes and initiatives.

Digital skills concepts and frameworks

An important feature of the debates around digital skills development, and the related skills requirements, has been the discussions on a common understanding of the concept of digital skills and which competencies exactly need to be strengthened as countries go through the digital transformation. There is plenty of literature on the classification and frameworks related to digital skills and how they can be used in the policy process. Some of

the research has been presented and discussed in previous editions of this publication. Additional studies have emerged over the past year, and the 2021 edition also features several articles that examine the conceptual approaches to digital skills.

ITU has taken a more practical approach towards the concept of digital skills and identified three levels of skills, with a focus on technical competencies or proficiencies (ITU, 2018). Basic skills refer to foundational skills for performing basic tasks and cover hardware, software and basic online operations. Intermediate skills refer to skills that enable the use of technologies in more meaningful and beneficial ways. They include skills needed to perform work-related functions and they expand to account for changes in technology. Advanced digital skills are needed by specialists in ICT professions such as computer programming and network management. They include skills related to emerging technologies, such as artificial intelligence, big data, cybersecurity, the Internet of Things and app development, and are acquired through advanced formal education.

Others have taken a broader approach and include – in addition to technical skills – soft skills and other competencies required to succeed in the digital economy. The Broadband Commission (2017) has identified several cognitive and non-cognitive skills (such as interpersonal and communication skills) as part of the digital skills spectrum. Such concepts take a more holistic view and look at key skills required in the digital economy and society more generally rather than just technical competencies.

There are several global digital skills frameworks available. Those most commonly applied are the one developed by the European Commission (Digital Competence Framework for Citizens – DigComp) and the UNESCO Digital Literacy Global Framework. The DigComp framework, which was presented in Digital Skills *Insights* 2019, includes five competency areas – including technical and non-technical competencies – and specifies the knowledge, skills and attitudes required for each area. The Digital Literacy Global Framework supplements the DigComp framework by adding two competency areas in order to make the framework more applicable in a developing country context.

A recent World Bank study (Melhem & Jacobsen, 2021) takes yet another approach and uses the concept of 'digital capabilities' to refer to an organization's ability to leverage staff resources to achieve its goals. Digital capabilities include not only digital skills but also digital capabilities in leadership and digital culture, all of which are necessary to successfully implement a digital transformation strategy. The study authors developed a digital capabilities framework around these attributes that countries can use and adapt in the planning of their digital transformation strategies.

In light of the multitude of available concepts and frameworks, what should policymakers wishing to strengthen digital skills in their countries focus on? What are the most suitable approaches towards developing digital literacy and skills at the national level? Clearly, there is no one-size-fits-all approach since each country is different in terms of its digital skills requirements, digital development, economic development, skills development, etc. As usual, general frameworks provide a point of departure and guidance.

Therefore, the responsible policymakers in a country are best advised to develop a digital skills framework adapted to their country's specific situation, which they can then apply in the policymaking process. A good starting point is to review the internationally available frameworks, select one or several that are most relevant to the country's context, and adapt them to cater to national requirements.

As a second step, countries should consider carrying out national skills assessments. This will help them take stock and identify the existing supply of and demand for digital skills, as well as existing skills gaps. It is also important to find out what the future demand for digital skills will be. The results of such assessments and analyses will be crucial for

designing the right digital skills strategies, policies and programmes. The national framework developed earlier will guide the skills assessment process and help identify the core sectors and competencies that need to be assessed.

The ITU *Digital Skills Assessment Guidebook* published in 2020 can be a useful tool for countries embarking on such an exercise. It offers a step-by-step approach to determining the digital skills gap and carrying out skills anticipation exercises. It also features the most important global digital skills frameworks that could be used as a basis to develop a national skills framework.

Overview of the publication

This year's edition of Digital Skills *Insights* features a number of articles that reflect the abovementioned recent developments and debates. The eight articles in the publication can be broadly grouped into two main sets. The first set discusses the different types of digital skills required from a more academic perspective, in particular in the context of the pandemic and post-pandemic period, as countries accelerate their move towards the digital transition. It also features an article that looks at a specific development sector – humanitarian assistance – and demonstrates how digital skills training can help communities affected by crisis. The second set of articles presents concrete examples, from countries in different regions, of digital skills initiatives, policies and programmes; and provides insights on lessons learned and recommendations on the way forward.

Digital skills in a post-pandemic environment

The article by **Travis Heneveld** explores how the COVID-19 pandemic has affected digital skills development from the perspective of distance learning and Internet connectivity. He argues that the economic and social disruptions caused by the pandemic highlight the importance of last mile connectivity (LMC) for the development of digital skills. During the pandemic, everyone – from government and public health institutions to schools and rural farmers – has had to rely more than ever on affordable and resilient broadband and learn new digital skills to make use of the technologies.

The author uses the concept of connectivism (introduced by Downes in 2005), which refers to learning techniques – for example, massive open online courses – that use Internet technologies such as web browsers, email, social networks and others. He then relates connectivism to LMC, highlighting how the pandemic has intensified the importance of quality broadband access and exposed the digital skills gap even further.

Reviewing a number of recent digital skills initiatives, the author illustrates through concrete examples how they target digital skills development across different target areas and groups, including education, out-of-school youth, adult reskilling, underrepresented populations and the business sector. The shift towards digitization and skills development across these sectors and target groups, reinforced by the pandemic, requires reliable and affordable connectivity.

The author presents and discusses recent initiatives launched to respond to capacity and skills needs. For example, increased funding has been provided to improve data and monitoring for better evidence and to identify solutions; online learning content provided by global, regional and national providers from both public and private sectors increased significantly over the past year; and more partnerships and networks were established or reinforced to join forces among stakeholders in the field of digital skills and connectivity to scale activities and expand outreach and impact. He also identifies gaps, such as the need for communication service providers to complement their infrastructure deployment with initiatives that make content more accessible and drive digital skills uptake.

The article concludes by calling on governments and policymakers to build on

ongoing digital skills initiatives and ensure that Internet connectivity is an integral part of the 'digital skills paradigm', and vice versa. Digital skills initiatives in areas such as agriculture, business, education, health, financial inclusion and e-government applications need to consider and address LMC in order to be effective.

The article by **Gedeon Hakizimana** focuses on an analysis of the different skill sets at different proficiency levels that are required across countries in light of the digital transformation. He points to the striking gap and short supply of digital skills in developing countries, particularly sub-Saharan Africa, and highlights the urgent need for countries to develop and adapt digital skills frameworks tailored to their specific needs. He argues that the successful development of digital skills requires active public–private partnerships and the involvement of all stakeholders, including policymakers, educational systems authorities, academia, the ICT industry, funding bodies and citizens in general.

The author analyses three types of skill sets: basic, intermediate and advanced digital skills. Basic digital skills can be subdivided into life skills and work skills. Intermediate digital skills are required by a wide range of job profiles in both developed and developing countries and are now key to access employment. Advanced digital skills are required by specialist ICT occupations and are in high demand by the public and business sectors alike. These skills encompass e-business skills and highly specialized computing and emerging technology skills, such as data scientists, Internet of Things engineers, and artificial intelligence and machine learning specialists. The author also stresses the importance of developing ordinary literacy and numeracy proficiency as a foundation for acquiring digital skills and the need to address those, especially in developing countries.

He points to the prevalent digital skills shortage – even in developed countries – and the skills gap between developed and developing countries. This is creating a second digital divide, in addition to the digital infrastructure and access divide. In sub-Saharan Africa, most demand will be for basic and intermediate digital skills (in all economic sectors) and will surge in the near future.

The author recommends that countries put in place well-organized digital skills frameworks in order to address the skills gaps. Different skills frameworks that can accommodate the different levels of skills have already been developed at the global level. Countries should use and adapt those frameworks to their individual context for maximum output.

He concludes with an appeal to turn challenges into opportunities. The window is open for job seekers to acquire digital skills and pick the best ICT jobs. There are huge opportunities for investments in training and education to cater to skills demand. For example, based on IFC figures, it is estimated that over the next decade, 114 million training opportunities in five African countries could emerge, providing for the creation of 57 million jobs. Success will require all stakeholders to synchronize their actions and create the necessary enabling environment. This includes urgent reform of training programmes to address the demand for a skilled workforce necessary for the economic development of countries.

The article by **Emmanuel C. Ogu** looks at post-pandemic learning and skills acquisition. The author highlights challenges, elaborates on the most important skill sets and provides suggestions on how to improve capacity development approaches and policies to ensure success.

The author first recalls the challenges faced by educators and learners following the abrupt transition to online-only learning when the pandemic started. Apart from the well-known lack of access to high-quality Internet infrastructure, power supply and affordable ICT devices, learners also suffered psychologically due to extraordinary circumstances caused by the pandemic. Furthermore, online learning is not suitable to all types of skills acquisition; vocational training, for example, often requires practical/hands-on learning approaches to be effective.

Looking at the post-pandemic future, the author explores and highlights the need to focus on personal character components such as courage, curiosity, mindfulness and leadership (among others), in addition to digital literacy competencies and other soft skills such as critical thinking, collaboration and communication. He argues that all of these traits will be needed to determine success in a post-pandemic digital future. The pandemic was a test bed for these traits and showed that those who emerged successful were those who were able to assume and make use of those skills.

Based on this analysis, the author argues that traditional learning models and frameworks applied in educational institutions do not take into consideration this entire basket of skills and therefore need to be transformed to equip learners with the capacities to thrive in the post-pandemic digital future.

Such transformations and new approaches need to incorporate input from learners themselves and treat them as collaborators and co-creators rather than as mere consumers. Furthermore, educational policies should require that certain educational content be delivered online in the future rather than returning to pre-pandemic situations where all education was delivered face-to-face. This will improve the necessary skills, further develop/strengthen educational technology platforms, and prepare learners and teachers for the next pandemic.

The author concludes by calling on policymakers and educators to take into consideration the soft skills required in the future digital skills ecosystem and incorporate the development of such skills into capacity development approaches and policies. In addition to the various technical/hard skills, such skills enable young graduates to become successful in the digital economy.

The next article, by **Matthew Downer**, focuses on a specific development sector by examining the role of digital skills in humanitarian assistance projects and initiatives, and highlights how the pandemic has accelerated the use of digital technology in humanitarian assistance.

The author, himself a practitioner in this field, first provides evidence that demonstrates the importance of providing digital skills training to communities affected by crisis, and how development organizations are supporting this. He focuses specifically on mobile technologies, given that these are the most common technologies for people requiring humanitarian assistance and provide popular applications such as mobile money or SMS. Most of the challenges refugees face when accessing online services are related to literacy, skills and relevant content in local languages.

The author highlights four key reasons why digital skills training is critical in the humanitarian work context: (i) to ensure that the assistance provided is efficient and effective, including by building trust among beneficiaries in the services provided; (ii) to promote digital inclusion since many beneficiaries have not used digital technologies and services before, and they often include marginalized groups such as women and persons with disabilities; (iii) to mitigate digital protection concerns by equipping people with the right knowledge and skills to better understand the technical and social risks of using digital technology; and (iv) to promote self-reliance and generate income by, for example, delivering coding classes to refugees that help them find suitable employment.

The article then provides a number of suggestions on how digital skills programmes can be implemented effectively in humanitarian contexts. Training should be tailored to the specific needs and lives of the communities to be trained and users should be involved in the design of the training. Programmes should include marginalized groups and training should be delivered in local languages. Using existing networks within the community helps raise awareness about the service and reach a larger number of people. Finally, training should be provided on a continuous basis over an extended period of time; for example, by working with local partners to ensure sustainability of the training programmes.

Cross-regional examples of digital skills initiatives and programmes

The article by **Khawar Iqbal and Frederick Van Gysegem** presents how the State of Qatar is preparing its workforce for the digital transformation by implementing the Tasmu Smart Qatar programme and its digital skills initiatives. Their analysis is based on the results of a study that revealed the impact of technology on skills in the country and identified the skills gaps and future skills requirements. Based on the findings, they also propose solutions for the design of sustainable and effective digital skills strategies at both national and organizational levels.

The authors first present the approach that was applied in Qatar to develop a needs-based digital skills strategy. This approach is called human intelligence planning and optimization. It comprises four steps: baseline, which analyses the current state of the workforce on a macroeconomic level; forecast, which projects future workforce supply and demand; gap analysis, which quantifies the mismatch between demand and supply; and recommendations on skill development needs.

The results of the study illustrate the key productivity changes that are expected to impact Qatar's economic sectors between 2020 and 2030, many of which are due to growth in digital technologies. It is expected that sufficient levels of digital skills will be key to harnessing economic efficiency gains across various sectors. A comparison between the expected demand for and the current supply of a digitally skilled workforce provided important insights on digital development priorities across sectors, with over 40 per cent of the workforce expected to require reskilling or upskilling because of changes to the nature of their jobs.

Among the most important competencies that will be required are those related to collaboration with robots, cobots and virtual reality/augmented reality (e.g. in the construction and manufacturing sectors), followed by those related to the use of administrative software and collaboration platforms, data science and cybersecurity. In addition, science, technology, engineering and math-focused industries will face an important skills gap, as well as the health-care, education and transport and logistics sectors, which are moving from traditional to technology-driven business models. The study also finds that despite automation and digitization, overall workforce demand in the country will increase by 5 per cent until 2030.

The authors then present some initiatives that have been launched in Qatar to address the digital skills gap. These include the development of a common digital skills framework, the launch of the Tasmu Centre of Excellence targeted at civil servants, and the Studio 5/6 lab targeted at young digital learners.

The article finally identifies three success factors for a successful national digital skills strategy. The first is to design inclusive, holistic and tailored policies adapted to the specific workforce environment. In Qatar, as in other Middle Eastern countries, there are unique challenges created by a multinational and fluctuating workforce, a high inflow of workers from abroad and reliance on foreign talent. In addition, heavy investments in the diversification of the economy accelerate economic and technological change in industries, which can increase existing skills gaps. All of these elements need to be considered in the digital skills policy design.

The second success factor is to create initiatives with tangible outcomes based on the results of thorough analyses. Individuals and organizations should both be part of the process. The development priorities identified in the study could be a starting point for designing concrete training initiatives. The third success factor is to engage actors involved in providing education and training, and create an ecosystem where all stakeholders come together in the discussion and design of the digital skills strategy. These include representatives from the public sector, employers, and education and training institutions.

The authors conclude by emphasizing the importance of taking a systematic and analytical approach when assessing labour-market and skills requirements, and for designing needs-based digital skills strategies, as was illustrated in the case of Qatar.

The article by **Carlos Baca-Feldman and Erick Huerta Velázquez** focuses on capacity development programmes targeted at indigenous communities in the Americas region. It presents experiences from delivering the ITU training programme for indigenous peoples in the region since 2005. The programme aims to provide indigenous communities with skills to use technology while respecting their cultural heritage, and helps communities operating their own local communication networks.

The ITU programme started in 2005 with a workshop delivered to different communities across the Americas region and was subsequently developed into a tailor-made training programme for indigenous people. In 2017, the programme was enhanced and two online and blended training courses focusing on community networks were created. The paper argues that the involvement of indigenous people and communities in all stages of course design and implementation was crucial to the success of the programme.

The article first looks at how indigenous people in the region incorporate ICTs in their ways of communication. The authors argue that indigenous communication is unique in the sense that it relates to where and how people and tribes live in their territories or land. Communication technologies therefore need to undergo a process of appropriation to adapt to those diverse ways of living. This is also why the community networks movement is rather strong in the region and includes elements such as sovereignty and autonomy of indigenous communication. Rather than communities adapting to the technologies, the understanding here is that the tools should be adapted to the principles, values and ways of life of those inhabiting the territory.

The authors then discuss different capacity development processes that were developed by indigenous communities (in collaboration with other partners) in the region on the topic of communication and technology. Based on a participatory approach involving indigenous organizations, the *Techio Comunitario* training programme was developed, targeted at indigenous technicians in telecommunications and broadcasting in Mexico. Elements from this programme were later incorporated into the ITU training programme that was developed in 2019. The programme runs online over the course of one year, with five modules lasting four weeks each followed by a 10-day face-to-face training camp involving practical exercises in a real-life context. The focus of the course is on quality rather than quantity and participants, who are nominated by their communities, are limited in number. This ensures that the knowledge gained will be brought back to the communities and thus the programme has a much larger impact. A network of indigenous technicians is being established among those who took the course.

The authors conclude by highlighting the importance of gaining real experience in the context of rural communities (rather than in a lab) as part of the capacity development programme, and of the practical exercises being developed by the communities where the training takes place. Furthermore, building relationships and forming a community among the participants and the instructors is an important outcome of the training. This ensures continuity of the programme, with members sharing information and supporting each other to solve technical problems that occur once they return to their communities. Finally, a crucial element to the success of the training is to involve indigenous peoples and communities in the entire process, from design to implementation. This ensures that the technologies and their use are adapted to the special needs, cultural values and development goals of the indigenous communities.

The article by **Sumeysh Srivastava** looks at the link between digital skills and the digital divide, with a particular focus on India. The author highlights that less than 15 per cent of

the population in India have computer skills and 20 per cent have Internet skills, calling this a second-level digital divide beyond the first-level access divide. He argues that the first-level divide is dependent on the second-level divide and that digital inclusion is dependent on the ability to use digital technology. Therefore, digital literacy initiatives in India need to take this into consideration.

The author first looks at the concept of digital literacy and its evolution over time. While at the early stage the concept was more focused on computer literacy and skill acquisition, it expanded later on – and with the evolution of the Internet – to include cultural, political and social dimensions. Most of these models are cognitive in nature and focus on how people process information.

One of models introduced in the article – the Technology Acceptance Model – can also be linked to digital literacy. It explains a user's motivation to use technology by three factors: perceived usefulness, perceived ease of use and attitude towards use of the technology. The author argues that such factors need to be taken into consideration in digital literacy programmes and cites the results of studies that have revealed a relationship between users' perceptions of ease of use and usefulness of technology, and digital literacy. He argues that digital literacy and Internet access must be seen as co-dependent and need to be evaluated together. The author also argues that access to technology and digital skills can affect human capabilities more broadly; for example, by increasing a citizen's ability to access resources available online through mobile apps.

The article then moves on to present a number of government programmes and initiatives in India that aim to increase digital literacy and Internet access. He highlights that many first-time Internet users are using smartphones (rather than computers) and infrastructure programmes should therefore take mobile access and devices into consideration. Usage patterns differ significantly according to age, gender, location, occupation, etc. and this needs to be reflected in digital literacy programmes. Informal, community-centred learning can act as a supplement to formal learning and therefore the author suggests that programmes should make use of community infrastructure networks, which often involve the local community in the development and management of them. Research has shown that this can improve digital literacy skills programmes and make them more effective. Efforts are under way in India to expand public Wi-Fi networks across the country, which also has the potential to expand community networks in India.

The author recommends that digital literacy programmes in India take into consideration the needs of the beneficiaries, in particular the fact that many of them are digitally illiterate and do not have Internet access. In order to mitigate this, the response from policymakers needs to go beyond infrastructure creation and must focus on building the ability of citizens to access and use digital technologies.

Digital skills vary significantly among individuals when it comes to factors such as age, gender, education and overall experience with technology. This affects their abilities to participate successfully in digital literacy training and assessments. Further data collection on the differences among users' interaction with technology can improve the design of digital skills programmes. Finally, since a lot of government services are provided digitally in India, it is equally important to ensure the digital literacy of civil servants.

The article by **María Cristina Cárdenas Peralta** and **Ana Lidia Franzoni Velázquez** features a practical example from Mexico of distance education and digital skills training for teachers. It presents and discusses a methodology that was applied to assess teachers' training needs during the pandemic and to subsequently develop and deliver tailor-made courses for them. The authors argue that by using the appropriate methodology, policymakers can design digital skills training programmes that engage the population and achieve higher impact.

The article first provides a snapshot of Mexico's digital access, in particular Internet and computer access. With the closure of schools and shift to online education from March 2020, household access was a critical factor in whether schoolchildren were able to take online courses or not. Less than half of households in Mexico had computers at home and less than a third of schoolchildren took online courses during the pandemic, with the situation especially challenging in rural areas.

The article then looks at teachers' skills when it comes to using ICTs in the classroom. Mexico's education system started to incorporate ICTs in 1997, mostly by equipping classrooms with digital devices and infrastructure. Recognizing that it was not sufficient to merely provide technological equipment, digital skills training for teachers and students was introduced in 2009. As a result of these initiatives, when it comes to the use of ICT for education, teachers, students and schools in Mexico were better prepared to face the pandemic compared with the average for Organisation for Economic Co-operation and Development countries.

Nevertheless, the difficulty in moving from face-to-face to distance education prompted the Mexican Chamber of Electronics, Telecommunication and Information Technology to develop a methodology to tailor courses based on identified learner needs, which is presented in the article. The methodology that was applied to the teacher training programme included five steps: training course design, implementation of a baseline survey, training delivery, implementation of a follow-up survey and issuance of diplomas.

Through in-depth conversations and surveys with teachers, the most required competencies and challenges when it comes to distance education were identified and then incorporated into the training course design. The training was delivered to 5,700 teachers, with over 80 per cent female participation. Follow-up surveys were then used to further improve the courses.

The authors find that very few teachers were able to combine high-technology and low-technology approaches to help student learning during the pandemic. Reskilling and upskilling of teachers in areas of pedagogy and soft skills will therefore be required to cater to those needs. Personalized training can be very effective but should not replace peer work. The study also revealed the advantages of distance training, which is cost-effective and efficient, and can reach a wider population. In addition, distance learning provides the same quality of instruction to all pupils and flexibility in accessing knowledge.

In view of urban/rural infrastructure divides, it is important to design training in rural areas that makes use of, for example, free social networks offered by telecom service providers, and trains teachers in how to download materials and be consulted offline, among others.

The authors conclude by highlighting the importance of carrying out surveys and using focus groups, chats and other tracking mechanisms to design effective training courses. These will help identify teachers' need and areas for improvement, and help schools monitor teacher performance. Finally, positive reinforcement for teachers – such as providing opportunities to share ideas and concerns, or issuing diplomas and certificates – can be effective and encourage success.

Conclusion

While each article presented in this edition of Digital Skills *Insights* offers its unique perspective and 'insights', there are a few common points and messages that can be extracted.

First, with respect to the post-pandemic scenario, the acceleration of the digital transition the pandemic has caused will not fall back to a pre-pandemic level. Digitization will continue to spread rapidly and with it the demand for digital infrastructure and digital skills. The new tools, solutions, platforms and services that mushroomed during the pandemic will continue to be applied – and others will appear – as part of the new normal. With this trend, the demand for a digitally skilled population and workforce will continue to increase. It will stimulate job creation in areas, sectors and occupations that increasingly require digital skills knowledge and capabilities. It will also create huge opportunities for investments in training and skilling. We can therefore expect to observe a continuous expansion in the education, training and learning sector to cater to those needs.

Second, digital skills and digital access need to be seen in combination and as dependent on each other. Several articles highlighted the close relationship between the two and how one can reinforce the other. Therefore, infrastructure-related measures and programmes (in particular, LMC) need to be planned and implemented together with digital skills measures. Only if both are addressed together can the digital divide be narrowed.

Third, digital skills policies need to be designed and developed based on a solid methodological approach, applying systematic analyses and assessments. Before embarking on policy measures and initiatives, countries need to collect data and evidence to take stock of the status quo and identify local gaps and needs. The concept and design of national digital skills frameworks need to be adapted to countries' labour-market and skills needs. It is crucial to involve all relevant stakeholders that are part of the digital skills ecosystem in the analysis, design and implementation of such frameworks and needs assessments, as well as the subsequent formulation of strategies and measures.

Finally, training efforts will only be successful if carefully designed and adapted to the needs of participants. All the articles that presented concrete case studies highlighted the importance of targeted training that takes into account the needs of user groups. For example, schoolteacher training should first assess the teachers' specific needs and incorporate these into the course. Citizens/beneficiaries at large have very different requirements when it comes to learning, training and skills levels, according to gender, age, location, income groups, or whether they are students or adults. In addition, participants' previous experience with technology also plays an important role in terms of training impact and should therefore be explored beforehand. Training of refugees needs to consider their specific situation and focus more on beginner-level digital skills and practical applications, such as mobile payments. Finally, the use of community networks and community-centred learning has been shown to increase the effectiveness of digital skills training and should be considered in the design and development of training programmes.

List of references

Broadband Commission for Sustainable Development. (2017). Working group on education: Digital skills for life and work. https://www.broadbandcommission.org/Documents/publications/WG-Education-Report2017.pdf

International Finance Corporation. (2021). Demand for digital skills in sub-Saharan Africa. Key findings from a five-country study: Cote d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda. https://www.ifc.org/wps/wcm/connect/b5ad161e-a2e2-4010-86f2-54717e68b239/Demand+for+Digital+Skills+in+Sub-Saharan+Africa_web.pdf?MOD=AJPERES&CVID=nEldzv7

International Telecommunication Union. (2018). Digital skills toolkit. https://academy.itu.int/main-activities/research-publications/digital-skills-toolkit

International Telecommunication Union. (2020). Digital skills assessment guidebook. https://academy.itu.int/main-activities/research-publications/digital-skills-insights/digital-skills-assessment-guidebook

Melhem, S. & Jacobsen, A. H. (2021). A global study on digital capabilities. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/959181623060169420/a-global-study-on-digital-capabilities

United Nations Children's Fund & International Telecommunication Union. (2020). How many children and young people have Internet access at home? Estimating digital connectivity during the COVID-19 pandemic. https://data.unicef.org/resources/children-and-young-people-internet-access-at-home-during-covid19/

Endnotes

1 https://globaleducationcoalition.unesco.org/

2 https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en

3 Further information on the Digital Transformation Centre Initiative is available at https://academy.itu.int/main-activities/digital-transformation-centres-initiative

5 https://aws.amazon.com/training/digital/ and https://www.aboutamazon.com/news/workplace/amazon-to-help-29-million-people-around-the-world-grow-their-tech-skills-with-free-cloud-computing-skills-training-by-2025

6 https://e.huawei.com/en/talent/?fbclid=IwAR3Fs0P4G_hAVjYTA6OSwNNkWwHbHrZ7Xqb3nbHi4vN189t8q_pFU-kqSwg#/ict-academy/news-details?consultationId=465

7 https://www.weforum.org/agenda/2021/01/building-a-future-ready-global-workforce-post-covid/

8 More information on Facebook's initiative is available at https://www.facebook.com/business/news/new-efforts-to-support-job-seekers-with-facebook-career-programs# and https://www.socialmediatoday.com/news/facebook-partners-with-coursera-on-new-digital-skills-training-initiatives/603676/ and https://www.itweb.co.za/content/8OKdWMDYazDqbznQ

From connectivism to connectivity: Digital skills in the COVID-19 context[1]

By Travis Heneveld

Introduction

More than ever, the economic and social disruption of the COVID-19 pandemic has emphasized how critical last mile connectivity (LMC) is for digital skills building and development. From the first lockdowns and emergency measures, governments and public health institutions have depended on social and other digital channels to raise awareness and promote responsible safety behaviour, while schools and businesses have relied more than ever on affordable and resilient broadband. For example, a farmer who used to drive to the village market to sell their harvest must now learn to coordinate logistics and pricing remotely. A young coder who once attended physical training sessions at a city centre maker space must now connect online using cameras and speakers. The rapid rise of digital connectivity as the primary form of interaction – including for everyday remote work, learning and general social and business interaction – has placed new demands on digital skills development practices worldwide.

While dependence on LMC has intensified since the start of the pandemic, so has the use of connectivism, a learning theory introduced by Stephen Downes in his paper *An introduction to connective knowledge* (2008). Downes uses the concept of connectivism to describe learning techniques "that can be observed via the interactions of numerous instances of knowledge" through Internet technologies such as web browsers, email, wikis, social networks and online discussion forums. Massive open online courses, with an estimated market size of USD 4.6 billion in 2020 and projected to grow by 32 per cent annually through 2026 (MarketDigits, 2021), are a good example of effective connectivism.

As an avid observer of both behavioural and societal activity across all technology areas, the author has been struck by the extent to which connectivism and LMC are intertwined. The COVID-19 pandemic context has intensified the importance of reliable and affordable broadband connectivity, exposed digital skills gap even further and made effective and accessible initiatives even more necessary. When it comes to virtual learning, access to digital infrastructure – including phones, laptops and Internet connectivity – is essential. Resilient and affordable connectivity is a necessity if people are to learn and share information with others.

Prior to the pandemic, relevant digital skills connectivism led by industry, social partners, public authorities and education providers had already gained significant momentum. Thousands of virtual learning resources are available online (see a selection of digital learning platforms in Annex 1). For instance, the United Nations Educational, Scientific and Cultural Organization (UNESCO) identified 47 country-level implementations of national digital skills strategic plans focused on competency areas such as communication and collaboration, digital content creation, problem solving and career planning (Law et al., 2018). Civil society also plays an active role. In India, for example, Plan International operates 104 Digital Learning Centres,[2] using a combination of Internet-based network solutions and sustained home visits to educate parents about blended learning, and to connect digitally and champion change from within communities.

Existing digital divide challenges are well understood. In terms of infrastructure, 10 per cent of the global population do not have access to electricity (International Bank for

Reconstruction and Development & World Bank, 2019), and the '3G coverage gap' – those living outside areas covered by mobile broadband networks – now refers to 600 million people or 7 per cent of the world population (Bahia & Delaporte, 2020). With the cost of data-only mobile broadband above the targeted 2 per cent of monthly gross national income per capita in 84 out of 180 countries and fixed broadband access still unaffordable in 111 countries worldwide,[3] affordability remains a key issue.

Language is a key barrier to local adoption and use, with only 10 languages making up 90 per cent of online content (Devlin, 2019 and W3Techs, 2021 – see Table 1.1). Furthermore, large portions of the population in sub-Saharan Africa (34 per cent), South Asia (27 per cent) and the Arab states (20 per cent) are considered illiterate,[4] and men remain 21 per cent more likely to be online than women, rising to 52 per cent in the world's least developed countries.[5] In contrast, provision of digital government services has improved significantly: more than 84 per cent of surveyed countries now offer at least one online transactional service (United Nations Department of Economic and Social Affairs, 2020).

The objective of this article is to explore how the COVID-19 context has affected digital skills development from the perspective of distance learning and connectivity requirements. First, we will examine how the pandemic context has influenced key target areas for digital skills development. We will then analyse actions taken by the private sector, international institutions and civil society to address the urgency of the situation, with a particular focus on initiatives that bridge the gap between digital skills content delivery and the provision of affordable Internet access. Finally, we will identify the action area gaps that still exist, and on which government policy and partnerships need to focus to help ensure a better future. A practitioner's toolkit (Annex 1) and a list of essential digital skills for teachers (Annex 2) are included for information and reference. Digital technologies are a critical tool for socioeconomic inclusion but without a connected approach, progress will be confined to those with electricity and telecom services– further isolating individuals and communities without such access and widening the digital divide.[6]

Table 1.1: Top 10 most-used languages globally

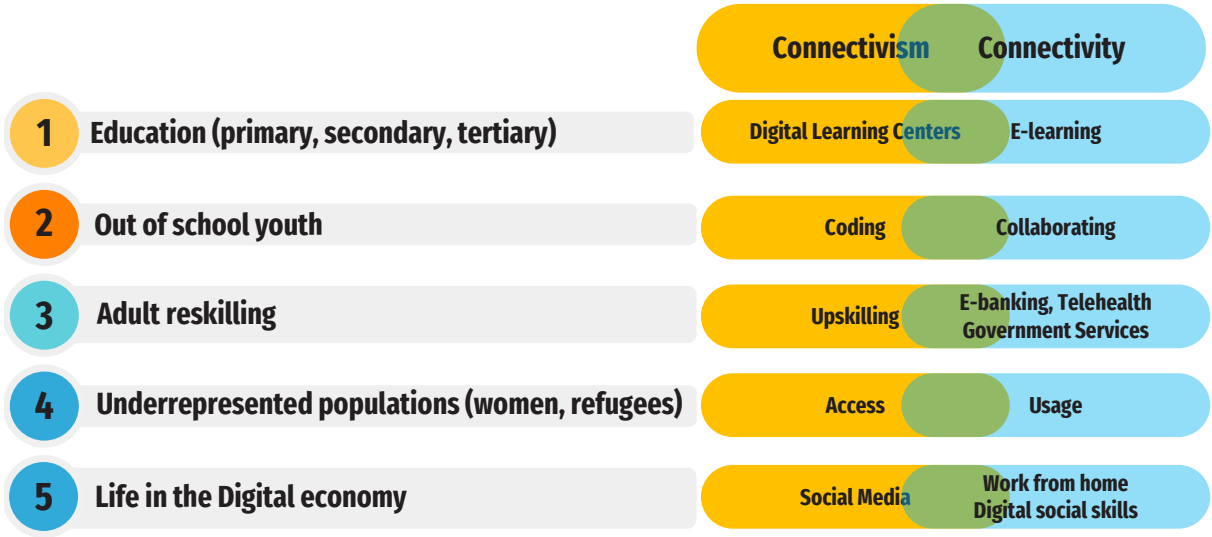
Most-used languages in the world	Usage (%)	Most-used online by content	Usage (%)
English	15	English	61.8
Chinese	15	Russian	7.7
Hindi	7.2	Spanish	3.8
Spanish	6.9	Turkish	3.8
French	3.8	Persian	3.4
Arabic	3.7	French	2.7
Russian	3.6	German	2.1
Bengali	3.6	Japanese	1.9
Portuguese	3.2	Vietnamese	1.8
Indonesian	2.6	Chinese	1.3
Total	**64.6**	**Total**	**90.3**

Sources: Devlin (2019) (left side); W3Techs (2021) (right side)

Digital development target areas in the age of COVID-19

As a guide to developing comprehensive digital skills strategies at the country level, the International Telecommunication Union (ITU) *Digital Skills Toolkit* (2018) defines five target areas for establishing digital skills development goals: 1) primary, secondary and tertiary education; 2) out-of-school youth; 3) adult reskilling; 4) underrepresented populations including women and refugees; and 5) life in the digital economy. Based on an analysis of more than 25 digital skills initiatives either launched or enhanced since the beginning of the pandemic,[7] there is a significant trend towards initiatives that combine connectivism and LMC. With populations facing lockdowns, imposed distance learning and work from home restrictions, the main mobilization lever is to establish virtual links between content and students that are affordable, resilient and simple to use. As outlined in Figure 1.1,

Figure 1.1: LMC as an enabler for digital skills development initiatives



Source: Author's own 2021, unpublished

examples of this connected connectivism exist across every digital skills target area.

Education

Education technology has been a high-growth area for several years, with global investments reaching USD 18 billion in 2019 and the overall market for online education projected to reach USD 350 billion by 2025.[8] Since digital education platforms were already available when the pandemic hit, usage exploded almost immediately in such areas as language apps, virtual tutoring, video conferencing tools and online learning software. In the United Kingdom, for example, based on a survey of parents with children aged 11–15 taken between May and June 2020 (United Kingdom Office for National Statistics, 2020), 72 per cent of respondents said that schools had provided digital resources via online learning platforms. Keeping in mind that approximately 1.2 billion students found themselves unable to attend physical school settings,[9] even a conservative estimate of the potential number of new online learning users is in the hundreds of millions.

The pandemic context has also influenced innovations in e-learning, such as the launch of a free, small-group tutoring session concept by Sal Khan, founder of the popular non-profit Khan Academy portal. Through Schoolhouse.world,[10] students can connect for free with volunteers around the world (Anderson, 2020). Grass-root community initiatives to promote virtual learning have also been established. This is what Kenyan teacher Job Wafula Nukhwana did when he founded the Kibabii Online School during the pandemic to promote remote learning.[11] Virtual schools with reliable broadband Internet and tools can help ensure that students keep learning and stay connected.

Out-of-school youth

While young people are often considered 'digital natives', the reality is that most do not possess job-relevant digital skills and, as a result, jobs requiring coding and other advanced information and communication technology (ICT) skills go unfilled.[12] High-profile campaigns, such as the 2017 joint International Labour Organization and ITU Digital Skills for Decent Jobs Campaign, are helping reduce this gap by training 25 million young people globally by 2030. Having resilient LMC infrastructure in place to upskill for job readiness, especially in low-tech and low-resource communities, is a

critical success factor for such programmes. Global Youth Mobilization – a multisector coalition established in 2021 by six leading civil society youth organizations including World YMCA and Scouts/Girl Guides – made LMC a key recommendation for education policy, specifying the importance of access to reliable and affordable Internet connectivity and devices.

Another area of focus is around grass-roots computer programming initiatives for youth. The African Development Bank's Coding for Employment Programme launched in 2018, for example, was primarily based on in-person training classes. In response to COVID-related school closures, national lockdowns and restriction of movement, the Programme moved to an online e-learning platform.[13] Course participation has increased significantly, with one source indicating an increase of 38.5 per cent in Coding for Employment users within one week.[14] Note also that the cost savings of e-learning over traditional learning, including travel and accommodation, can be factored into the total cost of connectivity investment.

The switch to online meetings and conferences during the pandemic has made it easier for job seekers of all ages to interact, share, network and learn with prospective peers and employers (Gichora et al., 2010; Abbott, 2019; Rolnick et al., 2019). This is especially relevant for out-of-school youth with a home Internet connection. In September 2020, for example, Caribbean Girls Hack,[15] Restore a Sense of I Can[16] and IBM hosted a virtual global conference[17] that included 24 hours of hands-on coding sessions. Connected students from around the world came together to learn enterprise computing, coding skills and how to build innovations.

Even 'hybrid' virtual events that combine on-site meetings with online participation require reliable connectivity and device access. The COVID-19 pandemic has enhanced the use of digital spaces and made it possible to combine coding, mentoring and interactive game sessions into one digital skills event, but those without access to the Internet are unable to participate.

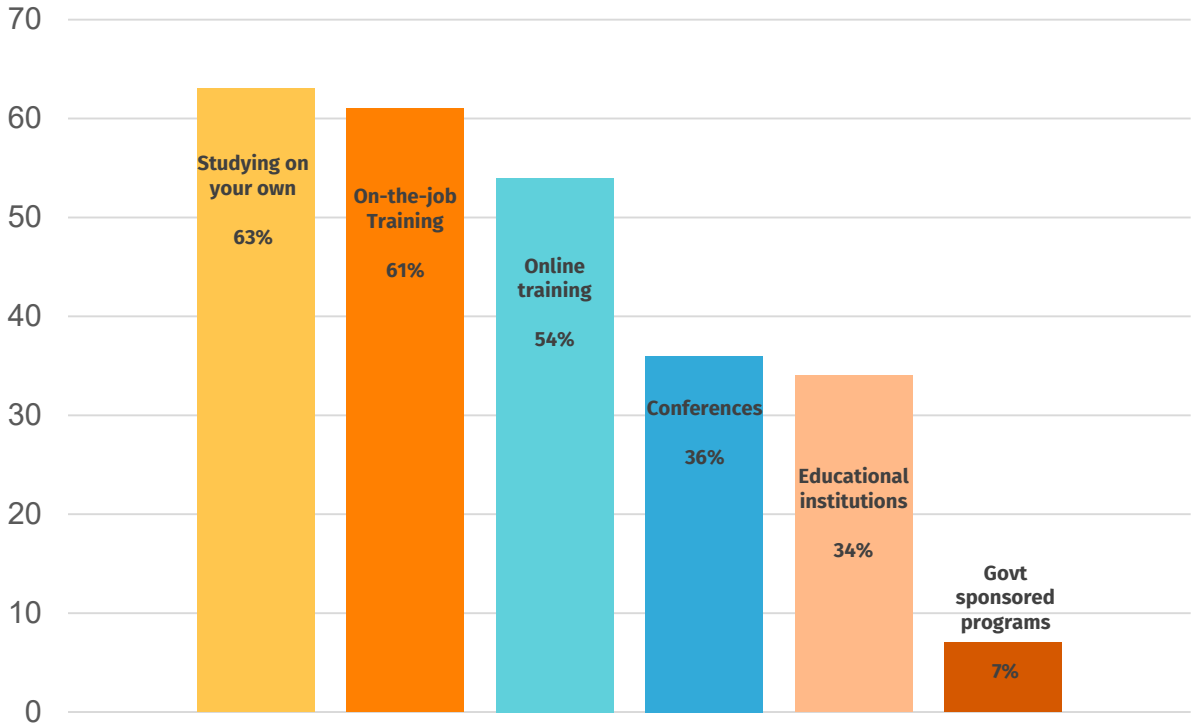
Adult reskilling

Digital skills learning and connectivity are critically important for today's job market. It is well documented that global trends such as digitization, clean energy and automation will change the skill sets needed in many industries (World Economic Forum, 2020). Jobs in such areas as quantum computing, fintech, artificial intelligence (AI) and machine learning are all projected to grow significantly in the next five years (Vaccarino & Pelucchi, 2021). Furthermore, connected and digitally proficient populations are ready to learn new skills using virtual and distance learning. A Boston Consulting Group global survey of 366,000 respondents (Kovács-Ondrejkovic et al., 2019) found that when people need to learn new job skills, most choose active and adaptable learning approaches such as studying on one's own and on-the-job training versus more structured and traditional learning, including educational institutions and government-sponsored programmes (see Chart 1.1).

Finally, experts agree there is a correlation between the rise in mobile phone usage in the Global South's informal sector and improved market access, better negotiation deals with suppliers, and better use of financial services such as short-term savings options.[18] While there are variations between regions and countries, we can surmise that reliable Internet access and usage makes learning digital skills using digital services easier.

In addition to accelerating digitization, the pandemic has created what could be lasting employment shifts that require reskilling of new workers. There are examples in the services sector (to help reduce avoidable physical interactions) and in the financial sector (to train employees how to deal with customers who need help with digital products and services).[19] All these shifts require reliable and affordable connectivity. Furthermore, we have seen a "4–6 years" acceleration of e-commerce growth (Koetsier, 2020) and an uptick in the use of digital marketplaces for jobs. As more work is performed remotely, connected workers will need to have the relevant skills to handle the data and software used.

Chart 1.1: Job skills: Preferred learning methods



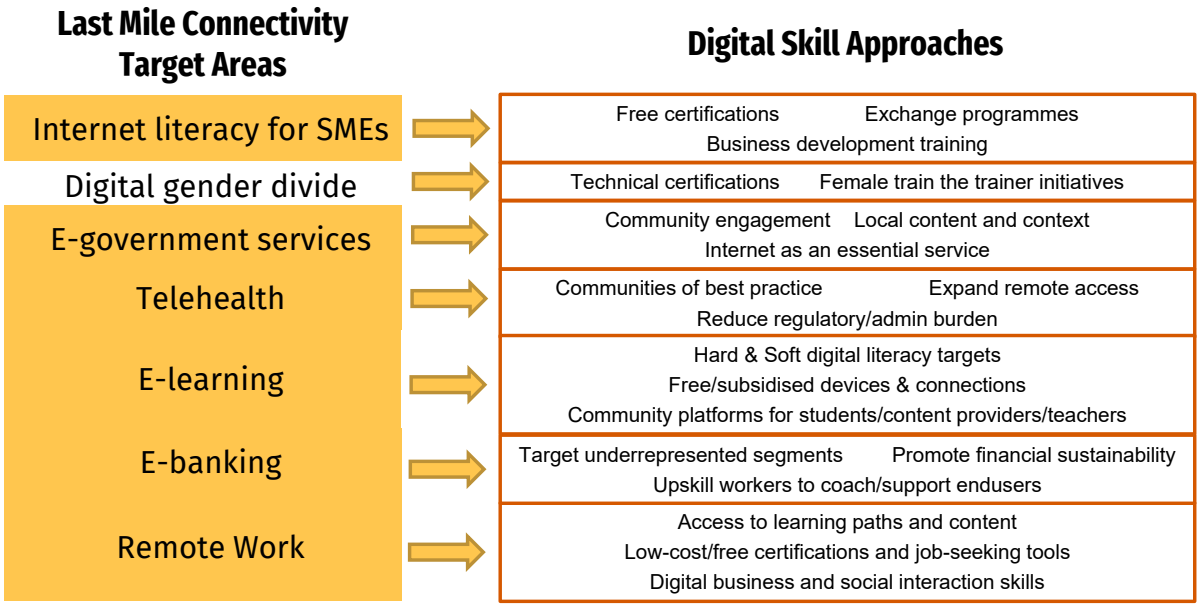
Source: Kovács-Ondrejkovic et al. (2019)

Underrepresented groups

In contrast, the almost 50 per cent of the world – an estimated 3.8 billion people – that is unconnected and unable to benefit from the digital world, first and foremost need access to it. For example, a 30 per cent difference in high-speed broadband penetration rates exists between small and medium-sized enterprises (SMEs) with 10–49 employees and large firms with 250 or more workers (Organisation for Economic Co-operation and Development (OECD), 2021a). Based on the ITU and UNESCO Broadband Commission for Sustainable Development framework launched in May 2010 to devise strategies that advocate for higher priority to be given in all countries to the development of broadband infrastructure and services, there are seven LMC target areas that can be linked to key digital skills approaches, as shown in Figure 1.2.

1. Micro, small and medium-sized enterprises need free accelerated digital access to technical certification trainings, sharing of best practice exchange programmes, and business development trainings.
2. Women-run businesses and girls in school deserve privileged access to technical certifications and female train-the-trainer initiatives.
3. E-government services should be leveraged as a driver and tool for digital skills learning on public safety, social and economic grounds.
4. Tele-health services and content can be used to create and/or extend communities of digital best practice and expand remote access. Digital health records management can also be used by practitioners and patients to reduce administrative burden.
5. E-learning needs to incorporate soft digital literacy targets in areas such as communication, leadership, teamwork and situational awareness; and free/ subsidized devices and local community platforms should be part of broadband network expansions, upgrades and rollouts.
6. Digital financial services that cater to underrepresented segments should be promoted, and bank employees can be specifically upskilled to coach/support end users.

Figure 1.2: Digital skill approaches by broadband adoption target areas



Source: Author's own 2021, unpublished

7. Encourage learning paths and content that facilitate remote work access and use of digital job seeking, digital business portals and digital social interaction skills.

Targeting digital skills and literacy uptake in underrepresented members of the population will increase the reach and impact of digital services and help close the 'usage gap', used to refer to those who live within the footprint of a broadband network but are not using the Internet. ITU, in partnership with Cisco, launched the Digital Transformation Centres (DTC) Initiative (2019)[20] with the objective of supporting countries to strengthen their citizens' digital capacities, particularly in underserved communities. Nine DTCs (four in Africa, two in the Americas and three in the Asia Pacific region) have been launched. In response to the COVID-19 crisis, DTC trainers were provided with free tools and skills in how to conduct remote teaching.

Such actions help ensure scalability and self-sustainability in digital skills capacity development and make it easier for uninitiated members of the population to start using available e-government, tele-health and e-banking services. The *Mobile Gender Gap Report 2020* highlights that in Nigeria, for example, 27 per cent of women and 22 per cent of men who were aware of but do not use the Internet cited a lack of digital skills as the most important barrier.[21] Within the urgency and mobilization of the COVID-19 context, we now have a clear road map to help plan effective and inclusive connectivity infrastructure for distance learning initiatives.

In 2020, the United Nations High Commissioner for Refugees recommended building blocks for distance learning in the pandemic context[22] that are an example of what I will call 'connected connectivism'. Digital infrastructure investment is recognized as a necessary precursor for places of learning to allow educators to receive instructional design and teacher training for virtual learning. A key success factor for (informal and formal) places of learning in the COVID-19 context is that existing connectivity hardware and infrastructure might need to be used differently and, in many cases, the available teacher, content and connectivity resources will be insufficient to meet needs.

The 2020 UNESCO blueprint for distance learning initiatives[23] goes further, addressing connectivity for under- and un-served

populations by recommending the following critical steps.

1. Incorporate the use of low-technology solutions such as feature mobile phones and broadcasting through radio and television.
2. Consider the reliability of local power supplies, Internet connectivity and the digital skills of teachers and students.
3. Implement measures to ensure needs-based access to both devices for distance learning programmes and Internet connectivity.
4. Mobilize tools to connect schools, parents, teachers and students with each other; and create communities to ensure regular human interactions, enable social caring measures and support submission of student feedback (for example, edukasyon.ph in the Philippines).[24]
5. Engage local information technology (IT) support to help teachers prepare basic IT and Internet data settings.
6. Blend synchronous and asynchronous lessons, and limit the number of applications and platforms.

In the COVID-19 context, there is potential to scale digital skills development further via community networks and digital platforms. For example, the #LIBERAoWIFI campaign, created by a community co-working space in Brazil, trains people to open their Wi-Fi networks safely so that unconnected people can access the Internet, thus promoting both digital solidarity and learning.

The COVID-19 pandemic has also encouraged further development of decentralized, community-led network solutions that enable rural communities not to be dependent on private-led infrastructures. Examples of such networks in Africa include Macha Works, Zambia;[25] Bosco, Uganda;[26] Fanstsuam, Nigeria;[27] Ensemble Pour la Différence, Democratic Republic of the Congo;[28] Tunapanda, Kenya;[29] iNethi, South Africa;[30] and the Soweto Wireless User Group, South Africa.[31] These grass-roots LMC infrastructure initiatives provide a unique and impactful opportunity to emphasize the communication needs of marginalized community members less likely to adopt technologies, i.e., older persons, people with disabilities, etc.

Life in the digital economy

The Internet sociologist Anders Skov (2016) defined digital competency as a "combination of knowledge, skills and attitudes with regards to the use of technology to perform tasks, solve problems, communicate, manage information, collaborate, as well as to create and share content effectively, appropriately, securely, critically, creatively, independently and ethically".[32] But how do we establish common criteria and key performance indicators that can be used to compare within and across countries, regions and communities? One way is to focus on everyday digital literacy criteria such as solving problems with your (smart) phone, using common tools such as WhatsApp, YouTube and Google search, and working online with others. While effective, such an approach overlooks the importance of digital soft skills, such as how to apply your business acumen in a virtual environment and how to develop the social skills necessary to work and interact 'digitally'. This lack of a common standard has made it more difficult to compare and address educational and training gaps in digital skills across regions, sectors and genders.

Coincidentally, a concerted definition of digital literacy, skills and readiness was established in October 2020, when the Institute of Electrical and Electronics Engineers Standards Board approved the 3527.1™ Standard for Digital Intelligence. While the scope of measurements in the Standard goes beyond digital literacy to cover competencies such as Digital Identity and Digital Rights,[33] the framework's three development focus areas can be used to assess and/or segment effective digital skills criteria as follows.

1. **Citizenship** comprises the skills needed to use technologies responsibly, safely and ethically. Examples include understanding how to create/use family/group passwords, or the sharing of a digital certificate such as a vaccination pass.

2. **Creativity** applies to problem-solving techniques that contribute to the creation of new knowledge, technologies and content. Using shared digital spreadsheets or drafting a cover letter for a job application online fits in this category.
3. **Competitiveness** refers to innovations that contribute to positive community and economic change. Learning about the use of video communication presentation techniques and/or interpersonal etiquette for online interaction and collaboration apply here.

Establishing a common set of adaptable capacity, attitude and value definitions across both digital skills and broadband connectivity initiatives acts as a valuable reference for government, industry and education stakeholders to help coordinate digital skills efforts, set target outcomes and effectively enhance the digital skills of local communities.

Private sector, international organization and civil sector initiatives

The COVID-19 pandemic has accelerated the ambitions and momentum of digital skills and capacity-building initiatives worldwide, led by global technology vendors and public–private partnerships. Furthermore, the overall lack of Internet (and traditional) literacy among underserved and unconnected populations has intensified the need for aggressive digital capacity-building initiatives. These developments can be grouped into three initiative areas.

Funding research for data and monitoring

First, there has been a renewed sense of urgency and innovation among policymakers, the private sector and civil society to use data to monitor the situation, including geographic and cultural disparities. Microsoft, for example, expanded its support for the Alliance for Affordable Internet to identify areas, populations and geographies with the highest need for improved connectivity. Facebook has engaged with the Economist Intelligence Unit Inclusive Internet Index to benchmark 120 countries, representing 98 per cent of global gross domestic product (GDP) and 96 per cent of the global population, on Internet availability, affordability, relevance and the readiness of people to use it. The United Nations Children's Fund (UNICEF)–ITU Giga initiative that is mapping connectivity demand using schools as a base point, and identifying where there are connectivity gaps, has continued to gain momentum during the pandemic. Such information, combined with existing ITU mapping data, allows countries to take stock of their existing infrastructure and assess appropriate solutions for connecting schools. More than 800,000 schools in 30 countries have been mapped through Project Connect, a mapping and connectivity monitoring platform. The digital skills gap is wide, and only by collecting relevant data as accurately as possible can needs assessments and private/public sector pledges be made.

New impulse to make online training available and affordable

Online learning, while readily available prior to COVID-19, has seen a significant increase towards more structured virtual certification and skill-building during the pandemic. In March 2020, for example, the online learning platform Coursera began offering a wide selection of courses free of charge, many related to digital skills learning, thus enabling users to earn certificates. By April 2021 it had activated more than 220 programmes for governments across 100+ countries, benefiting more than a million learners. On the African continent, Liquid Intelligent Networks' 21C Skills programme provides skills training and development programmes on the latest technologies for African students, start-ups and developers. Aline Berabose Joyce, Partnership Coordinator for the 21C Skills programme at Westerwelle Startup Haus in Kigali, Rwanda, states that although the COVID-19 pandemic has its challenges, "working virtually has made a lot of things more efficient and will allow us to scale even going forward".[34]

There is a wide array of innovative distance learning solutions and several are gaining

momentum in the COVID-19 context. In Bolivia, for example, the Mujeres Conectadas project[35] equips women in Bolivia, Argentina and Paraguay with mobile technology tools and digital literacy and entrepreneurial skills. LinkedIn, Microsoft and GitHub are offering free learning paths mapped to in-demand jobs, discounted Microsoft certifications to validate skills, and best practices for job searching and interview prepping.[36] Huawei's ICT Academy Programme is piloting 'women only' science, technology, engineering and mathematics classes aimed at creating a network of women supporting each other's learning.

To be effective and maintain momentum during the pandemic, existing and well-established learning programmes have found ways to implement processes that are 100 per cent virtual. IBM's data science learning approach, for example, now combines regular broadcasting of information, one-on-one virtual meetings, and collaborative creation sessions (see Figure 1.3).

Figure 1.3: IBM's three-pronged approach to virtual data science

Source: Appugliese (2020)

While tech vendor initiatives often focus on helping users learn how to use their own tools, non-conventional learning pathways can often be a more agnostic platform to help make digital learning accessible to all. Community sites such as Data Science Nigeria,[37] Zindi,[38] Blockgeeks[39] and others make hands-on learning possible, irrespective of where you are (Hewitt, 2020). They also allow students and practitioners to showcase their skills and job readiness to prospective employers.

Establishing and/or reinforcing networks of networks

Third, the COVID-19 context has driven more open exchange and knowledge-sharing among digital skills and connectivity partnerships and networks. The increased focus on Internet use for health care, education and remote working has made it even more critical to include a variety of stakeholders and subject matter experts in a collaborative discussion on future solutions. For example, Accenture's People + Work Connect initiative[40] – designed to shorten the complex, lengthy cycle of unemployment and launched during the pandemic with the participation of leading companies including ADM, Baxter, Marriott, Mondelēz, Nordstrom, ServiceNow and Walmart – now has approximately 273 companies fully live on the platform across more than 90 countries. A multilateral government initiative example is the *Roadmap for digital cooperation* (A/74/821) launched by the United Nations Secretary-General in June 2020. One of the Roadmap's key "connected, respected and protected" actions is the establishment of a multi-stakeholder network to promote holistic, inclusive approaches to digital capacity development for sustainable development (United Nations, 2020).

Another example is the Global Education Coalition,[41] an international multisector partnership launched by UNESCO in March 2020 that brings together 175 institutional partners from the United Nations family, civil society, academia and the private sector. According to UNESCO's website, coalition members are currently engaged in 233 projects across 112 countries, impacting directly or indirectly at least 400 million learners and 12 million teachers. Further examples of alliances that have gained traction during the

pandemic include the European Union's Pact for Skills initiative, launched in November 2020, and the Amazon Web Services (AWS) re/Start programme to help people from underrepresented communities transition into tech jobs.

Sharing platforms and best practices while establishing effective working arrangements are critical success factors for the delivery of universal connectivity. The innovation lab movement of the last decade has created such platforms for collaboration and 'fit for local context' solution development. The Afrilabs network of innovation spaces is a good example, with over 225 innovation centres for developers, entrepreneurs and investors across 47 African countries. At the beginning of the pandemic, Afrilabs launched a temporary online platform to promote and share advocacy, capacity-building, knowledge-sharing and collaboration best practices.[42] Other platform initiatives include Covid Action Collab[43] and the COVID Response Alliance for Social Entrepreneurs.[44]

Partnership gaps

While much has been done to address the challenges of both digital skills development and LMC in the COVID-19 context, partnership gaps between stakeholders remain. First and foremost, communication service providers need to complement their competencies in areas such as infrastructure deployment and affordable service delivery with initiatives that make digital skills content more accessible, as well as creating partnerships. These actions will drive tangible digital skills uptake and usage. Building on and enabling fellow stakeholder networks and expertise can stimulate opportunity and deliver effective, accessible and sustainable digital skills initiatives. Table 1.2 provides a summary of ICT industry, training providers, public authorities and civil society stakeholders, and recommended connectivity partnership objectives to enable digital skills take-up.

Second, since COVID-19 has made clear the long-term dependency of digital skills development on resilient and reliable broadband, governments and policymakers need to build on digital skills-building initiatives already under way. From a connectivity perspective, they can help implementing agencies, partners, industry and communication service providers by (re)assessing targets and objectives in the following areas.

1. Digitizing national education curricula, including making computer skills a ubiquitous part of the educational curriculum. UNESCO has a portal of national learning platforms[45] – these need to be assessed locally, and digital resources should be aligned further.
2. Establish and extend licensing agreements for digital resource providers that encourage digital inclusion by adhering to "open-source software, open data, open AI models, open standards and open content that adhere to privacy and other applicable laws and best practices, do no harm, and help attain the Sustainable Development Goals".[46] In addition to minimizing administrative costs, digital public goods make it easier for digital skills initiatives to thrive by creating common terms around such areas as digital usage, fees and pricing models, territory and content ownership.
3. Make connectivity part of the digital skills paradigm. Ensure interoperability of communication platforms and learning resources, regardless of technology and platform.
4. Continuously assess demand and collect feedback to be channelled into improvement measures, using tools such as the *Digital skills assessment guidebook* (ITU, 2020). (Re)assess relevant digital skill goals and targets across various population segments.[47] Use existing public and private sector data-collection and monitoring efforts in such areas as mobile phone use, job skills and affordability indices.[48]
5. Consider the human costs of virtual interaction and learning – take measures with relevant state agencies and ministries to address, for example, the mental health, digital safety and child protection elements of daily life in the digital world.
6. Incorporate digital skills-building activities and targets into key regional initiatives.

Table 1.2: Connectivity applications and digital skills objectives by stakeholder

Sector	Example stakeholders	Connectivity applications	Digital skill partnership objectives
ICT industry	AWS, Microsoft	Data management, business intelligence and cloud services	Support unemployed and underemployed individuals
	Afrilabs, Code.org	Coding schools, incubators and co-working set ups	Fill specialty skills gaps and build a pipeline of business-ready tech talent across industries
Training providers	Benchprep, Intrepid	IT-based training and labour-hire services	Help low-income and vulnerable youth find and maintain employment
	Coursera, Stackfuel	Audit, cybersecurity and IT training and certification	Advance economic and educational attainment and research opportunities
Public authorities	State-led vocational training	Skills acquisition and empowerment programmes	Help individuals build digital skills and create attractive work opportunities
	Ministries of Labour and Social Welfare	Technology, employment and life skills programmes	Drive positive and proven social change in communities
	Ministries of Education	State-funded educational entities	Training, advancing and hiring early-career technology talent
Civil society	Universities, national organizations	Workforce development	Empower motivated young adults to move to meaningful careers through training
	Save the Children, CARE	Donations, data collection, monitoring and evaluation	Make IT jobs and tech entrepreneurship available to all
	Chambers of Commerce, Rotary, Kiwanis	Digital networking, partnership building, sharing of best practices	Improve the qualifications and training of people in all areas
International public sector	African Union, European Union, Asian Development Bank, Pan American Health Organization	Initiative mapping	Situational awareness and remote programme implementation and assistance
	UNICEF, ITU, United Nations Development Programme, OECD	Remote learning, and global/ regional workshops and collaboration	Sharing of best practices

Source: Author's own 2021, unpublished

In July 2020, the European Commission launched the European Skills Agenda, which defines 12 actions for upskilling (improving existing skills) and reskilling (training in new skills) for the following five years.[49] Other regional agreements should take a similar approach. In Africa, for example, there is an opportunity to include digital skills literacy and learning targets as part of the African Continental Free Trade Area, which aims to create a single market with a combined GDP that exceeds USD 3.4 trillion and includes more than 1 billion people.

Conclusion

Whether we like it or not, society is now engaged in a 'new' normal where the ability to engage, connect and interact digitally is even more critical. Advances in emerging technology areas like AI, nanotechnology, 3D printing and other technologies is altering patterns of consumption, production and employment. LMC coverage and usage gaps are significant obstacles to effective digital skills development, especially among underrepresented populations. This has only become clearer in the COVID-19 context, as universal connectivity has become a lifeline for the provision of vital economic and social community services. Individuals from all walks of life have an essential right to access what they need, and digital skills development can facilitate and accelerate their ability to engage, interact and contribute through digital platforms.

Effective and comprehensive digital skills development can be a driver of both economic recovery and resilience, but only if the right steps are taken to close existing affordability, usage and access gaps. Rather than aiming for simple connections, LMC connectivity targets need to address gaps in digital skills development to maximize impact. Similarly, digital skills programmes in agriculture, business, education, health, financial inclusion and/or e-government applications need to consider the LMC reality of their programme geographies.

Digitalization cannot be left mainly to civil society and the private sector. Local/national governments, regional organizations, industry associations, non-formal training providers and educational institutions also have a vested interest in strengthening and adapting digital skills development to survive the COVID-19 context and build back stronger. This needs to be addressed at both the advocacy and project implementation level. We need to rethink existing approaches and focus our collective efforts on aggressively expanding, adapting and proposing achievable initiatives in such areas as Internet literacy for SMEs, the digital gender divide and the Internet usage gap in government services, tele-health, e-learning, e-banking and working from home. As we learned from the Boston Consulting Group study mentioned above, connected populations will choose studying on their own versus in groups, for example. SMEs need to have affordable access to digital capacity-building programmes. Certification trainings should establish gender targets such as female train-the-trainer initiatives. Development funding should be used to help communities mobilize local digital experts, including among youth, to raise awareness and upskill underrepresented populations in such areas as distance learning, tele-health, government services and remote work.

The deep disruptions generated by the pandemic represent an opportunity to make digital skills development a driver of physical, social and economic resilience. I encourage interested digital skills practitioners to use both the selection of digital skills platforms and the list of essential digital skills for teachers provided in the annexes to learn more about the connectivism of today's digital skills communities and content, but also to demand and discover whether each has an inclusive connectivity component. Together we can enable populations with the relevant skills, including those that are social and emotional in nature, by building on the legacy of digital skills initiatives of the past, maintaining the momentum of 2020, and leveraging the drive to close the Internet usage and coverage gaps that still exist.

Annex 1: Practitioner's toolkit

Selection of digital skills platforms

African Development Bank: https://coding4employment.org/

AWS Training and Certification: https://aws.amazon.com/training/

AWS Educate: https://aws.amazon.com/education/awseducate/

Cisco Networking Academy: https://www.netacad.com/

Coursera for Government: https://www.coursera.org/government

Database for Digital Capacity: https://digital-capacity.org/database/

Digital Competence Framework 2.0 (DigCom 2.0): https://ec.europa.eu/jrc/en/digcomp/digital-competence-framework

Digital Square e-health community platform: https://digitalsquare.org/

EdTech Hub Open Educational Resources: https://edtechhub.org/coronavirus/oer/

FutureDotNow (United Kingdom): https://futuredotnow.uk/

Google Digital Skills for Africa: https://learndigital.withgoogle.com/digitalskills/courses

Khan Academy: https://khanacademy.org

Kolibri Learning Platform: https://learningequality.org/kolibri/

IBM Remote Learning Enablement: https://www.ibm.com/remotelearning/

LinkedIn Skills for In-Demand Jobs: https://opportunity.linkedin.com/en-us

Liquid Virtual Education: https://go.liquidtelecom.com/Liquid_Virtual_Education.html

Annex 2: Essential digital skills for teachers

Digital skills	Tool examples
Record/edit audio clips	Soundcloud, Audioboo, Vocaroo, Clyp
Engaging video content	TED Ed, Edpuzzle, Wevideo, Magisto
Visually engaging content	Piktochart, Canva, Google Draw, Glogster, Thinglink
Social networking websites to create personal learning networks, connect and discover new content	Twitter, Facebook, Google Plus, LinkedIn
Blogs and wikis to create participatory spaces for students	Blogger, Wordpress, Edublog, Kidblog, Wikispaces, Weebly
Social bookmarking websites to curate and share resources with your class	Diigo, Scoop.it, Pinterest, Edshelf, Participate, Symbaloo
Engaging presentations	Google Slides, Haiku Deck, Prezi, Zoho Presentation
Digital portfolios	SeeSaw, Pathbrite, Google Sites, Silk, Weebly
Non-traditional quizzes	Testmoz, Quizalize, Factile, Riddle, QuizBean

List of references

Abbott, A. (2019). Low-carbon, virtual science conference tries to recreate social buzz. *Nature, 577*(13). https://doi.org/10.1038/d41586-019-03899-1

Anderson, J. (2020, July 2). There is an education crisis hiding behind Covid's health and economic crises. *Quartz*. https://qz.com/1857486/how-khan-academy-hopes-to-reduce-covid-19s-impact-on-education/

Appugliese, C. (2020, May 19). Data science and AI from anywhere. *IBM Community*. https://community.ibm.com/community/user/datascience/blogs/carlo-appugliese/2020/05/19/data-science-and-ai-from-anywhere

Bahia, K., & Delaporte, A. (2020). *The state of mobile Internet connectivity 2020*. GSMA. https://www.gsma.com/r/wp-content/uploads/2020/09/GSMA-State-of-Mobile-Internet-Connectivity-Report-2020.pdf

Billing, F., De Smet, A., Reich, A., & Schaninger, B. (2021). *Building workforce skills at scale to thrive during – and after – the COVID-19 crisis*. McKinsey & Company https://www.mckinsey.com/business-functions/organization/our-insights/building-workforce-skills-at-scale-to-thrive-during-and-after-the-covid-19-crisis

Daws, R. (2021, March 9). Huawei launches program to support and empower female developers. *Developer Tech*. https://developer-tech.com/news/2021/mar/09/huawei-launches-program-support-empower-female-developers/

Downes, S. (2008). An introduction to connective knowledge. In Hug, T. (Ed.), *Media, knowledge & education: Exploring new spaces, relations and dynamics in digital media ecologies* (pp. 77–102). Innsbruck University Press. www.downes.ca/cgi-bin/page.cgi?post=33034

Gichora, N. N., Fatumo, S. A., Ngara, M. V., Chelbat, N., Ramdayal, K., Opap, K. B., Siwo, G. H., Adebiyi, M. O., El Gonnouni, A., Zofou, D., Maurady, A. A. M., Adebiyi, E. F., de Villiers, E. P., Masiga, D. K., Bizzaro, J. W., Suravajhala, P., Ommeh, S. C., & Hide, W. (2010). Ten simple rules for organizing a virtual conference – anywhere. *PLOS Computational Biology*, Article 6:e1000650. https://doi.org/10.1371/journal.pcbi.1000650

Global Youth Mobilization. (2021). *Young people championing post-pandemic futures*. https://globalyouthmobilization.org/wp-content/uploads/2021/03/Final-Young-People-Championing-Post-Pandemic-Futures.pdf

GSMA Mobile for Development Foundation. (2020). *Mobile Internet skills training toolkit*. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/07/GSMA-Mobile-Internet-Skills-Training-Toolkit-2020-English.pdf

Heneveld, T. (2020) *Last mile connectivity in the context of COVID-19* [REG4COVID Discussion Paper]. ITU. https://reg4covid.wpengine.com/wp-content/uploads/2020/11/FINAL_Last-Mile-Connectivity_Covid.pdf

Hewitt, N. (2020, June 9). Four ways African governments can bridge digital skills gap needed for post-Covid economic recovery. *Mail & Guardian*. https://mg.co.za/coronavirus-essentials/2020-06-09-four-ways-african-governments-can-bridge-digital-skills-gap-needed-for-post-covid-economic-recovery/

(continued)

Institute of Electrical and Electronics Engineers. (2021). Standard for digital intelligence (DQ) – Framework for digital literacy, skills, and readiness. In *IEEE Std 3527.1-2020*, 1–47. https://doi.org/10.1109/IEEESTD.2021.9321783

International Bank for Reconstruction and Development & World Bank. (2019). *Tracking SDG7: The energy progress report 2019*. https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/May/2019-Tracking-SDG7-Report.pdf

International Telecommunication Union. (2017, June 15). *ITU, ILO launch campaign to train five million youth with job-ready digital skills* [Press release]. https://www.itu.int/en/mediacentre/Pages/2017-PR26.aspx

International Telecommunication Union. (2018). *Digital skills toolkit*. https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/ITU%20Digital%20Skills%20Toolkit.pdf

International Telecommunication Union. (2018, December 6). New ITU statistics show more than half the world is now using the Internet. *ITU News*. https://news.itu.int/itu-statistics-leaving-no-one-offline/

International Telecommunication Union. (2020a). *Connecting humanity: Assessing investment needs of connecting humanity to the Internet by 2030*. https://www.itu.int/dms_pub/itu-d/opb/gen/D-GEN-INVEST.CON-2020-PDF-E.pdf

International Telecommunication Union. (2020b). *Digital skills assessment guidebook*. https://academy.itu.int/sites/default/files/media2/file/D-PHCB-CAP_BLD.04-2020-PDF-E_02%20June%202020.pdf

Koetsier, J. (2020, June 12). COVID-19 accelerated e-commerce growth '4 to 6 years'. *Forbes*. https://www.forbes.com/sites/johnkoetsier/2020/06/12/covid-19-accelerated-e-commerce-growth-4-to-6-years/?sh=1d3bab24600f

Kovács-Ondrejkovic, O., Strack, R., Antebi, P., Gobernado, A. L., & Lyle, E. (2019). *Decoding global trends in upskilling and reskilling*. Boston Consulting Group. https://image-src.bcg.com/Images/BCG-Decoding-Global-Trends-in-Upskilling-and-Reskilling-Nov-2019-Rev_tcm22-234120.pdf

Law, N., Woo, D., de la Torre, J., & Wong, G. (2018). *A global framework of reference on digital literacy skills for indicator 4.4.2*. UNESCO Institute for Statistics. http://uis.unesco.org/sites/default/files/documents/ip51-global-framework-reference-digital-literacy-skills-2018-en.pdf

MarketDigits. (2020). Massive Open Online Course (MOOC) market, by component (CMOOC, XMOOC), course (humanities, computer science & programming, business management), user type (high school, undergraduate, postgraduate, corporate) and geography – Global forecast to 2026. https://marketdigits.com/massive-open-online-course-mooc-market/

Organisation for Economic Co-operation and Development. (2021a). *Policy highlights: The digital transformation of SMEs*. https://doi.org/10.1787/bdb9256a-en

Organisation for Economic Co-operation and Development. (2021b). *Towards a skills strategy for Southeast Asia: Skills for post-COVID recovery and growth*. https://doi.org/10.1787/6db0907f-en

(continued)

Patil, L., Thomas, S., Michalchik, V., & Moorthy, S. (2014). *Intel Education research on technology adoption in large-scale deployments: Guiding eLearning from vision to practice*. Intel Corporation. https://www.intel.com/content/dam/www/program/education/us/en/documents/elearning-from-vision-to-practice.pdf

Rolnick, D., Donti, P. L., Kaack, L. H., Kochanski, K., Lacoste, A., Sankaran, K., Ross, A. S., Milojevic-Dupont, N., Jaques, N., Waldman-Brown, A., Luccioni, A., Maharaj, T., Sherwin, E. D., Mukkavilli, S. K., Kording, K. P., Gomes, C., Ng, A. Y., Hassabis, D., Platt, J. C., … Bengio, Y. (2019). *Tackling climate change with machine learning*. ArXiv. http://arxiv.org/abs/1906.05433

United Kingdom Office for National Statistics. (2020, July 22). *Coronavirus and homeschooling in Great Britain: April to June 2020*. https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/coronavirusandhomeschoolingingreatbritain/apriltojune2020

United Nations (2020). *Report of the Secretary-General: Roadmap for digital cooperation*. https://www.un.org/en/content/digital-cooperation-roadmap/assets/pdf/Roadmap_for_Digital_Cooperation_EN.pdf

United Nations Department of Economic and Social Affairs. (2020). *E-Government survey 2020: Digital government in the decade of action for sustainable development*. https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf

Vaccarino, A., & Pelucchi, M. (2021, April 20). *After the storm: the jobs and skills that will drive the post-pandemic recovery* [Conference presentation]. Cedefop Virtual Workshop: Digital Skills Post-COVID-19 – Shifting gears in the digital transition. https://www.cedefop.europa.eu/files/workshop_3_vaccarino_after_the_storm.pdf

World Bank. (2021). *How the private sector is supporting youth employment during the COVID 19 pandemic* [S4YE Knowledge Brief Series, Issue 12]. https://www.s4ye.org/sites/default/files/2021-03/S4YE%20Brief%20on%20Private%20Sector%20Inititiatives%20during%20COVID%20Final.pdf

World Economic Forum (2020). COVID-19 action agenda leaders on the front line: Why social entrepreneurs are needed now more than ever. http://www3.weforum.org/docs/COVID19_SocEnt_Alliance_Report_2020.pdf

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Endnotes

1 https://www.geekswf.org/. Note: this article builds upon the ITU (2020) *Last Mile Connectivity in the Context of COVID-19* discussion paper that I authored.
2 https://www.planindia.org/our-project/digital-learning-centres/
3 https://reg4covid.wpengine.com/ and https://www.itu.int/en/mediacentre/backgrounders/Pages/digital-inclusion-of-all.aspx
4 https://www.statista.com/statistics/262886/illiteracy-rates-by-world-regions/
5 https://webfoundation.org/2020/03/the-gender-gap-in-Internet-access-using-a-women-centred-method/
6 https://www.imf.org/external/pubs/ft/fandd/2021/03/africas-digital-future-after-COVID19-duarte.htm
7 Organizations researched for this analysis include Microsoft, Facebook, Google, Amazon, Coursera, Dell, GSMA, Liquid Intelligent Technologies, Huawei, Cisco, African Development Bank, IBM and the United States Agency for International Development.
8 https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/
9 https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/
10 https://schoolhouse.world/
11 https://www.liquid.tech/about-us/news/Liquid%20Intelligent%20Technologies%20provides%20a%20boost%20to%20remote%20learning%20at%20Kibabii%20virtual%20school%20amidst%20Covid-19%20pandemic
12 https://www.decentjobsforyouth.org/theme/digital-skills-for-youth#Why
13 https://www.afdb.org/en/news-and-events/african-development-bank-and-partners-digital-coding-employment-program-ensuring-african-youth-are-competitive-global-digital-economy-37314
14 https://www.afdb.org/en/news-and-events/relevance-digital-skills-covid-19-era-36244
15 http://sheleadsit.com/
16 https://restorersc.wixsite.com/restoreasenseofican
17 https://www.stemcaribbean.com/caribbean-girls-hack-and-rsc-collaborate-with-tech-giant-ibm-to-host-caribbean-session-during-virtual-global-conference/
18 https://iloblog.org/2018/08/30/digital-tools-an-opportunity-for-africas-informal-sector/
19 https://www.mckinsey.com/business-functions/organization/our-insights/to-emerge-stronger-from-the-covid-19-crisis-companies-should-start-reskilling-their-workforces-now
20 https://academy.itu.int/index.php/main-activities/digital-transformation-centres-initiative
21 https://www.gsma.com/mobilefordevelopment/blog/working-together-during-covid-19-to-empower-digital-skills/
22 https://www.unhcr.org/getinvolved/teachingtools/5e787bea4/ensure-continue-learning-amid-coronavirus-situation.html
23 https://en.unesco.org/news/covid-19-10-recommendations-plan-distance-learning-solutions
24 https://www.edukasyon.ph/
25 http://www.machaworks.org/
26 http://boscouganda.com/
27 https://www.fantsuam.org/
28 https://www.la-difference.com/
29 https://tunapanda.org/
30 https://www.inethi.org.za/
31 https://www.facebook.com/SowetoWirelessUserGroup/
32 https://digital-competence.eu/dc/front/what-is-digital-competence/
33 https://beyondstandards.ieee.org/new-standard-will-help-nations-accelerate-digital-literacy-and-digital-skills-building/
34 https://medium.com/african-innovations-liquid-telecom/21c-skills-spotlight-westerwelle-startup-haus-kigali-1537cb7c2790
35 https://www.mujeres-conectadas.org/
36 https://opportunity.linkedin.com/skills-for-in-demand-jobs
37 https://www.datasciencenigeria.org/
38 https://zindi.africa/
39 https://blockgeeks.com/

[40] https://www.accenture.com/us-en/about/company/people-work-connect
[41] https://globaleducationcoalition.unesco.org/
[42] https://africaeurope-innovationpartnership.net/news/third-party-covid-19-hackathons-funding-opportunities-and-online-platforms
[43] https://covidactioncollab.org/
[44] https://www.weforum.org/covid-alliance-for-social-entrepreneurs
[45] https://en.unesco.org/covid19/educationresponse/nationalresponses
[46] https://digitalpublicgoods.net/about/
[47] https://impakter.com/covid-19s-impacts-on-women-entrepreneurs-the-challenges-and-the-solutions/
[48] https://www.mckinsey.com/business-functions/mckinsey-accelerate/our-insights/adapting-workplace-learning-in-the-time-of-coronavirus
[49] https://eua.eu/news/538:european-commission-launches-a-new-skills-agenda.html

Skill sets required due to the digital transformation

By Gedeon Hakizimana

Introduction

Progressions in technology – from the invention of the transistor to the fourth industrial revolution – propel substantial shifts in the skills needed on the labour market. Predictably, the future requires a particular set of skills, with socio-behavioural and digital skills mandatory for success (Gonzalez Vazquez et al., 2019). However, the problem of gaps and short supply of these skills, already identified as key for current and future success, is observed around the globe, with the most critical condition in developing countries, mainly in sub-Saharan Africa.

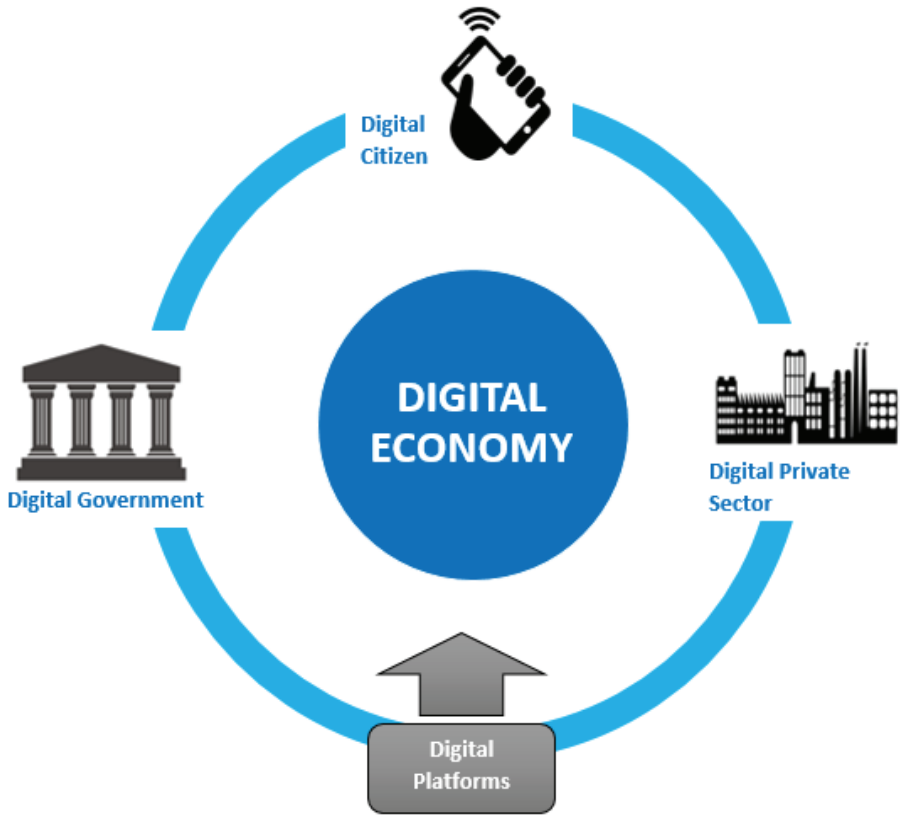
This alarming status constitutes a solemn call upon all stakeholders, including educational and capacity-building organs, to urgently reform training programmes to avoid failures to supply the skilled workforce necessary for the economic development of countries. In this article, special attention is paid to digital skills due to their bedrock role in the digital economy already shaping the current and future world business environment. The digital economy builds on the digital competencies of governments and private sector workers who, through digital platforms, operate to deliver improved services and products to digital citizens (see Figure 2.1). In order to participate actively in the digitally transformed life, people must be prepared with a range of digital skills (ITU, 2018a). It is therefore necessary to change what, how and when people learn, in order to achieve effective digital readiness. There is hence a need to invest in policies and human capital, particularly across sub-Saharan African countries, that embrace these education shifts as rigorously as they endeavour to ensure children are learning in schools.

Digital skills entail the competencies indispensable for an individual to use information and communication technology (ICT) to accomplish defined goals in their personal or professional life (Commission on Science and Technology for Development, 2018). The need for these skills has been made more urgent by the universal outbreak of COVID-19, which has stimulated increased demand for digital solutions and competencies. This has resulted in a boom in digital solutions, platforms, products and services. In turn, this has amplified both the need for digitalization of business processes (Guo et al., 2020) on the one hand, and the need for a digitally skilled workforce on the other, in order to cope with the constraints imposed by the pandemic. Gaps in digital skills supply are today noted by employers worldwide, while managers across Africa are witnessing how these gaps constitute a major hindrance to their competitiveness in the global economy.

The objective of this article is to discuss the different sets of digital skills required to cope with the constantly shifting labour market environment and prepare for the future workforce market, given that digital transformational process will not cease (Harvard Business Review Analytic Services, 2020). The article highlights the inequitable distribution of digital skills between developed and developing countries, and the gaps existing between the demand and supply of these skills at global level, with a special focus on the danger that threatens African countries if serious measures are not taken to bridge the gap, both now and in the future.

Three types of digital skills are debated by level, with examples of the technical competencies required for social integration

Figure 2.1: Elements of the digital economy environment



Source: Digital Economy for Africa Initiative (2020)

and professional development in the digital economy ecosystem. The three levels of skills include basic, intermediate and advanced digital skills, which are sometimes named differently, depending on context. The most comprehensive frameworks to handle the digital skills issue globally are also summarized. Practically, these frameworks will have to be adjusted to individual country contexts for maximum output.

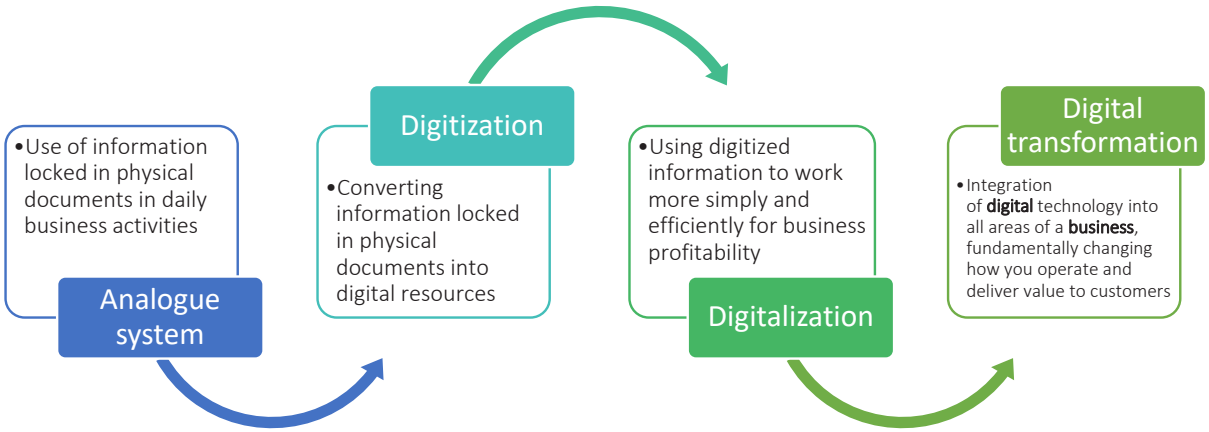
The digital skill sets required in current and future digital environments

Business process alterations, from digitization to digital transformation (see Figure 2.2) are reshaping millions of jobs[1] and having a profound impact on labour markets and skill sets around the globe. These transformational changes are mainly led by computer-based automation, altering the inner configuration of a myriad of occupations (World Economic Forum, 2018) and creating new types of jobs as well. As a result, the skills needed by the world population are also changing, creating the need for serious human capital investments.

Before discussing the three main types of digital skills mandatory for resilience in the current technological transformational waves, some important contexts for the definition of digital skills are considered. These include the Organisation for Economic Co-operation and Development (OECD) context, the European Union (EU) and the International Telecommunication Union (ITU) digital skill types and levels. Figure 2.3 summarizes these contexts. Each was consulted for a comprehensive analysis.

However, the ITU grouping is used in this article because it is considered the clearest in categorizing the proficiency levels of digital skills needed by individuals for their social inclusion, and by employees currently and to

Figure 2.2: Digital transformation technical process



Source: Authors' own 2021, unpublished

Figure 2.3: Popular digital skills contexts

OECD context	EU context	ITU context
•ICT generic skills	•Digital user skills	•Basic digital skills
•ICT specialist skills	•Digital specialist skills	•Intermediate digital skills
•ICT complementary skills	•Digital entrepreneurship skills	•Advanced digital skills

Source: Authors' own 2021, unpublished

future-proof their career.[2] As the development of a supply scheme for these competencies requires a good definition of frameworks, it is suggested that the EU's DigComp 2.1 Digital Skills Framework and its adaptation by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in the Digital Literacy Global Framework (DLGF) are the most inclusive for citizens in developed and developing countries. Nevertheless, the adaptation of these frameworks to individual country contexts is crucial in order to develop appropriate education curricula, training agendas and assessment schemes (Bashir, 2020).

Skill set 1: ICT basic skills

In the DLGF, basic or generic digital skills are referred to as foundation digital abilities that help individuals participate in a digital ecosystem at a minimum level, by accessing and using digital technologies to perform basic tasks. They cover the skills needed by all ICT consumers (Claro et al., 2017) to use digital tools and devices in their non-ICT tasks, to interact with others and to access various commercial and government online services as needed in their daily life. These skills include the abilities to use a computer and mobile telephone, operate a touch screen, connect to the Internet and explore it, and use

various digital applications at consumer level. According to the framework created by the United Kingdom Department for Education,[3] Accenture and other organizations, these skills (outlined under six areas) are subdivided into life skills and work skills as follows.

- **Digital foundation skills:** These are the basis for using digital technologies in daily life, such as:
  - turning on a computer or a telephone and entering any account information as required
  - using a mouse and keyboard on a computer
  - operating a touch screen on a smart phone or tablet
  - adapting device settings to your preferences
  - choosing the correct icons for a wanted application
  - fixed or mobile connection to the Internet by handling obligatory authentication
  - web search
  - staying safe by keeping confidential all your login information.

- **Communication skills:** These are abilities necessary to create and edit content with digital devices and applications to share information, create and send emails, use attachments and use social media platforms to actively participate in life.
- **Information and content handling:** The secure management of digital information and content such as the use of search engines and accessing content across a variety of devices.
- **Transacting:** Setting up accounts for the purchase of online goods or services, using different payment methods and filling in an online form. For example, in most African countries, every citizen should know how to transact with mobile money, especially during and post COVID-19, where governments recommend the use of digital payments to curb the spread of the virus.
- **Problem solving:** Necessary abilities to find answers to questions by the use of digital tools and online services such as FAQ pages, tutorials and chats.
- **Online safety:** Competencies needed by every online user to stay safe and confident by respecting the best practices in data storage and sharing, and knowledge of password security, with awareness of and precautions against viruses and other online malware.

Skill set 2: ICT intermediate skills

Applicable to a wide range of job requirements today, interestingly this category of skills seems to constitute a common determinant for access to jobs in both developed and developing countries. It encompasses the ability to use ICT to perform work-related tasks and constitutes a key to access employment, with strong contribution to the professional growth of a society. Examples of intermediate digital skills include but are not limited to:

- using word processing software
- using electronic formats such as web publishing and multimedia presentation
- using dedicated software for analytics, project management, digital marketing and social media analytics
- using spreadsheets to visualize data
- visual communication of ideas through digital graphics
- treatment of database records
- filtering and sorting data for report production and sharing.

Skill set 3: ICT advanced skills

Also called digital specialist skills, these are the competencies needed to research, design, develop, produce, install, manage and maintain ICT systems and software (OECD, 2016) for the continuity of systems and business operations. Digital entrepreneurship skills also fall into this group. Occupational domains in this category include but are not limited to software development, programming, web design and app development.

The market also needs special skills such as enterprise architecture design, network and system administration, and information system and network security.[4] In addition, as

countries are exploring possibilities to adopt digital currency, blockchain skills are highly needed today. These include cryptography, smart contracts, data structures, blockchain architecture, distributed ledger expertise and web development. Considering that the global working environment is becoming more Internet-based, cybersecurity skills are extremely needed to protect consumers against a variety of online attacks. Top cybersecurity competencies required in today's business environment include application security development, cloud security, threat intelligence analysis, penetration testing/red teaming, network security, digital identity and access management, risk and compliance auditing, and mobile/remote computing.

Digital entrepreneurship (e-business) skills

While some scholars consider them 'intermediate digital skills', in this article e-business competencies are considered ICT specialist skills. In fact, the corporate environment needs more complex technical ICT skills, as well as the soft skills of leadership, communication and business/marketing aptitude. Digital entrepreneurship skills therefore comprise a combination of business and technology abilities enabling people to identify how digital technologies can create new business opportunities, new business models or new ways of running existing business. Specifically, any digital business needs the following skills.[5]

- **Data visualization and digital design:** The skills to create dynamic and effective user interfaces for data visualization is a corporate need today for all websites and digital services.
- **Digital project management:** These skills cover the competencies to develop digital products and services in a timely and cost-effective fashion. They include digital management methods such as Agile and Scrum, which are highly in demand because these skills increase a company's confidence in its efficiency and competitiveness.

High-level computing and emerging technologies

To ensure their future resilience, ICT professionals need to invest in the acquisition of a number of new high-level computing and automation technologies that are proliferating and seem likely to dominate the future of the business environment. Data scientists; Internet of Things (IoT) systems engineers; and blockchain, artificial intelligence and machine learning specialists are quickly coming to dominate the computing workforce, both within and outside the technology sector. These occupations will form a core part of the economies of the future.[6] Figure 2.4 illustrates the most in-demand competencies considered by many to dominate the digital future (Hwang & Cheng, 2017).

To reiterate, Figure 2.5 comprises all the three types of digital skills as per their proficiency level in life and the workplace. There are normally more individuals with basic digital skills, with fewer as proficiency grows, up to advanced or specialist levels.

Grouped by category, the technical competencies of the digital skills required to face the digital transformation era are compiled in Figure 2.6 by way of review and consolidation. The list may appear incomplete but it is believed that the most important competencies are captured. The list could serve as a reference, especially for curriculum developers, educators and any other stakeholders concerned with the development and transfer of digital skills.

However, while countries are struggling to develop digital skills, special attention should be paid to the issue of ordinary literacy and numeracy proficiency. These skills are the foundation of the overall development and acquisition of digital skills. In fact, in the typical case, the acquisition of even quite basic digital literacy demands that the user is literate and numerate. However, many developing countries face a schooling issue that hinders the attainment of digital competencies. Table 2.1 shows the proportion of children and adolescents who are unable to achieve

Figure 2.4: Trending computing technologies to lead the future economy

Source: Authors' own 2021, unpublished

minimum levels in mathematics and reading by the time they are of age to complete primary and lower secondary education (UNESCO Institute for Statistics, 2017).

Table 2.1: Proportion of children and adolescents not achieving minimum levels in mathematics and reading, by region

Region	Reading (%)	Mathematics (%)
World	58	56
Sub-Saharan Africa	88	84
Central and Southern Asia	81	76
Western Asia and North Africa	57	57
Latin America and Caribbean	36	52
East and South-East Asia	31	28
Oceania	22	22
North America and Europe	14	14

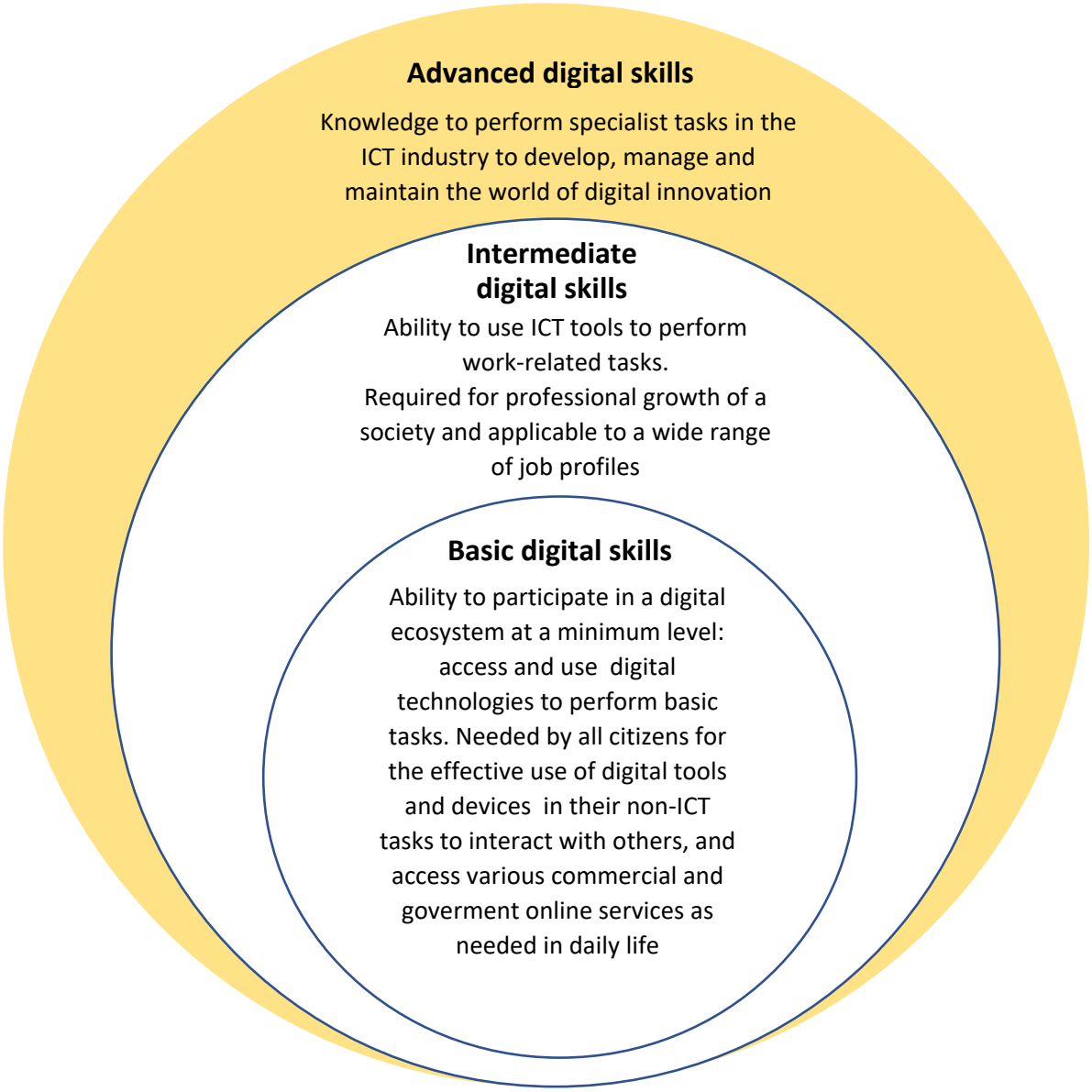
Source: UNESCO Institute for Statistics (2017)

It is clear that developing countries will lag behind in digital skills readiness, with more risks observed in sub-Saharan countries, unless suitable strategies are adopted.

It is paramount to restate that the development and acquisition of these skills requires well-organized frameworks to address the issue objectively. A number of frameworks exist; the most globally accepted are summarized in Figure 2.7.

The DigComp2.1/UNESCO Framework Proficiency Level 5 is suitable for the development of basic digital skills needed by all citizens. The DigComp Framework Proficiency Level 3 is appropriate to deal with intermediate and advanced digital competencies needed by public and private workers to improve private sector productivity and competitiveness, and develop innovative ICT infrastructure, products and services on the one hand; and to improve public sector

Figure 2.5: Digital skills sets for digital inclusion and employment



Source: Author's own, unpublished, adapted from OECD (2016); Gonzalez Vazquez et al. (2019); Hüsing et al. (2012) and ITU (2018a)

efficiency and quality on the other hand. However, it is important to note that these frameworks need adaptation at country level to cater for individual contexts.

Digital skills supply/demand issue

The digital skills gap is a global issue today, to the point that even the world's most technologically and economically advanced countries such as the United States of America and European countries are struggling with it.[7] This gap – normally defined as a lack of digital skills among citizens, a lack of digital competencies among the existing labour force, and a lack of well-trained graduates to fill digital posts in the rising high-tech industry and other economic sectors – can hamstring the growth of businesses and affect economies to the level of instigating contractions.[8] It is in this context that countries are struggling to fill the gaps by implementing appropriate measures.

Figure 2.6: List of digital competencies needed in a digital ecosystem

DIGITAL SKILLS REQUIRED DUE TO DIGITAL TRANSFORMATION AS AT 2021

ICT basic skills

- Digital foundation skills
  - *Turn on a computer, telephone or any other digital device*
  - *Enter any account information as required*
  - *Use a mouse and keyboard on a computer*
  - *Use a touch screen on a smart phone or tablet*
  - *Use device settings menus*
  - *Find different applications by choosing the correct icons on the home screen*
  - *Connect to the Internet by fixed or wireless technologies*
  - *Handle required connection authentication*
  - *Locate a browser and find a wanted website*
  - *Keep login information secure*
- Communication skills
- Information and content handling
- Transacting
- Problem solving
- Being safe and legal online

ICT intermediate skills (sometimes advanced)

- Desktop publishing
- Web publishing
- Multimedia presentation
- Use of dedicated software for analytics
- Social media analytics
- Use of spreadsheets and digital graphics
- Database record treatment
- Digital project management
- Digital marketing
  - *Content marketing*
  - *User experience design*
  - *Email and social media marketing*
  - *Search engine optimization and search engine marketing*
  - *Copywriting and editing*
  - *Data analysis*
  - *Web analytics*
  - *Video production*
  - *Conversion rate optimization*
  - *Customer relationship management*
  - *Basic design skills*
  - *Mobile marketing*

ICT advanced skills

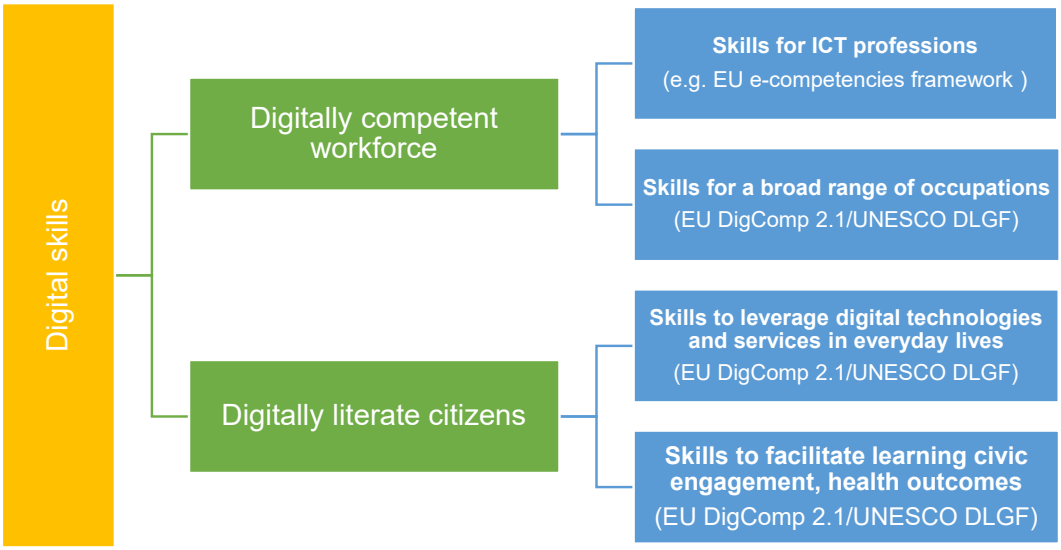
- Software development
- Programming, web design and app development
- Enterprise architecture design
- Network and system administration
- Information system and network security
- Database and data pipeline automation
- DevOps dexterity
- Artificial intelligence
- Machine learning
- IoT
- Big data analytics
- FinTech
- Blockchain
  - *Cryptography*
  - *Smart contracts*
  - *Data structures*
  - *Blockchain architecture*
  - *Distributed ledger expertise*
- Robotic process automation
- Virtual and augmented reality
- Quantum computing
- 3D printing
- Cloud computing
- Cybersecurity
- Mobile applications
- Practical delivery drones

Foundational literacy and numeracy proficiency

Source: Authors' own 2021, unpublished

Given that it is believed that success in today's life and workplace depends and will depend on digital skills (Pew Research Center, 2016), it is unfortunate that about 44 per cent of Europeans aged 16–74 do not have basic digital skills.[9] The numbers are even higher in developing countries, especially in sub-Saharan Africa. Table 2.2 shows the divide that exists between developed and poor countries on the percentage of people with basic and intermediate (standard) ICT skills.

Figure 2.7: Global digital skills frameworks



Source: Bashir (2020)

Table 2.2: The divide in digital skills between developed and developing countries

Type of digital skills	Developed countries (average proportion of individuals)	Developing countries (average proportion of individuals)
Basic	65%	46%
Standard (intermediate)	49%	20%

Source: ITU (2018a)

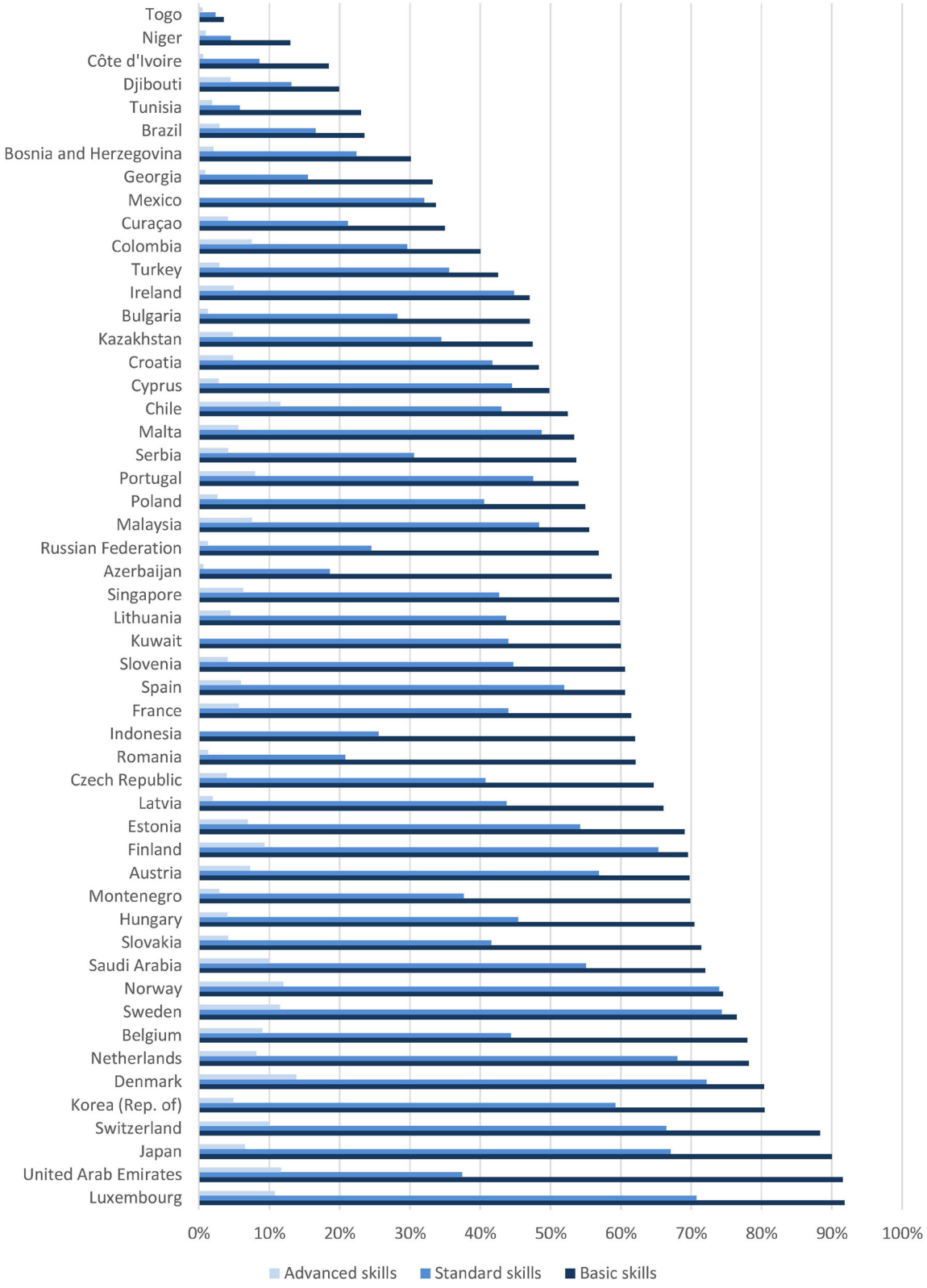
The result of this gap, particularly among the existing labour force in developed economies, is that many companies with large workforces are becoming unable to adopt the digital technologies that are supposed to make their businesses more successful. In developing countries, this gap is creating a second digital divide – revealed through a striking shortage of digital skills – in addition to the digital divide caused by variations in access to digital technologies between and within countries (James, 2019).

According to Bashir (2020), the number of people with basic digital skills is very low in many African nations. Chart 2.1 indicates the percentage of the world population in 2017 with basic, intermediate (referred to as standard on the figure) and advanced digital skills, based on self-reported behavioural measures of digital skills. It is noticeable that the countries with a lower proportion of people with digital skills (compared with Europe, Asia and South America) are in Africa (Togo, Niger, Cote d'Ivoire, Djibouti and Tunisia). Huge in-region variances are also witnessed, whereby a number of North African countries have a higher percentage of citizens with basic, intermediate and advanced digital skills compared with countries in the sub-Saharan region.

In addition, according to a report about the changing landscape of work and skills in the digital age (Gonzalez Vazquez et al., 2019), it is recognized that a moderate (intermediate) level of digital skills will be essential in the future of the European workforce. However, the continent is threatened by a potential mismatch in advanced digital skills in more than half the EU Member States between 2016 and 2030. It is believed that in the future, a combination of intermediate digital skills and strong non-cognitive skills will be in high demand, due to increased wages for workers who already have these skills (Gonzalez Vazquez et al., 2019).

A similar situation of high demand for basic and intermediate digital skills is observed in African countries. It is, for instance, projected

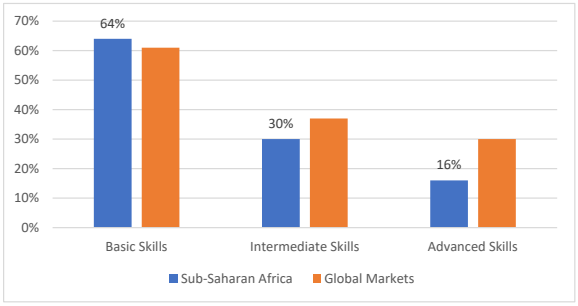
Chart 2.1: Proportion of the population in various economies with basic, standard and advanced skill levels



Source: ITU (2018b)

that by 2030, more than 230 million jobs will require digital skills and mostly in sub-Saharan Africa (IFC, 2019), with a faster growth in demand than in other parts of the global market. Although a large percentage of people living in African countries do not have the most basic digital skills today, it is projected that basic and intermediate ICT skills will be in high demand on this continent as more businesses are aligning strategies for digital transformation (IFC, 2019). Chart 2.2 shows that about 64 per cent of the demand will be for basic skills, while 30 per cent will be for intermediate digital skills. Demand for a digitally trained workforce in Africa will surge in the future because most jobs that did not need digital skills previously have already begun to do so.[10]

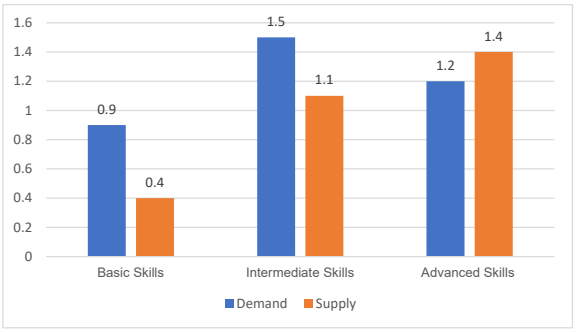
Chart 2.2: Proportion of digital recruits requiring at least the stated level of digital skills in sub-Saharan Africa



Source: IFC (2019)

There are already gaps between the demand for and supply of basic and intermediate digital skills in sub-Saharan Africa (see Chart 2.3). For example, society is able to supply only 110 out of 150 demands for intermediate-skilled workers, leaving a gap of 40, equivalent to a shortage of 27 per cent. The same issue exists for basic digital skills, with a supply of 40 against demand for 90 workers with basic digital skills, creating a gap of 56 per cent.

Chart 2.3: Status of demand/supply of digital skills in sub-Saharan Africa



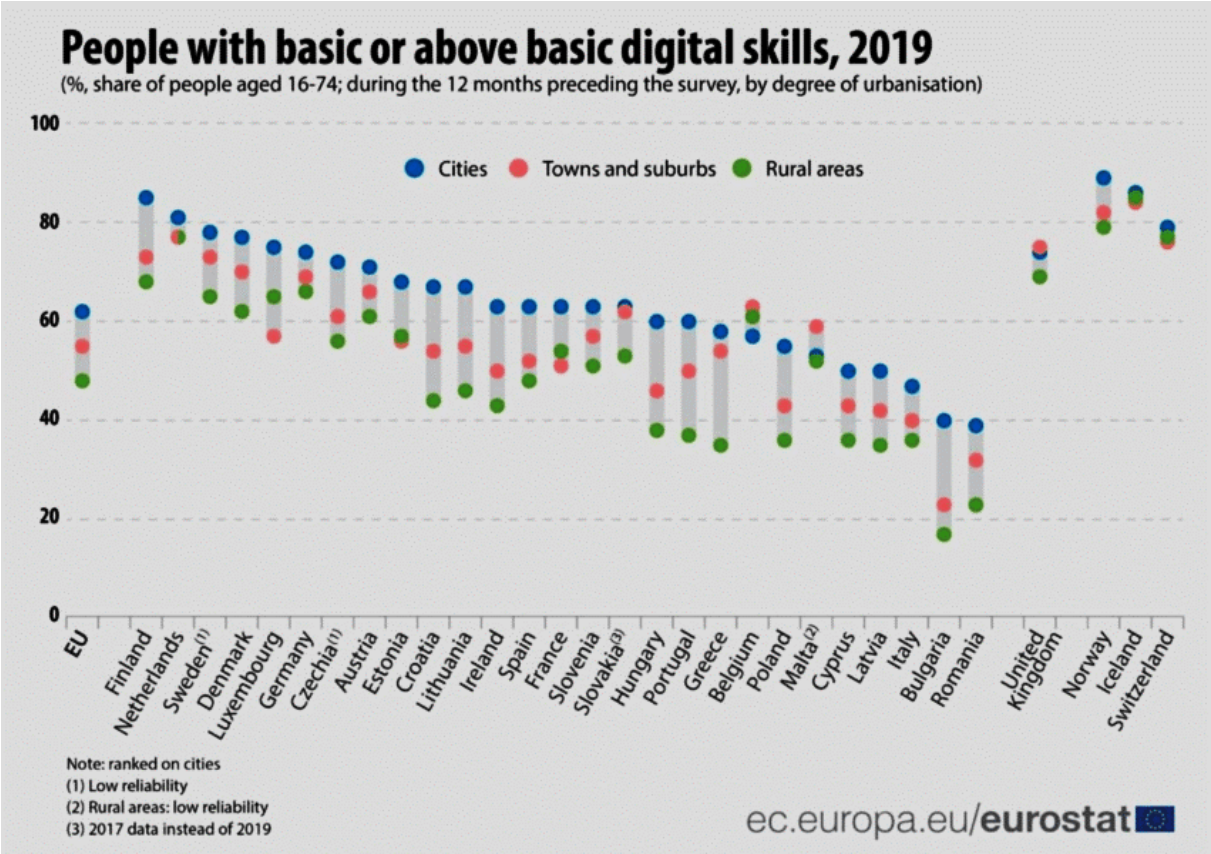
Source: IFC (2019)

On the European side, the same challenge of gaps exists for the entire population but also between genders. Statistics from 2019 show that gaps exist between men and women who have at least basic digital skills (respectively, 60 per cent and 55 per cent). In addition, only 31 per cent of people with a low educational level or without no education have basic digital skills. Chart 2.4 shows the gaps existing between urban and rural areas, with 49 per cent of rural citizens versus 63 per cent of urban populations having basic digital skills (Arregui Pabollet et al., 2019).

Despite these challenges, plans and projections are promising. In the EU, it is planned that at least 70 per cent of adult citizens will have basic digital skills by 2025, and initiatives have been put in place to curb the level of underperformance in computing and digital literacy in general from 30 per cent (in 2019) to 15 per cent (in 2030) among 13–14-year-old youths.[11] For Africa, it is projected that the digital adoption rate, which is still below 20 per cent in most African countries, will increase to 50 per cent in 2030, as illustrated in Table 2.3 from a survey conducted in five African countries (IFC, 2021).

It is also predicted that the highest portion of digital skills demand on the African continent will be for intermediate skills in all economic sectors. Table 2.4 provides more details.

Chart 2.4: Percentage of people in European countries with basic or above basic digital skills, 2019



Source: Arregui Pabollet et al. (2019)

Table 2.3: Estimated adoption rate of digital skills by sector across five African countries

Country	Agriculture (%)		Industry (%)		Services (%)		Total (%)	
	2019	2030	2019	2030	2019	2030	2019	2030
Rwanda	5–10	25–30	15–20	35–40	35–40	60–65	20–25	40–45
Kenya	15–20	35–40	25–30	45–50	40–45	60–65	25–30	50–55
Mozambique	0–5	10–15	5–10	20–25	20–25	40–45	5–10	20–25
Nigeria	5–10	25–30	10–15	30–35	35–40	50–55	20–25	40–45
Cote d'Ivoire	5–10	25–30	15–20	30–35	35–40	55–60	18–23	35–40

Source: IFC (2021)

Challenges but also opportunities!

In view of the massive gaps existing in a field believed to drive current and future success for personal and business life, opportunities are arising for individuals to bridge their own digital skills gaps. The pick of the best ICT jobs today belongs to graduates and skilled workers with information technology (IT) qualifications, and it is time for individuals to add a digital qualification to their resume while the digital skills gap remains open.

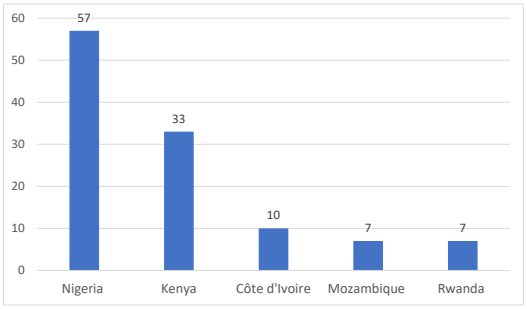
On the other side, wherever the digital skills gap is considered an obstacle to an economy, the problem will in the long run be solved through training. Therefore, the digital skills gaps constitute a window for smart investors to

Table 2.4: Demand for digitally skilled trained workers by sector and proficiency level in five African countries (2030 forecast, as a percentage of the total labour force)

Country	Sector	Skill types			
		Foundational	Intermediate		Advanced
			Non-ICT	ICT	
Rwanda	Agriculture	83	13	3	0
	Industry	76	18	5	1
	Services	49	37	10	4
Kenya	Agriculture	21		78	1
	Industry	27		69	4
	Services	37		54	9
Mozambique	Agriculture	16		84	0
	Industry	27		71	2
	Services	28		63	9
Nigeria	Agriculture	15		84	1
	Industry	22		76	2
	Services	37		59	4
Cote d'Ivoire	Agriculture	13–15		84–86	0.5–1
	Industry	22–24		71–73	3–5
	Services	40–42		50–52	5–7

Source: IFC (2021)

Chart 2.5: Number of digital skills training opportunities (millions) in five African countries



Source: IFC (2021)

get into the digital training space ahead of the curve. For example, the high demand for digital skills needed for 57 million jobs to be created over the next decade will result in the creation of about 114 million training opportunities just across the five African countries shown in Chart 2.5 (IFC, 2021).

Conclusion

In a digitally transformed environment like ours, digital skills are mandatory[12] for an informed community and workforce that can participate actively through the consumption, use, design and development of digital products and services. Three levels of digital skills are necessary: basic, intermediate and advanced digital skills. These skill sets are in high demand today, with many job profiles requiring the possession of basic and intermediate digital skills, while the high-tech industry needs advanced or specialist skills to sustain the innovation momentum.

Unfortunately, gaps in these skills exist around the globe. For instance, at least 65 per cent of the population in developed countries possess basic digital skills, compared with 46 per cent in developing countries. The situation worsens with intermediate (or standard) skills in poor countries, where up to 80 per cent of the population do not have standard digital skills, against 49 per cent that have intermediate skills in developed countries (ITU, 2018a).

As of 2020, a good number of OECD countries and some Asian and Latin American states had already developed frameworks to guide the measurement of digital skills in their populations and then support the development of education and training materials, while many countries in Africa still lack comprehensive frameworks for digital skills (Bashir, 2020). In addition, developing countries face a schooling crisis whereby more than half of children and adolescents at school are unable to achieve the minimum levels of proficiency required in mathematics and reading by the time they are of age to complete primary and lower secondary education, making the acquisition of digital competencies for such societies even more complicated.

It is high time to turn challenges into opportunities. Digital technologies are creating millions of jobs, requiring people to learn new digital skills. The window is open for individuals and graduates to add digital skills and IT certification to their resume, to pick the best ICT jobs. Investors now have an opening to enter a rapidly growing marketplace that is sure to dominate the future of business worldwide, with millions of opportunities in digital skills training around the globe. However, individual countries' success in this journey requires high-level synchronization between all stakeholders, from governments to the general public. Policymakers need to create an enabling policy environment, education providers need to reform their programmes to accommodate the surge in digital skills demand, and the private sector needs to invest in the development of the required infrastructure and solutions.

List of references

Almeida, F., Santos, J. D., & Monteiro, J. A. (2020). The challenges and opportunities in the digitalization of companies in a post COVID-19 world. *IEEE Engineering Management Review, 48*(3), 97–103. http://dx.doi.org/10.1109/EMR.2020.3013206

Baldwin, R., & Weder di Mauro, B. (Eds.) (2020). *Economics in the time of COVID-19*. CEPR Press. https://cepr.org/sites/default/files/news/COVID-19.pdf

Bashir, S. (2020). *Digital skills: Frameworks and programs*. World Bank. https://documents1.worldbank.org/curated/en/562351611824219616/pdf/Digital-Skills-Frameworks-and-Programs.pdf

Bloomberg, J. (2018, April 29). *Digitization, digitalization, and digital transformation: Confuse them at your peril*. Forbes. https://www.forbes.com/sites/jasonbloomberg/2018/04/29/digitization-digitalization-and-digital-transformation-confuse-them-at-your-peril/?sh=6ca83ae2f2c7

Claro, M., Preiss, D. D., San Martín, S., Jara, I., Hinostroza, J. E., Valenzuela, S., Cortes, F., & Nussbaum, M. (2017). Assessment of 21st century ICT skills in Chile: Test design and results from high school level students. *Computers & Education, 59*(3), 1042–1053. https://doi.org/10.1016/j.compedu.2012.04.004

Cochoy, F., Hagberg, J., McIntyre, M. P., & Sören, N. (Eds.). (2017). *Digitalizing consumption: How devices shape consumer culture*. Routledge.

Digital Economy for Africa Initiative. (2020). *Digital Economy for Africa country diagnostic tool and guidelines for task teams*. https://thedocs.worldbank.org/en/doc/694441594319396632-0090022020/original/DE4ADiagnosticToolV2FINALJUNE24.pdf

Ding, W., Levine, R., Lin, C., & Xie, W. (2020). *Corporate immunity to the COVID-19 pandemic* [NBER Working Paper No. 27055]. National Bureau of Economic Research. https://doi.org/10.3386/w27055

Dolata, U. (2011). *Radical change as gradual transformation: Characteristics and variants of socio-technical transitions* [SOI Discussion Paper No. 2011-03]. University of Stuttgart. http://hdl.handle.net/10419/88171

Dosi, G., & Galambos, D. (Eds.) (2013). *The third industrial revolution in global business*. Cambridge University Press. https://assets.cambridge.org/97811070/28616/frontmatter/9781107028616_frontmatter.pdf

European Commission. (2018). *Digital economy and society index report 2018: Human capital – Digital inclusion and skills*. https://ec.europa.eu/information_society/newsroom/image/document/2018-20/2_desi_report_humancapital_B5DC055D-DD1E-51CD-229138BE55F9AE8A_52247.pdf

Gašová, K., Mišík, T., & Štofková, Z. (2018). Employers demands on e-skills of university students in conditions of digital economy. In Hájek, P., & Vít, O. (Eds.), *CBU international conference proceedings 2018: Innovations in science and education* (Vol. 6, pp. 146–151). http://dx.doi.org/10.12955/cbup.v6.1147

Gonzalez Vazquez, I., Milasi, S., Carretero Gomez, S., Napierala, J., Robledo Bottcher, N., Jonkers, K., & Goenaga Beldarrain, X. (Eds.). (2019). *The changing nature of work and skills in the digital age*. Publications Office of the European Union. https://doi.org/10.2760/373892

(continued)

Gourova, E., Antonova, A., & Nikolov, R. (2006, October 12–15). *Building skills for the knowledge society* [Paper presentation]. Third International Scientific Conference 'Computer Science', Istanbul, Turkey. https://www.researchgate.net/publication/264116277_Building_skills_for_the_knowledge_society

Guo, H., Yang, Z., & Huang, R., & Guo, A. (2020). The digitalization and public crisis responses of small and medium enterprises: Implications from a COVID-19 survey. *Frontiers of Business Research in China, 14*. https://doi.org/10.1186/s11782-020-00087-1

Harvard Business Review Analytic Services (2020). *IT leadership in the next normal: Four priorities for CIO success*. Harvard Business School Publishing. https://www.redhat.com/rhdc/managed-files/rh-harvard-business-review-it-leadership-analyst-material-f27187-202102-en.pdf

Hüsing, T., Korte, W. B., Fonstad, N., Lanvin, B., Cattaneo, G., Kolding, M., Lifonti, R., & van Welsum, D. (2013). *E-leadership: E-skills for competitiveness and innovation – Vision, roadmap and foresight scenarios*. Empirica. https://www.almendron.com/tribuna/wp-content/uploads/2015/03/vision-final-report.pdf

Hwang, K., & Chen, M., (2017). *Big-data analytics for cloud, IoT and cognitive computing*. Wiley Publishing.

International Finance Corporation. (2019). *Digital skills in sub-Saharan Africa: Spotlight on Ghana*. https://www.ifc.org/wps/wcm/connect/ed6362b3-aa34-42ac-ae9f-c739904951b1/Digital+Skills_Final_WEB_5-7-19.pdf?MOD=AJPERES

International Finance Corporation. (2021). *Demand for digital skills in sub-Saharan Africa: Key findings from a five-country study: Côte d'Ivoire, Kenya, Mozambique, Nigeria, and Rwanda*. https://www.ifc.org/wps/wcm/connect/b5ad161e-a2e2-4010-86f2-54717e68b239/Demand+for+Digital+Skills+in+Sub-Saharan+Africa_web.pdf?MOD=AJPERES&CVID=nEldzv7

International Telecommunication Union. (2018a). *Digital skills toolkit*. https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/ITU%20Digital%20Skills%20Toolkit.pdf

International Telecommunication Union. (2018b). *Measuring the information society report 2018, Volume 1*. https://www.itu.int/en/ITU-D/Statistics/Documents/publications/misr2018/MISR-2018-Vol-1-E.pdf

International Telecommunication Union. (2020). *Digital skills insights 2020.* https://academy.itu.int/sites/default/files/media2/file/Digital%20Skills%20Insights%202020.pdf

James, J. (2019). Confronting the scarcity of digital skills among the poor in developing countries. *Development Policy Review, 39*(2), 324–339. https://doi.org/10.1111/dpr.12479

Organisation for Economic Co-operation and Development. (1999). *Economic and social impact of e-commerce: Preliminary findings and research agenda* [OECD Digital Economy Papers, No. 40]. https://doi.org/10.1787/236588526334

Organisation for Economic Co-operation and Development. (2016). *Skills for a digital world: 2016 ministerial meeting on the digital economy background report* [OECD Digital Economy Papers, No. 250]. https://doi.org/10.1787/5jlwz83z3wnw-en

(continued)

Organisation for Economic Co-operation and Development. (2019). *Enhancing access and connectivity to harness digital transformation* [OECD Going Digital Policy Note]. https://www.oecd.org/going-digital/enhancing-access-digital-transformation.pdf

Orlik, J. (2018). *Delivering digital skills: A guide to preparing the workforce for an inclusive digital economy*. Nesta. https://media.nesta.org.uk/documents/Readie_Digital_Skills_booklet_online.pdf

Pew Research Center. (2016). *The state of American jobs: How the shifting economic landscape is reshaping work and society and affecting the way people think about the skills and training they need to get ahead*. https://www.pewresearch.org/social-trends/wp-content/uploads/sites/3/2016/10/ST_2016.10.06_Future-of-Work_FINAL4.pdf

Teltscher, S. (2019, June 18). *Why digital skills training is so important if we are serious about closing the digital divide*. ITU News. https://news.itu.int/why-digital-skills-training-is-so-important-if-we-are-serious-about-closing-the-digital-divide/

UNESCO Institute for Statistics. (2017). *More than one-half of children and adolescents are not learning worldwide* [Fact sheet No. 46]. http://uis.unesco.org/sites/default/files/documents/fs46-more-than-half-children-not-learning-en-2017.pdf

United Nations Economic and Social Council Commission on Science and Technology for Development (2018). *Building digital competencies to benefit from existing and emerging technologies, with a special focus on gender and youth dimensions.* https://unctad.org/system/files/official-document/ecn162018d3_en.pdf

van der Klashorst, L. (1999). Impact of the world-wide web on today's society – The economic and business sectors. *South African Journal of Information Management*, *1*(4). https://doi.org/10.4102/sajim.v1i4.80

World Economic Forum. (2018). *The future of jobs report 2018*. http://www3.weforum.org/docs/WEF_Future_of_Jobs_2018.pdf

Endnotes

1 https://ec.europa.eu/jrc/en/facts4eufuture/changing-nature-work-skills-digital-age
2 https://en.unesco.org/news/digital-skills-critical-jobs-and-social-inclusion
3 https://www.gov.uk/government/publications/essential-digital-skills-framework/essential-digital-skills-framework
4 https://blogs.worldbank.org/sites/default/files/preparing_ict_skills_for_digital_economy-revised_7mar2018.pdf
5 https://digitalskillsglobal.com/blog/the-top-10-digital-skills-tech-companies-are-looking-for-today
6 https://digital-strategy.ec.europa.eu/en/library/europes-digital-progress-report-2017
7 https://digitalskillsglobal.com/blog/understanding-the-digital-skills-gap-and-the-opportunities-it-presents
8 https://digitalskillsglobal.com/blog/the-top-10-digital-skills-tech-companies-are-looking-for-today
9 https://digital-strategy.ec.europa.eu/en/library/digital-skills-gap-europe
10 https://www.weforum.org/agenda/2020/10/africa-needs-digital-skills-across-the-economy-not-just-tech-sector/
11 https://digital-strategy.ec.europa.eu/en/policies/digital-skills-and-jobs
12 https://olc.worldbank.org/content/digital-skills-why-what-and-how

Learning and skills acquisition in a post-pandemic digital future

By Emmanuel C. Ogu

Introduction

Traditional approaches to learning and skills acquisition have been contested by the contemporary realities of the modern digital era. On the one hand, this has been occasioned by a global struggle to keep education and learning going amid a rampaging pandemic (Nuere & de Miguel, 2020), resulting in a massive emergency transition to remote teaching and adoption of educational technologies (EdTech), but without the careful planning that characterizes meaningful online learning (Hodges et al., 2020). Simultaneously, learners' growing desire to assume greater control over what they learn, how they learn and where they learn (Zhao, 2020) has seen them begin to push and advocate more decidedly for this control in recent times (Hillman et al., 2021).

In this new landscape, learning and skills acquisition has faced many challenges. This is in part due to the well-established realities of the digital divide (Ceres, 2020), which were exacerbated following the onset of the COVID-19 pandemic (Ramsetty & Adams, 2020), the resulting lockdowns, and socioeconomic and other factors. The impact of the pandemic has permanently refocused traditional frameworks and approaches to education (Li & Lalani, 2020). This has broadly necessitated a new approach to curriculum design (Cahapay, 2020) and delivery (Gamage et al., 2020) as well as structuring learning assessments (Cairns, 2020) and outcomes, among several other areas of relevance for education and learning (Toquero, 2020).

This article presents some of the challenges to learning and skills acquisition during these times, with case evidence from multiple jurisdictions. It then elucidates the most important skill sets that will distinguish those who would remain successful in the 'new normal' post-pandemic digital future. Finally, it discusses some transformations to existing capacity development approaches that will be crucial to helping young twenty-first century students and graduates develop and hone these skill sets, as well as the supporting policy requirements that will be critical for success in this new digital era.

Challenges to learning and skills acquisition in the time of COVID-19

Academic activities were in progress at the onset of the global lockdowns occasioned by the pandemic. Thus, the learning domain was one of many sectors to take a hit – the impact of which was, indeed, multidimensional (Schleicher, 2020). With schools closed, teachers were forced to make rapid transitions to a fully online delivery model (e-learning). The same was true of employees (as well as clients) of small- and medium-scale businesses, large corporations and government agencies. Teleworking (or remote work) has become the preferred mode for continued operations during lockdowns.

Existing research had previously uncovered issues of attention, attrition, comprehension and retention in e-learning (Bawa, 2016). These issues became even more urgent during the pandemic (Al-Amin et al., 2021), when online-only (or exclusively online) learning became the dominant model. This is of even greater concern given that the preference for online-only learning has recently been ranked behind other learning models and approaches; for

example, blended and face-to-face (Kulikowski et al., 2021).

The reality was grimmer for low-income developing countries as it became difficult to support at-risk learners under these circumstances, in part due to insufficient national budgets for education (Schleicher, 2020). In regions like sub-Saharan Africa – where nearly 80 per cent of students have no access to an Internet connection (Miller, 2021) – the challenge was greatly multiplied. For instance, high data costs, poor Internet services, erratic power supply, technophobia and lack of access to computing devices and (online) library resources/facilities were among the factors that impeded effective learning during this time in countries like Indonesia (Giatman et al., 2020), Nepal (Subedi et al., 2020), Nigeria (Olayemi et al., 2021) and Pakistan (Adnan & Anwar, 2020), to mention a few.

The psychosocial dimensions of learning have also been impacted (Al-Salman & Haider, 2021), resulting from the economic anxieties arising from income uncertainties (Irawan et al., 2020), diminished social connectedness, stress and lack of motivation to learn. The latter is often nurtured through co-curricular and extracurricular relations with peers, mentors and the wider learning community (Besser et al., 2020). Another factor is difficulty in sustaining healthy behavioural routines associated with nutrition and exercise (Gonzalez-Ramirez et al., 2021), which has led to learners exhibiting hazardous (anti-social) behaviours, including drug/substance abuse (Ngwacho, 2020).

In addition, while remote learning has been able to provide some relief to the struggles of academic learning during the pandemic, the same has not been true for vocational training/hands-on skills-based learning. Challenges have been reported in productively mastering competencies, with a consequent diminishing of the entire learning experience (Syauqi et al., 2020), resulting from an inability to tangibly connect with the practical aspects of learning in this domain.

For example, in one Iranian research case within the medical/health sciences discipline (Mortazavi et al., 2021), interviewed students reported being largely dissatisfied with online learning. This was particularly due to challenges such as a lack of effective feedback/engagement mechanisms, inadequacies in the educational content, problems with the channels of communication, and the learners being unprepared to cope with the delivery style/model. Similar issues have also been reported in Pakistan (Farooq et al., 2020).

The implications of these challenges could be far-reaching, as there is the possibility of a skills gap/deficiency in graduates trained in hands-on skills-based vocations and disciplines during the pandemic, compared with those who were trained during the pre-pandemic era. Indeed, sources such as Gaur et al. (2020) have already hinted at this reality.

The post-pandemic digital future: Learning and skills acquisition in the 'new normal'

In the wake of these realities, the post-pandemic digital future is one that has been forecast to reflect a focus on soft skills (Christensen, 2020). Thus, the meta-cognitive framework (Bialik & Fadel, 2015) for twenty-first century learning and skills acquisition first proposed by Trilling & Fadel (2009) assumes fresh relevance for this impending digital future.

Indeed, beyond knowledge that is afforded through traditional learning (which came under threat almost as soon as the pandemic began), the character components of courage, curiosity, mindfulness, resilience, ethics and leadership would unite with digital literacy competencies (in information, media and ICT) and other skill components (of creativity, critical thinking, communication and collaboration) to embody the meta-cognitive traits that will become the key determinants of success in the post-pandemic digital future (Trilling & Fadel, 2009) (see Table 3.1).

Table 3.1: Meta-cognitive traits for the emerging digital economy

Meta-cognitive trait	Definition/description	Source(s)
Courage	The attribute of being able to persevere in the face of difficulty, uncertainty and failure.	Seibert, 2021
Curiosity	The characteristic that provokes a desire to seek information and solutions out of induced motivation rather than strategic concerns (which then becomes research).	Wang & Hayden, 2021
Mindfulness	The capacity to be objectively aware of the present moment, across the intrinsic and extrinsic dimensions of reality.	Toniolo-Barrios & Pitt, 2021
Resilience	The capacity to competently face challenging situations and withstand adversity by deploying internal and external resources.	Cassidy, 2015
Ethics	The standards of conduct that society establishes to preserve the common good, guided by the norms of good/acceptable action and bad/unacceptable action.	Pasca & Riman, 2021
Leadership	The talents and competencies of an individual in motivating/inspiring self, or in persuading others to pursue/achieve a set(s) of goals.	Drewniak et al., 2020
Digital literacy	An individual's knowledge, disposition and aptitude in identifying, accessing, integrating, synthesizing, managing, analysing and evaluating digital resources for the purpose of interacting with others, constructing knowledge and creating expressions through multimedia, by deploying digital tools and competencies within the framework of particular realities; so that social action can be constructively pursued, while enabling reflections on the realities of the process.	Forutanian, 2021
Creativity	The ability to apply imagination in generating ideas and solutions to a task or problem at hand, by thinking about it differently and recognizing useful alternatives/possibilities.	Indeed Editorial Team, 2020
Critical thinking	Being able to, among other things, consider an argument in light of the foundations and relationships between its main postulations and underlying factors, and arrive at deductions by analysing the evidence in available information to correct personal misconceptions.	Nussbaum et al., 2021
Communication	The purpose-oriented, mutual exchange of ideas, perceptions and facts between two or more individuals, involving psychosocial aspects of thoughts, feelings and emotions, and bringing about a common understanding between parties.	Sarla, 2020
Collaboration	The capacity (for learners) to effectively team up for the purpose of planning or developing solutions to problems, through interactions that are continuous and interdependent.	González-Lloret, 2021

In many ways, the pandemic period has tested, once again, these traits and characteristics, effectively translating them into a digital dimension. Those who have emerged strong, unscathed and successful in various spheres are those who have been able to bring to bear these traits and characteristics (highlighted in Table 3.1) during this period.

For instance, it is the courage (in the face of imminent danger), resilience (against many odds) and effective leadership of health-care teams working at the frontlines of the global response initiatives (even applying various technological solutions – eHealth, telemedicine, mHealth, etc.) during these times that has reflected the needed manifestation of fortitude that has borne many sick and despondent individuals to recovery (Stephens et al., 2020). Correspondingly, courage (to try new approaches at the risk of failure), curiosity (to independently discover and master new techniques and media), compassion (for the various challenges in adjustment that are being experienced by learners) and resilience (to just keep going, against all odds) have been spotlighted among the key attributes that have

distinguished teachers during these difficult times (Gedro et al., 2020).

Similarly, courage has been discovered to be a key attribute for active participation, effective engagement and the success of learners in an online class (Retnaningsih, 2021), even as critical thinking has been pointed out to be a key competency for the success of learners in online education (Li, 2021). It has also been discovered that collaboration, team cohesion, self-efficacy and regulation, and digital literacy/competence within online distance learning environments, among other skills, have been key determinants in maximizing learning outcomes during the pandemic (Nugroho et al., 2021).

These skills embody the competencies that will set apart successful players, and that will be needed to thrive, in the emerging digital future of the 'new normal'. This is especially true because a focus on 'the digital' has already permanently redefined traditional approaches to recruitment, engagement, work, learning, collaboration and socializing. The popularization of online conferences, webinars, massive open online courses, Zoom parties and remote working, as well as online job interviews and aptitude tests, is a manifestation of this new digital future.

An interesting interrelationship already exists between these soft skills/competencies, particularly within the context of online environments, and more so when learning or skills acquisition is involved. For example, the development of creativity has been linked to developing critical thinking (Li, 2021) because, in a sense, it is by thinking critically about a problem that creative new solutions often emerge. Nevertheless, creativity and critical thinking on the part of learners require them to be focused and present in the experience, which is often difficult to achieve in the absence of grit – the sibling of courage/fortitude (Nussbaum et al., 2021). Also, research has spotlighted courage as a core component of effective leadership during crisis (Marshall et al., 2020), even as effective communication has been highlighted as a necessary competency for productive inter-professional collaborations, specifically within virtual learning environments (Diaz & Walsh, 2020). Mindfulness of ethics in the application of the skills and strategies of digital literacy has also been described as a core requirement for responsible digital citizenship (Buchholz et al., 2020).

The digital transitions occasioned by the pandemic, particularly in education and learning, have come to stay (Schwartz et al., 2020). However, in juxtaposing the challenges to learning and skills acquisition being experienced during the pandemic with the character traits and attributes that are distinguishing the successful players in various spheres during these times, the existence of a mismatch between the skills that are needed to thrive in the 'new normal' post-pandemic digital future and those with which college and university graduates are being imbued through traditional learning models, frameworks and apparatuses becomes obvious. What transformations to existing approaches and policy imperatives are thus necessary to equip and support learners with the capacities and attributes that are needed to thrive in the post-pandemic digital future?

Transformations and policy imperatives for the post-pandemic digital future

Traditionally, decisions regarding the structure and delivery of learning have been taken by education administrators/regulators and then imposed on learners. This occurs with almost no input from the learners themselves in many cases, and sometimes with motives that seem driven almost entirely by non-pedagogical organizational or financial interests. This approach needs to change, and perhaps this is a good place to start. Calls are already being made in this regard as part of recent global discussions (Hillman et al., 2021). Indeed, all learners should have input into decisions regarding what they learn, how they learn and where they learn, particularly at higher levels of education (Bovill, 2020). If the learning/skills that they acquire are to prove useful for future pursuits, then the learners who are the subjects of such futures should not be treated as mere consumers of the learning/skills acquisition

regimen but rather as collaborators and co-creators (Carey, 2013). The support of effective educational policies to help galvanize progress in this regard is critical for success.

Furthermore, many of the challenges to learning and skills acquisition during the pandemic could be traced (directly or indirectly) to the fact that both teachers and learners were largely unprepared for full-scale digital transitions (Kundu & Bej, 2021). Everyone was basically compelled to adjust and adapt 'on the go'. Thus, in the post-pandemic digital future, it would be helpful for regulators to consider and explore educational policies requiring that a certain minimum percentage of curricular, co-curricular and extracurricular educational content be delivered through training courses with blended or fully online modalities. This way, both teachers and learners would have ample opportunity to hone and master the necessary skills and competencies needed to thrive in this new digital era; and more importantly, prepare for the next pandemic (Joi, 2021).

Beyond this, the adjoining impact and implications of the digital divide in this dimension cannot be overlooked. On the one hand, there is a need to develop more robust and resilient EdTech platforms for online learning with improved accessibility functions and the integration of certain features. These include 3D simulations, virtual/augmented reality laboratories and workshop environments, artificial-intelligence-based teaching assistants, and automated grading of various types of learning assessments. These would help expand the cross-disciplinary utility of EdTech for hands-on skills-based learning and vocational training.

On the other hand, and perhaps more importantly, there is also a need to invest in the digital infrastructure and economic aids that would help learners effectively harness the benefits of such EdTech – such as Internet connectivity that is reliable and accessible, stable power/electricity supply and affordable digital devices – as well as lowering/subsidizing the cost of data and Internet subscriptions, to mention a few. The role of policy in the actualization of this reality cannot be trivialized, especially for the Global South's developing and underdeveloped countries.

For instance, educational regulatory bodies might begin to look favourably towards policies that empower the research and development outcomes of the adjoining technology innovation and digital development sectors so that products and solutions can synchronize to solve problems, even as investment is able to target needs and incapacities with better precision. Necessary regulatory transformations can be catalysed through such a cross-sectoral policy-focused synergy, with impacts that would be felt tangibly within classrooms and learning environments.

Finally, educators and regulators should begin to pursue a transformative and policy-supported balance and synergy between the mastery of hard skills and soft skills, for teachers and learners alike. This is especially true given that policy constraints have recently been spotlighted as an obstacle to the development and measurement (or assessment) of learners' soft skills as part of learning outcomes (Mukarromah & Wijayanti, 2021), even though mastery of soft skills has been discovered to be crucial for successful online learning, as discussed in preceding sections of this paper. They are also crucial because employers now show a preference for prospective employees who possess a balance of both technical capabilities (hard skills) and soft skills (Alhawsawi, 2019).

Conclusion

"Historically, pandemics have forced humans to break with the past and imagine their world anew. This one is no different. It is a portal, a gateway between one world and the next" (Roy, 2020). In conclusion, therefore, the future digital skills ecosystem that has been birthed by the COVID-19 pandemic is one wherein the successful players will be those who are curious in the face of uncertainty and unfamiliarity, courageous in the face of adversity, digitally competent yet ethically mindful, resilient against failure, compassionate towards the struggles and frustrations of others, and creative and critically minded in the exploration of new frontiers.

This paper has explored the dimensions of these soft skills for learning and capacity development in career and life while also highlighting some of the effects and implications of young graduates and professionals being found to be lacking these skills in the post-pandemic digital society and economy. The impact of policy unpreparedness in this emerging digital landscape has also been mitigated by way of recommendations being proposed towards fixing insufficiencies in the current policy/ regulatory domain for learning and skills acquisition.

In many ways, the soft skills that have been explored in this paper represent the characteristics of the future digital skills ecosystem, and it is imperative that changes in capacity development approaches and policies focus on the development and mastery of these skills and competencies to better prepare twenty-first century graduates for life in the post-pandemic digital future.

As the now almost-permanent effects of the digital transitions occasioned by the COVID-19 pandemic are being analysed and understood more comprehensively across various sectors and industries, the roles and importance of these skills in coping with and navigating this new frontier of realities cannot be hyperbolized – both across and beyond the domain of learning and skills acquisition. In this emerging dimension of life, young graduates and professionals who have mastered these soft skills (in addition to various technical competencies/hard skills) will be better positioned to thrive and excel.

List of references

Adnan, M., & Anwar, K. (2020). Online learning amid the COVID-19 pandemic: Students' perspectives. *Journal of Pedagogical Sociology and Psychology, 2*(1), 45–51. https://www.doi.org/10.33902/JPSP.2020261309

Al-Amin, M., Al Zubayer, A., Deb, B., & Hasan, M. (2021). Status of tertiary level online class in Bangladesh: Students' response on preparedness, participation and classroom activities. *Heliyon, 7*(1), E05943. https://doi.org/10.1016/j.heliyon.2021.e05943

Al-Salman, S., & Haider, A. S. (2021). Jordanian university students' views on emergency online learning during COVID-19. *Online Learning, 25*(1), 286–302. https://files.eric.ed.gov/fulltext/EJ1287127.pdf

Alhawsawi, M. (2019). Soft accounting skills between employers' expectations and students' reality after COVID-19 pandemic. *Australian Academy of Accounting and Finance Review, 5*(2), 69–76. http://aaafr.com.au/index.php/AAAFR/article/view/115

Bawa, P. (2016). Retention in online courses: Exploring issues and solutions – A literature review. *SAGE Open,* January–March, 1–11. https://doi.org/10.1177/2158244015621777

Besser, A., Flett, G. L., & Zeigler-Hill, V. (2020). Adaptability to a sudden transition to online learning during the COVID-19 pandemic: Understanding the challenges for students. *Scholarship of Teaching and Learning in Psychology.* Advance online publication. https://doi.org/10.1037/stl0000198

Bialik, M., & Fadel, C. (2015). *Skills for the 21st century: What should students learn?* Center for Curriculum Redesign. https://curriculumredesign.org/wp-content/uploads/CCR-Skills_FINAL_June2015.pdf

Bovill, C. (2020). Co-creation in learning and teaching: The case for a whole-class approach in higher education. *Higher Education, 79*, 1023–1037. https://doi.org/10.1007/s10734-019-00453-w

Buchholz, B. A., DeHart, J., & Moorman, G. (2020). Digital citizenship during a global pandemic: Moving beyond digital literacy. *Journal of Adolescent & Adult Literacy, 64*(1), 11–17. https://doi.org/10.1002/jaal.1076

Cahapay, M. B. (2020). Rethinking education in the new normal post-COVID-19 era: A curriculum studies perspective. *Aquademia, 4*(2), ep20018. https://doi.org/10.29333/aquademia/8315

Cairns, R. (2020). Exams tested by Covid-19: An opportunity to rethink standardized senior secondary examinations. *Prospects*. https://doi.org/10.1007/s11125-020-09515-9

Carey, P. (2013). Student as co-producer in a marketised higher education system: A case study of students' experience of participation in curriculum design. *Innovations in Education and Teaching International, 50*(3), 250–260. https://doi.org/10.1080/14703297.2013.796714

Cassidy, S. (2015). Resilience building in students: The role of academic self-efficacy. *Frontiers in Psychology, 6*, 1781. https://doi.org/10.3389/fpsyg.2015.01781

Ceres, P. (2020, July 8). *A 'COVID slide' could widen the digital divide for students*. WIRED. https://www.wired.com/story/schools-digital-divide-remote-learning/

(continued)

Christensen, U. J. (2020, November 9). *The importance of soft skills in a post-pandemic world*. Forbes. https://www.forbes.com/sites/ulrikjuulchristensen/2020/11/09/the-importance-of-soft-skills-in-a-post-pandemic-world/?sh=37e40f555c26

Diaz, M. C. G., & Walsh, B. M. (2020). Telesimulation-based education during COVID-19. *The Clinical Teacher, 18*(2), 121–125. https://doi.org/10.1111/tct.13273

Drewniak, R., Drewniak, Z., & Posadzinska, I. (2020). Leadership styles and employee expectations. *European Research Studies, 23*(Special Issue 1), 398–411. https://ideas.repec.org/a/ers/journl/vxxiiiy2020ispecial1p398-411.html

Farooq, F., Rathore, F. A., & Mansoor, S. N. (2020). Challenges of online medical education in Pakistan during COVID-19 pandemic. *Journal of the College of Physicians and Surgeons Pakistan, 30*(Supp2), S67–S69. https://doi.org/10.29271/jcpsp.2020.supp1.s67

Forutanian, S. (2021). Digital literacy, competence, identity and intelligence: The four teachers essential skills in 21st century. *International Journal of English Language Studies, 3*(1), 9–16. https://doi.org/10.32996/ijels.2021.3.1.2

Gamage, K. A. A., Wijesuriya, D. I., Ekanayake, S. Y., Rennie, A. E. W., Lambert, C. G., & Gunawardhana, N. (2020). Online delivery of teaching and laboratory practices: Continuity of university programmes during COVID-19 pandemic. *Education Sciences, 10*(10), 291. https://doi.org/10.3390/educsci10100291

Gaur, U., Majumder, M. A. A., Sa, B., Sarkar, S., Williams, A., & Singh, K. (2020). Challenges and opportunities of preclinical medical education: COVID-19 crisis and beyond. *SN Comprehensive Clinical Medicine, 2*, 1992–1997. https://doi.org/10.1007/s42399-020-00528-1

Gedro, J., Allain, N. M., De-Souza, D., Dodson, L., & Mawn, M. V. (2020). Flattening the learning curve of leadership development: Reflections of five women higher education leaders during the Coronavirus pandemic of 2020. *Human Resource Development International, 23*(4), 395–405. https://doi.org/10.1080/13678868.2020.1779911

Giatman, M., Siswati, S., & Basri, I. Y. (2020). Online learning quality control in the pandemic Covid-19 era in Indonesia. *Journal of Nonformal Education, 6*(2), 168–175. https://doi.org/10.15294/jne.v6i2.25594

González-Lloret, M. (2021). Online collaboration through tasks for L2 pragmatic development. In M.D. García Mayo (Ed.), *Trends in applied linguistics*: *Vol. 30. Working collaboratively in second/foreign language learning* (pp. 199–226). De Gruyter Mouton. https://doi.org/10.1515/9781501511318-009

Gonzalez-Ramirez, J., Mulqueen, K., Zealand, R., Silverstein, S., Mulqueen, C., & BuShell, S. (2021). Emergency online learning: College students' perceptions during the COVID-19 pandemic. *College Student Journal, 55*(1), 29–46. https://dx.doi.org/10.2139/ssrn.3831526

Hillman, V., Martins, J. P., & Ogu, E. C. (2021). Debates about EdTech in a time of pandemics should include youth's voices. *Postdigital Science and Education*. https://doi.org/10.1007/s42438-021-00230-y

(continued)

Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020, March 27). *The difference between emergency remote teaching and online learning*. Educause Review. https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning

Indeed Editorial Team. (2021, June 10). *Creativity skills: Definition, tips and examples*. Indeed. https://www.indeed.com/career-advice/career-development/creativity-skills

Irawan, A. W., Dwisona, D., & Lestari, M. (2020). Psychological impacts of students on online learning during the pandemic COVID-19. *KONSELI: Jurnal Bimbingan dan Konseling (E-Journal), 7*(1), 53–60. https://doi.org/10.24042/kons.v7i1.6389

Joi, P. (2021, March 19). *The next pandemic*. Gavi, the Vaccine Alliance. https://www.gavi.org/vaccineswork/next-pandemic

Kulikowski, K., Przytuła, S., & Sułkowski, Ł. (2021). E-learning? Never again! On the unintended consequences of COVID-19 forced e-learning on academic teacher motivational job characteristics. *Higher Education Quarterly*. Advance online publication. https://doi.org/10.1111/hequ.12314

Kundu, A., & Bej, T. (2021). COVID 19 response: An analysis of teachers' perception on pedagogical successes and challenges of digital teaching practice during new normal. *Education and Information Technologies*. Advance online publication. https://doi.org/10.1007/s10639-021-10503-5

Li, C., & Lalani, F. (2020, April 29). *The COVID-19 pandemic has changed education forever. This is how*. World Economic Forum. https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/

Li, Z. (2021). Critical thinking cultivation in Chinese learning classes for international students during the COVID-19 pandemic. *Thinking Skills and Creativity*. Advance online publication. https://doi.org/10.1016/j.tsc.2021.100845

Marshall, J., Roache, D., & Moody-Marshall, R. (2020). Crisis leadership: A critical examination of educational leadership in higher education in the midst of the COVID-19 pandemic. *International Studies in Educational Administration, 48*(3), 30–37. https://www.thecommonwealth-educationhub.net/wp-content/uploads/2020/11/ISEA-2020-48-3.pdf#page=36

Miller, C. (2021, March 14). *Online education statistics*. EducationData.org. https://educationdata.org/online-education-statistics

Mortazavi, F., Salehabadi, R., Sharifzadeh, M., & Ghardashi, F. (2021). Students' perspectives on the virtual teaching challenges in the COVID-19 pandemic: A qualitative study. *Journal of Education and Health Promotion, 10*, 59. https://doi.org/10.4103%2Fjehp.jehp_861_20

Mukarromah, U., & Wijayanti, W. (2021). Implementation of the online learning at vocational high school during Covid-19: Between obligations and barriers. *Jurnal Pendidikan Vokasi, 11*(1). https://doi.org/10.21831/jpv.v11i1.37110

Ngwacho, A. G. (2020). COVID-19 pandemic impact on Kenyan education sector: Learner challenges and mitigations. *Journal of Research Innovation and Implications in Education, 4*(2), 128–139. https://jriiejournal.com/wp-content/uploads/2021/03/JRIIE-4-2-015.pdf

(continued)

Nuere, S., & de Miguel, L. (2020). The digital/technological connection with COVID-19: An unprecedented challenge in university teaching. *Technology, Knowledge and Learning*, 1–13. https://doi.org/10.1007/s10758-020-09454-6

Nugroho, Y. S., Anifah, L., Sulistiyo, E., Cahyaningtias, S., & Firmansyah, R. (2021). Analysis of learning quality with Internet-based distance learning during the COVID-19 pandemic. *IJORER: International Journal of Recent Educational Research, 2*(1), 96–110. https://doi.org/10.46245/ijorer.v2i1.81

Nussbaum, M., Barahona, C., Rodriguez, F., Guentulle, V., Lopez, F., Vazquez-Uscanga, E., & Cabezas, V. (2021). Taking critical thinking, creativity and grit online. *Educational Technology Research and Development, 69*, 201–206. https://doi.org/10.1007/s11423-020-09867-1

Olayemi, O. M., Adamu, H., & Olayemi, K. J. (2021). Perception and readiness of students' towards online learning in Nigeria during Covid-19 pandemic. *Library Philosophy and Practice (e-journal)*. https://digitalcommons.unl.edu/libphilprac/5051

Pasca, C. M., & Riman, C. F. (2021). Thinking ethics differently (challenges and opportunities for engineers education). *Independent Journal of Management & Production, 12*(1), 165–184. https://doi.org/10.14807/ijmp.v12i1.1266

Ramsetty, A., & Adams, C. (2020). Impact of the digital divide in the age of COVID-19. *Journal of the American Medical Informatics Association, 27*(7), 1147–1148. https://doi.org/10.1093/jamia/ocaa078

Retnaningsih, R. (2021). Group work activity to enhance students' courage in delivering questions during online learning: A classroom action research. *ELT Forum: Journal of English Language Teaching, 10*(1), 79–86. https://doi.org/10.15294/elt.v10i1.30186

Roy, A. (2020, April 4). The pandemic is a portal. *The Financial Times*. https://www.ft.com/content/10d8f5e8-74eb-11ea-95fe-fcd274e920ca

Sarla, G. S. (2020). Non-verbal communication: Be kind with what you wordlessly say. *Practique Clinique et Investigation, 4*(1), 8–11. https://www.researchgate.net/publication/344037351_Non-verbal_Communication_Be_Kind_with_What_You_Wordlessly_Say

Schleicher, A. (2020). *The impact of COVID-19 on education – Insights from 'Education at a Glance 2020'*. Organisation for Economic Co-operation and Development. https://www.oecd.org/education/the-impact-of-covid-19-on-education-insights-education-at-a-glance-2020.pdf

Schwartz, H. L., Grant, D., Diliberti, M. K., Hunter, G. P., & Setodji, C. M. (2020). *Remote learning is here to stay: Results from the first American school district panel survey*. RAND Corporation. https://doi.org/10.7249/RRA956-1

Seibert, S. A. (2021). Problem-based learning: A strategy to foster generation Z's critical thinking and perseverance. *Teaching and Learning in Nursing, 16*(1), 85–88. https://doi.org/10.1016/j.teln.2020.09.002

Stephens, E. H., Dearani, J. A., & Guleserian, K. J. (2020). Courage, fortitude, and effective leadership of surgical teams during COVID-19. *World Journal for Pediatric and Congenital Heart Surgery, 11*(5), 675–679. https://doi.org/10.1177/2150135120938330

(continued)

Subedi, S., Nayaju, S., Subedi, S., Shah, S. K., & Shah, J. M. (2020). Impact of E-learning during COVID-19 pandemic among nursing students and teachers of Nepal. *International Journal of Science and Healthcare Research, 5*(3), 68–76. https://www.academia.edu/43808376/Impact_of_E_learning_during_COVID_19_Pandemic_among_Nursing_Students_and_Teachers_of_Nepal

Syauqi, K., Munadi, S., & Triyono, M. B. (2020). Students' perceptions toward vocational education on online learning during the COVID-19 pandemic. *International Journal of Evaluation and Research in Education, 9*(4), 881–886. https://www.doi.org/10.11591/ijere.v9i4.20766

Toniolo-Barrios, M., & Pitt, L. (2021). Mindfulness and the challenges of working from home in times of crisis. *Business Horizons, 64*(2), 189–197. https://doi.org/10.1016/j.bushor.2020.09.004

Toquero, C. M. (2020). Challenges and opportunities for higher education amid the COVID-19 pandemic: The Philippine context. *Pedagogical Research, 5*(4), em0063. https://doi.org/10.29333/pr/7947

Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times.* Jossey-Bass/Wiley.

Wang, M. Z., & Hayden, B. Y. (2021). Latent learning, cognitive maps, and curiosity. *Current Opinion in Behavioral Sciences, 38*, 1–7. https://doi.org/10.1016/j.cobeha.2020.06.003

Zhao, Y. (2020). COVID-19 as a catalyst for educational change. *Prospects, 49*, 29–33. https://doi.org/10.1007/s11125-020-09477-y

Digital skills development for equitable and dignified humanitarian assistance

By Matthew Downer

Introduction

Digital technology, notably mobile technology, is increasingly being used to deliver assistance to the more than two hundred million people in humanitarian need (United Nations Office for the Coordination of Humanitarian Affairs (OCHA), 2021). The humanitarian sector is recognizing more and more that technology has the potential to provide faster, more effective and more anticipatory assistance (Arendt-Cassetta, 2021). The COVID-19 pandemic has accelerated and energized this shift, highlighting the need for inclusive digital assistance (GSMA, 2021a). However, while digital technology is a powerful tool for improving the efficacy and impact of programming, it is likely that without the requisite digital skills, people and communities in need of assistance will be left behind, damaging the inclusivity and equity of assistance and limiting the likelihood of these groups benefiting from digital dividends.

As humanitarian cash payments continue to digitize, recipients will increasingly need the knowledge and skills to navigate and use digital wallets. As communication and complaints mechanisms move to hotlines and chat-bots, communities will need to develop the capacity to use these types of services. As vital information on rights goes digital, people affected by crisis will need to be comfortable online.

Structure

This paper uses published evidence from the GSMA and key stakeholders, as well as unpublished documentation from innovative digital humanitarian solutions supported by GSMA's Mobile for Humanitarian Innovation programme. This evidence demonstrates why it is essential that actors involved in the provision of digital assistance ensure that communities affected by crisis are supported to learn relevant digital skills. It also highlights examples of organizations at the forefront of digital equity in humanitarian assistance supporting the development of digital skills within the communities they serve.

As this paper is rooted in the experience of the Mobile for Humanitarian Innovation programme, it focuses mostly on the use of mobile technology in humanitarian settings. Additionally, while it is important that humanitarian actors have adequate digital skills to implement technology-based solutions and often struggle to recruit staff with technical experience (Downer & Hamilton, 2021), this paper focuses on the skills needed by affected populations that enable them to meaningfully engage with digital solutions they have access to.

This paper makes the case that humanitarians providing assistance digitally need to give attention and resources to helping communities develop digital skills. These skills will enable communities to use technology effectively and make informed choices around whether or not to do so. The paper first outlines what is meant by digital skills in the context of providing humanitarian services, then posits four key reasons why the provision of these skills should be a priority for organizations providing digital humanitarian assistance:

1. Ensuring impactful digital assistance
2. Promoting digital inclusion
3. Mitigating digital protection concerns

4. Promoting self-reliance.

The paper closes by offering recommendations on how this might be done effectively.

Understanding digital skills

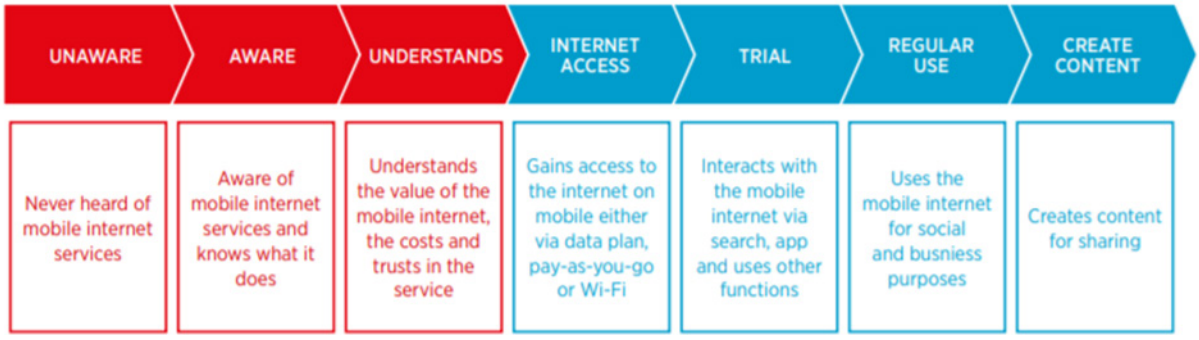
Digital skills are the foundation on which digital inclusion is built,[1] and the United States Agency for International Development (USAID) has positioned them as a key stepping stone on the "digital journey to self-reliance" (USAID, 2020, p. 8). This paper understands digital literacy as the ability of individuals to meaningfully engage with a broad range of technologies and "having the knowledge and skills required to effectively use a mobile device and mobile services",[2] a mobile-centric definition building on a range of positions, including those of the International Telecommunication Union and the United Nations Conference on Trade and Development.

Individual digital skills are taken to be the ability to complete specific tasks or use individual technologies or services, learned throughout a 'skills journey'. Journeys move from being unaware of a specific service through to having the knowledge and skills for its effective use (see Figure 4.1). It is important, however, to reflect on the requirements of different technologies, services and users. The skills that people develop while using digital technologies are often transferrable and complementary, and evidence suggests that skills journeys may frequently begin at similar starting points. However, these journeys appear to diversify as users progress, due to the range of different needs that individual users aim to meet by using the technology. Additionally, these journeys are not always linear. It may well be that an individual gains access to a service before they are aware of it or understand its value (think of an individual with a smartphone who has yet to learn about mobile money) (Jacobs, 2021).

The skills journeys of recipients of mobile-enabled humanitarian assistance can be unique in that adoption is often not a choice. People who have previously been unaware of certain technologies, such as mobile money or SMS, are required to become users in order to receive transformative or even life-saving assistance (Etulain, 2020). This is all the more challenging given that in many humanitarian contexts people – especially marginalized groups – are less likely to have previously engaged with digital technologies and hence face longer journeys towards being able to meaningfully engage and effectively use these technologies (Casswell, 2019).

When thinking about the use of digital technology more broadly than for the delivery of assistance, people affected by crisis often experience barriers more acutely. Providing access to technology will not always mean that they can use it (Madianou et al., 2015). Among the most prevalent of these barriers is a lack of adequate knowledge and skills to enable constructive use of technology (Willitts-King et al., 2019). Vernon et al. (2017) found that six of the top 10 challenges that refugees face in

Figure 4.1: Skills journey for mobile Internet



Source: GSMA (2017)

accessing connectivity services were linked to usability, functional literacy, skills and a lack of relevant content in local languages.

With all this in mind, it is essential that humanitarians consider the ways in which they support communities affected by crisis to develop digital skills, giving due attention to assessing whether and to what extent the communities they serve face specific barriers. Organizations should adopt approaches assuming a negative burden of proof, i.e., assuming communities do not have the requisite digital skills for specific services until proven otherwise (GSMA, 2021b). They should then proactively design education and programming that offer communities tailored opportunities to gain these skills.

This paper asserts that it will drive efficacy of their programming, and by giving people adequate space and time to move along adoption journeys, organizations can support communities into broader digital literacy and see benefits beyond formal assistance.

Ensuring impactful digital assistance

Humanitarian actors and agencies are increasingly shifting to digital delivery mechanisms due to the potential for increased efficacy and efficiency of programming, delivering more for people affected by crisis. This paper asserts that these gains will only be fully realized for affected communities if the people being served have the skills to use services effectively.

Implementing as planned

Simply put, it is easier to implement digital services when users have the necessary skills. When this is not the case, programmes' potential for impact will be limited. As an example, if an organization uses mobile money to deliver cash assistance to communities with no experience with this technology and no access to mobile phones, it is likely to encounter both logistical issues and a limit to the potential for digital and financial inclusion.

One such programme in Burundi found that "… the lack of digital literacy across all respondent types was so consistent, and impacted user experiences so profoundly, that it was difficult to isolate the effect of any of the other vulnerabilities…" (GSMA, 2020b, p. 4).

These challenges can be overcome by providing tailored and meaningful support to communities. In Kenya, the International Rescue Committee (IRC) provided digital skills training to cash recipients in advance to ensure that they "understand why [IRC] are doing what they are doing" and to make sure they convey to users "the positive aspects of using mobile money. Educating [them] that there are merchants/agents where they can carry out other transactions without withdrawing cash" (Casswell et al., 2019, p. 38). This ensures users understand the programme and are able to maximize the benefits of a digital modality.

Building trust among end users

For services to work, users need to trust and use them. All journeys to effective use of digital technology include a component of learning and refining digital skills and building trust in such a service (as well as broader themes such as regulation and market factors, which dictate price and availability). Digital skills training should have a large focus on building this understanding because users will only be able to see a service as meaningful to them if they understand what it is and how it works. The United Nations High Commissioner for Refugees (UNHCR) has found this to be a general trend for the adoption of the Internet by refugees: "meaningfulness evolves as a person's digital skills and world awareness grows" (Etulain, 2020, p. 7).

Conversely, a lack of understanding can lead to mistrust. When digitizing village savings and loans associations in Rwanda, a number of group members were suspicious of adopting the new approach due to concerns around what would happen to their savings if a SIM card was lost. Until a conscious effort was made to provide an understanding that money would be safe, something that basic mobile money

training would have confirmed, implementers found it very difficult to build acceptance of the new service. It is in the interest of those providing digital humanitarian assistance to ensure communities have the knowledge and skills to ensure they understand a chosen technology and that they can engage meaningfully.

Promoting digital inclusion

For many people who receive humanitarian assistance digitally, it can be the first time they are included in the digital ecosystem and, as such, the first step towards being digitally included. Digital inclusion should be important to humanitarians because by acting as a stepping stone to the broader uptake of digital services, and the broad range of benefits they can bring, programmes can have a multiplier effect in terms of their impact.

If humanitarians are interested in people continuing to use and benefit from digital services after a programme has finished, then a key factor is ensuring programme beneficiaries have the skills and confidence to do so. One study in Bangladesh found that many recipients of a cash programme lacked the skills to continue to use mobile wallets once payments ended, as they felt that they had not received adequate training and lacked confidence that they could successfully use the system (Willis, 2016). Additionally, a survey of cash recipients in Burundi showed that only 6 per cent had received training on how to use mobile money and that this lack of training "exacerbated" the lack of existing skills and led to a "missed opportunity that can come from digital/financial inclusion" of service users. (GSMA, 2020b, p. 50).

When done right, however, the services continue to be used, as an IRC service user from a different programme in Burundi explained. "Even after the transfers stopped, they put us in associations that trained us in how to save money and how to meet our basic needs" (Casswell et al., 2019, p. 38). Training can also lead to people using their SIMs for a broader range of services than the specific purpose they were given to them for.

Closing the digital divide

While digital skills, and programmes to improve them, are essential for the digital inclusion of all people affected by crisis, technology is not equitable by default. Without due consideration of digital divides such as the mobile gender gap in access to and use of mobile phones, digital humanitarian services can further exclude marginalized groups (Willitts-King et al., 2019). This can compound inequity for groups disproportionately affected by humanitarian crises such as women, the elderly, ethnic minorities, persons with disabilities and those who lack formal identification (GSMA, 2021a). GSMA research (Casswell, 2019) in two refugee camps in East Africa found notable gender and disability gaps. Women were 47 per cent less likely to own a phone and 89 per cent less likely to use mobile money than men in Bidi Bidi, Uganda, while persons with disabilities were 17 per cent less likely to own a phone than those without in Kiziba, Rwanda.

While awareness of these divides is growing across the humanitarian sector, the response from humanitarians has largely been identifying and mitigating, where possible, the risks that they pose to programming. There is often little more than token attention paid to identifying how these gaps might be closed or how digital assistance might be designed to be more equitable (Willitts-King et al., 2019). These divides are often driven by gaps in digital skills, knowledge and confidence. UNHCR (2021b, p. 1) has found that "many persons with disabilities, their families and disability service providers, especially in low and middle income countries, are not aware of the range of accessible online tools available and how these can be used".

While digital skills are not the only prerequisite for effective digital inclusion (GSMA identifies four additional categories of barriers: affordability, relevance, safety and security, and accessibility (Rowntree & Shanahan, 2020))

the body of evidence shows that where these skills are lacking, it is likely to drive inequity in access to life-enhancing digital services. Without equipping affected communities with digital skills, marginalized groups like women, older people and people with disabilities are likely to be left behind as assistance is digitized, exacerbating existing divides.

Mitigating digital protection concerns

Technology, especially when used for the first time, comes with a degree of risk. This includes both technical risks – such as data security – and social risks, such as scams or fraud. While humanitarians adhere to the principle of 'do no harm', most digital protection to date focuses on technical risk and often technical solutions, such as policies for data management. There are, however, digital skills aspects to mitigating both categories of risk that humanitarians should consider within their protection mandate, especially when agencies themselves are connecting people by delivering assistance digitally (Maitland, 2020).

When thinking about technical risk, a key element is ensuring that when people consent to services, it is genuinely 'informed'. Without the requisite skills and knowledge, a person is consenting to something they do not truly understand and hence they are unlikely to be able to conceptualize the risk that they are accepting (Cilem & McKenzie, 2019). As users increasingly understand what is being asked of them, they are likely to have greater hesitation or genuine concern with aspects such as sharing personal data digitally (Latonero et al., 2018). This raises concerns that without being equipped with the right knowledge and skills, people are accepting a higher degree of risk than they otherwise might.

Considering social risk, people with low digital literacy are often reliant on others to help them use technology, making them vulnerable to fraud or abuse. This can range from allowing others to access communication services which might leak private data that later can be used against them, to revealing personal financial information. One study in rural Burundi found that only 16 per cent of users knew their own personal identification number (GSMA, 2020b). Adequate training can help end users make informed decisions about who to rely on and what information to share on which platforms (Callandar et al., 2018). Humanitarians should ensure that they are not implementing services in a way that, combined with a lack of understanding by users, can exacerbate risk of harm.

In many contexts it seems that delivering training to address these forms of behaviours would be welcomed by end users. Staff at a refugee connectivity centre in Kampala stated that "we're receiving an increasing number of requests from community members to help them improve their digital skills, like showing them how to sign off securely and keep their details private" (UNHCR, 2021a, p. 52). During field research, groups without skills often express a desire to learn them so that they can be competent and safe with digital technology.

When looking at digital risk with an awareness of the digital divides that exist, it is clear that without action, it is groups already at enhanced risk of harm that will face greater risk if they are not supported to learn how to use technology safely and in ways which benefit them.

Promoting self-reliance

Under initiatives like the Comprehensive Refugee Response Framework, humanitarians increasingly aim to find sustainable, dignified opportunities for affected communities. Provided that they have the necessary skills, digital technology and the digital ecosystem more broadly can provide people affected by crisis with opportunities to generate an income and be less reliant on assistance.

In their 2020 digital strategy, USAID (2020, p. 8) sees digital skills as a key element of promoting digital self-reliance for communities receiving development assistance. Looking at income and livelihoods, the International Labour Organization has presented a wealth of evidence to demonstrate how digital skills can

help refugees in particular support themselves financially (Heckl, 2021).

There are two clear ways in which digital skills can help people affected by crisis generate an income, though this is unlikely to be an exhaustive list.

Accessing the local digital ecosystem

Organizations are equipping communities with functional skills that enable them to run their own businesses within local digital ecosystems. These are mostly businesses that use agent networks (such as a mobile money agent), acting as the customer face of a larger digital service.

Both Grameen Foundation and United Healthcare Distributors are running programmes in refugee settlements in Uganda that support individuals to set up their own businesses within these ecosystems. Grameen Foundation is training women and youth to become MTN mobile money agents. The aim is to build the capacity of the agent network in the region to provide mobile-enabled services to the community. United Healthcare Distributors, as part of a consortium, are supporting local people to set up their own lessee businesses working as distributors of an innovative energy solution. In both instances the organizations provided detailed training on the digital and technical skills their beneficiaries would need.

Additionally, organizations such as Alight are giving digital and technical skills trainings to individuals so that they may be directly employed as the face of digital solutions in humanitarian settings.

Accessing broader technology employment opportunities

As global labour markets digitize, they continue to shape the skills people need to succeed professionally, largely towards digital skills. With this in mind, organizations are helping equip people with these skills to help them access digital employment opportunities.

These trainings can become crucial mediators between economically marginalized people affected by crisis and the highly competitive digital economy (Heckl, 2021).

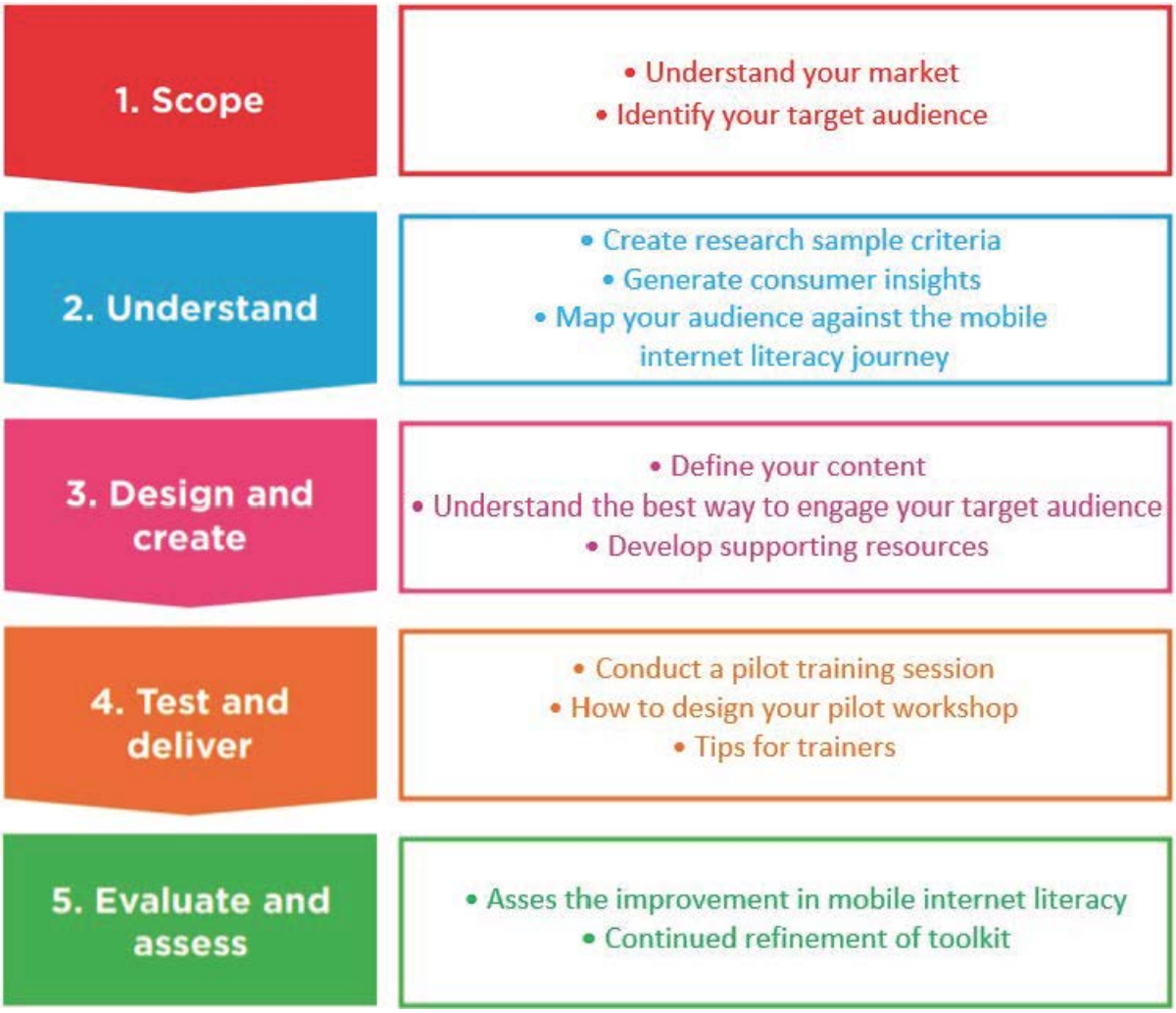
These programmes often take the form of coding schools, which have been set up across a range of humanitarian settings, from camps in Africa and the Middle East to urban settings in Europe. They took off based on an assumption they could open doors for people who already had some basic digital literacy.[3] These initiatives show promising potential: one programme, RE:CODED, reported that nearly 90 per cent of their graduates in Iraq, Turkey and Yemen found employment within six months of graduating.[4]

Classroom-style learning like this has not been restricted to coding skills. A project in Bidi Bidi, Uganda, led by the Community Technology Empowerment Network and supported by Mercy Corps and GSMA, developed a curriculum to train refugees in digital skills in demand at that time in the market, which led to a number of recipients finding employment with local NGOs, government and businesses in technical roles or roles related to information technology. Additionally, initiatives like the Digital Skills Training programme in Lebanon equip refugees with both technology and language skills to help them to find suitable employment (Shibli et al., 2021).

Considerations for digital skills training

With major donors like USAID (2020) mandating that all programmes that utilize technology, irrespective of geography or sector, must include digital literacy training by design, it is clear that humanitarians need to give conscious thought to how they can deliver these. A lot of work has already been done creating effective digital skills training programmes for users at the bottom of the pyramid, by GSMA and many others. The GSMA mobile Internet skills training toolkit (see Figure 4.2) provides guidance on how organizations can design and deliver effective training programmes. The guidance breaks down such programmes into five essential

Figure 4.2: Developing a digital skills training programme



Source: GSMA (2017)

stages. Building from this, as well as drawing from the experience of implementers, this paper identifies some key considerations for how training design and delivery may be done effectively in humanitarian contexts.

Training should be tailored

The process of digital skills development varies depending on the motivations and barriers that individuals experience, where they are in their skills journey, and the use cases that are most relevant to them (Jacobs, 2021).

Where possible, humanitarians should use assessments and consultative research to identify the needs of different segments in the community and create skills development opportunities closely aligned to these (GSMA, 2021b). Without understanding the needs and lives of the communities to be trained, initiatives are more likely to fail to have an impact. For example, during implementation of a GSMA-funded project in Myanmar, the Norwegian Refugee Council team realized that many users did not have the skills to use the digital channels the project relied on. This meant that they had to pivot the project to include provision of training, including elements of GSMA's Mobile Internet Skills Training Toolkit. While the level of digital literacy in the communities they were serving had been assessed through desk reviews, this project experience led them to commit

to conducting thorough primary assessments before starting or scaling up future projects.

Additionally, users should be involved in the design of trainings so that they can validate whether curricula are fit for purpose. As part of this, humanitarians should think of digital training sessions as an opportunity for two-way learning. End users are able to improve their digital literacy when organizations providing assistance can also learn how to better serve these communities (International Federation of Red Cross and Red Crescent Societies, 2021).

As much as possible, training should support individuals to protect personal information and recognize fraud. Human behaviour is an important element of online security and training that focuses, for example, on recognizing phishing, the importance of strong passwords and keeping information safe, can be incredibly impactful (Groenestege, 2021). Training should take account of local norms and cultures to identify how secure behaviours can be culturally specific.

Focus on marginalized groups

Digital divides are often larger in humanitarian contexts (Casswell, 2019) and therefore it is imperative that digital skills programmes are specifically designed with these groups in mind. Organizations should consider not just groups that are at risk of digital exclusion due to demographics such as age or gender, but also consider how they can include groups who struggle with literacy or who do not speak a language in which services are available. Training should always be delivered in local languages (Rowntree & Shanahan, 2020).

Use existing networks where possible

Using touch points within the community can be an effective way of training a larger number of people and raising general awareness of services (Bahia & Delaporte, 2020). This may require training these agents or community staff to deliver this training. Train the trainer models are often successful in the humanitarian space. Grameen Foundation in Uganda currently requires participants of their programme hoping to become mobile money agents to train members of their community in digital skills before they can access the support and start-up capital to establish their own business.

Additionally, training can be delivered as part of existing programmes. In Somaliland, CARE and Telesom found that by delivering training on the requisite skills as part of their registration process, users were able to take these skills away and use a novel verification technology (GSMA, 2021c).

Networks do not necessarily need to be formalized. The Norwegian Refugee Council in Myanmar saw success by working directly with the leaders of communities of internally displaced persons so that they could continue to share training messages after the intervention was complete. The Council found that this approach led to a higher number of women building the skills to confidently access their services.

Training should be regular and comprehensive

A key challenge in humanitarian settings is that while programme decisions are often made in the short term, digital skills cannot be easily improved in the same time frame (Etulain, 2020). However, organizations committed to providing comprehensive training that leads to genuine change should be prepared to provide training over an extended period of time, especially for populations who are new to mobile technology, as they will require continued training and opportunities to practice.

Humanitarians should consider working with governments, mobile network operators, civil society and other partners to create longer-term, more sustainable digital skills trainings that advance beyond individual programmes or pilots (USAID, 2020). These trainings can combine commercial benefits for mobile network operators and other private sector

partners (such as increasing customer interest in services) with the development objectives of governments and humanitarian agencies.

Actors should also consider providing training in broader skills than those specific to the programme that they are implementing, focusing on and emphasizing the transferability of taught skills to other digital use cases. IRC has found that when they provide comprehensive training, it leads to increased comfort and use of a given technology and often contributes to an improvement in the overall success of a programme (Casswell et al., 2019). The Danish Refugee Council in Uganda found that the impact of their specific training on mobile money was limited by a lack of broader digital skills, and as a result have committed to rolling out broader training in future programming that utilizes digital technology to ensure their users are able to take advantage these broader skills.

Conclusions

This paper has highlighted the importance of ensuring that people in need of humanitarian assistance are supported to develop adequate digital skills. As the humanitarian sector continues its shift to digital, this will play a major role in ensuring that communities feel digital dividends, as well as the agencies seeking efficiency.

Humanitarians should reflect on how supporting the development of these skills can help them deliver impactful digital programming for affected communities; support the broader digital and financial inclusion of people affected by crisis; mitigate the protection concerns that technology and connectivity bring about; and support greater self-reliance among affected communities.

Supporting the meaningful development of digital skills among affected communities is not a simple task and should not be an afterthought. Humanitarian actors need to ensure that they engage communities regularly and comprehensively to ensure skills gains outlive individual projects or pilots. Successful programmes are those that are considered, intentional and meaningfully involve and listen to the communities they aim to support. Actors should work together, keeping the interest of these communities at heart, and think bigger than the specific interventions they hope to run.

List of references

Arendt-Cassetta, L. (2021). *From digital promise to frontline practice: New and emerging technologies in humanitarian action*. OCHA. https://www.unocha.org/sites/unocha/files/OCHA%20Technology%20Report.pdf

Bahia, K., & Delaporte, A. (2020). *The state of mobile Internet connectivity 2020*. GSMA. https://www.gsma.com/r/wp-content/uploads/2020/09/GSMA-State-of-Mobile-Internet-Connectivity-Report-2020.pdf

Callandar, A., Pirlot de Corbion, A., Hosein, G., Fisher, T., Geraghty, E., & Bouffet, T. (2018). *The humanitarian metadata problem: "Doing no harm" in the digital era*. International Committee of the Red Cross & Privacy International. https://privacyinternational.org/sites/default/files/2018-12/The%20Humanitarian%20Metadata%20Problem%20-%20Doing%20No%20Harm%20in%20the%20Digital%20Era.pdf

Casswell, J. (2019). *The digital lives of refugees: How displaced populations use mobile phones and what gets in the way*. GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/07/The-Digital-Lives-of-Refugees.pdf

Casswell, J., Hamilton, Z., Khan, M., & Baah, B. (2019). *Navigating the shift to digital humanitarian assistance: Lessons from the International Rescue Committee's experience*. GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2019/12/IRC_Report_R4_WebSpreads.pdf

Cilem, N., & McKenzie, A. M. (2019). *Digital dignity in armed conflict: A roadmap for principled humanitarian action in the age of digital transformation*. Wilton Park. https://www.wiltonpark.org.uk/wp-content/uploads/WP1698-Report.pdf

Downer, M., & Hamilton, Z. (2021). *Building resilience through mobile enabled solutions: Lessons from the Mobile for Humanitarian Innovation Fund*. GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/04/MobileEnabledResilience.pdf

Etulain, T. (2020). *Collaboration for connectivity: Digital access, inclusion and participation*. UNHCR. https://www.unhcr.org/innovation/wp-content/uploads/2020/06/Collaborating-for-Connectivity_WEB062020.pdf

GSMA. (2020b). *Mobile money enabled cash assistance: User journeys in Burundi*. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/12/M4H_Burundi_User_Journeys.pdf

GSMA. (2021b). *Humanitarian connectivity needs and usage assessment*. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/01/CoNUA-Toolkit_Beta.pdf

GSMA. (2021c). *Verifying recipients of cash assistance through Voice ID: Pilot project lessons and outcomes*. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/08/M4H_VoiceID_Evaluation.pdf

Groenestege, M. T. (2021). *Accelerating mobile Internet adoption: Policy considerations to bridge the digital divide in low- and middle-income countries*. GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/05/Accelerating-Mobile-Internet-Adoption-Policy-Considerations.pdf

(continued)

Hackl, A. (2021). Introduction. In Hackl, A. (Ed.) *Digital refugee livelihoods and decent work: Towards inclusion in a fairer digital economy* (pp. 28–38). International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---migrant/documents/publication/wcms_785236.pdf

International Federation of Red Cross and Red Crescent Societies. (2021). *Digital identity: An analysis for the humanitarian sector*. https://solferinoacademy.com/wp-content/uploads/2021/05/Digital-Identity%E2%80%93An-Analysis-for-the-Humanitarian-Sector-Final.pdf

Jacobs, L. (2021). *Understanding people's mobile digital skills needs: Insights from India and Ghana*. GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/05/Understanding-peoples-mobile-digital-skills-needs.pdf

Latonero, M., Poole, D., & Berens, J. (2018). *Refugee connectivity: A survey of phones, mental health, and privacy at a Syrian refugee camp in Greece*. Harvard Humanitarian Initiative and the Data & Society Research Institute. https://hhi.harvard.edu/files/humanitarianinitiative/files/refugee_connectivity_web.mb4_.8-2.pdf?m=1607102226

Madianou, M., Ong, J. C., Longboan, L., Cornelio, J., & Curato, N. (2015). *Humanitarian technologies: Understanding the role of digital media in disaster recovery*. Ateneo de Manila University. https://archium.ateneo.edu/cgi/viewcontent.cgi?article=1041&context=dev-stud-faculty-pubs

Maitland, C. (2020). *Access and agency: Digital refugees and the future of protection in the context of ubiquitous connectivity*. UNHCR. https://www.unhcr.org/innovation/wp-content/uploads/2020/04/Access-and-agency_WEB042020.pdf

Rizzo, S., Amaral, B., Vicentini, L., & Lau, K., (2020). *Building skills and communities: The role of digital skills and platforms in refugee and host community relations*. British Council. https://www.britishcouncil.org/sites/default/files/digital-skills-communities.pdf

Rowntree, O., & Shanahan, M. (2020). *The mobile gender gap report 2020*. GSMA. https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2020/05/GSMA-The-Mobile-Gender-Gap-Report-2020.pdf

Shibli, R., Kouzi, S., & Atherton El-Amine, B. (2021). Digital skills training in Lebanon: Reinforcing resilience in a restrictive environment. In Hackl, A. (Ed.). *Digital refugee livelihoods and decent work* (pp. 28–38). International Labour Organization. https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---migrant/documents/publication/wcms_785236.pdf

United Nations High Commissioner for Refugees. (2021a). *Connecting with confidence: Managing digital risks to refugee connectivity*. https://www.unhcr.org/innovation/wp-content/uploads/2021/03/CWC-Managing-Digital-Risks-To-Refugee-Connectivity-Report.pdf

United Nations High Commissioner for Refugees. (2021b). *Digital access and inclusion of people with disabilities* [Background note]. https://www.unhcr.org/innovation/wp-content/uploads/2021/03/Digital-Access-and-Inclusion-of-People-with-Disabilities.pdf

United Nations Office for the Coordination of Humanitarian Affairs. (2021). *Global humanitarian overview 2021*. https://reliefweb.int/report/world/global-humanitarian-overview-2021-enarfres

(continued)

United States Agency for International Development. (2020). *Digital strategy 2020–2024*. https://www.usaid.gov/sites/default/files/documents/15396/USAID_Digital_Strategy.pdf

Vernon, A., Deriche, K., & Eisenhauer, S. (2017). *Connecting refugees: How Internet and mobile connectivity can improve refugee well-being and transform humanitarian action*. UNHCR. https://www.unhcr.org/5770d43c4.pdf

Willis, M. (2016). *Can e-transfers promote financial inclusion in emergencies: A case study from Bangladesh*. Electronic Cash Transfer Learning Action Network. https://www.calpnetwork.org/wp-content/uploads/2020/03/bangladeshcasestudyfinal-1.pdf

Willitts-King, B., Bryant, J., & Holloway, K. (2019). *The humanitarian 'digital divide'* [Working paper]. Humanitarian Policy Group. https://cdn.odi.org/media/documents/The_humanitarian_digital_divide.pdf

Endnotes

1 https://ec.europa.eu/digital-single-market/en/human-capital-and-digital-skills
2 Definition taken from a currently unpublished GSMA policy paper.
3 https://medium.com/unhcr-innovation-service/the-refugee-coding-school-trend-lessons-and-reflections-5b6ee8168bc
4 https://digitalskillsfortoday.org/about/2018-report/

Tasmu Smart Qatar – Digital skills as a pillar for transformation

by Khawar Iqbal and Frederick Van Gysegem

Introduction

Digital technologies have developed rapidly in recent years and changed the way goods and services are produced now and in the future. However, to fully harness the economic potential of new technologies and digital solutions, it is critical that the workforce can operationalize innovative use cases and rapidly adopt new technologies. The competency shift that this requires is a challenge for all countries but even more so for nations that are currently transforming and diversifying their economy. This is because for them: (1) the economy is evolving at an even faster pace towards a new target state that is not always 100 per cent clear at the start; and (2) the training and education infrastructure to deliver up-/re-skilling efforts is largely yet to be developed. In order to ensure that skills development is in line with economic ambition, both a high level of transparency on the prevalence of digital skills and a reliable projection of future economic, labour market and technology trends are required. Quantifying and qualifying expected skill gaps is the basis for organizations and governments to take action and equip their workforces with the right digital skills.

This study demonstrates how granular analysis can be used to identify the skills gaps to be filled and how a needs-based nationwide skills development strategy can be designed. We provide detailed insights into the quantitative results of investigation into the workforce transformation in Qatar, illustrative of the dynamic in the Middle East region. This article also provides insights into the impact of key technologies on the digital skills needed, and proposes ways digital skills efforts can be steered at both the national and organizational level.

The first section highlights the analytical, systematic and objective approach to strategic competency planning that was followed, providing a quantified and qualified foundation for the design of a needs-based digital skills strategy. The second section provides an in-depth insight into the concrete results and challenges identified for the State of Qatar, which is representative of the dynamics in the Middle East around digital transformation and digital skills requirements. In the third section, three key pillars for designing sustainable and impactful digital skills strategies are discussed, demonstrating how these results can be leveraged for skills development both nationally and at organizational level. We conclude this article with an overview of the key insights and lessons learned so far.

An analytical approach to designing a needs-based digital skills strategy

Setting the right targets to meet specific competency needs is key to designing an effective digital skills strategy. The status quo and 'natural' skills evolution of the workforce also need to be taken into account. This requires a proven, structured and analytical approach that provides reliable results over a long period of time.

The Human Intelligence Planning and Optimization approach developed by Roland Berger has been applied in the State of Qatar.[1] This approach allows critical questions about the future labour market to be answered at the level of policymakers (countries, regions), sectors and individual organizations.[2] It qualifies and quantifies the available human capital and

their competencies, and shapes a vision about future skill needs. Four steps were followed.

1) **Baseline:** Analysis of the current state of the workforce.
2) **Forecast:** Projecting workforce demand and supply over a certain time frame.
3) **Gap analysis:** Assessing the mismatch between demand for and supply of the workforce, including critical digital skills, on a year-to-year basis.
4) **Recommendations:** Identifying skill development needs in the workforce on a granular level.

The individual steps are outlined in the following.

Baseline

To set the foundation for future projections about the workforce, the first step focuses on analysing the current state of the workforce. This includes macroeconomic analysis of recent dynamics within the economy and labour market, and any related policies that impact the workforce on a macroeconomic level. Results of this first step include a granular and quantified view of the current size and structure of the workforce.

Forecast

In the forecasting step, future workforce demand is projected and the natural job and talent pool evolution for the near future is mapped. Workforce demand is largely impacted by economic, labour market and technology trends as well as investments within certain business areas. On the supply side, in- and out-flows of new talent/graduates, attraction of foreign workers and retirements need to be considered. By projecting these dynamics on the demand for and supply of the workforce, a granular view of talent pool evolution and an outline of the necessary skill needs of the future is obtained.

Gap analysis

The labour market is not a static environment and there are continuous shifts between jobs and sectors at an increasingly rapid pace. As a result, the expected competency mismatch in the labour market needs to take into account: (a) demand and supply imbalances at granular level; and (b) likely shifts between jobs/sectors based on the proximity levels between them. We applied an advanced matching algorithm to take both aspects into account. The results include a quantified view of workforce flows such as redeployment, recruitment and outflow, as well as necessary skill upgrades such as upskilling (light / moderate / heavy) and reskilling.

Recommendations

Analysis of the workforce flows provided us with an in-depth view of shortages/excesses and the reskilling that needs to happen in response to, among other factors, expected digital and business trends. This view needs to be completed by the likely competency shifts needed by people staying within their job. This is being done by deriving long-term digital development priorities that reflect the competency changes within each workforce segment (e.g. sector or job profile) that need to be achieved in order to ensure sustainable growth of the economy or organization.

Key results for the State of Qatar: Tasmu Smart Qatar

The outlined approach was applied to obtain an in-depth view of the challenges related to the digital transformation of the State of Qatar. In line with its ambitious National Vision 2030, the State of Qatar strives to transform into a smart nation as diversification of the economy is achieved by leveraging technologies and innovations.

This ambition is deeply anchored in the Tasmu Smart Qatar programme,[3] which harnesses advanced technology and innovation to drive sustainable economic diversification

and improve the quality of life for Qatar's citizens, residents and visitors. The realization of Tasmu's efforts is supported through a collaborative and thriving information and communication technology (ICT) ecosystem and global innovation network working together to co-create, implement and establish relevant technology solutions. In line with this transformation, Tasmu aims to steer its workforce to develop world-class leading digital skills that support the adoption of new technological use cases across different industries, and the use of accompanying digital solutions.

As mentioned above, it is vital to understand the critical challenges that the workforce faces. The State of Qatar has challenges that are representative of the Middle East region. Due to the small size of its local workforce, Qatar heavily relies on the inflow of expatriate workers to drive sustainable growth across industries. The design of a digital skills strategy thus needs to reflect the dynamics of a multinational, fluctuating and transient workforce. Additionally, the digital transformation of the country is largely determined by heavy investments that build the digital infrastructure of organizations and sectors from the ground up. To fully realize the impact of these investments, the development of available human talent needs to occur in parallel with the transformation of the economic ecosystem.

The analytical and quantified approach described above provides a unique tool to identify the requirements for external talent that needs to be sourced internationally. Given that Qatar relies heavily on expat workers to fill its skill gaps, the granular view of the different skill needs across sectors and job profiles can serve as a basis to provide the right incentives to attract trained human resources. The following insights from our analysis demonstrate the dynamics and challenges that Qatar will address through its national programmes over the coming years.

To identify the digital skills that need to be developed in the near future, the current situation of the labour market and expected economic development was quantified for 16 sectors and 132 individual jobs (around 7–9 jobs per sector) covering the entire economy of the State of Qatar. Based on this foundation, we assessed planned investments, local trends and key digital technologies with critical impacts on this development, jointly with key stakeholders from the private, public and education sectors. These insights resulted in a projection of productivity patterns (gross domestic product per worker) and provided granular insights for each sector and job.

Table 5.1 shows the key technological changes expected for each economic sector in Qatar, and the resulting annual productivity growth rate between 2020 to 2030. The growth rate is not only impacted by digital technologies but also by non-digital developments in the different sectors. The expected cumulative impact is very significant: on a cross-sectoral level, we expected an increase in productivity per worker of 25 per cent (implying that an average worker will be able to produce one quarter more in 2030 than in 2020).[4] It is clear that the availability of sufficient digital skills will be a key prerequisite to harness the efficiency gains from these technologies and realize additional income streams by providing new digital offerings.

The key technologies provide us with a demand perspective on digital skills. Based on comparing the status quo of digital competencies for the respective sectors with projected future needs, we identified 16 digital development priorities, consisting of five cross-sectoral and 11 sector-specific ones. These priorities are presented in Figure 5.1.

Table 5.1: Projected annual growth rates for Qatari sectors, including key technologies impacting that growth

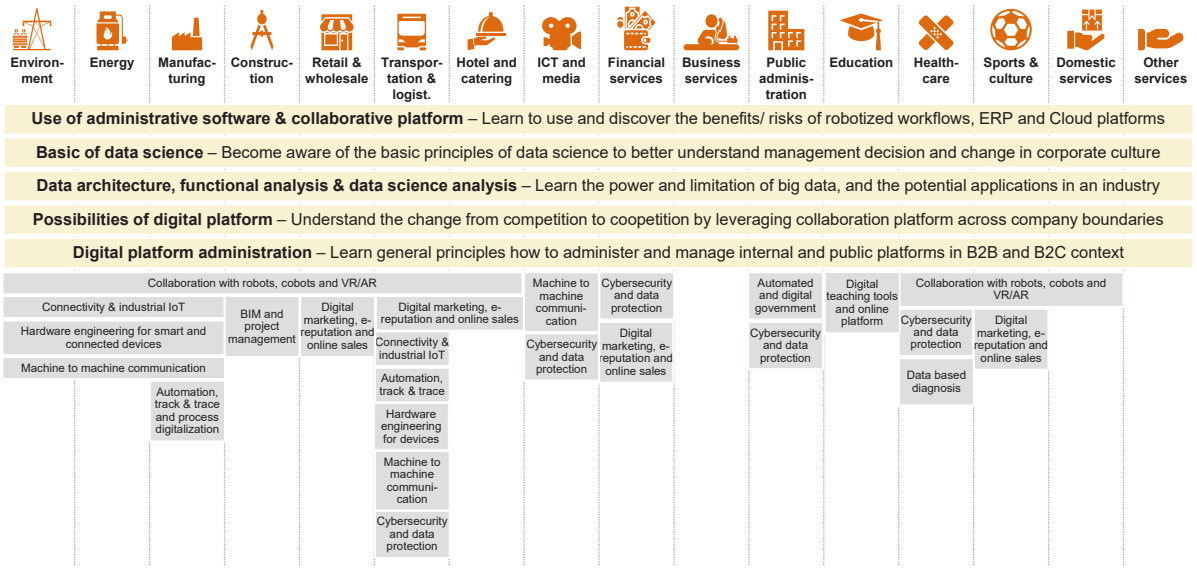
Sector	Key technologies (selection)	Expected annual productivity growth rate 2020–2030 (%)
Environment	• Process automation • Data-driven optimization • Internet of Things (IoT)	3.8
Hotels and catering	• Digital sales and service channels • Automated workflows • Big data and artificial intelligence (AI)	2.7
Public administration	• Online customized self-servicing • Automated workflows • Data-sharing platforms	2.7
ICT and media	• Open collaboration • Software as a service • Remote servicing • Robotization of administrative tasks	2.3
Domestic services	• Robots and cobots • Automated workflows • Robotic process automation	2.3
Other services	• Robotization of administrative tasks • Digital sales and service channels	2.2
Manufacturing	• Automation of production processes • Wearables • Virtual reality (VR) • Track and trace technologies	1.8
Retail and wholesale	• E-commerce • Big data and AI • Digitization of logistics and supply chains	1.7
Financial services	• Digital sales and service channels • Robotic process automation • Big data and AI	1.7
Business services	• Digital sales and service channels • Automated workflows • Robotic process automation • Big data and AI	1.5
Health care	• Big data and AI • Data-sharing platforms • Robots and cobots • IoT and cloud technologies	1.5

Table 5.1: Projected annual growth rates for Qatari sectors, including key technologies impacting that growth (continued)

Sector	Key technologies (selection)	Expected annual productivity growth rate 2020-2030 (%)
Construction	• Building information modelling • Robots and cobots	1.5
Sports and culture	• Digital sales and service channels • Digitization of content • Digital sports platforms • VR	1.4
Education	• Digital learning methods • VR • Robotization of services and administration	1.2
Transportation and logistics	• Big data and AI • Digital sales and service channels • Warehouse automation and predictive logistics	0.8
Energy	• VR and drones • Digital interfaces • Predictive maintenance • Robotization of services and administration	0.7

Source: Author's own 2021, unpublished

Figure 5.1: Overview of digital development priorities for the 16 sectors analysed



Source: Author's own 2021, unpublished

Based on the digital road map, we see that, per sector, these digital development priorities have been mapped to the 16 sectors and 132 jobs across the different sectors. The results indicate that in Qatar, more than 40 per cent of the workforce require deep reskilling and must develop completely new digital skills because the nature of their jobs is changing drastically. These volumes were obtained based on our analysis of the individual outlook per job and sector, and the extent to which a digital development priority applies. The analysis demonstrates the following, among other factors.

- A very significant need for competencies in **collaboration with robots, cobots and VR/augmented reality (AR)** (330,000 workers to be upskilled, or 16 per cent of the total workforce), with big volumes of construction professionals and labourers, and manufacturing tradespeople/operators concerned, including for applications such as bricklaying machines and high-precision tasks. Health-care workers, retail and wholesale workers, and energy workers are also involved.
- A significant need across all sectors for competencies in using **administrative software and collaborative platforms**, mainly for clerks (160,000 workers, or 8 per cent of the total workforce, to be upskilled).
- An important need across all sectors for competencies in the **basics of data science**, concerning mainly technicians, service workers and clerks, and focusing on awareness of the basic principles of data science (100,000 workers, or 5 per cent of the total workforce, to be upskilled).
- **Cybersecurity and data protection competencies** for various specific jobs (among others, health-care professions in regard to medical data; public administration professionals in regard to citizens' data; transportation and logistics professionals; ICT and media professionals; and financial services professionals) (61,000 workers, or 3 per cent of the total workforce, to be upskilled).

Chart 5.1 shows the number of workers in Qatar who require re-/up-skilling across the defined digital development priorities.[5]

Our insights also highlight that emerging skill gaps over the next 10 years will critically impact high-skilled job profiles in industries focused on science, technology, engineering and math (STEM), such as the environmental, energy or manufacturing sectors. Additionally, sectors that are fundamentally shifting from traditional business models to technology-driven solutions – such as health care, education or transport and logistics – will see the emergence of completely new job profiles requiring an advanced set of digital skills.

The quantified insights further reveal an upward shift of the job pyramid affecting low-skilled job profiles in a way that their tasks might become redundant and the skill requirements of these profiles shift to more complex activities. Low-skilled job profiles are most heavily impacted by the continuous move towards fully automated and robotized workflows and solutions, decreasing the demand for manual labour. However, despite strong automation and digitization, our analysis suggests that overall workforce demand will still increase by 5 per cent until 2030, signalling that digitization will not cannibalize net jobs but rather create new ones. For the State of Qatar, we further identified a risk of 10 per cent of vacancies not being able to be filled if not addressed through the right up-/re-skilling initiatives.

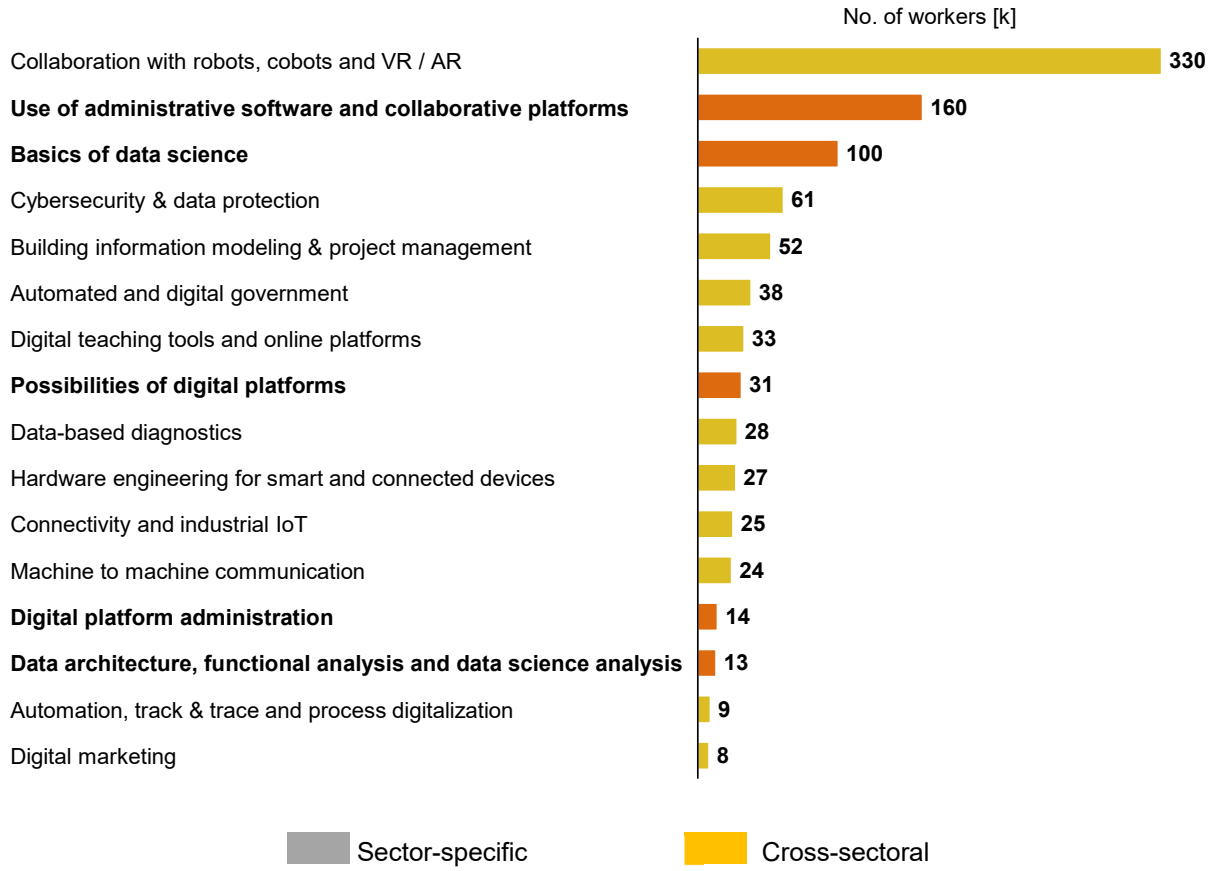
To address these challenges, Tasmu has developed a holistic digital skills road map that launches targeted initiatives to raise awareness and actively support the development of digital skills across the current workforce, as well as nurture young people for a future digital workforce. In the following, we highlight some of the successful initiatives already launched by the Ministry of Transportation and Communications in Qatar.

Initiatives

Common Digital Skills Framework

The Common Digital Skills Framework is a powerful initiative that sets a national standard for digital and digital-enabling skills that individuals within Qatar's workforce need to

Chart 5.1: Number of workers to be reskilled or upskilled in Qatar (thousands)



Source: Author's own 2021, unpublished

obtain. It establishes a holistic and universal language applicable for all jobs across key sectors in Qatar. It also provides a holistic view on the skill development path for Qatar and covers more than 100 individual skills across 15 unique skill categories covering core and supporting digital skills, managerial digital skills and digital-enabling skills.

Tasmu Centre of Excellence

In order to realize massive up-/re-skilling in line with the 'digital development priorities' identified (see Figure 5.1), an appropriate delivery infrastructure is required. The Tasmu Centre of Excellence aims to become the training institution accessible to all employees in Qatar, and is currently under development. Through training programmes focused on the skills in the Common Digital Skills Framework, the Tasmu Centre of Excellence will facilitate a decrease in the digital skills gap in the Qatari labour market. Several target audiences have been identified in two dimensions: civil servants versus non-civil servants, and ICT professionals versus non-ICT professionals. For each of these audiences, specific initiatives need to be taken.

As an example, for civil servants working as ICT professionals, the Qatar Digital Government Training Programme offers the opportunity to build important digital capabilities (e.g. cybersecurity, digital collaboration, administrative software) following a tailored approach to skill development that considers different layers of competencies, ranging from core technical skills to dedicated leadership programmes.

Studio 5/6

Studio 5/6 is one of the first fabrication labs for children in the Middle East and nurtures Qatar's youth as digital learners by sharpening their twenty-first century learning skills as they develop in an all-pervasive digital environment. The project was launched in November 2018 and is steered by the Digital Society Department of the Ministry of Transport and Communications. In 2019, more than 3,000 students participated in workshops where they learned to work with, among others, 3D modelling, robotics, computer numerical control laser cutting and VR/AR wearables. By exploring innovative technologies in a playful way and within an inclusive and collaborative environment, Studio 5/6 fosters the imagination, creativity and innovation of youth. Studio 5/6 contributes to early skill development of Qatar's youth, which is key in building a sustainable inflow of digital talent for the future labour market.

Success factors for an impactful digital skills strategy

We demonstrated above how an analytical design approach to a needs-based digital skills strategy can support the development of a digitally enabled workforce at national level. In this section, we will further discuss the success factors involved in devising an impactful digital skills strategy that creates sustainable change within the assessed workforce. Three key pillars for success will be presented.

1. **Policy design:** Policy responses need to be inclusive, holistic and tailored to the unique challenges of the workforce.
2. **Tangible impact:** The implications of our analysis need to be translated to the challenges of each organization, creating tangible initiatives and outcomes.
3. **Ecosystem activation:** Service providers in skills development and education need to rethink their role in a lifelong learning journey.

Inclusive, holistic and tailored policy design

National policies have a significant impact on the education and development of the affected workforce. To realize this impact, policies need to be adapted to the specific circumstances of the workforce environment. Representative of the Middle East, Qatar identified challenges unique to a multinational and fluctuating workforce that relies on an inflow of adequately skilled expatriates who need to meet and change with the rapidly changing technological developments to stay relevant within the labour market. Additionally, the Middle East is currently investing heavily in diversifying its sectors and building economies that are competitive in international markets. The heavy investments across selected focus sectors and key organizations in turn accelerate economic change and technological advances within individual industries. Therefore, existing skill gaps can broaden further if not addressed properly. Policies need to reinforce this relationship and provide strong incentives for organizations to support the development of the local workforce by recruiting and training the right employees. As states in the Middle East also rely on foreign talent, effective policy design supports the acceleration and incentivization of relocating to the local market.

Within responsible policy design, governments must also take a holistic and long-term view of the workforce, focusing on the unique challenge of currently employed individuals as well as youth, as the latter constitute the workforce of the future. Additionally, policies designed around enforcing and supporting digital skills development must ensure inclusion of under-represented audiences such as the elderly, rural inhabitants or persons with disability.

Ultimately, policy design can ensure the effective and efficient realization of digital skills strategies and is a powerful tool in creating a productive and sustainable environment in which individuals and organizations can thrive. To realize these benefits and the right impact, policies around digital skills development should focus on holistic provision of services, inclusive design for people within and outside

the workforce, and supporting the unique challenges of the local labour market.

Translation into tangible impact for organizations/individuals

The holistic view of the workforce outlook generated by this approach provides a reliable starting point to design skill development initiatives, and allows a granular view of the challenges of key industries and job profiles due to its comprehensive segmentation. To succeed in developing critical digital skills, the implications resulting from our analysis need to be translated into concrete impacts and initiatives at the level of organizations and individuals. It is vital that individuals participate in respective re-/up-skilling initiatives to achieve the expected outcome of nurturing a digitally enabled workforce.

The previous section presented one key element of successful digital skills strategies that supports the translation of arising skill requirements into concrete digital development priorities. In Qatar, 16 digital development priorities were identified, with five priorities spanning all sectors (e.g. basics in data science, digital platform administration) and 11 sector-specific digital development priorities (e.g. Machine to machine communication). These digital development priorities create a foundation for launching concrete training initiatives that focus on promoting skill development across them.

It was also demonstrated that more than 80 per cent of employees in Qatar need to undergo at least a light form of upskilling with respect to their digital skills. To reach this scale, successful digital skills programmes need to provide concrete and targeted training initiatives that ultimately create tangible impact by increasing the performance of trained employees. In order to reach these individuals, the insights from the analytical strategy design need to be translated to the organizational and employee level to ensure the desired impact of the actual training and skill development delivery.

Rethink the role of skills and education service providers

Because digitization and digital technologies evolve rapidly, jobs and their associated competencies shift continuously, with new skill requirements emerging regularly. In the past, traditional education equipped its students with a comprehensive skill set that ensured a long fit to their chosen careers. However, today's graduates face a less stable environment. Especially in STEM fields, students learn topics and skills in their first year that might be outdated by the time they graduate. This requires employees to implement lifelong learning skills to continue to develop their competencies at the fast pace of digital change. Given the size of the challenge, it is clear that broad activation of the ecosystem will be crucial. On a national level, this could be supported by setting up working groups inviting key stakeholders in the local market to align on the strategic objectives of digital skills development and ensure commitment for concrete initiatives that address the skill gaps of the future.

It is critical that all stakeholders involved in skills development take responsibility for steering the digital skill development of youth, graduates and employees over their entire lifespan. Creating a thriving ecosystem in which different stakeholders align on the digital skills strategy can accelerate the implementation of initiatives. In the following, we highlight some of the key roles within such an ecosystem.

- **Public institutions:** Public sector representatives play a critical role in setting the long-term agenda for national initiatives. With respect to the development of digital skills, public institutions must provide a clear direction. Furthermore, public institutions should provide reliable and accessible resources on digital priorities and support other organizations to align their development initiatives to an overarching strategy. Public institutions must also create incentives that attract and retain digital talents and promote investment from private organizations in technology, innovation and human capital.

- **Employers:** To a large extent, people in the workforce shape their skill profiles based on their workplace demands. Interaction among employees and confronting constant (technological) change both force them to develop new skills and stay up to date with the latest developments. Given the acceleration in technological advances, employers must actively support and steer the development of their employees' skills: they should adapt their training curriculum and provide on-the-job training opportunities.

- **Education and training institutions:** Schools, colleges, universities and other training institutions support formal skills development for all people, starting from a young age. Hence, curricula must be aligned with digital priorities and develop skills that equip students not only with the hard skills required to work with digital technologies but also with the ability to be lifelong learners. The shift to lifelong learning and accompanying individuals through that journey is also seen in emerging trends in education technologies and has been accelerated by remote learning initiatives during COVID-19.

Conclusion

This study argues that a systematic and analytical approach to strategic workforce assessment provides reliable insights into current and future skill gaps and supports the design of needs-based skill strategies that meet the needs of the labour market. Throughout this exercise, we developed several key insights and lessons learned.

First of all, we demonstrated how a structured and analytical approach was applied to quantify the workforce needs of the State of Qatar. Crucially, this approach builds on expected demand and supply imbalances and takes into account the likely shifts that workers will make between jobs/sectors in response to demand evolutions, to fully reflect the dynamic nature of the labour market.

We then mapped the key digital technologies that are expected to have a critical impact on sector development in Qatar and assessed their impact on both overall productivity and resulting competency needs across 16 sectors and 132 individual jobs until 2030.

Third, we provided clear guidance on the competencies that need building in Qatar in the near future, resulting in a comprehensive yet synthetic set of 16 digital development priorities specifically tailored to Qatar and the corresponding number of workers to upskill.

Following that, we analysed what is at stake and calculated that insufficiently addressing reskilling needs could lead to an increasing vacancy rate and missing out on 10 per cent growth in gross domestic product.[6] Lastly, we summarized a series of interesting initiatives currently launched or in the pipeline in Qatar that could be inspiring for other countries and regions. These initiatives aim to raise awareness and actively support the development of digital skills across the current/future workforce: (1) the Common Digital Skills Framework (national standard for digital and digital-enabling skills that individuals within Qatar's workforce need to obtain); (2) the Tasmu Centre of Excellence (training institution accessible to all employees in Qatar); (3) Studio 5/6 (fabrication lab that nurtures digital skill with Qatar's youth in an all-pervasive digital environment).

Ultimately, our work highlights some key success factors to developing a needs-based digital skills strategy with sustainable impact: (1) inclusive, holistic and tailored policy design; (2) translation into tangible impact for organizations/ individuals; and (3) rethinking the role of skills and education service providers in the context of a lifelong learning journey.

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The authors would like to thank Melissa Ott for her contribution to this work.

Endnotes

1 https://www.rolandberger.com/en/Insights/Publications/Skills-Roadmap-for-climate-transition-%5B2020-2035%5D.html

2 Approach developed by Roland Berger and applied for the State of Qatar.

3 https://www.tasmu.gov.qa/

4 The weighted average productivity increase in 2030 versus 2020 across sectors and profiles reflects the impact of mainly technological/digital progress. It was analysed per sector and per job, based on each one's specific outlook (see Table 5.1 for a granular view on the outlook per annum and underlying drivers).

5 For each of the 132 jobs identified across 16 sectors (see Figure 5.1), a qualitative assessment was made on the extent to which a digital development priority applies. This qualitative assessment was based on: (1) key technologies that are expected to impact a given sector (see Table 5.1 for a summarized view); and (2) interviews with 14 local sector experts in Qatar conducted between 12 February and 25 March 2020.

6 Assuming that average productivity for open vacancies is similar to the average productivity of the workforce.

Capacity development for Indigenous communities of the Americas region

By Carlos Baca-Feldman and Erick Huerta Velázquez

"One of my big dreams is to fly, to fly like those birds, and go round and round until we land and plan a project that really serves the community. One in which the people say: 'I want it, I need it and it is useful for me'. So, one of those big dreams I have for my community is to be a little more autonomous and independent in terms of media and communication." (Ana María V., Mexico, graduate of the first edition of the ITU training programme).

Introduction

Indigenous communication and telecommunications experiences are based on the idea that the communication process goes beyond a simple exchange of information; they are understood more as ways to articulate and strengthen social relations, allowing indigenous people to fulfil their needs and follow their own dreams and development objectives. Indigenous communication projects are a space of practice of indigenous values, reflected not only in the content they transmit but in the way the operation of the media itself is organized and designed, and how people are trained.

In 2002, the International Telecommunication Union (ITU) adopted a recommendation on indigenous peoples that later became Resolution 46 of the 2017 World Telecommunication Development Conference (WTDC) held in Buenos Aires. This Resolution recognizes: "the necessity of continuing to foster the training of indigenous technicians on the basis of their cultural practices and technological innovation solutions, while at the same time ensuring the availability of resources and spectrum to support the development and sustainability of telecommunication/information and telecommunication (ICT) networks operated by indigenous peoples" (ITU, 2017, p. 421).

Based on these identified needs and mandates, since 2005 the ITU Telecommunication Development Sector, through its Digital Inclusion programme and in collaboration with the Regional Office for the Americas, has implemented a tailored capacity-building programme. This programme aims to empower indigenous people and communities by providing them with the skills to use technology to help them reach their socioeconomic development goals, while respecting their cultural heritage. This tailored programme further aims "to achieve the goal of digital inclusion, enabling universal, sustainable, ubiquitous and affordable access to ICTs for all, including indigenous peoples, and to facilitate accessibility of ICTs for all, in the framework of access to information and knowledge" (as indicated in ITU-related resolutions[1]), thus contributing to the Sustainable Development Goals. The programme also facilitates the training of indigenous communities in essential skills to access and use ICT, including by implementing and operating their own local networks. With various revisions and updates to the content and methodology of the original programmes, two trainings are currently offered in Spanish for indigenous peoples in the Americas region.

Over the years, ITU has sought ways to fully accomplish the mandate of Resolution 46: "to do the trainings according to indigenous

cultural practices". This has been done by engaging indigenous peoples in different stages of training programme design. In 2005, together with the Mexican Government, ITU organized the first indigenous workshop on ICTs. This workshop brought together 150 indigenous people from different nations and communities across America. For three days they discussed capacity-building, content development, self-management of ICT projects and how to better organize their work and collaborate in strengthening their projects (Sandoval Forero & Guerra García, 2010, pp. 151–155).

In its quest to best respond to end-user needs and requirements, ITU looked to identify relevant partner representatives of indigenous communities. Based on advice received from ITU Americas Region, the knowledge development programme for indigenous people was created in collaboration with *Fondo para el Desarrollo de los Pueblos Indigenous de America Latina y Caribe* (FILAC) [Fund for the Development of Indigenous Peoples of Latin America and the Caribbean].[2] FILAC contributed by identifying priorities and topics of interest to be included in the ITU online trainings. The curricula of the trainings were jointly validated by the two institutions. This ensured that this capacity-building programme was not perceived by indigenous people as an obligation to be digitally included but rather as a means of empowerment through technology to support the independent living of their communities, their socioeconomic development and self-sustainability. Developing and maintaining indigenous local (radio) networks and developing indigenous technicians (to ensure technical maintenance of these networks at the community level) are two of the priorities identified in the last few years.

Within this framework, the ITU Telecommunication Development Sector has, since 2017 (the last WTDC), developed two online and blended training courses on these topics to support self-employment and sustainability of the indigenous communities, in accordance with Resolution 46 (WTDC 2017). The ITU Telecommunication Development Sector also supports the fulfilment and implementation of Article 16 of the *United Nations declaration on the rights of indigenous peoples* (United Nations, 2007), by providing indigenous peoples with the means to own, administer and operate their communication networks, and to ensure creation of local digital content. Since 2019, ITU has delivered two complementary trainings:

- an online training course, 'Innovative communication tools for the strengthening of indigenous communities', with a special focus on how to develop, manage and operate an indigenous radio network.
- a blended training programme (year-long) to develop 'technical promoters in indigenous communities in telecommunications and broadcasting'.

To best respond to indigenous communities' requirements, ITU identified individuals and relevant indigenous organizations with expertise in both indigenous people/communities and their styles of learning, and the proposed course content. ITU then facilitated these individuals' and organizations' participation in this capacity-building programme. This added substantial value to both the training curriculum and the pedagogical processes and learning approach used in delivering these trainings.

In this paper we reflect on how this partnership – in which indigenous peoples participate in all stages of the creation and implementation of the capacity-building programme – has led to improved pedagogical processes and ways of learning that could be useful not only for other indigenous training programmes but also for capacity-building processes of other kinds where community groups should be involved.

In the first part of the article, we explain how indigenous peoples in the Americas have positioned themselves around the incorporation of ICT media in their communities, and the importance of capacity-building to their strategies for building enabling environments in which to develop their own communication media. We also present one of the frameworks indigenous people have developed for training in communications and new technologies.

In the second part, we describe how ITU has developed the training programme for indigenous technicians in the Americas region in close collaboration with some of the organizations, communities and media that were involved in previous experiences of indigenous training, and the results of these partnerships. Finally, we explore the lessons learned from this process and their contribution towards new paths in capacity-building in rural and indigenous communities.

Pathways to indigenous communication and technological autonomy in Latin America

Indigenous communication mediated by ICT is not new, nor does it respond only to the expansion of digital technologies. In fact, to understand it, one must go back to the simplest notion of communication, where a series of actions emanating from the body itself enable collective life in a given territory and time, allowing culture to be transmitted, reproduced and transformed. Therefore, to understand what we mean by indigenous communication, we must start from this more elemental definition of communication, which is not related to technologies but instead to how people inhabit territory, and the way they organize, work, communicate and celebrate (Martínez Luna, 2016).

In this sense, it is also necessary to avoid homogenizing the characteristics of indigenous peoples: each group, tribe or nation has its own ways of living and inhabiting the land, expressed in their language and forms of governance and social organization, among others. Nevertheless, indigenous people around the world tend to share common characteristics, such as a holistic view of communication within the traditional knowledge and practices that maintain links with their territory or land.

For example, due to fog and the ruggedness of their territory, the Mazatec and Chinantec communities in Mexico generated a language of whistles, which contains more than 30 distinctions of accent and tone, allowing complex messages to be transmitted (Sicoli, 2016; Duncan, 2012). In the same country, in the Rarámuri communities of Chihuahua, who live far away from each other in the middle of a very rugged mountain range, messages are passed among people as they walk along mountain paths until they reach the receiver, sometimes days later (G. Palma, personal communication, August 12, 2019).

With the arrival of communication technologies, there has been a process of appropriation within the communities that can be observed in the way they are used, in many cases, to enhance and realize indigenous peoples' dreams and objectives, overcome struggles and share meaning, as well as to link them beyond their territorial limits (Baca-Feldman, 2017). From the diversity of community radios, video and film, print media, local websites and apps we find examples of these technological appropriations of media that reflect the diverse ways of living in communities (Magallanes-Blanco, 2008; Rodriguez, 2005; Wortham, 2013).

More recently, especially since the beginning of this century, there has been a process of technological appropriation by indigenous peoples linked to ICT and telecommunications (Arcilla Calderón et al., 2018). We can find experiences such as the community-owned cellular networks in Oaxaca, Mexico (Srinivasan, 2019; Magallanes-Blanco & Rodriguez-Medina, 2018). We can also find them in the community networks movement in the region (Baca et al., 2018), in which various indigenous communities participate, such as the Jnoptik IntraBach and the Ik'ta ko'op Collective in the Tzetal community of Abasolo, Chiapas, Mexico (*Redes por la Diversidad, Equidad y Sustentabilidad* A.C., 2021); or the Jxa'h Wejxia Casil network in six Nasa communities in Cauca, Colombia.[3] This is in addition to initiatives focused on the generation of applications, websites or even translation of software into their own languages (Morales, 2020), or production of local content and the sharing of digital audiovisual productions (Ginsburg, 2018).

This process has been a collective path traced by indigenous communities. Their

intercommunity links and those with civil society organizations have been the key to building towards technological sovereignty or autonomy. In this process, the Continental Summits of Indigenous Communication of Abya Yala have been key meeting spaces. These meetings have allowed indigenous peoples to articulate and generate the fundamentals from which to use, create and transform media and communication technologies. The *Declaración final de la Segunda Cumbre de Comunicación Indígena del Abya Yala* [Final Declaration of the Second Continental Summit of Indigenous Communication of Abya Yala] (2013) speaks about autonomy linked to indigenous communication processes in the following terms.

> "The autonomy of indigenous communication is based on the principle of life, a fundamental pillar of the worldview of Abya Yala, which is based on the relationship between human beings and Mother Earth, that is learned from the family. This autonomy must be protected by the life plans and organizational processes of our peoples and their legitimate authorities." (*Declaración final de la Segunda Cumbre de Comunicación Indígena del Abya Yala*, 2013).

In other words, there is a clear premise in that Declaration that understands technologies as instruments to strengthen indigenous peoples' communication processes. These tools must be adapted to the principles, values and ways of life of those inhabiting the territory, in contrast to mainstream views, where communities should 'adapt' to what technologies and external societies want to impose (Parra Hinojosa & Baca-Feldman, 2021). The path stretches into the future because the sovereignty or autonomy of communication of indigenous peoples is not something that has an end point or a goal to be achieved; rather, it is a never-ending process of building alternative models of communication in accordance with self-defined contexts, needs and aspirations.

Throughout this process, indigenous peoples have sought political and social advocacy strategies that have allowed them to generate enabling environments to create, operate and manage their own media and telecommunications projects, a right protected by Article 16 of the *United Nations declaration on the rights of indigenous peoples* (United Nations, 2007). These instruments, together with the political advocacy processes of indigenous communities, are gradually generating more favourable conditions for these communities in the field of ICT and telecommunications. Although there is still a long way to go, there are cases such as Mexico, where the *Ley Federal de Telecomunicaciones y Radiodifusión* [Federal Telecommunications and Broadcasting Law] (2014) has recognized indigenous communities and established a specific licence for telecommunications and access to the radio frequency spectrum.

Although significant progress has been made in achieving this enabling environment from a regulatory perspective, an enabling environment also includes other elements, such as technological development (i.e., affordable, quality tools with which to produce their communication materials) and access to mass media to disseminate their productions (Baca et al., 2018). Among all these elements, probably the most important is the creation and strengthening of local capacities – through programmes designed and directed specifically for and by indigenous peoples – that allow indigenous peoples to develop the technical, social, economic and cultural skills to manage their own telecommunications networks.

Indigenous communities and the development of their capacity-building programmes

In 2010, during the First American Summit on Indigenous Communication in la María Piendamó, Cauca, Colombia, discussions around capacity-building resulted in the following mandate: "To create an itinerant school of indigenous communication, based in indigenous methodologies, that incorporates exchanges and internships within the different communication experiences across the continent" (*Declaración final de la Segunda Cumbre de Comunicación Indígena del Abya Yala*, 2010). From this mandate, several capacity-building processes were developed by indigenous communities, organizations and media around the continent. Some were in the form of indigenous universities (e.g. the Indigenous University of the Regional Indigenous Council of Cauca) and others were associated with indigenous organizations (e.g. Itinerant School of the Latin American Coordinating Committee for Indigenous Peoples' Cinema and Communication).

One of these initiatives was a participatory action research process taken on by some indigenous communities, organizations and media in Mexico in 2012. As a result of using this process, one of the main problems of indigenous media was identified: the lack of technical capacity to develop and maintain radio broadcasting and other telecommunication infrastructure. The research also identified the fundamentals of the methodology to develop capacity-building among indigenous media, based on an ancient agricultural system still in use throughout Mesoamerica called *milpa* (Baca-Feldman et al., 2021).

Milpa is an agricultural system used for growing corn. It is based on diversity, in which various species such as beans, zucchini and other edible plants and vines coexist. It is cultivated collectively by the community and people learn by doing, with children learning by participating in the process from a very young age. It is also a traditional system that strengthens the relationships among community members and the land, as it is also a celebration. Therefore, the research considered that any training programme for indigenous peoples in the Americas should have as its core this form of collective work (*la milpa*). This translates concretely to diversity of knowledge and experiences, shared responsibilities among all participants, spaces for people to learn by doing, and creating the conditions to foster a community of knowledge and practice that could go beyond the training programme and the strengthening of the relations of the participants to their communities. This methodology was systematized in the book *Haciendo milpa* (Cruz Cárcamo & Huerta Velázquez, 2015).

This workshop collaboratively defined the foundations of the training course for community technicians in telecommunications and broadcasting in Mexico, *Techio Comunitario*. The name of the programme, which was chosen collectively, expresses very well its meaning and form, as it is a combination of the words *'tequio'*, a form of collective work that exists in most of the communities in Oaxaca, and 'tech', an abbreviation of technology. The first edition of *Techio Comunitario* had four common core modules (community communication and technologies, electricity, electronics and free software); three specialties (radio broadcasting, wireless networks and community cellular telephony), and a final integration module (legal framework and sustainability). Participants were allowed to choose to study one, two or all three specialty subjects.

From October 2016 to May 2017 the modules were taught face-to-face in various indigenous communities in southern Mexico, with indigenous and non-indigenous groups as part of an Advisory Committee[4] that participated in each of the modules, either coordinating the logistics or teaching the topics. Some 27 participants from six states of Mexico graduated from this edition.

Subsequently, based on the experience gained, some improvements were made to the process in the second edition. The number of modules was reduced to six in total and the number of

Figure 6.1: Drawing of a *milpa* made by the participants in the workshop 'Strategies to support the training of indigenous communicators'

Source: Cruz Cárcamo & Huerta Velázquez (2015)

days of each module was increased. As this edition of the training was still being delivered face-to-face, these changes reduced both the cost of transportation for participants and the amount of time they spent away from their daily responsibilities at home. The technical courses were also redesigned and special workshop facilitators were invited to participate, as it was detected that it was hard for some participants to understand these subjects. In total, 17 participants from six states of Mexico graduated from this second edition.

After the second edition of the *Techio Comunitario* training programme in Mexico (2018–2019), continuous capacity-building activities were provided to the participants, such as building community Wi-Fi networks in different indigenous communities, in which trainers from different countries came to share their experience. An example is the Abya Yala Community Networking Workshop held in June 2019 in Cherán K'eri, Michoacán, Mexico.

ITU programmes towards strengthening the ICT capacities of indigenous peoples

Actions carried out by ITU since 2005

As mentioned in the introduction, since 2005 ITU has undertaken various actions to strengthen the capacities of people belonging to indigenous communities in the Americas region. To date, ITU has implemented various training courses that have been updated and transformed according to the context and the realities experienced.

From the beginning, ITU focused on ensuring that courses were designed and delivered to best respond to the needs expressed by indigenous peoples by partnering with FILAC. The current knowledge development programme resulting from this partnership is: 'Innovative communication tools for strengthening indigenous communities with a focus on how to develop, manage and operate an indigenous radio network', which has been offered since 2015. This course is delivered entirely online and consists of five two-week modules that address topics such as

website creation, emergency communications systems, tools, elements of indigenous radio networks and the use of digital content. Hundreds of indigenous people from the region have graduated from this course over the years. In 2020, the programme underwent a review aimed particularly at updating and improving the methodology of the module on emergency communications, especially due to the importance of this topic because of the COVID-19 pandemic.

A new step in capacity-building was taken in 2019 when the Mexican civil society association *Redes por la Diversidad, Equidad y Sustentabilidad* A.C. [Networks for Diversity, Equity and Sustainability A.C.], one of the organizations that developed *Techio Comunitario*, was incorporated into the existing partnership between ITU and FILAC to develop the new 'Training programme for technical promoters in indigenous communities in telecommunications and broadcasting', consisting of five online modules and a face-to-face training camp.

The main objectives of the new programme are to equip indigenous technicians with the necessary knowledge to install, maintain, operate and administer their communication and telecommunications projects; and to consolidate a network of indigenous communicators and technicians that support each other to develop community media and technology strategies to meet their needs and pursue their dreams. The programme is aimed at women and men involved in indigenous media in the Americas region. Since its inception, women's participation has been encouraged, as there is a significant gap between women and men in the management of community media and community networks.

Figure 6.2: Participants learning how to install a Wi-Fi network in the fifth module of the first edition of *Techio Comunitario*, developed in Guelatao de Juárez, Oaxaca

Source: Baca-Feldman 2017, unpublished

Figure 6.3: *Semillero de Redes Comunitarias del Abya Yala*, **held in Cherán K'eri, Michacán in 2019**

Source: Karla Velasco 2019, unpublished

Increased participation of women was achieved because the indigenous and community media organizations in the region were invited to nominate women directly for the programme. As a result, women's participation in *Techio Comunitario* rose from 3.9 per cent in the first edition to 27.8 per cent in the second. However, while the graduates from the first edition of the ITU programme were 60 per cent women, the expected proportion of female graduates from the second edition is 36.8 per cent, so efforts to boost women's participation need to continue.

The new programme is divided into five online courses implemented during a year, with a duration of four weeks each, with close guidance provided to participants. The modules are:

1. Community communication and technologies
2. Basic electricity and electronics
3. Radio frequency and computer networks
4. Regulatory environment for telecommunications and broadcasting
5. Sustainability in telecommunications and broadcasting projects.

Upon completion of the online training, participants who have completed all five courses are invited to participate in a 10-day face-to-face training camp, the objective of which is to generate a network of indigenous technical promoters in the region through an in-person space of integration and knowledge-sharing. It also provides an opportunity to learn about and share successful communication and telecommunication projects developed in indigenous communities in an experiential way. Finally, there are some practical exercises, such as tower climbing or electronics soldering, which must be carried out in a face-to-face context.

Unlike previous online training, this programme focuses on quality rather than quantity. Participants are nominated by their communities or organizations; this ensures that the knowledge will serve a community or group that needs a technician. Only those who graduate from all five online modules have the chance to attend the face-to-face training and obtain the training certificate. The participants form a community of knowledge among their

fellow partners and trainers that continues after the programme has ended. This is why the course has a limited number of graduates but an important impact, as those graduates are linked to an indigenous organization or community with a communication strategy. They are not just individuals wanting to obtain new skills.

In the first edition of the new ITU training programme mentioned above, which took place between May 2019 and February 2020, 20 indigenous communicators from 10 different countries in the region graduated, all of them previously linked to communication and/or telecommunication community projects. Fourteen of the 20 were women.

The face-to-face training camp was developed in collaboration with an indigenous cooperative, the *Unión de Cooperativas Tosepan Titataniske* in Cuetzalan del Progreso, Puebla, Mexico. This face-to-face space brought together different organizations and specialists in the technical, organizational and economic issues common to indigenous communication experiences in the region, which reinforced the knowledge gained during online courses through practical exercises done in real contexts. In addition to the ITU training programme students, 19 indigenous Nahua and Tutunaku youth who had completed a training programme in community communication within the cooperative also participated.

The second edition of this training started in October 2020. While there was no face-to-face bootcamp due to the COVID-19 pandemic, an intensive two-week online course was developed instead.

The innovative approach of the new training programme for technical promoters in indigenous communities in telecommunications and broadcasting is an important step towards the goals expressed in WTDC Resolution 46 because it incorporates indigenous peoples in all stages of the capacity-building programme, not only as beneficiaries but also as designers and implementers, enriching and innovating capacity-building methodologies in addition to incorporating indigenous peoples' knowledge and values.[5]

Graduates have developed different actions linked to the knowledge they acquired. Some examples are listed below.

- A graduate from Carabobo, Venezuela created a community intranet for the residents of his neighbourhood.
- One graduate developed a process to obtain a licence to operate their community radio station in the Yoreme communities of Sonora, Mexico.
- In Zacate Grande, Honduras, a graduate has managed to improve the transmission quality and coverage area of the community radio station where he works.
- In Cuetzalan del Progreso, the activities of the Union of Tosepan Titataniske Cooperatives continue. Among them is the Tlayolchikahualis Initiative, which is a communication strategy to confront the COVID-19 crisis from the perspective of the ways of life and health care of the Nahua and Tutunaku peoples. Also, many of the young people who participated in the 2019 camp are now part of the team that organizes the film club, helped build the communication 'house', supports the community radio, and collaborates on the installation of the mobile phone network and community intranet.
- There has been a lot of participation of graduates in virtual events where they have shared their experience of this training process, such as the series of preparatory roundtables for WTDC 2021, in which a graduate from Oaxaca, Mexico, participated.

The consolidation of an indigenous technicians network has also progressed. This is evidenced, for example, in the frequent sharing of achievements, questions or experiences in the messaging group we have, with the new generation (2020–2021) being joined by people recommended by those who have already graduated.

Figure 6.4: Participants of the training camp in Cuetzalan del Progreso, Puebla, February 2020

Source: Itzel Muñoz 2020, unpublished

Figure 6.5: Working on one of the stages of the Free Software rally in Cuetzalan del Progreso, Puebla, February 2020

Source: Itzel Muñoz 2020, unpublished

Figure 6.6: Participants learning how to climb towers at the training camp in Cuetzalan del Progreso, Puebla, February 2020

Source: Itzel Muñoz 2020, unpublished

Figure 6.7: Participants learning about solar energy at the training camp in Cuetzalan del Progreso, Puebla, February 2020

Source: Itzel Muñoz 2020, unpublished

Figure 6.8: Participants learning how to make bamboo soundproofing panels at the training camp in Cuetzalan del Progreso, Puebla, February 2020

Source: Itzel Muñoz 2020, unpublished

Figure 6.9: Participants learning how to assemble broadcast cables at the training camp in Cuetzalan del Progreso, Puebla, February 2020

Source: Itzel Muñoz 2020, unpublished

Lessons learned

The learnings presented in this section are the result of our experience and constant reflection on the process we have developed among indigenous communities in the Americas region. They include the results of several evaluation exercises, both quantitative and qualitative, carried out at different stages of the ITU training programme for indigenous technicians; in particular, the results of the evaluation we conducted at the end of 2020 with the graduates of the first edition.[6]

Learning by doing

"It has transformed me, because one thing is that they talk to you about telecommunications, open networks or mobile telephony in theory, and another thing is that you see the whole process in practice, everything that is needed to be able to have something like that. This is something that has happened in this course." (Tsitsiki M., Mexico, graduate of the first edition of the ITU training programme).

More than the knowledge gained, it is essential that participants feel confident enough to act and participate. This feeling comes from the experience of doing things. Once they know that they have the ability to perform a certain task, it is easier for them to provide themselves with the means to do so by looking for and obtaining by themselves the knowledge, resources and relationships that allow them to perform the task.

Relevant experience must be gained in the context of rural communities, where many things must be improvised, and not in a laboratory where things are controlled, as people learn best in situations similar to the ones they will face in their communities. Many technology training courses are conducted in a laboratory or in urban contexts that do not always match the reality of the persons who participate in the training.

For this reason, each *Techio Comunitario* module was linked to real projects that are developed in the communities where the training takes place, with participants actively building, installing and evaluating network infrastructure that was and is used by communities.

In February 2020, the indigenous community of Cuetzalan del Progreso was chosen as the site for the face-to-face bootcamp of the ITU training programme. One of the reasons for choosing this community was that the Union of Tosepan Titataniske Cooperatives has been developing an integral telecommunication and broadcasting project for the region. This allowed participants to experience first-hand the installation of a community intranet, the installation and grounding of a photovoltaic system, testing of mobile network coverage, and re-siting of an FM radio transmitter.

In addition to the knowledge they generate, these on-site bootcamps make the bonds among participants stronger.

Building relationships

"Apart from the knowledge, a great community is formed. It unites us in a great project called communication from the people for the people […] I now support not only the radio station where I come from but also other radio stations in the region, because that's the way to work and move, to go wherever the need exists." (Daniel R., Mexico, graduate of the first edition and teacher in the second edition of *Techio Comunitario*).

We have learned that after ensuring that people feel confident that they have the ability to do something, it is necessary to provide them with a social network that can help them gain knowledge they may be lacking or provide them with continuous access to experiences. Participants should feel that they belong to a network in which they can get help and help others.

One example is that during the COVID-19 pandemic, this support network has been crucial for the connectivity projects that some of the graduates have undertaken, such as intranets to share educational materials in their communities. The knowledge participants gained from the programme at a technical level was important but so too was the support of the specialists they had the opportunity to meet, such as one of the developers of LiberRouter or the creator of the free package of software components EtherTICs GNU/Linux, which is a turnkey solution for community radio stations.

The social/community networks that were generated in these two editions of the programme continue, with members sharing information and supporting each other to solve breakdowns in their equipment, undertake new projects or invite each other to events, courses or calls for proposals. As mentioned before, the network also continues with activities, including sharing experiences, raising awareness and specific training activities in which *Techio Comunitario* and ITU training programme graduates participate as instructors or speakers.

Use of new metaphors to explain technology

One of the most difficult tasks has been finding a way to explain how electricity and electronics function, as the metaphors generally used for explaining them are not always related to the context in which indigenous people live.

In one of the workshops related to building intranets, the facilitator was finding it hard to explain the parts of the computer but when she started using an analogy of the body to explain the parts of the computer, people began to understand. Similarly, when explaining the transport and access network, it was not until we changed our analogy to that of a rural water network that people got excited and started participating. Additionally, participants generated their own metaphors to understand the technologies from their own worldview.

In the first edition, two Tseltal students said that a community network resembles what they call *mankomun*. This is a collective activity that is done during the most important community festivities, in which a cow is bought to feed everyone, and everyone participates in its preparation. The reason for doing this is to save money but at the same time, it provides the chance to strengthen community ties. Therefore, as explained by Mariano, one of the course participants, a community network is like *mankomun*:

"We create our own infrastructure and divide it up among the users. Just like someone skins and butchers the cow, someone takes charge of climbing the radio tower, someone else creates the network connections, and someone else takes care of the electrical power. We all do this together, and so this type of project has succeeded in surviving for a long time."[7]

Technological training beyond the technical field

"I found it very important for a better understanding of the integrality of communication, to clearly differentiate our objectives from the tools we have to reach those objectives. The experiences [community radio, intranets, solar energy systems] I saw in Cuetzalan were very interesting to me because they are very enlightening. They helped me to gain more clarity about the community process, the collective process." (Elena C., Argentina, graduate of the first edition of the ITU programme).

As in the *milpa* system we mentioned earlier, concepts cannot be isolated because they are part of a complex system in which life is created and recreated. Therefore, when understanding technology, we cannot separate it from the communications system to which it belongs.

For indigenous people technology is not just a tool that helps them perform some specific task but also a new element that must be incorporated into a community's way of life and that must be understood, adapted, used and transformed under the principles and values of local communities.

Conclusion

The road we have travelled with communities and organizations committed to indigenous communication in Latin America has been full of joys and achievements, but also of challenges and lessons about things to be improved. Among these challenges is achieving greater participation of women, as there are still many barriers that need to be broken so that they are able to participate. These barriers include sharing responsibilities with their partners around the care of children during the time they are away or incorporating budgets for children's activities during the course.

Connectivity issues such as the expense and bad quality of Internet in indigenous communities limit or make difficult participation in some activities such as webinars, but participants are able to access all the content in ITU Academy. However, we need to go beyond this practical solution, so for future editions it will be necessary to think about technological tools that will allow working on the digital platform offline.

Another learning is that we had to consider that for most of the participants, Spanish is their second language. Therefore, it was necessary to avoid restricting evaluations to written reports and allow participants the opportunity to present their homework in a format they feel confident with, such as a podcast, drawings or video. We also incorporated oral instructions at the beginning of the modules so that written instructions for the activities could be better

understood. We chose illustrated materials when available, although this is something we should invest more in.

We also need to rethink the methodologies of developing and delivering the online trainings. While in each course we make an evaluation and try to improve the experience, it is still very difficult to achieve experiential and practical learning online. It is also important to reinforce follow-up programmes aimed at supporting participants to ensure the sustainability of their projects by helping them to access mechanisms to continue learning and sharing.

A crucial element that should be reiterated in the knowledge development process is that it is fundamental to ensure indigenous peoples' and communities' involvement in the whole process, from design to implementation. Another important consideration is to understand that the purpose of capacity-building is not only about how to use this or that technology but rather that connectivity and access to ICT in community contexts is an organizational and social governance issue, where technologies must be adapted to the dreams, needs and development goals of the communities.

Therefore, the role of those who facilitate these knowledge development processes is to generate a diverse and contextualized learning environment that allows the appropriation of technologies in each community in accordance with their cultural heritage values and development aspirations.

List of references

Arcilla Calderón, C., Barranquero, A., & González Tanco, E. (2018). From media to buen vivir [good living]: Latin American approaches to indigenous communication. *Communication Theory 28*(2), 180–201. https://doi.org/10.1093/ct/qty004

Baca, C., Belli, L., Huerta, E. & Velasco, K. (2018). *Community networks in Latin America. Challenges, regulations and solutions*. Internet Society. https://www.internetsociety.org/wp-content/uploads/2018/12/2018-Community-Networks-in-LAC-EN.pdf

Baca-Feldman, C. F. (2017). Experiencias resonantes de comunicación en Oaxaca, México: posibilidades, límites y contradicciones del proceso comunicativo en el capitalismo [Resonant experiences of communication in Oaxaca, Mexico: possibilities, limits and contradictions of the communicative process in capitalism] [Doctoral thesis]. Universidad Autónoma de Puebla. https://nube.yanapak.org/index.php/s/xdnF4o8RiNHwXmX

Baca-Feldman, C. F., Bello López, D., Carrillo Olano, A., Parra Hinojosa, D., & Soto Sánchez, A. P. (2021). Technological autonomy as a constellation of experiences. A guide to collective creation and development of training programmes for technical community promoters. Association for Progressive Communications. https://www.apc.org/sites/default/files/FINAL_Technological_autonomy_as_a_constellation_of_experiences_18-03.pdf

Cruz Cárcamo, B. & Huerta Velázquez, E. (2015) *Haciendo milpa: Memoria del taller – Estrategias de apoyo a la formación de comunicadores indígenas* [Doing milpa: Record of the workshop – Strategies to support the training of indigenous communicators]. Redes por la Diversidad, Equidad y Sustentabilidad A.C. [Networks for Diversity, Equity and Sustainability A.C.]. https://bit.ly/3fn0oVU

Declaración final de la Primera Cumbre de Comunicación Indígena del Abya Yala [Final declaration of the First Continental Summit on Indigenous Communication of Abya Yala] (2010). https://www.cric-colombia.org/portal/declaracion-de-la-cumbre-continental-de-comunicacion-indigena-de-abya-yala/

Declaración final de la Segunda Cumbre de Comunicación Indígena del Abya Yala [Final declaration of the Second Continental Summit on Indigenous Communication of Abya Yala] (2013). http://indigenasdf.org.mx/declaracion-de-la-ii-cumbre-continental-de-comunicacion-indigena-del-abya-yala/

Duncan, D. (Director & Producer). (2012). Whistles in the mist: Whistled speech in Oaxaca (Season 2, Episode 2010) [TV series episode]. In Duncan, D. (Director & Producer), *In the Americas with David Yetman*. The Southwest Center, University of Arizona; Arizona Board of Regents. https://vimeo.com/57291304

Ginsburg, F. (2018). Indigenous media from U-Matic to YouTube: Media sovereignty in the digital age. *Sociologia & Antropologia* [Sociology & Anthropology], *6*(3), 581–599. http://dx.doi.org/10.1590/2238-38752016v632

Huerta Velázquez, E., Cruz Cárcamo, B. H., & Álvarez Malvido, M. (2018). *Comunicaciones de emergencia. Guía rápida para radios comunitarias* [Emergency communications. Quick guide to community radios]. Redes por la Diversidad, Equidad y Sustentabilidad A.C. [Networks for Diversity, Equity and Sustainability A.C.]. https://bit.ly/3ojvl1t

(continued)

International Telecommunication Union. (2017). *Final report: World Telecommunication Development Conference (WTDC–2017) – Buenos Aires, Argentina, 9–20 October 2017*. https://www.itu.int/en/ITU-D/Conferences/WTDC/WTDC17/Documents/WTDC17_final_report_en.pdf

Magallanes-Blanco, C. (2008). The use of video for political consciousness-raising in Mexico: An analysis of independent videos about the Zapatistas. Edwin Mellen Press.

Magallanes-Blanco, C., & Rodriguez-Medina, L. (2016). Give me a mobile and I will raise a community. In L. Robinso, J. Schulz, & H. Dunn (Eds.), *Communication and Information Technologies Annual* (*Studies in Media and Communications, Vol. 12*) (pp. 315–343). Emerald Group Publishing Limited. https://doi.org/10.1108/S2050-206020160000012019

Martínez Luna, J. (2016). Conocimiento y comunalidad [Knowledge and communality]. *Bajo el Volcán* [Under the Volcano], *16*(23), 99–112. http://www.apps.buap.mx/ojs3/index.php/bevol/article/view/1289/907

Morales, E. N. (2020). "Para que las lenguas indígenas también puedan tener presencia": Indigenizando el ciberespacio ["So that indigenous languages can also have a presence": Indigenizing cyberspace]. *Canadian Journal of Latin American and Caribbean Studies 45*(1), 122–142. https://doi.org/10.1080/08263663.2019.1662670

Nájera, J., & Salazar, G. (2018, January 22). The first mobile phone network for indigenous communities in Mexico is under threat. *Global Voices Advox*. https://advox.globalvoices.org/2018/01/22/the-first-mobile-phone-network-for-indigenous-communities-in-mexico-is-under-threat/

Parra Hinojosa, D. & Baca-Feldman, C. F. (2021). *Let us rethink communication technologies*. Redes por la Diversidad, Equidad y Sustentabilidad A.C. [Networks for Diversity, Equity and Sustainability A.C.]. https://bit.ly/3hqbxYG

Redes por la Diversidad, Equidad y Sustentabilidad A.C. [Networks for Diversity, Equity and Sustainability A.C.]. (2021). *Intranets comunitarias* [Community intranets]. https://www.redesac.org.mx/intranets

Rodriguez, J. M. R. (2005). Indigenous radio stations in Mexico: A catalyst for social cohesion and cultural strength. *Radio Journal: International Studies in Broadcast & Audio Media, 3*(3), 155–169. https://doi.org/10.1386/rajo.3.3.155_1

Rodríguez, C. (2000). Fissures in the mediascape: An international study of citizens' media. Hampton Press.

Sandoval Forero, E. A., & Guerra García, E. (2010). *Migrantes e indígenas: Acceso a la información en comunidades virtuales interculturales* [Migrants and indigenous people: Access to information in intercultural virtual communities]. Universidad Autónoma del Estado de México & Universidad Autónoma Indígena de México [Autonomous University of the State of Mexico & Indigenous Autonomous University of Mexico]. http://www.rosalux.org.mx/sites/default/files/pdf/migrantes_indigenas.pdf

Sicoli, M. A. (2016). Repair organization in Chinantec whistled speech. *Language 92*(2), 411–432. http://doi.org/10.1353/lan.2016.0028

Srinivasan, R. (2019). Beyond the valley: How innovators around the world are overcoming inequality and creating the technologies of tomorrow. MIT Press.

Stringer, E. T. (2007). *Action research*. Sage Publications.

United Nations. (2007). *United Nations declaration on the rights of indigenous peoples*. https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf

Wortham, E. (2013). Indigenous media in Mexico: Culture, community and the state. Duke University Press.

Endnotes

1 WTDC RESOLUTION 11 (Rev. Buenos Aires, 2017):Telecommunication/information and communication technology services in rural, isolated and poorly served areas and indigenous communities. WTDC RESOLUTION 46 (Rev. Buenos Aires, 2017): Assistance to indigenous peoples and communities through information and communication technology. ITU Plenipotentiary Conference RESOLUTION 184 (Guadalajara, 2010): Facilitating digital inclusion initiatives for indigenous peoples.

2 http://www.filac.org/

3 https://comunicares.org/2019/10/30/technological-processes-of-autonomy-in-cauca-colombia/

4 Made up of Altermundi, Centro de Estudios para el Desarrollo Rural, Fundación Comunalidad, Instituto Superior Intercultural Ayuuk, Ojo de Agua Comunicación, Palabra Radio, Radio Nanhdia, Red de Comunicadores Boca de Polen, Red de Radios y Software Libre, Redes por la Diversidad, Equidad y Sustentabilidad A.C., Rhizomatica, Telecomunicaciones Indígenas Comunitarias A.C., Servicios Universitarios y Redes de Conocimiento en Oaxaca A.C., Universidad Autónoma Metropolitana and Universidad Iberoamericana Puebla.

5 Although ITU actions aimed at indigenous peoples from the start, the collaboration with FILAC made it possible to link the courses to the needs of these communities in the Americas region, leading to a greater involvement of these communities with the innovative approach of the new programme. The main difference lies in the fact that indigenous communicators have participated in all phases of the design, implementation and evaluation of the programme, not only in defining the content and training needs to be addressed.

6 This research process took place between August and November 2020 and involved in-depth interviews with various members of the Techio Comunitario advisory committee. Alejandra Carrillo (Red de Comunicadores Boca de Polen), Alma Soto (CIESAS-Pacífico Sur), Daniela Bello and Carlos Baca (Redes por la Diversidad, Equidad y Sustentabilidad A.C.) developed the systematization of this information.

7 As cited in https://globalmedia.mit.edu/2020/02/21/a-participatory-action-research-project-weaving-technology-and-autonomy-with-indigenous-communities-in-mexico/

Digital literacy for a digital India

By Sumeysh Srivastava

Introduction

The COVID-19 pandemic has reinforced the importance of technology in various aspects of personal and public life. It cannot be denied that the one technology that has become a ubiquitous part of our existence is the Internet. Almost all activities in our everyday lives – work, education, entertainment, socializing, shopping, interacting with the state, etc. – are moving online. The Internet has also played a crucial role in broadcasting information and data related to COVID-19. People who have an Internet connection are more likely to stay at home, exercise social distancing and try to move forward in their lives.[1] Increased digitization has numerous benefits and has created new paths of opportunity for economic, social, political and educational progress. However, the inability to access this digitization deprives individuals and communities of the benefit of these opportunities and technological advancements.

Only 14.7 per cent of the population of India have the ability to use computers, and 20 per cent have the ability to use the Internet (Indian National Statistical Office, 2020, pp. 242–243). Ability to operate a computer means carrying out any of the following tasks.

- Copying or moving a file or folder
- Using copy and paste tools to duplicate or move information within a document
- Sending e-mails with attached files (e.g. document, picture or video)
- Using basic arithmetic formulae in a spreadsheet
- Connecting and installing new devices (e.g. modem, camera, printer)
- Finding, downloading, installing and configuring software
- Creating electronic presentations with presentation software (including text, images, sound, video or charts)
- Transferring files between a computer and other devices
- Writing a computer program using a specialized programming language (Indian National Statistical Office, 2020, p. 242).

Similarly, "If a person of age 5 years and above was able to use Internet browser for website navigation, using e-mail and social networking applications, etc. to find, evaluate and communicate information, he/she was considered as able to use Internet" (Indian National Statistical Office, 2020, p. 243).

Essentially, this situation refers to a second-level digital divide. The first level is who owns or has access to technology. The second level is who possesses or has access to the required knowledge and skills to use the technology. The existence of these different levels of digital divide, which go beyond questions of access, has been suggested by other authors as well (Molnar, 2003). The author would suggest that the first level of digital divide is dependent on the second, where digital inclusion is dependent on the ability to use digital technology, rather than access to the technology. Further, it has been argued that digital competency is required to live a 'full life' in the current era (Sefton-Green et al., 2009).

Given this context, this paper explores the question of whether some of the current digital literacy initiatives in India are enough to bridge this divide. The article begins by providing the reader with an overview of how the concept of digital literacy has been defined and how this definition has evolved over time. The next section introduces the Technology Acceptance Model (TAM) and analyses a possible link between digital literacy and TAM. This is followed by a section that discusses the

capability approach, looking at how access to, and having the skills to use, information and communication technology (ICT) affects human capabilities. The next section provides an overview of state efforts to increase digital literacy and Internet access in India. This is followed by a section that makes an argument for enabling community learning as a method to increase digital literacy. This is followed by two final sections – recommendations and a conclusion – which also discuss scope for further research.

Digital literacy: Conceptual evolution

In the author's opinion, the first conceptual definition of digital literacy focused on looking at it within the framework of education, within a formalized, structured learning environment (Gilster, 1997). However, the term itself was in use before that. Lanham described it as "Multimedia Literacy" (Lanham, 1995). He differentiated it from traditional literacy by emphasizing the ability to process the various types of information supplied by digital sources, such as audio, video and so on. (Lanham, 1995). The author found an approach suggested in 1996 to be very interesting. While it does not mention digital literacy, it provides essential components for computer literacy, as defined by:

- tool literacy – competence in using hardware and software tools
- resource literacy – understanding forms of, and access to, information resources
- social-structural literacy – understanding the production and social significance of information
- research literacy – using information technology (IT) tools for research and scholarship
- publishing literacy – ability to communicate and publish information
- emerging technologies literacy – understanding of new developments in IT
- critical literacy – ability to evaluate the benefits of new technologies (Shapiro & Hughes, 1996, p. 4).

Even though this conception used a quasi-skill-based approach, it also focused on building capacity beyond skill building and has relevance beyond the time when it was drafted. A distinction between looking at digital literacy via the viewpoint of skill acquisition versus cognitive development and socioeconomic issues has been noted as "leading to misunderstanding, misconceptions, and poor communication" about the phrase, as per Eshet-Alkalai (2004).

With the evolution of the Internet, technology and the scope of what can be done with digitization, the conception of digital literacy has also expanded, with elements of cultural, political and social participation also included (Aabø, 2005). According to Meyers et al. (2013), one framework for defining digital literacy has been that it represents a set of specific abilities or behaviours demonstrated by users of digital information systems, often throughout the enquiry process. These abilities are often characterized as the skills of the "Information Age" (p. 358).These skills can be seen as digital equivalents of the skills required in the print age and a digitally literate individual within this framework knows how to use digital tools to cater to their information needs (Eisenberg, 2008).

Another framework has been to see digital literacy as application of abstract mental models to digital content activities (Meyers et al., 2013). These models come from a variety of fields but the majority are cognitive in nature, concentrating on how people process information in their heads. This goes a step beyond the 'acquisition of skills' model and looks at digital literacy as training the mind across different digital interactions and tasks. An example of this is the Media Literacy 2.0 framework, which redefines media literacy for the digital era (Buckingham, 2003). The third framework, as mentioned by Meyers et al. (2013), is to look at digital literacy as participation in a set of activities utilizing digital tools and media that are firmly rooted in a specific environment or activity rather than being pre-set. These practices are emergent, socially formed and situational; they are based on what works rather than expert behaviours

or prescriptive models. This framework sees digital literacy as an evolving decentralized concept that depends on how people interact with technology in other aspects of their life and is influenced by local social and cultural factors.

It has been argued that the term digital literacy is broader than other terms like ICT literacy, and comprises different types of literacies that involve an interaction with technology (Martin, 2006). It also depends on an individual's life circumstances and will vary over time, based on skills, knowledge, attitude and personal growth (Martin, 2006). Based on the above, the author would suggest a definition of digital literacy as 'the capacity of individuals and communities to interact with, access and utilize new and existing digital technologies relevant to their existing as well as emerging needs and requirements'.

Digital literacy and Technology Advanced Model

Technology Advanced Model (TAM) is a widely used theory that seeks to investigate factors that influence a user to accept and adapt any technology. It has been described by Aggorowati et al. (2012) as a condensed theory of technology adoption in an organization which proposes that individual responses to a technology can trigger intentions or curiosity to use the technology, which can then influence actual usage. Using this model, it has been suggested that a user's motivation to use technology can be explained by three factors:

- perceived usefulness – the degree to which the user believes that using the technology will improve his or her work performance
- perceived ease of use – refers to how effortless he or she perceives using the technology will be
- attitude towards usage – a factor that guides future behaviour or the cause of intention that ultimately leads to a particular behaviour (Davis, 1989).

Certain factors that may influence perceived ease of use – such as characteristics of information resources, the job experience, technical equipment and support, etc. – have been identified by Barranis (2011), though these cannot always be considered universal and must be contextualized. As discussed in this paper, these are the factors where India's digital literacy programme may fall behind because it does not take into consideration the different levels of access that citizens have to technology and how they use it. The correlation between the factors given in TAM and digital literacy were tested in a study conducted by Gie and Chung (2019) among first-year students in a private institute in Malaysia. According to the study, a significant, positive and strong relationship was discovered between first-year students' perception of ease of use and digital literacy (Gie & Chung, 2019). Similarly, there was a significant, favourable and relatively strong association between first-year students' perception of usefulness and their digital literacy.

A crucial takeaway from the study was that it showed that there was a significant difference in levels of digital literacy, based on whether the person had Internet access. This shows that digital literacy and Internet access must be seen as co-dependent and need to be evaluated together.

An interesting data point can be seen from a survey conducted in India by the Digital Empowerment Foundation (Jha, 2020) where Internet occupied the last post in ranking of importance, after food, clothing, housing, employment and mobile phones. However, in terms of first preference ordering, Internet occupied second place. This shows that while people do have an idea of the utility of the Internet, they are yet to see it as a basic need. One of the reasons for this could be the operation of Common Service Centres: these are physical facilities, run by a village-level entrepreneur, that help citizens access a wide range of government information and services. If a citizen is using the Internet to access government entitlements and services but doing it through an intermediary who is facilitating it, then they may see the intermediary as the one adding value, rather than the medium itself. This is an assumption

by the author and needs to be tested further. The solution here calls for looking at the needs of different users and providing and designing digital literacy programmes that can help increase users' capabilities to fulfil those needs. If more people are digitally literate and are able to access the Internet by themselves, demand will increase naturally and should incentivize infrastructure creation.

Digital literacy and capability approach

One of the most influential frameworks that looks at improving the quality of life of individuals and communities is the capability approach (Robeyns, 2016) proposed by Amartya Sen and Martha Nussbaum. It stems from Sen's criticism of Utilitarianism, which he saw as too narrowly focused on the utility of objects as a measure of well-being (Landa, 2004). According to Nussbaum (2000) capabilities can refer to "human capabilities that can be convincingly argued to be of central importance in any human life, whatever else the person pursues or chooses" (p. 74). An analysis by Birdsall (2011) has shown each of the capabilities listed by Nussbaum as being enhanced by the ability to access and use ICTs. A related point is that a lack of the skills required to access and use technology has a negative effect on the flow of information to the poorest citizens. This impacts their ability to access resources that they are entitled to under government schemes. To illustrate this point, let us look at the Unified Mobile Application for New-Age Governance (UMANG) app,[2] which allows access to government services in India through a web and mobile app. Currently, the app provides access to 20,689 services provided by 234 government departments, across themes like education, health, finance, social security, etc.[3] As of December 2020, the app had 25 million registered users (Rathee, 2020). The ability to access and utilize the UMANG app enhances an individual's abilities to benefit from services that they are entitled to and require to live their lives.

Exclusion from digital infrastructure and access by Mukherjee et al. (2016) looks at the effect that Internet access and digital literacy have on access to public entitlements. Specifically taking the example of government schemes directed towards securing the livelihoods of marginalized communities, the report makes the argument that Internet access and the ability to use the Internet can enable the user to access genuine, cost-effective and timely information, thereby increasing the feasibility and efficiency of these programmes for the individual as well as the state.

State efforts to increase digital literacy and access to the Internet in India

As per Telecom Regulatory Authority of India data for March 2021, around 54 per cent of India's population have access to broadband Internet (Telecom Regulatory Authority of India, 2021). However, these figures do not represent the quality of access or usage of individuals. The *Digital in India 2019* report (Nielsen Holdings, 2020) points out three specific exclusion points with respect to the skills of individuals to access the Internet; location, age and gender. Now let us look at *Bharat Net*. *Bharat Net* is a project under the Digital India initiative, which seeks to provide Internet connectivity to all *Gram Panchayats* (village councils) in India, of which there are 250,000 in total. A *Gram Panchayat* is the most basic tier of state units in India and may consist of one village or a group of villages.[4] The project is expected to be finished by August 2021 and it has been shown that there are certain issues with *Bharat Net* and how it is implemented.[5] An important point to note is that as per data displayed on the *Bharat Net* website in March 2021, users on the network are consuming only 1.2 GB of data per month,[6] which is quite low. Demand creation is important because *Bharat Net* is supposed to generate revenue and is designed to create plug and play infrastructure, where telecom operators can use the infrastructure created to provide services.

There are three main digital literacy programmes in India that have either been implemented or are in the process of implementation. The National Digital Literacy Mission, the Digital *Saksharta Abhiyan* and the *Pradhan Mantri Gramin Digital Saksharta*

Abhiyan. The National Digital Literacy Mission was approved in March 2014 and had a target to train 1 million citizens in select districts. Subsequently, the Digital *Saksharta Abhiyan* was approved in December 2014 with an additional target of 4.25 million candidates across the country (Standing Committee on Information Technology, 2019). The coverage targets were increased under *Pradhan Mantri Gramin Digital Saksharta Abhiyan*, which seeks to make 60 million persons in rural India digitally literate. By October 2018, around 20 million individuals had been covered, which represents 1.67 per cent of India's population (Standing Committee on Information Technology, 2019).

First, the individuals represented in these statistics are measured based on their possession of a computer and their ability to operate a computer as parameters. This leads to a requirement for expensive IT infrastructure, as well as broadband connectivity, to make these trainings possible. However, the *Digital in India* report shows that in both rural and urban areas, 99 per cent of users access the Internet from a mobile device (Nielsen Holdings, 2020). This highlights a trend in technology penetration, which is that many first-time users are coming online by skipping computers and using smartphones. Hence, taking into consideration IT infrastructure mobile devices as part of the design and implementation requirements, paired with the broadband connectivity needed to make these trainings possible, could improve the outcome of this programme. The restriction of only one person per home in the scheme appears to neglect the reality of rural migration, as well as the unique obstacles faced by women and the elderly, and the requirements of persons of various ages.[7]

The current digital literacy effort in India does not distinguish between the usage patterns and specific conditions of different citizens. Research by Dixon et al. (2014) has shown that men logged onto the Internet more, spent more time online, and accessed more content than women even when the distribution of Internet users is the same among men and women. Specifically for India, it has been shown that factors including age, gender, occupation, caste, etc. have an effect on the diffusion of technology (Mohanty, 2020). It has also been shown that location can have an effect on familiarity with and comfort in using technology, with a distinction between students who stay in urban areas and those that stay in rural areas (Upcraft et al., 2004). Research on TAM has shown that despite overall growth in information usage, there is evidence that there is a significant decline in such usage among the elderly, illiterate and lower income earners compared with younger, well-educated and high-income earners (Porter & Donthu, 2006). One popular assumption is about the generation of digital natives, or those that grew up around technology, and this segment having a high level of digital literacy (Kivunja, 2014). However, it has been shown that even within this segment, inequalities based on gender, age and socioeconomic status are maintained (Bennett et al., 2008).

Digital literacy and community learning

Social learning theory suggests that people learn through observing the behaviour and actions of others (Bandura, 1977). The idea of situated learning takes this further, suggesting that the framework in which the social learning happens and the active participation of the learners helps in gaining new knowledge and skills (Lave & Wenger, 1991). Community-centred learning is not just about skill building; it can be supplementary to learning in formalized academic spaces and involves an interplay between people's perceived realities and their experience with technology. It has been suggested that using spaces like school libraries or community halls as places for informal community learning can enhance digital literacy as well as bypassing individual access issues (Mardis, 2013).

To create a seamless digital literacy learning mechanism, both informal, community-driven learning and formal, individual training must interact together. Community networks fit this model.

> "Wireless community networks, also called community-based Internet service providers, are networks whose infrastructure is built, managed, operated and administered by a community-driven organization or by a community itself by pooling their existing resources and working with partners to start up and scale their activities" (Srivastava, 2016, p. 15).

These networks are structured to be open and accessible, and generally involve the local community in development and management, with the network being enjoyed as a common good. It has been shown in other countries that community networks have a positive effect on digital literacy (Meneses & Mominó, 2010). It has also been shown that using community partnerships to educate students in digital technologies has a positive effect on their digital literacy skills (Truesdell & Birch, 2019). Research has demonstrated that community connections can have a beneficial effect on the implementation of digital literacy acquisition programmes (Jacobs et al., 2015). A case study also demonstrated that providing Internet access and capacity-building to a community of students benefited both their digital literacy skills and access to educational information (Internet Society, 2018).

A report on setting up community networks in India pointed out issues in spectrum allocation, navigating a complex licensing regulation regime, excessive compliance burden and technical challenges (Srivastava, 2016). However, in December 2020, the Public Wi-Fi Access Network Interface scheme was announced in India. This provides for:

> "Public Wi-Fi Networks by Public Data Office Aggregators to provide public Wi-Fi service through Public Data Offices spread across [the] length and breadth of the country to accelerate proliferation of Broadband Internet services through Public Wi-Fi network in the country" (Government of India Press Information Bureau, 2020).

Essentially, this would mean the ability to connect to Wi-Fi broadband almost anywhere, and allow anyone who has a Wi-Fi connection to set up a public Wi-Fi network seamlessly. The details of the implementation of this scheme are still awaited but it has the potential to fuel the expansion of community networks in India.

Recommendations

India's state-run digital literacy programme has been described as one of the largest digital literacy programmes in the world (Financial Express Online, 2017). However, the discussion seems to point out that there is room for improvement in terms of design, capacity and implementation. An additional factor that the author would like to note is the need to take into account the requirements of intended beneficiaries when rolling out policy initiatives. The author would suggest that this is not evidenced in the current state initiatives, because it has been pointed out that everything from information about the schemes, grievance redress mechanisms, fees, certification, etc. is only available online (Standing Committee on Information Technology, 2020). This does not seem to take into consideration the fact that a majority of the target users may be digitally illiterate.

It is increasingly important not only to look at who uses the Internet but also to distinguish varying levels of online skills among individuals.[8] Research has shown that factors including age, gender, education and experience with technology affect both the

ability to successfully complete different tasks online and the time taken, reinforcing the need for digital literacy trainings and assessments designed for segregated user groups (DiMaggio & Hargittai, 2001). The author would suggest that these are factors that should be considered when evaluating the impact and efficacy of any interventions focused on digital literacy.

In terms of further research on this issue, beyond the scope of this paper, the author has a few suggestions. First, a data-collection exercise can be conducted in India which looks at how and why people do or do not choose to interact with technology and which factors influence this decision. This research can be conducted through the framework of TAM, as discussed earlier. It is important that this exercise be conducted with different user groups, with disaggregation based on age, gender, education and location; and takes into account other sociocultural contexts such as religion and caste, which can also influence modern conceptions of digital literacy. It is important to understand how different individuals with different identifiers interact with technology and whether there are different factors that affect this interaction.

Second, one of the main points the author has discussed is the need to improve digital literacy in India because of the prevalence of e-governance. Further, it is suggested that the interaction of citizens with government services be analysed through a focus on the level of digital literacy of both citizens and individuals in government. Since this involves multiple entities, this should be analysed through the framework of actor-network theory. The actor-network theory situates the functioning of society as a conglomeration of the actions of different actors. It was developed through the writings of Latour (1988) as well as Law and Callon (1992). The theory asserts that the role of technology in society is determined by its interpretation by actors, who use their social lenses to arrive at a mutually identifiable use of technology towards a specific routine while maintaining their social network links (Haque & Mantode, 2013).

For example, a 2021 report that looks at last mile delivery of government services in India suggests that the digital literacy of officials as well as different segments of citizens affects how they use technology and access services, the quality of that access and how this affects their perception of the government (Sharma et al., 2021). Thirdly, the implication of digital literacy for access to education, especially when a lot of classes have moved online during COVID-19, needs to be explored and understood better, especially to look at whether this will affect students' future interactions with technology.

Conclusion

In conclusion, the author would highlight that the fact that India has recognized that infrastructure development is necessary to ensure that people are able to access technology is a positive development that could be improved on. In this context, it is hoped that this article provides the reader with some context on the importance of digital literacy to ensure that people use and adopt technology, and can access schemes and entitlements through digital media, while also underscoring the importance of combining formal structured training with community learning opportunities. While India's current digital literacy schemes can be enhanced or improved, like all government processes, user trends are constantly evolving based on needs and information. Digital literacy is important, not merely to access services or information but also to access basic rights and entitlements. It is critical that we endeavour to ensure that all citizens can be equal participants in the digital revolution that India is undergoing.

List of references

Aabø, S. (2005). The role and value of public libraries in the age of digital technologies. *Journal of Librarianship and Information Science, 37*(4), 205–211. https://doi.org/10.1177%2F0961000605057855

Aggorowati, M. A., Iriawan, N., Suhartono, & Gautama, H. (2012). Restructuring and expanding technology acceptance model structural equation model and Bayesian approach. *American Journal of Applied Sciences*, *9*(4), 496–504. https://doi.org/10.3844/ajassp.2012.496.504

Bandura, A. (1977). *Social learning theory* (1st ed.). Pearson. https://doi.org/10.1177%2F1059601177700200317

Barranis, N. J. (2011). *Altering user perceptions of applications: How system design can impact playfulness and anxiety* [Master's thesis, University of Illinois]. Illinois Digital Environment for Access to Learning and Scholarship. https://www.ideals.illinois.edu/bitstream/handle/2142/24139/Barranis_Nanthida.pdf?sequence=1

Bennett, S., Maton, K. A., & Kervin, L. K. (2008). The 'digital natives' debate: A critical review of the evidence. *British Journal of Educational Technology, 39*(5), 775–786. http://dx.doi.org/10.1111/j.1467-8535.2007.00793.x

Birdsall, W. F. (2011). Human capabilities and information and communication technology: The communicative connection. *Ethics and Information Technology, 13*, 93–106. https://doi.org/10.1007/s10676-010-9260-4

Buckingham, D. (2003). *Media education: Literacy, learning and contemporary culture* [Chapter 3: Media literacies]. Polity Press. https://digitalauthorshipuri.files.wordpress.com/2016/01/buckingham-media-education-chapter-3-pdf.pdf

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340. https://doi.org.10.2307/249008

DiMaggio, P. & Hargittai, E. (2001). *From the 'digital divide' to 'digital inequality': Studying Internet use as penetration increases* [Working paper No. 15]. Princeton University Center for Arts and Cultural Policy Studies. https://culturalpolicy.princeton.edu/sites/culturalpolicy/files/wp15_dimaggio_hargittai.pdf

Dixon, L. J., Correa, T., Straubhaar, J., Covarrubias, L., Graber, D., Spence, J., & Rojas, V. (2014). Gendered space: The digital divide between male and female users in Internet public access sites. *Journal of Computer-Mediated Communication, 19*(10), 991–1009. https://doilorg/1111/jcc4.12088

Eisenberg, M. (2008). Information literacy: Essential skills for the information age. *Journal of Library and Information Technology, 28*(2), 39–47. http://dx.doi.org/10.14429/djlit.28.2.166

Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia, 13*(1), 93–106. https://www.researchgate.net/publication/250721430_Digital_Literacy_A_Conceptual_Framework_for_Survival_Skills_in_the_Digital_Era

(continued)

Financial Express Online. (2017, February 8). One of world's largest digital literacy programmes in world, 'Pradhan Mantri Gramin Digital Saksharta Abhiyan' cleared by cabinet. *Financial Express*. https://www.financialexpress.com/india-news/cabinet-approves-pradhan-mantri-gramin-digital-saksharta-abhiyan/543139/

Gie, T., & Chung, J. F. (2019). Technology acceptance model and digital literacy of first-year students in a private institution of higher learning in Malaysia. *Berjaya Journal of Services & Management, 11*, 103–116. http://dx.doi.org/10.5281/zenodo.2622329

Gilster, P. (1997). *Digital literacy*. Wiley Computer Publications.

Government of India Press Information Bureau. (2020, December 9). Cabinet approves setting up of public Wi-Fi networks by Public Data Office aggregators to provide public Wi-Fi service through Public Data Offices without levy of any license fee [Press release]. https://pib.gov.in/PressReleasePage.aspx?PRID=1679342

Haque, A., & Mantode, K. (2013). Governance in the technology era: Implications of actor network theory for social empowerment in South Asia. In Y. K. Dwivedi, H. Z. Henriksen, & D. De' R. Wastell (Eds.). *Grand Successes and Failures in IT: Public and Private Sectors – Proceedings of the International Working Conference on Transfer and Diffusion of IT, TDIT 2013, Bangalore, India, June 27–29* (375–390). Springer. https://doi.org/10.1007/978-3-642-38862-0_23

Indian National Statistical Office. (2020). *Key indicators of household social consumption on education in India*. https://www.thehinducentre.com/resources/article30980071.ece/binary/KI_Education_75th_Final_compressed.pdf

Internet Society. (2018). *A pilot community network in Pakistan: Online supplementary education and its impact*. https://www.Internetsociety.org/wp-content/uploads/2018/09/Pakistan-SupplementaryEducation_short-report.pdf

Jacobs, G., Castek, J., Pizzolato, D., Pendell, K. D., Withers, E., & Reder, S. (2015). *Community connections: Digital literacy acquisition policy brief* [Research brief]. httpsredir=1&article=1019&context=dla_research_briefs

Jha, A. (2020). *Roti, kapda, makan ya Internet* [Food, clothing, shelter or Internet?]. Digital Empowerment Foundation. https://www.defindia.org/wp-content/uploads/2020/03/Roti-Kapda-Makan-Ya-Internet.pdf

Kivunja, C. (2014). Theoretical perspectives of how digital natives learn. *International Journal of Sustainability in Higher Education, 3*(1), 94–109. http://dx.doi.org/10.5430/ijhe.v3n1p94

Landa, R. O. (2004). Amartya Sen: Utilitarianism, ethics and public policy. *Revista Latinoamericana de Desarrollo Económico* [Latin American Journal of Economic Development], *2*, 149–152. http://www.scielo.org.bo/scielo.php?script=sci_arttext&pid=S2074-47062004000100008

Lanham, R. (1995). Digital literacy. *Scientific American, 273*(3), 160–161.

Latour, B. (1988). Science in action: How to follow scientists and engineers through society. Harvard University Press.

(continued)

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press. https://doi.org/10.1017/CBO9780511815355

Law, J., & Callon, M. (1992). The life and death of an aircraft: A network analysis of technical change. In J. Law & W. E. Bijker (Eds.), *Shaping technology/building society: Studies in sociotechnical change* (pp. 21–52). MIT Press.

Manzar, O., Kumar, R., Mukherjee, E., & Aggarwal, R. (2016). Exclusion from digital infrastructure and access. In Centre for Equity Studies, *India Exclusion Report 2016*. https://defindia.org/wp-content/uploads/2017/07/India%20Exclusion%20Report%202016_low.pdf

Mardis, M. A. (2013). What it has or what it does not have? Signposts from US data for rural children's digital access to informal learning. *Learning Media and Technology, 38*(4),387–406. http://dx.doi.org/10.1080/17439884.2013.783595

Martin, A. (2006). DigEuLit – A European framework for digital literacy: A progress report. *Journal of eLiteracy, 2*, 130–136.

Meneses, J., & Mominó, J. M. (2010). Putting digital literacy in practice: How schools contribute to digital inclusion in the network society. *The Information Society, 26*(3), 197–208. https://doi.org/10.1080/01972241003712231

Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: An introduction. *Learning, Media and Technology, 38*(4), 355–367. https://doi.org/10.1080/17439884.2013.783597

Mohanty, P. C. (2020). Is India digitally divided? Identifying the determinants of ICT diffusion at the household level. In D. Maiti, F. Castellacci, & A. Melchior (Eds.), *Digitalisation and development: Issues for India and beyond* (pp. 265–286). Springer Singapore. https://doi.org/10.1007/978-981-13-9996-1_10

Molnar, S. (2003). The explanation frame of the digital divide. Proceedings of the Summer School, Risks and Challenges of the Network Society, 4–8.

Nielsen Holdings. (2020). *Digital in India 2019 – Round 2 report*. https://cms.iamai.in/Content/ResearchPapers/2286f4d7-424f-4bde-be88-6415fe5021d5.pdf

Nussbaum, M. C. (2000). Women and human development: The capabilities approach. Cambridge University Press.

Porter, C. E., & Donthu, N. (2006). Using the technology acceptance model to explain how attitudes determine Internet usage: The role of perceived access barriers and demographics. *Journal of Business Research, 59*(9), 999–1007. https://doi.org/10.1016/j.jbusres.2006.06.003

Rathee, K. (2020, December 31). UMANG: Govt seeks to know impact of 3-year-old Unified Mobile Application for New-age Governance app. *Financial Express*. https://www.financialexpress.com/industry/umang-govt-seeks-to-know-impact-of-3-year-old-unified-mobile-application-for-new-age-governance-app/2161163/

(continued)

Robeyns, I. (2016). The capability approach. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition). https://plato.stanford.edu/cgi-bin/encyclopedia/archinfo.cgi?entry=capability-approach&archive=win2016

Sefton-Green, J., Nixon, H., & Erstad, O. (2009). Reviewing approaches and perspectives on "digital literacy". *Pedagogies: An International Journal, 4*(2), 107–125. https://doi.org/10.1080/15544800902741556

Shapiro, J. J., & Hughes, S. K. (1996). Information literacy as a liberal art: Enlightenment proposals for a new curriculum. *Educom Review, 31*(2).

Sharma, L., Natarajan, S., & Udhayakumar, K. (2021). *Last mile access study: Building offline architectures to enable better access to the state*. Aapti Institute, E-gov Foundation & Omidyar Network India. https://uploads.strikinglycdn.com/files/294143ba-333f-4bcc-9379-6d4742d15509/Last%20Mile%20Report-Digital-Aapti%20Institute.pdf

Srivastava, R. (2016). *Community networks: Regulatory issues and gaps – Experiences from India* [Policy paper]. Digital Empowerment Foundation. https://defindia.org/wp-content/uploads/2017/09/Community-Networks-Regulatory-Issues-Gaps.pdf

Standing Committee on Information Technology. (2019). *National Digital Literacy Mission: Problems and challenges – Fifty-ninth report.* https://eparlib.nic.in/bitstream/123456789/783392/1/16_Information_Technology_59.pdf

Standing Committee on Information Technology. (2020). Action taken by the Government on the observations/recommendations of the Committee contained in their fifty-ninth report (sixteenth Lok Sabha) on 'Review of National Digital Literacy Mission (NDLM) – Problems and Challenges': Eleventh report. https://eparlib.nic.in/bitstream/123456789/790786/1/17_Information_Technology_11.pdf

Telecom Regulatory Authority of India. (2020). *Highlights of telecom subscription data as on 31st January, 2020* [Press release]. https://trai.gov.in/sites/default/files/PR_No.29of2020.pdf

Truesdell, E., & Birch, R. (2019). *Developing digital literacy through community engagement*. Dominican University of California Education Faculty Conference Presentations [9]. https://scholar.dominican.edu/cgi/viewcontent.cgi?article=1007&context=education-faculty-conference-presentations

Upcraft, M. L., Gardner, J. N., & Barefoot, B. O. (Eds.). (2004). *Challenging and supporting the first-year student: A handbook for improving the first year of college*. Jossey-Bass. https://www.wiley.com/en-us/Challenging+and+Supporting+the+First+Year+Student+%3A+A+Handbook+for+Improving+the+First+Year+of+College-p-9780787959685

Endnotes

1 https://thewire.in/tech/india-must-treat-the-Internet-as-a-public-utility-during-covid-19-and-after
2 https://web.umang.gov.in/landing/
3 https://web.umang.gov.in/landing/
5 https://www.bloombergquint.com/technology/modi-repeats-old-digital-india-promise-but-it-needs-new-energy
6 http://bbnl.nic.in/
7 https://www.bloombergquint.com/technology/international-literacy-day-bridging-indias-digital-divide
8 https://www.bloombergquint.com/technology/international-literacy-day-bridging-indias-digital-divide

Best practices in distance education learning, Mexican experiences

By María Cristina Cárdenas Peralta and Ana Lidia Franzoni Velázquez

Introduction

The COVID-19 pandemic and resulting lockdowns have had a dramatic impact on many sectors, including education. According to the United Nations Educational, Scientific and Cultural Organization (UNESCO), nearly 1.6 billion learners in more than 190 countries have been affected by the closures of educational institutions (schools, colleges and universities) and learning spaces (UNESCO, 2020). Faced with this unprecedented upheaval, governments turned to distance learning, greatly accelerating the implementation and use of technology in the teaching-learning process. Despite significant and sustained investment in programmes to integrate technology into the teaching-learning process, the pandemic has revealed certain difficulties in using such technology. This article will serve as a public policy guide for those seeking to design student-centred distance classes.

The paper's initial section lays out the Mexican approach to digital matters pre-pandemic. In particular, it reviews Internet use by the Mexican populace directly before the pandemic. It also provides an overview of the numerous and widely varied government digital inclusion programmes. The paper then sets forth in detail the methodology developed to evaluate teachers' training needs with respect to using technology during the pandemic, and then tailor appropriate courses for them. This methodology's core is an assessment of the requirements of a country-specific population, using international reference frameworks and best practices to understand and address the challenges facing educators relating to technology and digital skills. Using an appropriate methodology, policymakers can design training that engages the population and equips them with the desired skills. Finally, the paper will review some findings from the development of training courses in Mexico during the pandemic and will offer some broader recommendations based on the Mexican experience.

Context

This section describes the shortage of digital equipment and connectivity in Mexico, particularly for the most vulnerable households. It also mentions the different digital inclusion programmes that Mexico has had since 1997, emphasizing the lack of teacher training in them.

Mexican digital access

On 14 March 2020, the Secretariat of Public Education announced that schools in Mexico would close their doors in response to the COVID-19 pandemic. In doing so, it was acting in accordance with World Health Organization recommendations to reinforce social distancing measures.

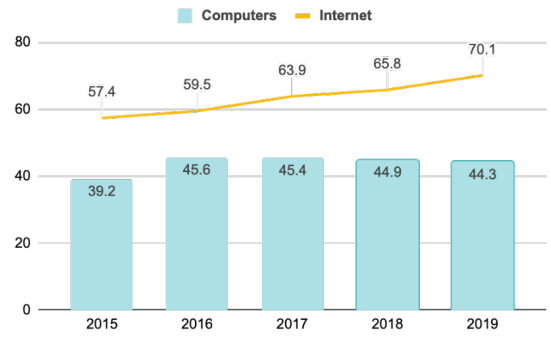
Closing schools had profound repercussions for Mexican education. According to national data, 33.2 million children and teenagers were affected, made up of 28 million enrolled in primary and secondary schools and close to five million more enrolled in pre-primary schools. After a brief pause, Mexico began to implement distance education programmes. Most prominent of these was '*Aprende en Casa*' (Learn at Home), an initiative permitting primary and secondary school students to access age-

based educational content through television programmes.

Schools in Mexico also began to shift learning online, despite lacking the infrastructure needed to face the full extent of the crisis. According to some estimates, the number of children who took online courses was less than 8 million, out of a total population of 26 million children eligible to take such courses (Signos Vitales, 2020).

These numbers may be explained by many Mexican households not having access to the Internet or adequate computer equipment. According to the National Survey on Availability and Use of Information Technologies in Households (Instituto Nacional de Estadística y Geografía, 2020), 80.6 million Mexicans over 6 years of age used the Internet but only 20.1 million households (approximately 70 per cent of total households) had a fixed or mobile Internet connection, while 49.4 million households (approximately 44.3 per cent of total households) had computers (see Chart 8.1). Although Mexico is better positioned than many other countries in Latin America regarding Internet access, there is nonetheless a profound gap within Mexico between rural and urban households (see Chart 8.2).

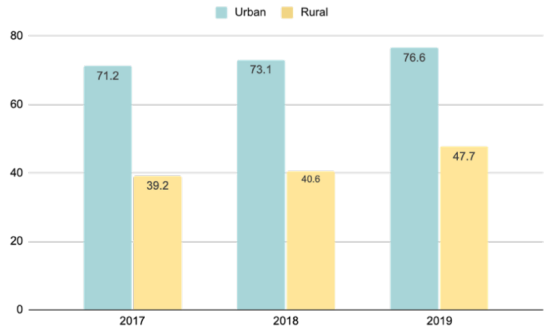
Chart 8.1: Households with computers and Internet, 2015–2019 (percentage of total households)



Source: Instituto Nacional de Estadística y Geografía (2019)

This gap represents a significant limitation on nationwide online courses that might have offered a better response to the pandemic.

Chart 8.2: Internet in rural and urban areas, 2017–2019 (percentage of users)



Source: Instituto Nacional de Estadística y Geografía (2019)

At the time of the crisis, 86.5 million people (75.1 per cent of the total population) over 6 years old used mobile phones, 44.3 per cent of households had a computer at home and 92.5 per cent had a television. The main activities of Internet users were 'passive'[1] and related to entertainment (91.5 per cent), obtaining information (90.7 per cent), and communicating (90.6 per cent) (Instituto Nacional de Estadística y Geografía, 2019).

Pre-pandemic teacher training

According to Mexican government information,[2] 1,197,778 Mexicans are employed as teachers. The majority of these (50.4 per cent) work in elementary schools, followed by secondary school teachers (25.9 per cent) and preschool teachers (23.7 per cent).

Studies published by international institutions show that the effectiveness of information technology (IT) in the learning environment largely hinges on the digital skills of the teachers utilizing that technology and the support provided to them. Although Mexico has incorporated information and communication technology (ICT) into the teaching-learning process since 1997 (see Figure 8.1), those efforts have centred on providing tools such as classroom equipment or delivering computers, relegating teacher training to a lesser position (Franzoni Velázquez et al., 2020).

Figure 8.1: Previous ICT programmes in Mexico, 1997 to present

Source: Authors' own 2021, unpublished

The incorporation of ICT in the Mexican education system started in 1997 (see Figure 8.1), with the School Network Programme (*Programa Red Escolar*, 1997–2004). This programme allowed students, teachers, principals and parents to communicate through networks on the Internet. After that initiative, Enciclomedia (2003–2011) equipped primary and secondary school classrooms with a computer, a projector, an electronic whiteboard, a computer table and a printer. Rather than a dynamic use of technology, this programme simply used technology to complement the current curriculum, with the extent of use wholly dependent on the teacher. Mexico then implemented Digital Skills for All (*Habilidades Digitales para Todos*, 2009–2012), a programme that sought to promote students' and teachers' digital skills in telematic classrooms. This programme was the first to promote training performance indicators and certification.

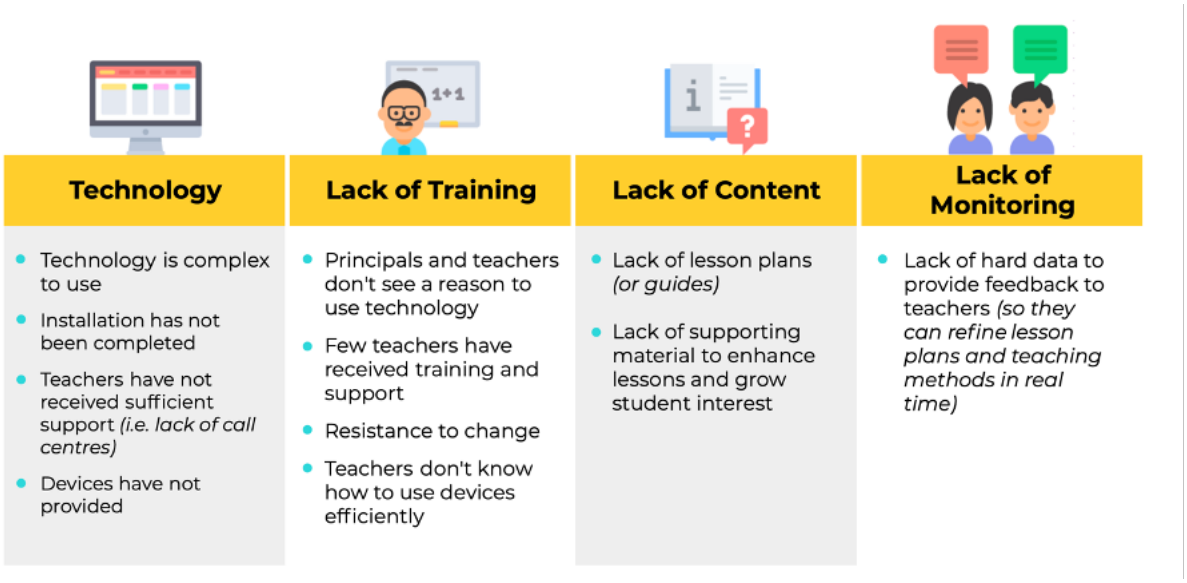
A change of government led to a new initiative (Mi Compu.mx, 2013–2014), centred on delivering over 240,000 devices to students in primary school Grades 5 and 6 in three different states. The programme sought to inspire the use of technology as a tool and object of learning. During the 2014/15 school year, the programme – which had changed its name to the Inclusion and Digital Literacy Programme (*Programa de Inclusión y Alfabetización Digital*) – expanded its reach, providing 708,824 tablets and technological equipment accessories in 16,000 public schools in six states. The equipment contained pre-loaded material for Grade 5 students, computer programs and content for the family. This expanded programme was Mexico's first significant foray into teacher training, with 8,096 educators trained. For the 2015/16 school year, the programme changed its name to Digital Inclusion Programme (*Programa de Inclusión Digital*). It reached 15 states, giving 1,073,174 tablets with the Windows operating system to Grade 5 students and 71,480 tablets to teachers in 32,000 schools.

Mexico then changed course. The next programme (@prende 2.0 Programme, 2016 to present) was a break from Mexico's previous pattern in that it was not focused on technological equipment. Rather, it sought to promote teacher training as the key element for the successful incorporation of ICT. The focus on teachers gave policymakers insights into why merely providing tools did not result in digital literacy in students (see Figure 8.2) (Franzoni Velázquez et al., 2020).

Certain data from the Organisation for Economic Co-operation and Development (OECD) prior to the crisis, i.e. the 2018 Teaching and Learning International Survey (TALIS), suggested that teachers, students and schools in Mexico were better prepared to face the impact of the COVID-19 pandemic than other countries.[3] However, the Mexican experience during the pandemic has illustrated the shortcomings in the country's emphasis on providing tools rather than teacher training in ICT to ensure effective digital learning (see Charts 8.3 and 8.4) (OECD, 2019).

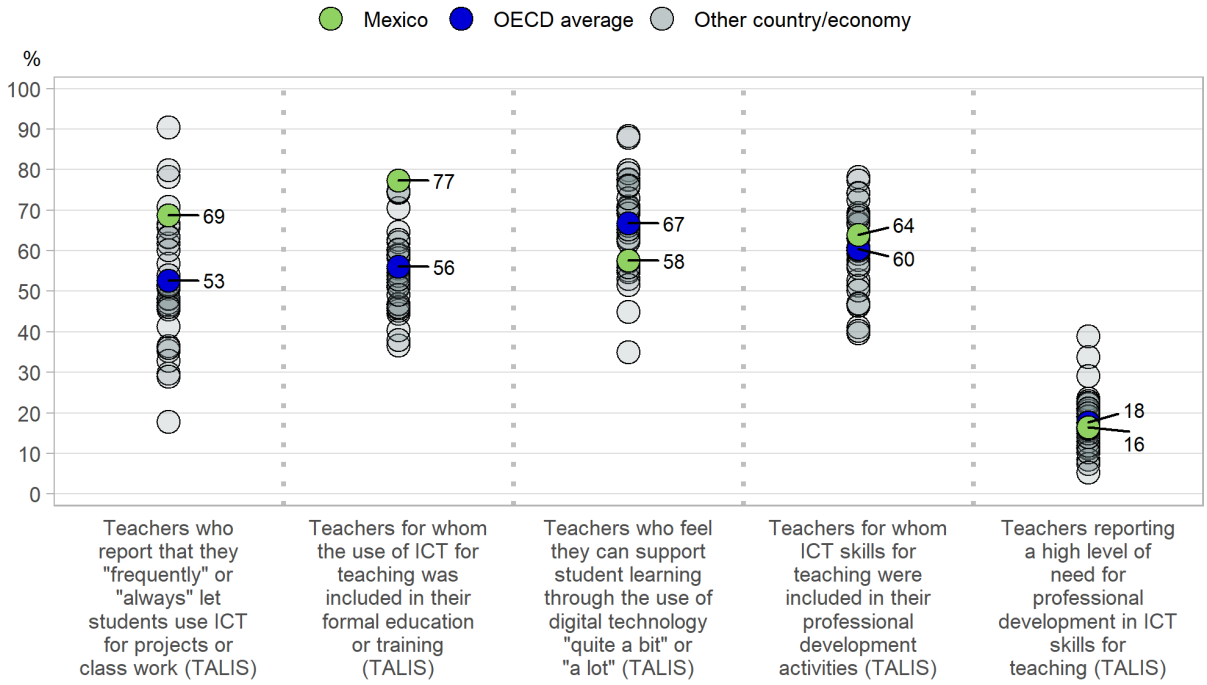
Despite Mexico's involvement with digital literacy and computational thinking, particularly with @prende 2.0, it was unable to build on its previous efforts to achieve nationwide, truly innovative and effective remote learning during the pandemic. It became apparent that teachers were struggling to move from face-to-face to distance education. Appreciating this difficulty, the Mexican Chamber of Electronics,

Figure 8.2: Why technology did not transform education



Source: Authors' own 2021, unpublished

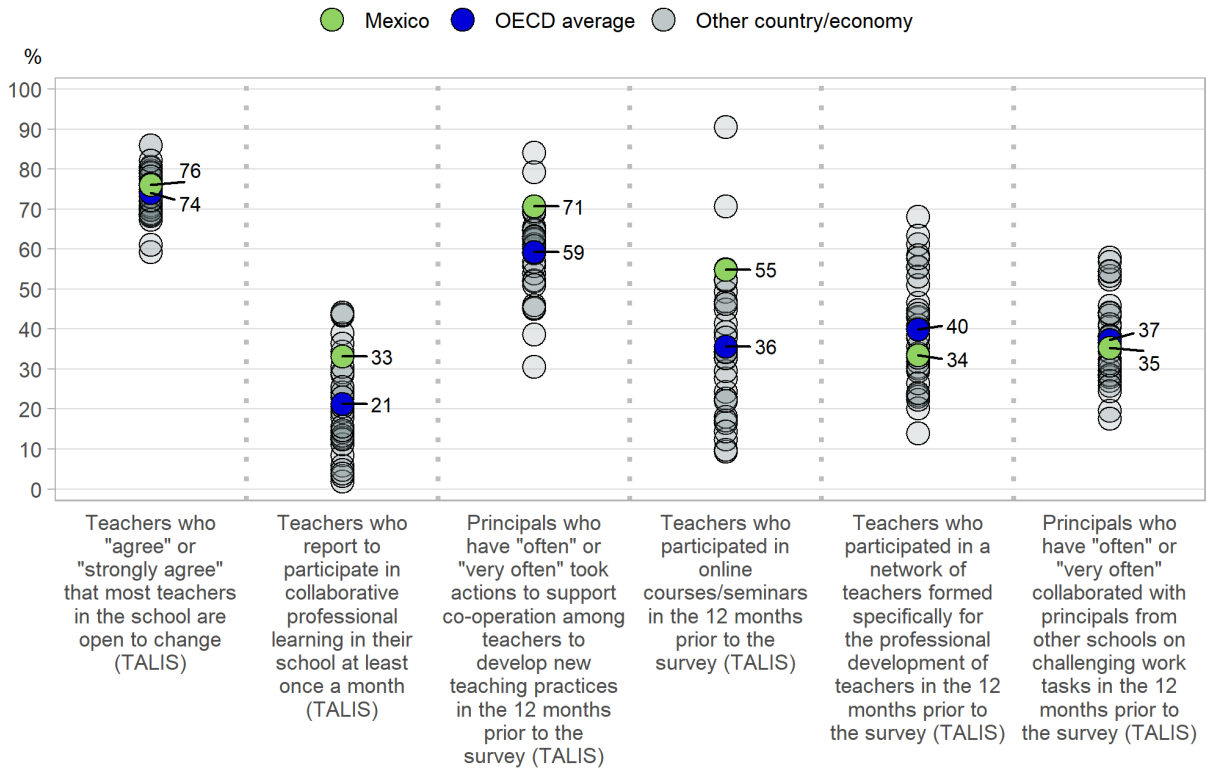
Chart 8.3: Teachers' preparedness for ICT-based teaching prior to the crisis



Source: OECD (2019)

Telecommunications and Information Technologies hired 3C Innovation for Human Development (3C), an education consulting company based in Mexico City, to develop a programme to support teachers and other populations in this transition. 3C began by developing a methodology that allowed it to understand learner needs and then tailor

Chart 8.4: Schools' leadership, collaboration and resources prior to the crisis



Source: OECD (2019)

courses to best help them. The following section explains this approach in detail.

Methodology

The methodology used to define the best training practices is derived from the results of online surveys and focus group surveys relating to training courses offered previously by 3C. The training programme supported teachers during the COVID-19 crisis by focusing more directly on training in practical technological and digital problems identified by teachers in focus groups. Surveys to determine the effectiveness of the courses were sent to the teachers and educational authorities who participated in the training.

3C designed the following five-step methodology to create each course:

- Stage1: Training design
  - Reference frameworks
  - Digital tools
  - Best distance learning practices
  - Challenges teachers face during the pandemic
- Stage 2: Application of the baseline survey
- Stage 3: Training delivery
- Stage 4: Application of a follow-up survey
- Stage 5: Issuance of a diploma.

Stage 1: Training design

The courses aimed to offer training in digital and pedagogical skills, as well as support for developing strategies to improve learning practices. In order to do so, 3C consulted different international reference frameworks, potential digital tools, the best practices for teaching via distance, and challenges the teachers themselves identified.

Table 8.1: UNESCO competency framework for teachers

Level 1: Basic knowledge of ICT	Use of IT as a tool for production, management and practice	The teacher demonstrates a basic level of IT management, using digital resources to guide the student in their learning. Use of productive tools, multimedia, searches for information on the Internet, and communication using social networks.
Level 2: Deeper knowledge of ICT	Solving problems via the use of IT	The teacher acts as a manager and guide for projects that consider real problems. Use of more sophisticated technologies, such as simulators, thematic search engines and/or collaboration tools
Level 3: Generation of knowledge	Creation of innovative products via IT	The teacher supports their students in the creation of products with IT and promotes the planning and management of their objectives and activities. Demonstrates a wide understanding of IT and uses programming and robotics to promote computational thinking.

Source: UNESCO (2018)

Reference frameworks

The selection of training objectives was based on a review of several existing frames of reference. In particular, the European Commission's DigCompEdu framework (Redecker, 2017), the UNESCO Competency Framework for Teachers (UNESCO, 2018) and the International Society for Technology in Education (ISTE) Standards for Educators were consulted (ISTE, 2021).

3C adopted different aspects of these frameworks. Foremost, it incorporated international standards to assess teacher skills in using ICT as set forth in the UNESCO and DigCompEdu frameworks. 3C employed the UNESCO framework to establish a baseline of the strengths and weaknesses of teachers at this level due to the emergency closure of schools (see Table 8.1). 3C also used the six competencies set forth in the DigCompEdu framework. These highlight that teachers need to be trained not just individually in ICT skills but also in transferring knowledge to their students in the application of digital technologies in a critical and responsible way in terms of information, communication, content generation, well-being and problem solving. The ISTE Standards were selected for transversality, knowledge and application (see Table 8.2).

Digital tools

The courses provided by 3C taught how to use and integrate a wide variety of digital tools for learning, including the Microsoft suite (Word, Teams, PowerPoint, etc.), the Google Suite (Drive, Search, Classroom, Meets), YouTube, Zoom, WhatsApp, Canva, Padlet, Kahoot, Flipgrid, etc. These digital tools were selected from the top 100 tools for educators, taking into consideration the infrastructure and teachers' equipment (i.e. most teachers have little connectivity, most of them use only telephones and the most common operating system that they use is Android). The top 100 tools were voted on by 2,369 educators from 45 countries (see Figure 8.3)(Hart, 2020).

Best practices in distance education

Best practices were also considered in designing teacher training. These best practices were drawn from previous experience and research in digital education, both in Mexico and around the world. They were important not only for the teacher training itself but also as a model for teachers to replicate in training their students. These best practices included:

1. identifying the goal and expectation of each course before starting the class

Table 8.2: Reference frameworks adaptation

DigCompEdu		ISTE	
Area 1: Professional engagement	1.1 Organizational communication		
	1.2 Professional collaboration	**Collaborator**	4a. Dedicate planning time to collaborate with colleagues to create authentic learning experiences that leverage technology
	1.3 Reflective practice		
	1.4 Digital continuous professional development	**Leader**	1c. Stay current with research that supports improved student learning outcomes, including findings from the learning
Area 2: Digital resources	2.1 Selecting digital resources	**Designer**	5b. Design authentic learning activities that align with content area standards and use digital tools and resources to maximize active, deep learning
	2.2 Creating and modifying digital resources	**Leader**	2c. Model for colleagues the identification, exploration, evaluation, curation and adoption of new digital resources and tools for learning
	2.3 Managing, protecting and sharing digital resources	**Citizen**	3d. Model and promote management of personal data and digital identity and protect student data privacy
Area 3: Teaching and learning	3.1 Teaching	**Learner**	1a. Set professional learning goals to explore and apply pedagogical approaches made possible by technology and reflect on their effectiveness
		Leader	2a. Shape, advance and accelerate a shared vision for empowered learning with technology by engaging with education stakeholders
	3.2 Guidance	**Collaborator**	4c. Use collaborative tools to expand students' authentic, real-world learning experiences by engaging virtually with experts, teams and students, locally and globally
	3.3 Self-regulated learning	**Facilitator**	6a. Foster a culture where students take ownership of their learning goals and outcomes in both independent and group settings
		Leader	2b. Advocate for equitable access to educational technology, digital content and learning opportunities to meet the diverse needs of all students

Table 8.2: Reference frameworks adaptation (continued)

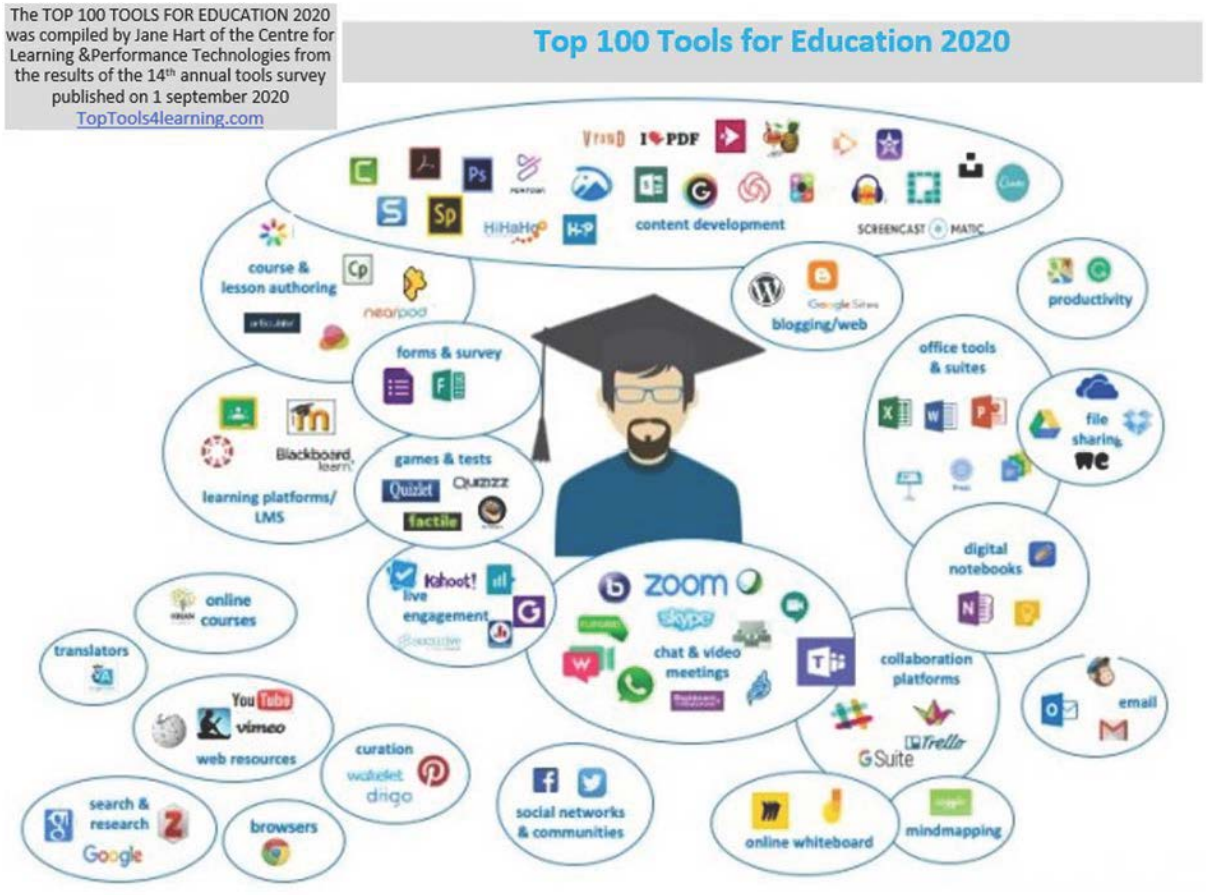
DigCompEdu		ISTE	
Area 4: Assessment	4.1 Assessment strategies	**Analyst**	7c. Use assessment data to guide progress and communicate with students, parents and education stakeholders to build student self-direction
	4.2 Analysing evidence	**Analyst**	7a. Provide alternative ways for students to demonstrate competency and reflect on their learning using technology
	4.3 Feedback and planning	**Analyst**	7b. Use technology to design and implement a variety of formative and summative assessments that accommodate learner needs, provide timely feedback to students and inform instruction
Area 5: Empowering learners	5.1 Accessibility and inclusion		
	5.2 Differentiation and personalization		
	5.3 Actively engaging learners	**Learner**	1b. Pursue professional interests by creating and actively participating in local and global learning networks
		Citizen	3b. Establish a learning culture that promotes curiosity and critical examination of online resources and fosters digital literacy and media fluency
Area 6: Facilitating learners' digital competence	6.1 Information and media literacy	**Designer**	5c. Explore and apply instructional design principles to create innovative digital learning environments that engage and support learning
	6.2 Digital communication and collaboration	**Collaborator**	4d. Demonstrate cultural competency when communicating with students, parents and colleagues, and interact with them as co-collaborators in student learning
			6d. Model and nurture creativity and creative expression to communicate ideas, knowledge or connections
	6.3 Digital content creation	**Designer**	5a. Use technology to create, adapt and personalize learning experiences that foster independent learning and accommodate learner differences and needs
		Facilitator	6b. Manage the use of technology and student learning strategies in digital platforms, virtual environments, hands-on makerspaces or in the field

Table 8.2: Reference frameworks adaptation (continued)

DigCompEdu		ISTE	
	6.4 Responsible use	**Citizen**	3a. Create experiences for learners to make positive, socially responsible contributions and exhibit empathetic behaviour online that builds relationships and community
		Citizen	3c. Mentor students in safe, legal and ethical practices with digital tools and the protection of intellectual rights and property
	6.5 Digital problem solving	**Facilitator**	6c. Create learning opportunities that challenge students to use a design process and computational thinking to innovate and solve problems

Source: Authors' own 2021, unpublished

Figure 8.3: Top 100 tools for education 2020



Source: Hart (2020)

2. making a 'real use' connection to transform the teaching practice
3. using interactive and playful tools to engage the participants
4. employing deeper, shorter and more targeted content
5. creating work groups during online classes

6. considering the emotional state of the participants.

Challenges teachers face during the pandemic

3C also attempted to identify the primary challenges facing teachers during the pandemic, using both Mexican national resources and its own methods. More particularly, from 30 July to 3 September 2020, 366,571 teachers participated in a national survey identifying the most important continuous training topics of interest that they needed for distance learning (see Table 8.3).

This extensive survey evidenced the need to make changes in the educational system to face the new challenges. Teachers, for example, demand training to develop digital skills and pedagogical tools, and continuous support to fulfil their teaching mission.

On 29 September 2020, 157 teachers who teach classes at different educational levels in different states of Mexico participated in a focus group. In this meeting, teachers mentioned the most important challenges they were facing, which were then used to further focus the courses offered by 3C (see Figure 8.4).

During the conversation, the teachers pointed out the unprecedented nature of the challenges facing teachers, students and their respective families. Teachers further emphasized the inequalities among students' families, which were brought into starker relief by the pandemic. Vulnerable households, for instance, lack access to digital devices and stable Internet connectivity, an adequate place at home to study, privacy, and parents who can guide and support their children's learning (parents have uneven levels of digital skills), among other problems. Lack of proper equipment and connectivity also presented problems for teachers.

Table 8.3: Topics of interest in continuing education

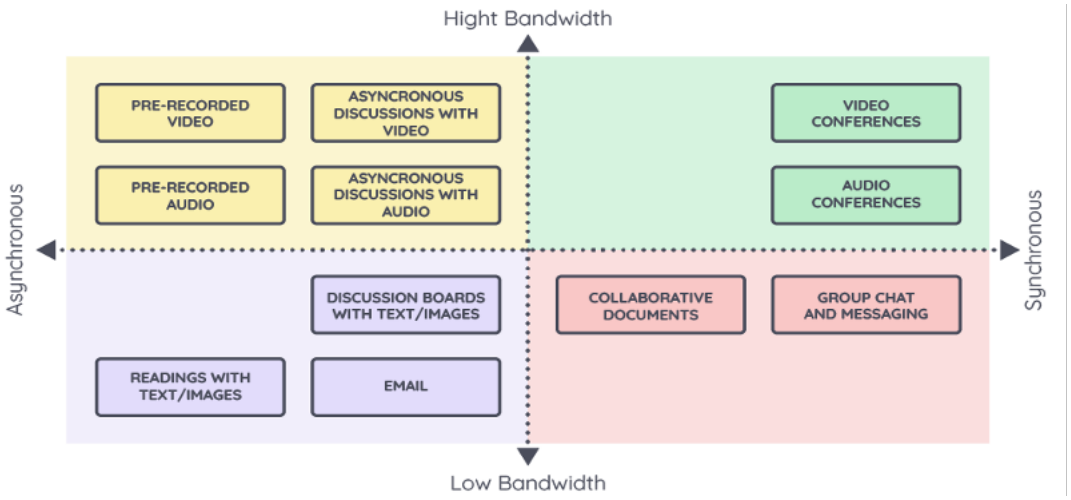
Topics of interest	Participants	%
Design of teaching strategies	233,714	12
Didactic use of ICT	226,200	11
Planning	201,606	10
Learning assessment	199,338	10
Innovation and credibility	192,109	10
Collaborative learning	169,511	9
Methodologies for teaching	162,396	8
Relationship and communication with families	125,614	6
Autonomy in learning	117,994	6
Tutorial of learning how to learn	104,546	5
Academic leadership	95,159	5
Peer tutoring	70,563	4
Basic literacy	59,526	3
Specific didactic models	15,715	1

Source: Secretaria de Educación Pública (2020)

Figure 8.4: Challenges teachers faced during the pandemic

Source: Authors own, 2021 unpublished

Figure 8.5: Teachers' use of technology



Source: Ho (2021)

In addition to equipment deficiencies, teachers lamented the inadequacy of their training for the challenge. Teachers highlighted a range of gaps in their training, including development of digital skills, use of digital tools and implementation of new pedagogical methods to create content. This lack of training led to some rejection of virtual classes, difficulties, problems engaging students in the remote environment, and failure to appreciate and attend to students' emotional needs. Finally, teachers were concerned about assessment practices. These failures in teacher training evidence problems with planning and execution in the Ministry of Education.

Stage 2: Application of the baseline survey

A baseline survey was conducted in each course to obtain reliable and useful data before the respective training project started. The survey had both closed and open-ended questions, employing a mix of multiple choice, rating scale, dropdown and matrix questions. The results were used to monitor and evaluate the project.

Stage 3: Training delivery

The individual courses were designed to be live-training webinars in Zoom. Each course addressed one topic (i.e. use of a digital tool or work on a particular pedagogical skill), and comprised between three and five hour-long sessions.[4]

The training considered two particularly important factors:

1. The type of infrastructure and equipment teachers have (types of connectivity, devices and operating systems).
2. The teachers' level of technology use. Even though teachers were invited to follow the class, it was recommended that they first understand the tool and then try to use it (it was assumed that teachers are at a basic level). For that reason, for most classes, the recorded lesson was available for several days after the class for review and consultation.

When designing training courses, 3C consulted the matrix shown in Figure 8.5.

Between May 2020 and April 2021, 3C offered 116 online courses (see Chart 8.5). These courses were provided to teachers from all grade levels, either free (44) or at a minimal

Chart 8.5: Number of courses offered by 3C

Source: Authors' own 2021, unpublished

Chart 8.6: Number of participants in 3C courses

Source: Authors' own 2021, unpublished

cost (72). Although most of the courses were targeted at teachers (60), 3C also offered by open invitation specific courses to empower women entrepreneurs to thrive in the digital economy (29) and students who wanted to develop computational skills such as programming or coding (27).

More than 14,400 attendees took the courses: 5,700 of them were teachers (see Chart 8.6).

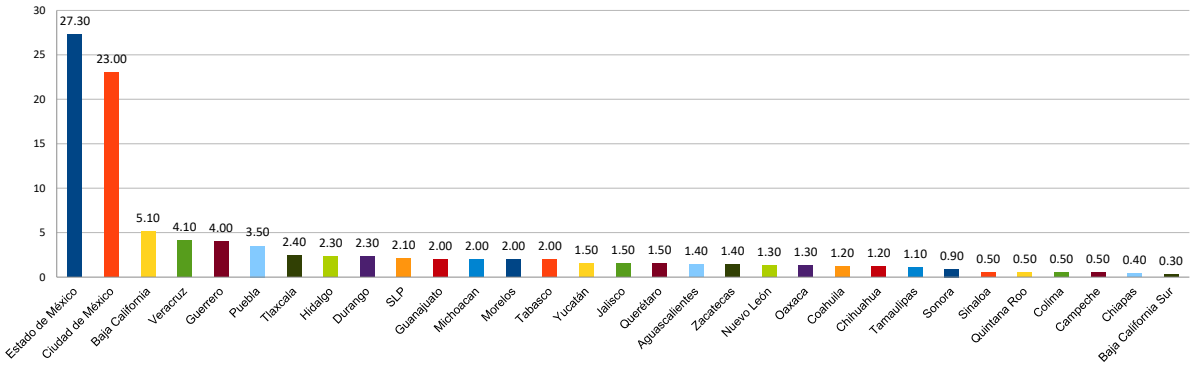
Focusing on the teacher population (as shown in Chart 8.7), more than 50 per cent were from Mexico City or the State of Mexico. This was expected given the relative proliferation of technology in those areas. Despite the heavy representation from these two areas, every Mexican state was represented.

Nationally and among the participants in this programme, more women than men work in the education sector in Mexico. According to the data used for this article, 82.4 per cent of teachers and students in the courses were women (see Chart 8.8).

At the time of the training, most of the teachers were teaching in high school (37.6 per cent), followed by upper primary (which corresponds to Grades 4–6 of elementary school) and higher education (see Chart 8.9).

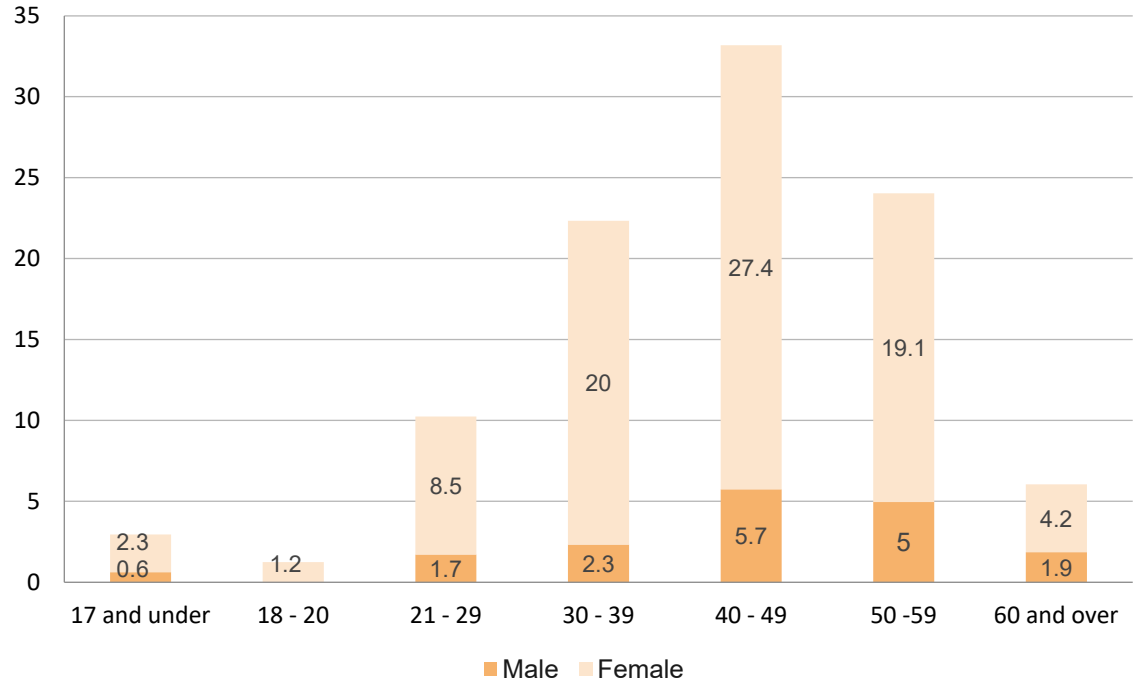
All the courses given were classified according to Table 8.2: Reference frameworks adaptation (see Chart 8.10). Some courses related to more than one competency required by teachers.

Chart 8.7: Teachers per state



Source: Authors' own 2021, unpublished

Chart 8.8: Teachers' age distribution by gender (% of total teachers)

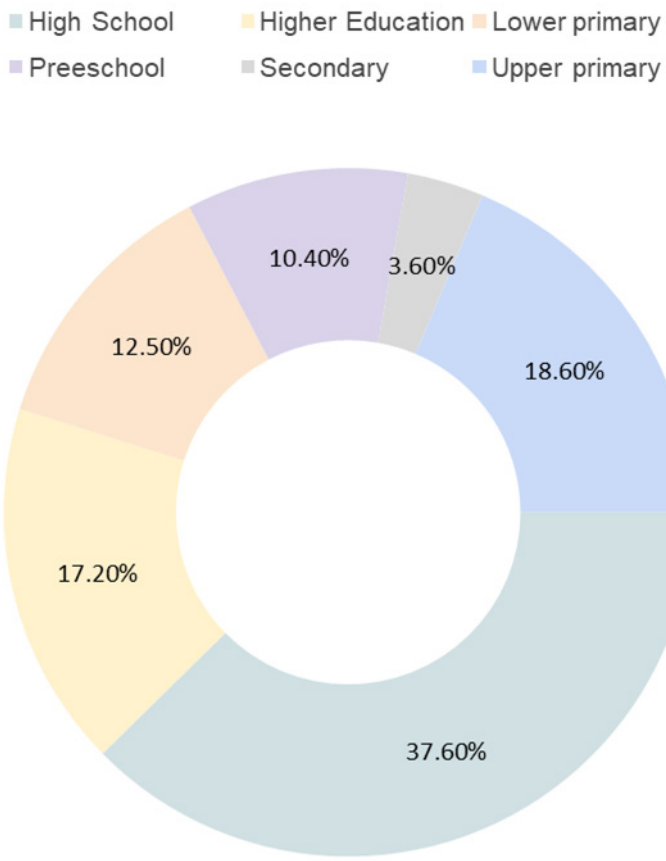


Source: Authors' own 2021, unpublished

Stage 4: Evaluation of the courses

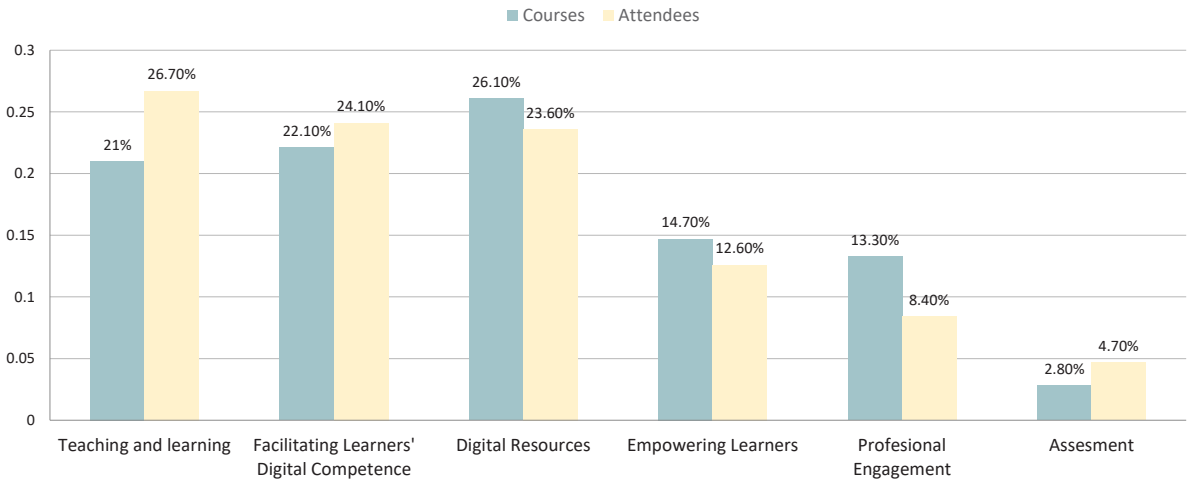
A follow-up survey was designed to obtain teachers' feedback and improve different aspects of the classes. Teachers were invited to complete the survey by the end of the class, providing important insights into which courses were useful and resonated with them. For example, teachers emphasized the usefulness of workshops (see Chart 8.11) and suggested other topics for courses. This collaboration was essential to proper tailoring of useful courses. It is interesting to note that, as the pandemic progressed, teachers suggested more courses

Chart 8.9: Grade level taught by training participants



Source: Authors own 2021, unpublished

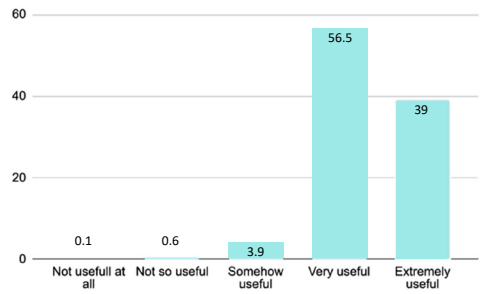
Chart 8.10: Courses given to develop each competency



Source: Authors' own 2021, unpublished

relating to retaining students' attention, assessment and emotional support.

Chart 8.11: Teachers' assessment of the usefulness of the courses (%)



Source: Authors' own 2021, unpublished

Stage 5: Issuance of the diploma

At the end of each course, 3C provided downloadable course completion diplomas for the attending teachers. Teachers were also able to enter the 3C site and access the records of the 3C courses that they had completed

Main findings and conclusion

Although 3C offered courses to women entrepreneurs and students using the same methodology as employed for teachers, this paper has focused on the information gathered from the teacher courses during the pandemic, given that it is the largest and most complete data set. These data provide great insight into the deficiencies in training to prepare for an event like the pandemic, as well as insights into ways forward.

The baseline information showed that very few teachers were adept enough to combine high-tech and low-tech approaches to help facilitate the student learning process, as necessitated by the pandemic. This knowledge gap is an important demonstration of the need for continuous training to reskill and upskill teachers. In particular, teachers require training in new pedagogical methods allowing for a smoother transfer of knowledge to students, as well as in soft skills to better support students' emotional well-being.

The courses and surveys conducted by 3C also revealed that teachers could benefit from personalized training focused on particular skill levels and needs. That personalization, however, should not come at the expense of peer work, which was seen to be critical to understanding the course content.

The pandemic showed that distance training could be done efficiently and cost-effectively, a marked departure from traditional face-to-face training. Distance training came with the additional advantage of effectively reaching a wider, more geographically diverse population than in the typical classroom setting. Distance learning also guarantees the same quality of instruction for all pupils while affording learners flexibility in accessing knowledge. This aspect of distance learning is important in developing countries like Mexico, where teachers are often hard put to find time for training given their intense workload.

The data also highlighted the importance of tailoring training to account for potential urban/rural divides. Training that takes into consideration the lack of connectivity in rural areas can help mitigate the differences. For rural populations, training teachers in how to use free social networks offered by telecommunications companies, evaluate students with different methodologies, and download material (PDFs, videos, etc.) to consult them offline and in different schedules, is essential in a way it is not in urban areas.

The experience of training Mexican teachers illustrated the vital role played by surveys and other tracking mechanisms in designing effective training courses. In the Mexican experience, the most effective surveys: (1) identified teachers in some way (such as a national ID), (2) were easy to complete (with only necessary questions) but engaging, and (3) were tied to incentives to answer (i.e. diplomas, raffles, etc.). This information can then be used to identify an individual teacher's needs and areas for improvement. Data can also help schools measure the effectiveness and performance of their teachers. It is therefore recommended to use a variety of tools (focus groups, community chats, etc.) proactively to obtain teacher opinions. This strengthens the

training courses and helps develop stronger educators.

Finally, the trainings showed the importance of building positive reinforcement for teachers. Teachers need more than three interventions to innovate and adapt technology to their classes. Sharing their ideas, doubts and worries with peers and experts in the field – and getting positive feedback – is important to encourage success.

The issuance of diplomas and certificates likewise acts as a tangible incentive for training. Safeguarding this information through technologies like blockchain insulates against problems stemming from job loss and government change, and gives a powerful incentive to teachers to continue developing their skills and act as agents of change in their localities (Franzoni Velázquez et al., 2019).

List of references

Franzoni Velázquez, A.L., Cardenas, C., & Almazan, A. (2019). Using blockchain to store teachers' certification in basic education in Mexico. *IEEE 19th International Conference on Advanced Learning Technologies (ICALT)*, 217–218. http://dx.doi.org/10.1109/ICALT.2019.00070

Franzoni Velázquez, A.L., Cardenas Peralta, M.C., & Mandujano Canto, J.Á. (2020). Lessons from the training and support of teachers in the development of digital skills: A case study of @prende 2.0. *Digital Education Review,* 37(June), 154–171. https://doi.org/10.1344/der.2020.37.154-171

Hart, J. (2020). *Top 200 tools for learning*. Top Tools for Learning 2020. https://www.toptools4learning.com

Ho, M. (2021, April 29). From face-to-face instruction to online teaching: practical considerations for synchronous and asynchronous teaching and learning. *FOCUS on University Teaching & Learning*. https://focus.clt.dal.ca/blog/from-face-to-face-instruction-to-online-teaching-practical-considerations-for-synchronous-and-asynchronous-teaching-and-learning#:~:text=Bandwidth%20Immediacy%20Matrix

Instituto Nacional de Estadística y Geografía (2020, February 17). *Encuesta nacional sobre disponibilidad y uso de tecnologías de la información en los hogares: ENDUTIH 2019* [In Mexico there are 80.6 million Internet users and 86.5 million mobile phone users: ENDUTIH 2019] [press release no. 103/20]. https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2020/OtrTemEcon/ENDUTIH_2019.pdf

Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado, and Gobierno de España Ministerio de Educación, Cultura y Deporte (2017). *Marco común de competencia digital docente* [Teaching digital competence framework]. http://educalab.es/documents/10180/12809/MarcoComunCompeDigiDoceV2.pdf

International Society for Technology in Education (2021). *ISTE standards for educators*. https://www.iste.org/standards/for-educators

Organisation for Economic Co-operation and Development (2019). *Education at a glance 2019: OECD Indicators.* OECD Publishing. https://doi.org/10.1787/f8d7880d-en

Organisation for Economic Co-operation and Development (2019). *TALIS 2018 results (Volume I): Teachers and school leaders as lifelong learners*. OECD Publishing. https://doi.org/10.1787/1d0bc92a-en

Organisation for Economic Co-operation and Development (2020). *TALIS 2018 results (Volume II): Teachers and school leaders as valued professionals.* OECD Publishing. https://doi.org/10.1787/19cf08df-en

Redecker, C. (2017). *European framework for the digital competence of educators*. Publications Office of the European Union. https://ec.europa.eu/jrc/en/digcompedu

Secretaria de Educación Pública (2020). *Encuesta sobre el taller 'Horizontes: colaboración y autonomía para aprender mejor' resultados Septiembre 2020* [Survey on the workshop 'Horizons: collaboration and autonomy to learn better' results September 2020]. https://dochub.com/crcarden/Dbd3xkWVe2N4X0Lw49AYlz/resultados-horizontes-nacional-1-1-pdf?dt=3YV21hjKQAYFpn8hjwyc

(continued)

Signos Vitales (2020). *The pandemic in Mexico: The scope of the tragedy*. https://signosvitalesmexico.org.mx/rb/wp-content/uploads/2020/10/Pandemic-in-Mexico-1.pdf

United Nations Educational, Scien-tific and Cultural Organization (2018). *UNESCO ICT competency framework for teachers*. https://unesdoc.unesco.org/ark:/48223/pf0000265721

Endnotes

1 Passive activities are related to liking, commenting, sending messages and otherwise engaging with other users. In educational environments, students can be 'passive users' when teachers are the sole operators of the technology.

2 Results from National Survey of Occupation and Employment, corresponding to the fourth quarter of 2019.

About the Contributors

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Carlos is the General Coordinator of the Centro de Investigación en Tecnologías y Saberes Comunitarios (CITSAC) and Research Coordinator at REDES A.C. and Rhizomatica. He has a PhD and master's in Sociology from Universidad Autónoma de Puebla and a bachelor's degree in Communication Sciences from Universidad de las Américas Puebla. He has been a member of the National System of Researchers Level 1 of the Consejo Nacional de Ciencia y Tecnología of Mexico since August 2019. As an expert consultant on indigenous people's issues at the International Telecommunication Union (ITU), he co-coordinates and teaches the 'Training Programme for Promoters and Technical Promoters in Indigenous Communities in Telecommunications and Broadcasting in Latin America'. He also coordinates the training and mentoring work package in the international project 'Supporting Community-led Approaches to Addressing the Digital Divide', developed by the Association for Progressive Communications and Rhizomatica.

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List of Acronyms

3C	3C Innovation for Human Development
AR	Augmented Reality
AWS	Amazon Web Services
CITSAC	Centro de Investigación en Tecnologías y Saberes Comunitarios
DigComp	Digital Competence Framework for Citizens
DLGF	Digital Literacy Global Framework
DTC	Digital Transformation Centres
EdTech	Educational Technologies
EU	European Union
FILAC	Fund for the Development of Indigenous Peoples of Latin America and the Caribbean
GDP	Gross Domestic Product
ICT	Information and Ccommunication Technology
IFC	International Finance Corporation
IRC	International Rescue Committee
ISTE	International Society for Technology in Education
IT	Information Technology
ITAM	Instituto Tecnológico Autónomo de México
ITU	International Telecommunication Union
LMC	Last Mile Connectivity
OCHA	United Nations Office for the Coordination of Humanitarian Affairs
OECD	Organisation for Economic Co-operation and Development
STEM	Science, Technology, Engineering and Math
TALIS	Teaching and Learning International Survey
TAM	Technology Acceptance Model
UMANG	Unified Mobile Application for New-Age Governance
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VR	Virtual Reality
WTDC	World Telecommunication Development Conference

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